A NEW SOCIAL MARKET ECONOMY FOR THE 21ST CENTURY

Emilio Fontela – Economist and Global Researcher

Edited by

Otto HIERONYMI and Martino LO CASCIO

Forewords.

Giorgio Alleva, Renato Guarini

All those who have met Emilio Fontela certainly noticed the mobility of his face, moving promptly from the concentration and attentiveness of listening, to a good-natured and open smile. This mobility of expression mirrored the swiftness of his thoughts as reflected in his bright and clever eyes, that moved fast, but also easily focused on a face or a detail. Even those who do not endorse physiognomics must concede that these physical traits corresponded not only with his disposition and character – it is not surprising that the nature of a man leaves a trace on his looks – but also with his interests. His scientific production ranged from long-term economic and technological forecasting to general equilibrium models and input-output tables, from development economics (also and especially at regional and local scale) to the economics of energy sources, from the issues of international trade to the problems related to the calculation of total factor productivity, from the role of technology (he first published a paper on ICT in the early 1980s) to the knowledge society.

These diverse and multiple interests can be found in the bibliography attached to this book. They should not be seen as a symptom of eclecticism – although Emilio Fontela was certainly eclectic and versatile – but rather as a mark of his brilliant curiosity. This too was an element that stood out since the first conversation with him. He never took anything for granted as concerned subject matters and when meeting people he was willing to believe that they were clever and in good faith, at least at first. From the intersection of these features derived his willingness to explore new roads, sometimes far away from the well-trodden ones. In his bibliography many titles confirm his inexhaustible curiosity as well as his ability to extract scientific lessons even from the most occasional and even trifling stimuli (he also worked in the field of consultancy and applied economy).

Emilio Fontela certainly possessed a free mind but he cannot be defined a heterodox economist: he was well-grounded in mainstream economic theory, as confirmed by his early interest for the Walrasian general equilibrium models and his lifelong adhesion to the Leontievian input-output scheme. He was not heterodox in his way of working, either, as we can see that even his most speculative research work always took account of the need for measurement and tried as hard as possible to support any statement with quantitative empirical evidence. And this effort makes him one of us, statisticians and quantitative economists.

However, heterodoxy can be found in his dissatisfaction with the state of the art of world economy (he thought that the market alone was unable to solve all the problems of globalization and that it would be necessary to mobilize all the resources of society to face this new challenges) and with the theoretical models of economics and of the other social sciences. Years before Sarkozy created the Stiglitz-Sen-Fitoussi commission, he had identified a possible solution in putting together economic development, removal of inequalities and sustainable growth: "Economists, or at least a non-negligible part of them, are increasingly searching for an approach to economic growth for countries, regions, enterprises or people which can be compatible with a reasonable use of natural resources, environmental preservation in a broad sense and a fair distribution of economic welfare on a global scale, even among future generations." [Fontela & Pulido 2004, p. 10]

In addition, this perspective – he stressed – makes it necessary to rethink our theoretical framework (neither Keynesian nor neo-classical models seem adequate) and the very accounting schemes, that he considered "meaningless." This dissatisfaction is certainly widely shared today and, if you allow me to make a reference to the Institute that I am chairing, it is a guiding principle in our work in that large experimental laboratory represented by the BES Project, the project for the measurement of equitable and sustainable development. Simple answers to complex problems do not exist: the creation of a series of specific indicators to describe the dimensions of equitable and sustainable

development is a necessary first step forward, but it is not sufficient to provide the answers expected from a consistent accounting system capable of explaining and quantifying the economic, social and environmental aspects. In this work, one of the spearheads of our research as public statisticians, the lessons of Emilio Fontela can still provide valuable guidelines.

Giorgio Alleva

President of Istat

It is my pleasure to co-write the foreword for this book edited by Martino Lo Cascio and Otto Hieronymi intended to cement the scientific legacy of our common friend Emilio Fontela.

I had the occasion to make his acquaintance in the early1960s since we were in a research group aimed at building the first input-output table for Italy, the 1959 Table, led by Vera Cao Pinna, who he was particularly fond of. Then I had the privilege to collaborate with Emilio during the 1980s at the “Interdipendence Model”, a compounded system of sectorial interdependence between Western and OPEC countries. What immediately struck me about his personality was the ability to communicate and exchange ideas with many different people, with different backgrounds and specializations, and to bring the best out of those formal and informal meetings. He had the natural capacity to integrate and synthetize different perspectives to face complex ‘real-world’ problems.

This multi-disciplinary effort was one of his distinctive traits that he also transmitted to his team co-workers and students. Economists, as well as other professionals, have been criticized for being too insular and, although they have strong disciplinary skills, yet they often struggled when confronted with new types of problems that called for different methods or a mix of approaches. These concerns link to a longstanding debate in economics on which the well-known words of Keynes seem to fit in well with Emilio's way of thinking, "The master-economist must possess a rare combination of gifts .... He must be mathematician, historian, statesman, philosopher—in some degree. He must understand symbols and speak in words".

Grounded on the ideas and foresights of Emilio Fontela, this book also discusses how a new social market economy for the 21st century can be implemented and sustained. At a different level, the policy document that sets the global strategy for the second decade of the century, Euro 2020, identified three priorities related to smart growth (developing an economy based on knowledge and innovation), to sustainable growth and to inclusive growth, the latter illustrating the influence of the social market economy notions. The essential features of such an economy have been lucidly sketched by Fontela in one of his latest projects (Toward a sustainable knowledge society, EC-HLEG Key Technologies, 2005). They include: labour as a "product"; knowledge as a factor of production; and - since the most intensive knowledge products are typically public goods – the role of public services as a dynamic driver. In line with this long term future scenario for society and technology, one main concern of Emilio was about measurement issues. His belief was that the national accounting system, as it stated, was totally unsuitable for the evaluation of the performance of a new society: "the changing nature of outputs and inputs, the emphasis on quality or on environmental protection is making meaningless key computations such as productivity".

Therefore a complete re-thinking of the economic, social and environmental accounting framework was in his research agenda and

considered an essential subject for research, like the authors of the volume do, in their view of a new Informative System as first step of the third future step, being the Ramsey-Stone, the first one, and the Solari-Fontela, the second one.

This new framework posits new challenges for researchers and especially for statisticians. In this regard, I would like to quote Nobel prize James Mirrlees (1969): "Undeniably, it is awkward to want an economic statistics that is not defined by standard procedures applied to observable data: the 'objectivity' of the statistics appears to be compromised. But there is no way out. Either one has a (relatively) meaningless figure, or one employs economic expertise and guesswork in the construction of the statistics. We should not have expected anything else". I think we should deem also this statement as part of Emilio's legacy.

Renato Guarini

Accademico dei Lincei

Chapter 1: Introduction: Emilio Fontela and the Changing Research Landscape

Martino LO CASCIO and Otto HIERONYMI

1.1 The objectives and scope of this book

This introductory Chapter is divided into four parts: i) the objectives and scope of this book; ii) the method of research; iii) Emilio Fontela and the evolving global research landscape; iv) overview of the rest of the book.

1.1.1. Objectives and Scope

The objective of this book, written by friends and colleagues who knew him well and had worked with him for decades, is to help explore his legacy. The book addresses the range and depth of his research and scientific contributions and the scope of the issues and subjects he had dealt with during almost five decades of professional intellectual exploration. It also includes an annotated list of his publications. Emilio (1938 – 2007) was taken from his family and friends at the height of his creative powers.

There is no single subject, field, school or group that can claim to own the legacy of Emilio Fontela. He taught all of us how to be both specialized and multi-disciplinarian. He also showed us the importance of understanding the present and the past in order to be prepared to shape the future.

None of us have a complete view of the scope of Emilio Fontela's intellectual production and of his research contributions during his four decades of a highly productive professional life. The authors of this book – who represent only a small percentage of his friends and

colleagues – believe that his constant search for the link between economics and the common good was one of the principal threads that connected the incredibly large number of issues and problems that Emilio had creatively addressed during the almost five decades of his professional life.

1.1.2. Making the most of Fontela's Legacy

Emilio Fontela, who died in July 2007 at the age of sixty-nine, left a great void and a very large and valuable intellectual legacy behind. Often the best are the first to leave. There is no way that Emilio can be replaced for any of us. We will feel his loss to the end of our lives. Being faithful to his spirit means going beyond the mourning, reflect and act. We should reflect on the essence of his work and of his message and preserve and pass to the present and future generations the results of the work and thought of this truly great and unique researcher of our time. The idea of this book first took shape in late 2007, a few months only after Emilio passed away. As it happens too often, other tasks and priorities put it onto the back burner. Thus we are happy that it has finally come to light.

1.2 The method of research: *rem tene*

Aristotele (*Retorica, III, I*), and his school taught that catching all the "*subject*" is not sufficient, being essential the way it is exposed. In the Roman Era, Catone (*Orationes*) and then Cicerone (*De oratore, 3. 125*) suggested: *rem tene*, *verba sequentur*, i.e hold the subject, words will follow.

Going through the scientific and operational line of thought of Emilio Fontela – an Andalusian, a Spanish, a Swiss, a French, an Italian, a Japanese, … , summing up, a world citizen - the Catone and Cicerone simplification, even though hard to be defined as generally true, seem us appropriate for our friend. The "*verba sequentur*" fits with the great facility Emilio had to express, in many languages, "*the argument*", in the context he was, fully capturing the concept. This was actually one of the greater Gifts he had been given. Of these *verba* in the "research landscape", we will discuss in part three of this chapter.

In the following, our ambition is to give a sketch of how, when enjoying the privilege of cooperating with him, we were looking at the "argument" from many different perspectives - theoretical, quali-quantitative, political, ethical, and many others - that, in the end, composed the puzzle that becomes our "design". We all still can remember his starting sentence: "Subject and Title", the latter considered by Emilio as a metaphor of the whole theme. It could be a narrow or ill-defined subject, to be placed in a complex framework or a wide subject to be distilled in few essential points.

Then, the ways to approach the subject: not only the *binary* or linear thinking, as the Greek heritage that still is at the basis of the classical approach in Western countries (and in computer programming), but indeed the *circular* (or spherical) ones, based on the process rather than the product (that partly explains his huge experience with Far-East world), or, at the same time, *lateral* thinking, that is proceeding by a series of FACTS, without *a priori* hypotheses, so to avoid the connected sequential steps that limit the range of solutions; going on exploring the same facts by different points of view. In the latter case, I feel that his religious education, his doctoral studies in the Geneva spirit's environment, his working experiences with hard science scholar of Battelle Memorial Institute played a relevant role, that brought him to rigorously apply or invent theoretical quali-quantitive tools.

We recall the light and satisfying dialogue on progress, step by step, we were making together. Long silences were part of this dialogue, when each of us was able to anticipate the other's thought: an enjoyable sports of ours, that from time to time Emilio was pleased to let some of us win. In the same way, when not every facet of the subject had been

fully investigated, all of us remember his urging request for small packs of ideas and schemes to be fixed on a sheet. And then, after shortly dialoguing and reasoning between us, Emilio could develop and supplement these small pieces, shaping, in few pages, a solid-built line of thinking. These were the team, or think tank reasoning proceedings: some flashes on researching together that other contributors to the volume, like André Gabus, Eugenia Sallin, Antonio Pulido, … almost all experienced.

Innovation in the research perspective has been the driving force of Fontela's method, which ran over the final results of a Project, a Paper, or a Book, that were always considered only as preliminary steps. That's why we spoke of circular sphere, or of lateral thinking, combined with a linear way of thinking. An example of that may be found in DEMATEL (DEcision MAking Trial and Evaluation Laboratory), firstly invented with André Gabus, for a vast range research objectives, further developed with Eugenia Sallin, in the framework of cross – impact analysis for EEC agencies, and finally left as heritage to mainly far-east scholars of various disciplines (engineering, environment, business, etc.), so high in the number and in their quality to bring us asking Isabella Carbonaro (Chapter 8), scholar in the field, to add to the Gabus' Chapter 7, a specific contribution surveying the last five years bibliography on DEMATEL based models.

Another example is the economy- energy- environment- analysis, modelling, and forecasting. Econometric, accounting and statistical tools, on their own methodological grounds, are depicted by Antonio Pulido and Ana Lopez, that authored respectively Chapter 5 and 6.

The Interdependence Model (I.M.) project, that has been developed in cooperation with a big Energy Company (ENI), a group of energy producer countries (OAPEC) and some western countries, mainly of Southern Europe, may be seen as a zoom on the research method that we followed with Emilio Fontela, as an *hidden thinker*, according to the definition of him that has been given in Chapter 3, and brought us to control billions of historical and projected figures, as well as several thousand equations, working on "strange data and parameters", that in our perspective, due to their informative power, were not to be considered as anomalous or to be corrected (as it is commonly done in econometrics). The anomalous data and parameters as informative and,

at the same time, starting point for rethinking approaches, models and results, were essential part of the research method. To this method, in fact, belongs the refusal of "*imaginary's statistics",* being the last one, the definition coined by a great physician scholar, lent to the economic statistics, Benedetto Barberi[1], when he reviewed the mainstream conceptualization of the residuals as realization of the errors in regressions on observational data, unlike to that correctly done in regressions on experimental sampling data.

To the *circular* thinking belongs the inquiry efforts towards the *Mesoeconomy*, mainly the Input-Output (I/O) accounting and modelling, a field in which he worked many times with Richard Stone and Wassily Leontief, Nobel's Prize winners. We say *circular*, because the high frequency, at different intervals of time, in its own deepening research efforts and in promoting this theoretical and applied field to other younger scholars. In a "out of time dialogue" with Luigi Solari, his first Master at the Geneva University, in a 2002 paper[2] he advances the idea to refresh a twenty-five old methodology that used Cost-Price and Real I/O model to account for losses of welfare due to the production and consumption wastes: so to give a value to the environmental protection public goal (by mean of fiscal policy). In that occasion, another double switching was suggested in order to make a revival Dynamic Linear Expenditure System (DLES) towards a proper utilization of market rules, clearing the values-prices related to the evolving societal needs and goods.

The most important message of Emilio on method that he left after an exceptionally rich life as a scholar is the importance of a sysnthesis of "deduction" and "induction", and the sense for reality. This emphasis on synthesis and the close observation and analysis of the "real world" was a common strength of the "three Masters" of the "virtual Geneva

[1] See "Macromeccanica Economica" (1968), Ceres, Edizioni Ceres and "Elementi di statistica economica", Boringhieri (1966)

[2] See Fontela E., (2002), Prix relatifs et structures des marchés, Dialogue hors du temps avec Luigi Solari, Revue Européenne des Sciences Sociales, N°124 pp.319-331

school of economics" – Jacques L'Huillier, Wilhelm Röpke and Luigi Solari – and what makes Emilio the fourth Master of this tradition. [3]

1.3 Emilio Fontela and the evolving global research landscape

1.3.1. Economist and Global Researcher

Emilio was first and foremost an economist. But the term that fitted him even better was "chercheur", "researcher" – he was one of the truly great researchers of our time. As a researcher he knew the importance of "method" and he was an exceptional methodological innovator. But he was as keenly interested in the *relevance of the results of research,* as he was in mastering and developing the most complex models and methods.

This book was prepared not so much out of respect for the memory of the one who left us too early, but first and foremost for the benefit of us, who were left behind and for the benefit of coming generations. There is no question that this inventory and assessment has to be as multi-faceted as Emilio's work and personality broad and rich had been and we hope that it will continue in the future.

In recent years, looking back on the tremendous wealth and diversity of all the projects, conferences, seminars, reports, and publications that marked his life, he liked to talk about the "intellectual adventures" that he had shared with so many of us. However, as in all true and great adventures, the challenge was among the most serious ones: how to understand better and to project and to improve the world around us.

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[3] Fontela, Emilio (2007): "The Geneva School of Economics and the Spirit of Geneva", in Hieronymi, Otto and Intag, Kathleen (Eds.): *The Spirit of Geneva in a Globalized World, Refugee Survey Quarterly, 2007*, UNHCR, Oxford University Press, Oxford and Geneva. See also Section 1.3.5 below andChapter 4 in this book.

For most of those who had the opportunity to work with Emilio Fontela or to study under his direction there is little doubt that his ideas, his approach and knowledge had a lasting influence on their professional evolution and on their understanding of the complexities of the world we live in.

Fontela transmitted his ideas and understanding through multiple ways of which "published" articles or books were a minority: research projects, project proposals, discussions of the results of projects the most important context in which his often unique scholarly contributions were developed and transmitted. "Formal articles" or books were most of the time a side product of the "project work".

Emilio Fontela's maturity as a scholar was achieved through and thanks to the "research project approach", an approach that was in full development in the post-1945 period and to which he made major contributions from the 1960s onward.

This had multiple positive consequences for his work and for diffusing his ideas through multiple channels and for the direct or indirect influence on "decisions" and on helping shape the modern economy and society.

If we want to add to the definition of Emilio as an economist, researcher, and scholar, the following two points have to come at the top of the list:

(1) he was a world-class "technical economist", in the best sense of the word;

(2) at the same time he practiced and not only preached "multidisciplinarity" with an exceptional skill and conviction throughout his professional life.

Emilio maintained a project mentality. He defined problems – economic, social, political, technological – in terms of projects from small to very large projects. His sense of the key issues and problems, of the results that could be expected, of the feasibility of the project and of the team and resources required, was unique. The objectives of the projects may have been pragmatic – but time and again they led to new,

important theoretical insights ahead of the more traditional "publish or perish" academic community.

Emilio's research experience was truly global both in geographic terms and in terms of organizations he worked for and with and sectors, problems covered. His original base was first Geneva to which he later added Madrid.

He was also often an advisor – and often at the highest level in government, companies and international organizations – but he was not a consultant. As a researcher he knew that all research, if properly done, with a keen eye and an open mind, could yield interesting and relevant results – but not necessarily the answers to the questions that were raised at the start.

Emilio Fontela was a uniquely international scholar in terms of his views and understanding of the modern world, through the scope of his work and the themes that he dealt with, the organizations with which he worked – private sector, government agencies, international organizations, universities and research centres – and in terms of the influence and impact of his research and advice. He was also a great teacher and a great friend and colleague, always ready to help, always ready for new intellectual discoveries adventures.

1.3.2. A "new European"

Fontela was first and foremost a "new European". Intellectual and personal freedom were the key values of the Western world that had emerged after World War II. Fontela knew how to cherish them and how not to take them for granted. This was all the more the case as Spain under the Franco regime was slow to join the free world.

But for Emilio freedom and intellectual adventures were also closely connected with the values of responsibility, discipline and hard work. Here again he was the most demanding towards himself and it was through his example rather than exhortation that he influenced his teams and colleagues.

Fontela was a restless traveller. Occasionally he took vacations (but always managed to bring along work) but most of his travelling was work-related. He was glad to discover new cities and countries, but mostly he liked to discover new ideas and problems and he enormously enjoyed discussions with people in small and large groups, seminars, conferences and work sessions. He had a sharp critical mind but if necessary could show great patience and tolerance with people who were narrow-minded and whose arguments were not convincing or often outright wrong.

Emilio was a sharp observer of human character and enjoyed discussing with his friends the characteristics (strengths and weaknesses) of individuals, professional groups, nationalities, including his friends and colleagues. He enjoyed the enormous diversity of contacts that his work and life-style opened up to him. While he did respect and was also impressed with individual achievements and positions, he was not a snob. While a true democrat not only in theory but very much also in practice, he was also proud of signs of recognition and to the access to people in important positions. Never a "party politician", not directly involved in electoral politics, he was enormously proud of the democratic achievements of Spain after the death of Franco under the young king Juan Carlos. Fontela was as much at ease in Barcelona as in Madrid or Seville and would have been deeply saddened to see the break-up of Spain under the impact of the Catalonian nationalists.

1.3.3. Battelle, the University of Geneva, Europe and the World at Large

In order to understand the scope of Emilio Fontela's work and contributions it is useful to consider the three main dimensions of his learning and activity: the University of Geneva, Battelle and the "rest of the World". These were interdependent and remained important and relevant until the end of his life.

The University of Geneva was his Alma Mater where he earned his doctorat at a relatively young age under the Direction of Jacques

L'Huillier, whom he identified in his last public presentation as one of the three gear master of the "Geneva school of economics". Fontela's thesis dealt with themes that were highly topical at the time (trade and development) and one that was going to be an increasingly important issue in his personal and professional life, the catching of Spain with Western Europe and the modern, democratic Western world in general.

The University of Geneva was also where he first met Luigi Solari (the second great master of the Geneva school) who during Fontela's student years worked with Professor Lucien Féraud who taught statistics and mathematics at the time. It was Solari who became the first Professor of Econometrics (1964) at the University of Geneva and the founder of its Département d'Econométrie. Solari and Fontela established a close cooperation in particular in the area of input-output modelling. Fontela who joined the faculty of the Department of Econometrics in 1978 and succeeded Solari as Head of the Department on Solari's death.

1.3.4. The Battelle experience

On finishing his graduate studies Fontela joined the Battelle Institute ("Institut Battelle"), part of the Battelle Memorial Foundation. Battelle-Geneva was one of the two research sites created by Battelle in the early 1950s (the other was in Frankfurt am Main), introducing an entirely new model of research in Europe. BMI (Battelle Memorial Institute) was established in 1929 in Columbus, Ohio based on the will of the late Gordon Battelle, and industrialist who stipulated that the (relatively modest) fortune he left should be used to create a research organization that would work for the "benefit of mankind". Since the funds left by Gordon Battelle were not of the order of magnitude of the resources of the more famous foundations (Ford, Carnegie, Rockefeller), the new costs of the research carried out by BMI would have to be financed by outside "sponsors" who then would become the owners of the results of the research. This is how the concept of "contract research" was invented and developed. The most famous (and successful) such research project was Battelle's participation in the development of the Xerox process that revolutionized of copying. The appreciation of

the Xerox company shares that BMI had received to cover its costs, boosted the foundations reserves, to reach by the 1960s around 300 million dollars. This allowed BMI to expand its research facilities to the point that by the 1960s it became the "world's largest independent research organization", a position it still claims today with a world-wide staff of twenty thousand and an annual research volume of the order of $7 billion.

During its first two decades Battelle Geneva became a great success in the European markets that were assigned to it (primarily, France, Italy, Britain, Spain and Belgium, while Germany, Austria and the Nordic Countries were Frankfurt territory). By the early 1970s the research staff and support personnel of Battelle Geneva exceeded 800, and its research volume was of the order of Sw.Fr. 50 million. Battelle Geneva had become the most international component of BMI, with non-governmental sponsors accounting for well-over 80 per cent of its research volume. It was also the most directly engaged in non-governmental projects – with income from the private sector representing close to 90 per cent of its annual research volume. This was in sharp contrast with the other three major Battelle components at the time: Battelle Columbus, Battelle Pacific North West (located in the State of Washington) and Battelle Frankfurt. These three sites, and especially North-West, depended much more on government financed projects and on the American respectively the German market. Also for many years Battelle Geneva was recognized as the most "innovative" component of Battelle – the highest compliment in an organization whose current motto is "the business of innovation".

Battelle was and remains primarily an applied science and technology oriented organization. However, it also has carried out both for government sponsors and for the private sector economic and business research programs. Many of these projects were related to industrial, sectorial or product issues and problems. One of the organization's specialties was the linking of technology and economic research and forecasting.

Emilio started his professional career at the Battelle Memorial Foundation in Geneva. Emilio played a significant role in the growth of

Battelle's Geneva Center and contributed to Battelle Geneva's international reputation as well as to the position at one point of Geneva as one of the most innovative sites in the Battelle network.

During his entire professional life he retained the lessons from his Battelle years. We would like to mention here four aspects.

- First, the combination of the motto of Battelle Memorial Foundation of working for the "benefit of mankind" and the need to be "chercheurs-entrepreneurs", "researcher-entrepreneurs". The Battelle formula allowed an intellectual independence while respecting economic realities and the needs of the market.
- The second important dimension of the Battelle experience was a life-long future-orientation: forecasting, projection, scenarios. This was at a time when most university research was firmly turned towards the past. What was a competitive necessity for Battelle turned into a great innovative advantage.
- The third important aspect was the recognition that although Battelle was essentially a technology center there was room for research in economics and in the other social sciences within the Battelle concept. Interdisciplinary team-work, linking technology and economic analysis had allowed innovative quantitative and qualitative methods, it also increased the relevance of the research results in a rapidly changing economy.
- The fourth lesson, also learned at Battelle, to which Emilio stayed faithful throughout his life was the truly open mind and intellectual curiosity, the international view of the world, and, last but not least, the respect for true democracy in the republic of the intellect.

Battelle was and remains essentially an organization focused on research and innovation in the area of technology and applied sciences. Fontela played a leading role in introducing and developing economics and social sciences into the research offered to "sponsors" (the term used for many years in Battelle to describe "clients" who financed the research projects and who were the owners of the results). Economics also found its (relatively limited) place in the other four main Battelle research centers (Columbus, Ohio, Richland, Washington and Battelle Frankfurt in Germany). But Geneva under the leadership of Fontela was the undisputed leader in this field.

Within the Battelle family, Geneva had a special place: it was the center that was most active and successful in selling research to the corporate sector as distinguished from government agencies. This had earned Battelle Geneva special respect within the Battelle system, but ultimately it proved to be also a source of weakness because of the growing role, from the 1970s onwards, in the financing or co-financing of corporate research by government agencies and the European Community.

By the mid-1960s Battelle-Geneva had established a reputation as an innovative organization serving primarily the corporate market. The international staff and also the fact that Battelle was part of a large and successful American organization strengthened its image in a Europe where companies were anxious to learn from abroad and to expand their activities across European markets.

In the mid-1960s the Economics Department with a staff of about 20 to 30 people (more than two-thirds research staff) consisted of 3 groups, the smallest of which was headed by Fontela (with 3 or 4 researchers working under his direction). As Fontela enjoyed the strong support of Hugo Thiemann, the Director of Battelle Geneva as well as of the Management in Columbus, Ohio, Emilio was soon appointed Director of Department of Applied Economics which, under his direction, continued its rapid growth to reach a staff of about 120 by 1972-1973.

This was a very important period of learning for Fontela both through the challenges and opportunities and through the successes and failures.

The first major crisis of Battelle Geneva coincided with the beginning of the economic, monetary and political crisis of the 1970s. Some of the factors responsible for the crisis of Battelle were “home-made”, others were the result of the changing environment in Europe and the world economy.

The shift in the market environment can be illustrated with the popular success of the report of the Club of Rome Limits to Growth.

1.3.5. The Spirit of Geneva

In his presentation on The Spirit of Geneva and the Geneva School of Economics on 14 February 2007 at the 12th Webster Annual Humanitarian Conference on the Spirit of Geneva in a Globalized World, Emilio spoke of three economists: (1) his friend and colleague Luigi Solari, a pioneer of econometrics at the University of Geneva; (2) his teacher Jacques L'Huillier who introduced him to political economy and from whom he learned about the theory and practice of international economic cooperation; (3) and about Wilhelm Röpke, one of the principal contributors to the concept of the social market economy.

The general conclusion of the February 2007 conference was that more than ever the world needed the "spirit of Geneva". We all agreed with Emilio that the three "Masters" he mentioned were true representative of the Geneva School of Economics – and we both agreed for quite some time that the world needed the spirit of the Geneva school of Economics.

To conclude: there is no doubt in our mind that in economic research, more than anyone else in our generation, Emilio Fontela represented the true spirit of Geneva.

None of us who listened to his vivid presentation could have imagined that this was to be his last public appearance before he was to pass away on July 29 2007 as a result of a severe disease.

The last one to think that his insightful analysis of the "Geneva school of Economics", was going to be his last public reflections about economic science, about economic order and about the future, was Emilio himself.

In his talk Fontela conceded that in the minds of most economists there was no recognized "Geneva school", as there had been an "école de Lausanne", a "Lausanne school" associated with the names of Leon Walras and Alfredo Pareto. He argued, however, that this was due not so much to the lack of outstanding economists in Geneva and a lack of impact of economic ideas emanating from Geneva but rather to

the common phenomenon of ignoring or forgetting the contributions of great scholars by their contemporaries or successors. Fontela illustrated his thesis with the example of three "great masters": Wilhelm Röpke, Jacques L'Huillier and Luigi Solari. [4]

Röpke, L'Huillier and Solari each made major contributions in a different, important area of modern economics: Röpke as one of the "fathers" of the "Social Market Economy" and of post-war "neo-liberalism" (which was very different from what is called "neo-liberalism" today), L'Huillier through his analysis of international economic and monetary institutions and of the theory and practice of international economic cooperation, and Solari as a pioneer of econometrics and the application of econometric analysis to social issues. Fontela argued that at the level of method, after different starting points – deductive vs inductive – all three aimed a (Kantian) synthesis. Also, according to Fontela what made possible to call three so different scholars as the originators and main pillars (without their knowing it) of the Geneva school of economics was their link to the spirit of Geneva. All three of them recognized the importance of both theory and practice (Fontela defined this as a form of realism), of the private and of the public actors (neither the state nor the private sector were deified or vilified by either of them), and finally while thorough internationalists (also at a time when many famous economists were also convinced nationalists) they also recognized the need to respect diversity at the national and international levels. The rejection of intellectual extremism or radicalism as well as of ethical or ideological relativism was a common feature of these great teachers.

During the 1990s and the years before his premature death, our discussions with Fontela about domestic and international economic order as well as the general state of economic science became more frequent and more intensive. These discussions had a major common

[4] Fontela, Emilio (2007): "The Geneva School of Economics and the Spirit of Geneva", in Hieronymi, Otto and Intag, Kathleen (Eds.): *The Spirit of Geneva in a Globalized World, Refugee Survey Quarterly, 2007*, UNHCR, Oxford University Press, Oxford and Geneva. See also Cahpter 4 in this book.

thread: our concern that the "pendulum has gone too far" in many areas where progress and important achievements were being threatened by the growing intolerance of the holders of the dominant doctrines. This was not only undermining the quality and the relevance of the work of economists but also represented a major threat for domestic and international economic and social order. The sources of concern included issues related to spreading of monetarism and of market fundamentalism, the dominance of financial issues and considerations over the real economy, the growing short-termism in all economic and political decisions, the growing abstraction and the excessive use of mathematics in economic theory, the loss of concern for social issues and the shortcomings of finance-dominated globalization.

Geneva has occupied a special position for most of the last one hundred years in the international economic and political system. Geneva is the principal center of international organizations in the world. At the same time it is an important international financial and business center. The term "spirit of Geneva" was coined in the 1920s with reference to the role of the League of Nations and related organizations as well as to the centuries old political, financial, religious and humanitarian tradition of the city. The 1930s Geneva witnessed directly the crisis of the League of Nations and of the spirit of Geneva. In the post-war period Geneva managed to re-establish its role as a major center of international cooperation despite the fact that the seat of the United Nations was established in New York. Geneva became the European seat of the U.N. and the headquarters of many "technical" U.N. related organizations were established or re-established in Geneva.

What is called today the "international Geneva" could in principle provide a fertile background for the emergence of a "Geneva school of economics". This was all the more the case that the prominence of Geneva as an international center was particularly relevant during the decades following World War 2 when international economic developments were the central issue in economic theory and practice.

Information and research and publications are one of the important functions of international organizations. Also, the growth of international organizations in Geneva was accompanied by the expansion

of their research functions. Thus, the Geneva-based international organizations have participated in the world-wide growth and diversification of the "research landscape" that can be observed ever since the 1950s.

Quantity, however, does not always mean quality. It must be remembered that the research carried out within or for the account of international organizations is often influenced by political and bureaucratic criteria. By and large, freedom of thought and freedom of speech are not the key principles and rules inside the research divisions of international organizations.

It is also true that the intellectual and professional links between the international organizations (including their research departments) and the academic and research community in Geneva have not always been as close and as productive as one could have wished or imagined.

Ideological as well as organizational factors have played an important role in bringing about this situation.

1.3.6. The Evolving Research Landscape

One of the most fascinating aspects of the political and intellectual history of the last 70 years has been the evolution and expansion of the "research landscape" in economics and of the interaction between major political trends and economic policies and the methods and orientation of economic research.

The "American model" has played an important role in the development of the European research landscape just as it has in many other areas (economy, political values and institutions, popular culture, lifestyle, management and industrial organization). At the same time important differences remained (and developed) between the American and the European (and the models of the individual European countries) approach in the organization of economic research.

While there was and remains a tendency to fear the "Americanization of Europe", there was also a "Europeanization of America": the

number of European economists who shaped the teaching of economics and economic research is truly impressive.

In the post Second World War period the United States had not only the strongest and largest economy in the world, with a highly expanded industrial structure and market, it also had the largest and most systematically organized research network.

The importance of systematic, organized research as a factor of economic and strategic strength and competitive position at the company and at the national level was increasingly recognized during the 20th century. This was true during and after the First World War, and even more so during the Second World War and its aftermath. "R&D" became an everyday expression and concept. While most of the attention had been rightly focussed on "hard" R&D, organized research economics and related areas also witnessed a quantitative and qualitative jump already in the 1930s. The planning and implementing of the war effort also required more systematic tools of analysis and vast amounts of statistical data.

The following are some of the major factors that have shaped the "research landscape" in economics since the 1930s: (1) The great depression; (2) The expanding economic role of the government (debate about communism and the planned economy vs. the market economy); (3) The emergence of new theories and the battle of ideas; (4) The volume and quality of available statistics: (5) New tools and methods; (6) The Second World War and the war economy; (7) Post-war reconstruction; (8) The Cold War; (9) International cooperation; (10) International organizations; (11) Increased competition; (12) International trade and economic integration; (13) Technology diffusion; (14) The challenge of economic development; (15) Financial and human resources; (16) Parallel and competing research; (17) Transformation of the university system; (18) Forecasting; (19) Project approach; (20) Freedom and competition.

1.3.7. Quantitative and Qualitative Models, Analyses and Projections

Throughout his professional life Emilio was deeply interested in detailed structural analysis and projections and in economic, sectorial, political and social models of all kinds. Trying to understand the nature and the factors responsible for economic, technological and social change and to try to project future structures and changes was one of the great passions of his life.

While he kept exploring, he was also aware of the limits of future studies, of the limits of our art and science. He knew that the future does not exist yet – even though it becomes very rapidly the present and the then the past. He was a seasoned forecaster – who knew that the future is the result essentially of three sets of factors: (1) trends, (2) unexpected changes (or events) that in fact change the shape and the direction of the trends, and last but not least (3) human action of policies.

He was a great innovator in the development and the use of econometric models. He was one of the pioneers of large scale quantitative analysis and projections – from a time onwards when computing – both hardware and software – were more cumbersome. For example in the early 1980s he was one of the principal architects of the so-called "Interdependence Model", (in fact a series of virtually hundreds of models) which simulated and projected the complex interdependence of oil-exporting and oil-importing countries. This project was built on, and in fact was made possible because of the existence of a whole range of input-output and other models that had been developed under his leadership from the 1960s onwards.

But Emilio knew also the limitations of models – not only because of the limits of the power of mathematics and because of the availability or the quality of the data – but more importantly because the complexity of the economy and its changing nature. This was one of the reasons that made him skeptical of pure monetarist theory: in general he did not think much about "single equation explanations of the world around us", even if backed up by the greatest intellects. The

same way he was not an adept of "mining and massaging" ever increasing masses of data with increasingly sophisticated statistical techniques without theory or real analysis.

1.3.8. National Accounts, Supply, Demand and Forecasting Future Trends

It was not by chance that Emilio enjoyed a close working relationship and the friendship and the respect of Richard Stone ever since the 1960s. National accounts were at the center of Emilio Fontela's work and thought throughout his professional career.

The 1930s witnessed a major progress in developing the concept of national income and new quantitative methods for estimating national income for the present and the past. One of the key innovation of Keynes was the definition of major macro-economic aggregates that proved to be ideal for quantitative estimates of the major components of the economy and for their interaction and past evolution. Comparative economics and economic policy analysis made an enormous leap forward with the Keynesian macro-economic aggregates. These variables have become an essential part of the economic vocabulary, even for those who contested the recommendations of Keynesian economics.

Richard Stone who had been a student of Colin Clark at Cambridge and an Assistant of Keynes during the War deserves much of the credit for using the new Keynesian concepts of macro-economics for developing a system of modern national accounts. Stone's system is the basis of all national accounts statistics that have been developed since the 1950s and are in use today.

It is not doing injustice to Colin Clark to compare his pioneering work and efforts to develop and use quantitative data, on the one hand, and the elegance and ease of use of Stone's System of Standardized National Accounts, on the other hand. In the post-war edition of his monumental Conditions of Economic Progress, Colin Clark made a

(desperate) appeal to the world-wide economics profession to help regularly update the data in and at the basis of his work.

Richard Stone defined in 1947 in eight points the advantages of the system of national accounts that he had developed. Four of these important objectives deserved to be listed here in the wording of Ingvar Ohlsson: (1) "it enables the logical consistency in the national income statistics to be seen clearly", (2) "it provides a meeting-point for economic theory and practical measurement", (3) "it is useful in connection with forecasting", and (4) "it aids international comparisons". (Ohlsson, Ingvar (1953): On National Accounting, National Institute of Economic Research, Stockholm, p. 62.)

1.3.9. A Great Economist?

For better or worse, Emilio Fontela's name and legacy were not and will not be associated with a single theoretical innovation or controversy. Emilio was keenly interested in theory and had a unique ability to apply theory to concrete problems and to submit them to the hard test of data. There were very few if any economists who have matched theory and data in so many different contexts and on so many issues as Emilio did.

We always thought that Emilio was more than "just" an economist. For us he was a true Renaissance man, without in his professional work any trace of dilettantism that so often is attached to this term. We think that he liked to think of himself a little bit in these terms, even before he had met Armando Verdiglione, and whose lasting claim to fame is to have put substance into the idea that we are living in period of a "second renaissance", even before some of the dramatic changes and innovations occurred during the last twenty years.

In our profession, the epithet "great" is generally reserved for those whose contribution consists of a "theoretical" innovation, and increasingly of the abstract mathematical kind. Emilio, about whose mathematical skills and whose love for mathematics can be no doubt,

found regrettable the tendency of the Swedish Central Bank to award the Nobel prize in economics increasingly to economists of the abstract type.

The list of people with whom he worked for shorter or longer periods of his life is very extensive and covers many, many countries. Some of them are here with us today. This list also includes some very famous names in our profession, such as the Nobel Prize winners Richard Stone, Wassily Leontieff or Lawrence Klein.

Was he himself a "great economist"? While he was alive at least we did not think of him in these terms, although we had been aware of his truly exceptional qualities and accomplishments at an early stage (even before we had the opportunity to work with him more regularly).

In his work Emilio combined at least five of the key characteristics of great economists:

(1) a penetrating ability to analyze and to understand the complex workings of the modern economy and to identify the constants and the elements of change and to distinguish between the secondary and important factors;

(2) a willingness and ability to deal with specific problems and situations and to move to the more general level;

(3) an analytical rigor combined with a healthy dose of pragmatism towards both established theory and the data;

(4) a life-long drive to innovate, to explore, to deal with new problems, new issues and to bring new methods and disciplines together;

(5) and last, but not least, his sense for the relevant, his unique gift to identify the heart of a problem and to draw conclusions and to communicate them in both technical and non-technical terms.

1.3.10. Emilio as a friend, colleague and teacher

Emilio was a very discrete and private person and at the same time open, direct and simple in his contacts. Contrary to many scholars he enjoyed human contact immensely and as a result of his exceptional capacity to concentrate he was always available to his friends, students, colleagues and contacts. No problem was too simple or too complex that he would refuse to pay attention.

Before the term was invented he became grand master in "networking" in the best sense of the word. For someone who was such a thorough professional – dealing with complex and often abstract information and who wrote so much and so well – it was remarkable how much he enjoyed verbal communication, directly or by phone. He was generous in every sense of the word and had an understanding for human weakness while at the same time he was an excellent judge of character.

He did not care for fools, for bureaucratic procrastinations but he could hide his impatience very well until on the rare occasion he would explode. He was a seasoned negotiator who knew how to build a compromise while saving the essential. He had the capacity and the patience of the politician to sit through endless meetings. This was partly due to his capacity to write important sections or entire chapters of a report, while also listening to what was going on in the meeting.

People enjoyed working with him not only because of his intelligence and wide knowledge and experience, but also because he would always do his share of the work and the tasks, and often also part of the work of others. He did not have a literary talent or inclination, but he wrote a rapidly flowing, clear and tight text on all professional matters in four or five languages.

1.4 Overview of the rest of the book

The title and the subtitle of the Volume are the subject, *the argument*, along which the following chapters and their authors run over the anxiety/foreword looking path to the future, a sort of optimism of will, beyond the pessimism of intelligence, captured yet.

The importance of Fontela's work for the future is outlined in Chapter 2, looking at some specific fields and issues as well as from a more global perspective. The emerging landscape shows the terse scrutiny of the present, as heritage of the past, and the multiplicity and diversity of suggestions to the decision making for the future, zooming, in the world context, on Europe, mainly in rethinking the welfare state options. A sort of a bridge to the future research is isolated as a third step in the trajectory running from Ramsey-Stone model, first step, to the Fontela-Solari model, second step. The end of the chapter also reminds the reader of Fontela's constant concern also for the developments beyond the borders of the OECD countries and in particular in Latin America.

The scattered seeds in the narrow path toward a New Social Market Economy, as milestones left to our century's thinking and practicing by Fontela in his life, are picked up by Martino Lo Cascio in Chapter 3 and by Otto Hieronymi in Chapter 4.

The author of Chapter 3, starts asking himself to look at the erratic wandering of economic facts, as commonly diffused myopia's disease, on how Emilio Fontela would have sort out the same facts as meaningful pieces of an evolving new, never completed, puzzle. After a list of controversial issues of mainstream and heterodox approaches, picking up excerpts from Fontela's writings, and common build and non -common build econometric models and scenarios, the European economy is zoomed. Risks and opportunities of current transitional path are summed up in few figures and concepts coupled with same insights for a new European global Social market economy. [5]

[5] See: European Commission (July 2015): *Completing Europe's Economic and Monetary Union*, European Union, Brussels, and Annex 1 to this "Five Presidents' Report", *Roadmap through 2025*

The author of Chapter 4, addresses directly the need for a new Social market economy both at the level of theory and as a working model of the economy, society and political order of the future in a globalized world. This thesis – that has been for a long time an essential part of the thinking of the author of the present chapter – came to be shared by Emilio from the 1990s onwards. This is the principal justification of devoting so muach space in Chapter 4 to the origins and the evolution of this concept and of its implementation in post-war Europe. This is also the explanation for the title of this book. The second important reason is that much of the nature of the theory and practice of the Social market economy is almost "terra incognita" outside Germany, or at least beyond the borders of German-speaking people. Even in Germany and Switzerland where the Social market economy is deeply ingrained in these two countries' economic, political and social traditions, few economists and other members of the academic establishment can give an up-to-date definition of what the Social market economy is about.

In the Chapter 5, Antonio Pulido, starting from his interwoven links with Emilio Fontela's scientific life, summarizes the items by items legacy of our common friend, in a sort of clearing house, whose strong message is the realistic and cautions understanding and applying of technically clean methods and tools belonging to an impressive large toolbox, enlarging the last one with ingeniously proposed but powerfully based innovations.

The above legacy is put as a milestone in the Accounting Systems, Applied Economics, Statistical Economics and Econometric landscape in Chapter 6, by Ana Lopez, firstly student and subsequently colleague in many intellectual adventures with Emilio Fontela and Antonio Pulido. Two points may single out: i) the terse taxonomy and the historical lines around witch these fields of human thought, she proposes, and how the last ones interact or partially overlap, without losing, however, their own *genetics*; ii) the way the Emilio Fontela's teaching,

and the same time, researching passing through these fields, never forgetting to see and to show the directions to the bridges towards the hard sciences and the moral fundamentals.

The subsequent chapters are dedicated to both quantitative and qualitative research themes and methods also by friends and former colleagues of Emilio Fontela. The logic underlying the DEMATEL (DEcision MAking Trial and Evaluation Laboratory), and the mechanics of base applicative tools to a large variety of decision problems and strategies, going on over the more usual Delphi methods, are the contents of the Chapter 7, written by André Gabus and Alexandre Hawthorne. The Chapter includes further extensions to the *cross-impact* analysis, many time used by public agencies and private enterprises, on their on grounds or coupled with econometric models and scenario's building activities.

A new bibliographic line DEMATEL-based, mostly developed by business, environment, engineers, scholars of the Far East, is surveyed by Isabella Carbonaro in Chapter 8.

Manfred Gilli and Enrico Schumann stress Emilio Fontela's scientific approach as essentially pragmatic, avoiding complex formalizations and focusing instead on how the research could contribute to an understanding, and solving pro-tempore, a problem on the table. In Chapter 9 they develop a clear distinction between the concept of *accuracy* and that of the *precision* of the data to be processed by different models to solve a variety of problems. They base the argument on a specific problem of finance. But they believe that the heuristic, computer-based, mathematic modelling switched from differential calculus, is in line with the spirit of Emilio Fontela and may be useful for a large class of empirical researches.

The Battelle experience of international modelling and forecasting is the content of the Chapter 10. The narrative of Eugenia Sallin-Kornberg, the author, scholar and friend of Emilio Fontela. She recalls many common studies and projects, carried out in always innovative and and rigorous ways, in the fields of Macroeconometric models, , international trade-flow models, input/output models and energy-economy models and forecasting.

Chapter 11 reflects the continued scientific interest in renewing Baumol's pioneering approach studing productivity gains transfers and relative prices.The author, Giorgio Garau, first a student of Emilio Fontela and Martino Lo Cascio, subsequently colleague of both of them, develops the TFPS (Total Factor Productivity Surplus) into PPT (Purchasing Power Transfer), that clears the rental positions linked to the various degrees of competition in the different sectorial markets.

The Baumol- Fontela path is not at the end.

In Chapter 12 Pàl Kukorelly, who had been a close friend of Emilio since the late 1950s and then for many years his colleague at Battelle, calls Fontela "The Comet". The author brings together a warm and incisive analysis of Fontela's personality, of his gifts in dealing with and leading people, his sense of humour and readiness to help, as well as his genius for innovation and for analysis and forecasting of economic, social and industrial reality. Kukorelly, a partner of Fontela's in developing at Battelle the line of projects dealing with industrial analysis and forecasting also discusses the introduction of so-called multi-client projects in specific industry and product areas. The story of the early years of "techno-economics" remains of interest for today's students and practitioners in both industry and government.

Alexandre Hawthorne, also a former colleague at Battelle-Geneva of Emilio, in Chapter 13 describes the years he worked in the Applied Economics department headed by Fontela as the *Age of Optimism*. He uses the example of consumer research to provide a detailed and original description of the evolution of the research landscape in the 1960s and 1970s. One of the most interesting parts of this chapter is the discussion of the convergence of technical and economic knowledge and of macroeconomic and product and sectorial analysis (and data generation) in the framework of Battelle projects. As for Fontela and for several others among the authors in this volume, for Hawthorne those years were the age of optimism – both individually and for the world around us, and

from a professional perspectives for many of us the best years of our lives.

Chapter 2: The Importance of Fontela's Work for the Future

Otto HIERONYMI and Martino LO CASCIO

2.1 Introduction

The uniqueness or importance of Emilio's contributions can be assessed and illustrated by looking at some specific fields and issues as well as from a more global perspective. In this chapter and in this book we are trying to do both without hoping to be able to give a complete or fully satisfactory answer on either account.

The answer to the question whether the legacy of the work of a scholar will remain important for the future depends as much on subjective assessments as on objective factors. To predict not only the relevance of the overall legacy or of specific contributions to theory and method is in itself an exercise in forecasting. In the case of Fontela, whose work and innovation were so closely linked to forecasting methods and projects, it is normal that we have to recognize that there is a high degree of uncertainty about our judgement of what part of his work will survive and when and under what circumstance it may exert a positive influence. In this context it is important to remember that one of the major uncertainties related to forecasting, beside the obvious question whether the forecast will be right or wrong (and how close it was to what actually happened or how far off the mark it was), is the question of what was the degree of recognition of the forecast and how far it did or did not influence decisions which ultimately also tend to shape the outcome.

It is very difficult to have a complete overview of Fontela's research work and contributions. None of the authors of the present volume nor his other friends and colleagues can claim to have such a knowledge. Most of us have a direct experience and understanding one

or possibly several major areas of Emilio's work with only an indirect view of involvement with areas that were equally important parts of his work and creative record. In fact, one of the main features of this legacy is the diversity of areas and issues and methods and at the same time constant search to enrich each endeavour with the lessons he derived from often unexpected areas and projects. He had an extremely rare talent of simultaneously innovating in analysis and in synthesis. As he argued in his talk about the Geneva School of Economics, for him it was essential to use both the deductive and inductive approach and to search a synthesis resulting from the two.

As a first step, we can look at two important areas, one of "content" and the other of "method" to illustrate the preceding points: the one of content is "Europe" and the other is "the future". Obviously, Emilio's work included national and sectorial issues as well as research beyond the boundaries of Europe. But the principal focus of his interest was Europe in its diversity and in its search for convergence and unity. Also, he had a great gift in analysing the current situation and the recent past in both quantitative and qualitative terms. However, from the start of his professional career in the early 1960s to the very end of his life the main thrust of his interest and of his contributions had to do with a systematic scrutiny of the future and of the methods to do so, while constantly reminding himself and the rest of us of the inherent limits and uncertainties involved in this activity. These will be followed by "technology", "sectorial analysis (meso-economics), including energy", "qualitative and quantitative comparative economics" and finally the "employment, the knowledge society and the social dimension of the market economy".

2.2 Fontela and Lessons for the Future

The importance for the future of his work and contributions can be best projected through the multiplicity of issues and methods rather than a single or a few specific theoretical or methodological innovations. It is the mastering of this multiplicity and diversity – in contrast

to the trend of narrower and narrower specialization – that made him so unique among world-class researcher in economics and social sciences. While the qualities and contributions under this heading are more difficult to assess and to transmit to future generations, they are not only essential today, but will grow in importance in the increasingly complex and changing environment that will shape and characterize the future.

One of the factors that made working with Fontela such a dynamic and enriching experience was his boundless intellectual curiosity and willingness to address new issues and new approaches. He was problem, and issue, and future oriented. At the same time, he was keen to apply rigorous and tested methods to understanding and solving new problems. Fontela also had an impressive gift in finding the right answers and approaches in the "existing literature", but he was never a slave to the dominant or conventional vision. Challenging the conventional theories was part of the "intellectual adventures" that he was ready to undertake at any moment alone or together with his friends and colleagues across the Europe and the across world.

2.2.1 Linking theory and practice: the multiple facets of "applied research"

The principal lesson of Fontela's work for current and future economists is the importance of systematically linking theory, method and direct observation and quantitative and qualitative information. For him it was always essential to maintain a critical view and to adopt an innovative approach towards all three of these key components of the analytical process. With all the due respect that he paid for the "giants" of economic theory, he never accepted theory as a dogma. Time and again he pointed out the risks for both theory and the quality of analysis and for relevance of the work of economists when any school tended to become too powerful and arrogant and when economists ceased to

question the relevance and validity of their assumptions and conclusions.

2.2.2. The project approach

Much of Fontela's work was related to analyses, projects, plans and policies of the public sector. The large quantitative macro and sectorial projects that he had initiated and/or directed often served as inputs in the decision-making of national, regional or local authorities as well as of international or supranational agencies.

In the post war period "economic planning" became a widely debate, pragmatic, and ideological issue. Except for a short period in the 1940s in Western Europe Communists, the last ones were never directly involved in national governments and policy making. Also, all the Western European economies were market economies and were not considered "planned economies", the Soviet inspired communist model in Europe, China and other parts of the world.

In some Western European countries economic planning gained a significant role under not only Socialist but also under Centrist and even Right-Center governments. Economic planning was inspired by Marxism as well as Keynesianism and by the 19th century French technocratic tradition.

How do we define Fontela's relation to economic theory and policy? What are the lessons that can be drawn from the evolution of his thinking at the level of theory and what are his principal contributions in this respect?

The interests and contributions of Fontela can be summed up under the following headings: (1) macroeconomics; (2) international economics; (3) the link between technology and economics; (4) fore-

casting; (5) model building; (6) input-output; (7) econometrics; (8) corporate strategies; (9) research strategies and management; (10) comparing national economies; (11) economic order; (12) quantitative economics; (13) interdisciplinary research; (14) European and other regional integration; (15) evolution of economic theory; (16) numerous sectors (energy, telecommunications, etc.).

Fontela was an accomplished macro-economist. He taught national accounting for many years and he was the author or co-author of many macro-economic models of various sizes and complexity. As a macro-economist and as a macro-economic forecaster, he was more interested in the medium-term and long-term view than in short-term fluctuations or in business cycles. He was certainly not the typical Keynesian (or anti-Keynesian) macro-economist, the two "out of Keynes".

The contributions of Emilio Fontela to the various aspects of the evolution of research from the 1960s through the first years of the present century and their relevance for the future, can be illustrated by a number of examples.

The first example to be mentioned is the linking of macro-economic and sectorial research with technical and technological inputs and insights.

2.2.3. The role of technology

Comparing and projecting medium and long-term structural changes in the European countries became of interest not only for companies abut also government agencies and for international bodies. Battelle's input-output models represented a pioneering contribution in this field.

For a long time main-stream economic analysis and forecasting tended to neglect the role of technology. (For example the listing of the main factors of production usually did not include technology.)

Fontela saw technological progress and technology diffusion as a principal source of economic growth and as a key factor in political influence and social progress. Thus, perhaps his most constantly recurring preoccupation with the state of Europe and of individual European countries and with their future, was his concern about their capacity to innovate and their position in the world-wide technological competition.

Through his Battelle experience Fontela was very much aware of the dynamics of the "research landscape" and of the close relationship between the public sector (as a source of both financial resources and of demand impulses for specific and for general subjects of research), industry, universities and more or less independent research organizations. It was his recurring fear that Europe – both individual countries and companies and the European Community and subsequently the European Union – was not able and willing to engage the necessary human, financial and material resources in the technology competition with the United States and Japan.

The study of the technology organization, of the nature and objectives, of the research policies, was a subject that Fontela dealt with in articles, book chapters as well as numerous studies for various organizations in Europe (in France, Spain, and Italy) and in Japan and for the European Commission.

His contributions to the FAST project and to the project on the assessment of the Spanish network of research organizations for COTEC (Fundación para la Innovación Tecnológica) should be mentioned in this context.

For Fontela and his colleagues one of the main challenges for Europe and for European economists was to understand the role of technological change in the growth of the European economies and in the process of "upward convergence" among the European economies and between Europe and the United States. It was the linking of three main approaches that became a specialty of Battelle Geneva under Fontela's leadership: (1) traditional macro-economic national-account-based

analysis and forecasting; (2) sectorial input-output analysis and technical coefficient projection; and (3) techno-economic analysis based on inputs by scientists and engineers in various relevant areas.

2.2.4. The Importance of Europe in Fontela's Work

The reconstruction and integration of Western Europe after the end of the Second World War was the most successful case of economic, political and social reconstruction and community building in modern history. The process of European integration has been the most impressive example of peaceful international political innovation and institution building in the history of a continent that had emerged from two world wars and from totalitarian regimes of the Left and the Right.

European integration was part of a broader process of democratic community building: the creation and consolidation of the "Western Community" that included from the start, beside old and new democracies of Western Europe, North America, Japan and a series of smaller countries such as Australia, New Zealand and Israel.

In both the emergence of the Western Community and in the initiation and process of European integration, the United States played a key role. Without American leadership and support there would be no Western Community and there would be no integrated Europe, no European Union.

Beside the political, strategic and economic initiatives and support provided by America, the United States also became a "model" for their partners in Europe and in the rest of the world in multiple areas. For many years this was also the case in a field that does not seem to receive sufficient attention today: industrial and structural patterns and the widening of markets and systematic technology diffusion.

Ever since the Marshall Plan and the OEEC, the creation of a Europe-wide market has been at the center of European economic policies. The advantages of economies of scale and of increased competition were illustrated through the example of the prosperity and the

higher living standards of the United States. Also, new patterns of consumption on the American model – the emergence of new mass markets –did provide stimulus to the economic reconstruction and the sustained growth. The inflow of new technologies from the United States was facilitated through the reconstruction and expansion of Western Europe's industrial and commercial structure and infrastructure. The arrival of American companies and the expansion of the facilities of those that had been present in Europe already before the war, was an important but not exclusive part of this process.

The planning of the future often meant looking at the American model.

Under the heading of "Europe" three additional issues should be mentioned. The first one was the relations of Europe (European Community/European Union) with Latin America and the relevance of the European experience and of the model of E.U. for Latin American integration. The second issue were the relations of the E.U. the countries around the Mediterranean.

The third one was the issue of coherence and convergence among the members of the E.U. and the relations between the "center countries" and the periphery. Fontela was concerned about the timetable of the Maastricht Treaty and the speed with which the common currency was to be introduced. He argued that the countries of the periphery were not ready for the convergence required under the Maastricht Criteria and that the fiscal and monetary restrictions required for creating EMU would lead to a drop in growth and would be an obstacle for effective convergence.

In the early 1990s Fontela was in favour of a two-speed Europe that would not have forced the Southern and Eastern European countries to follow recessionary policies in order to be considered "full Europeans". Convinced European that he was (also a strong advocate of Spanish membership in the European Community), he also believed that a certain diversity was part of the essence of Europe and the Maastricht Treaty reduced this diversity to a dangerous and unnecessary degree.

2.2.5. The current state of Europe and of the world economy and Fontela's thoughts

The eleven subsequent titles may summarize the link between the Europe and the world economy and the Fontela research items:

- Scenarios of the future: integration, convergence and diversity as an asset;
- Multi-disciplinarity, multiple tools and approaches;
- Theoretical and applied economics: inductive, deductive and convergent approaches;
- The role and challenge of models: theory, data, and judgement;
- Micro, macro and meso-economics;
- The role of money and finance;
- The knowledge society and the future of work;
- Understanding the past, projecting the future;
- The role of values and the common good;
- The contribution and the continued relevance of the input-output approach;
- From the "Wealth of Nations" to the "Wealth of the World".

2.2.6. The Crisis of Economic Order and of Economic Thought and Analysis

The current crisis in the world economy is also a crisis of economic thought, of economic analysis and of forecasting in particular. This is relevant for this chapter and for this book in general for several reasons.

The principal reason is that the current situation is a perfect illustration of the fluctuations in the perception of economic theories in the medium and long run as a result of developments in the economic as well as the political and social environment. Major crises – and less frequently changes for the better – often lead to the loss of credibility and influence of dominant doctrines and to the search for new theories and/or to the revival of economic theories that had been considered as obsolete often for many years.

The "pensée unique" to use the French designation of the "ultra-liberal market fundamentalism" that had come to dominate increasingly academic, business and government organizations, including the leading international agencies, such as the IMF, the World Bank, BIS and the Commission of the European Union had led to a general weakening of the debate on economic theory.

The revival of the Austrian school, the reclaiming of the importance of competition and of the market economy and of the need to reduce the role and the weight of the State in the economy had been a reaction to the widespread rule of Keynesianism (even not of Keynes). Monetarism which spread like a wildfire in the 1970s played a decisive role in the destruction of an international monetary order based on stable and predictable exchange rates. While limiting the economic role of the state was not an issue in the 1950s and 1960s in particular in the Britain and in the United States, these two countries became the leaders in the political and theoretical backlash against the policies and doctrines that prevailed especially in the U.S., the U.K. and the Scandinavian countries. This new trend had been designated under different names (liberalism, neo-liberalism, libertarianism, market fundamentalism, "pensée unique", etc.) by its defenders and critics. Whatever the term used, it had become increasingly doctrinaire and rigid, and even more intolerant towards efforts to find a more balanced approach, than Keynesianism had been in its heyday in the 1950s and 1960s.

Early on it, was recognized by some that this new orthodoxy was one of the main factors responsible for the growing domination of

financial considerations and decisions, over the "real" side of the economy, and the widespread short-termism that squeezed out medium- and long-term considerations from both business decisions and economic policy. This short-termism and the rule of finance also put its stamp on the model of globalization of the world economy. While the progress towardsthe free movement of goods and of financial instruments of all kind was impressive, monetary nationalism increased rather than decreased under globalization. [6]

These developments, at the policy level and in the dominant economic schools, also led to greater rather than less international monetary and financial instability and to recurring major international financial crises. One of the major consequences of the rise and spread of the new orthodoxy was the growing neglect of two major, on the whole positive post-war trends: one was the concern for the social dimension of the economy and of the economic policies, the other was the attention paid to sectorial developments.

The end of the Cold War was the peaceful victory of the free society over the totalitarian and authoritarian theory and practice. The collapse of the Communist economic doctrine and system was rightly attributed to the superiority of the market economy over the rigidly controlled Socialist or Communist economy.

While Marxist economics seemed to have disappeared from the scene overnight, the shortcomings of the prevailing model of globalization and especially the neglect of the social dimension, gave a new boost to the inveterate opponents of the market economy. This led to a new battle of the extremes at the level of both ideas and policies. The so-called "anti-mondialists", the anti-market economy, anti-extremists have received the greatest attention when it came to the criticism of the shortcomings of globalization. On the other side, all critical views of the shortcomings of the theory and practice of globalization were identified with leftism and a desire to promote a state controlled economy.

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[6] Hieronymi, Otto, Editor, (1980): *The New Economic Nationalism*, Macmillan, London

All warnings about the dangers of reckless de-industrialization, of excessive cutbacks in the social safety network or of high unemployment and the growing income and wealth inequalities earned the accusations of anti-market views.

The middle ground, which had been the principal source of the unprecedented success of economic growth, rising living standards and social progress during the post war decades mainly in continental Europe and in Japan but to some extent also in North America and in England, has been increasingly squeezed out of the theoretical and policy debate.

The need to revive and to strengthen this middle ground was the preoccupation that Emilio Fontela and some of us friends and colleagues shared ever since the 1980s. The importance of this intellectual and political task and the validity of our warnings issued during a quarter of a century – warnings that had gone largely unheeded – were fully confirmed by the outbreak of the world-wide economic, monetary and financial crisis. By then Emilio had left us. It is clear, however, that the importance of Emilio's work in the future is and will be connected to the lessons that can learned from his contributions to this "middle ground" both in terms of theory and methods and in terms of institutions and policy advice.

The near collapse of the world financial, monetary and economic system in 2008 led to a renewal of interest in economic theories and analyses related to the great depression of the 1930s. Not only did both economists and governments and international organizations rediscover (often simplified) Keynesianism, the real or alleged virtues of deficit spending and of expansionary monetary policies (including negative interest rates promoted by Central Banks that used to be known for their conservative tradition) to fight recession and unemployment, but ideas and theories of other once famous economists also became part of the questioning of how to deal with the debt problem, with the stubborn unemployment crisis and the with structural slowdown and the threat of stagnation in the advanced OECD countries. No satisfactory practical or theoretical answer has been found so far to this question. The question of how to find a new valid consensus on economic order and economic theory is as open today as it was in the years before the crisis broke out into the open. This question consists of three parts: how

much of the orthodoxy of recent years (and even decades) is worth preserving, how much can be learned from the theories that had been discarded maybe too hastily, and finally how much innovation and new elements are needed to provide forge a new and valid approach for the future.[7]

It is in terms of these three questions that the experience of the post-war period, the trial and error and at the level of research and analysis and of policies should be reconsidered. It is also in this perspective that Emilio Fontela's professional career is rich in lessons that can be valid both for students and researchers and for policy makers.

2.2.7. Forecasting

Throughout his professional experience Fontela was engaged in the field of forecasting. It was in of forecasting that he had the broadest professional experience at the level of the theory of forecasting, methodology, model building and preparing short-, medium-, and long-term forecasts. He was a recognized innovator in quantitative and qualitative forecasting methods. The importance of his contributions was internationally recognized. He was recognized as a leader in this field and had a close working relationship with one of the great pioneers in this area, such as the Nobel Prize winners Richard Stone, Lawrence Klein and Wassily Leontieff. It is also in the area of forecasting that the example of Fontela's work may be the most important for future generations.

[7] Hieronymi, Otto (1998) "Agenda for a New Monetary Reform", in *Futures*, Vol. 30, No.8, pp. 769-781, Pergamon, Elsevier Science Ltd.

Four lessons should be mentioned in this context: (1) economics is a pragmatic discipline and forecasting is an essential function of economics; (2) the "reality" of economics is changing and this should be taken into account by both theory and pragmatic analysis and in forecasting; (3) good forecasting uses a combination of methods and tools; (4) there is no single predetermined future.

2.2.8. Misery and bliss

Richard Stone (1966) in his volume *"Mathematics in Social Sciences and Other Essays"* updates the Ramsey " mathematical theory of Saving" (1928), on how much community ought to save if it is to attain the highest standard of living and satisfaction, which its technology will allow.[8] Furthermore, how that share of outputs or assets should be distribute between *have* and *have not* peoples and employed over time in order to yield the largest possible stream of consumption and leisure for the have, and the better levels of subsistence and human conditions for the *have not*.

Stone stressed the positive theory and the normative theory to catch the stronger adaptive behaviour to fixed or changing technological environment.

Even highly abstract, and so out of the surport to provide practical answers to practical question, the Stone argument of Misery and Bliss in the technology evolving systems, is at the core of Emilio's work

[8] See also: Stone, Richard (1970): *Mathematical Models of the Economy and Other Essays*, Chapman and Hall, London; Stone, Richard (1981): *Aspects of Economic and Social Modelling*, Conférence Luigi Solari 1, Librairie Droz, Genève

in the theoretical or decision making landscape, his heritage for scholar and practitioner of tomorrow. And this, also, in his case, to provide the lines for practical answers to practical questions, like:

- How to rethink the welfare state in European Countries and in Anglosaxon countries without losing, in the former, the lower agency costs, and forcing efficiency in the latter, by means of technology improvements disposable yet;
- How to encompass the environment protection goals, discounting the wastes for all vertically integrated sectors, and intervention needs by net final product, item by item[9];
- How to take in to account the gaps in demographic structure and levels between North and South countries and how to think mass-immigrants in Europe, in a long term perspective, as a driving force that let our continent to take profit of diversity in economies and social and cultural attitudes;
- How to rethink education in light of the emerging phenomenon of knowledge as a factor of production, in a labour market where the share of labour as a production factor is continuously lessening and the share labour-product is growing; and how to rethink the research and high education, as centralized and cooperative in a unique Europe landscape (technology push to the economy, chapter 3, for details);
- How to organize public services, not only for improving their efficiency, but also as technology demand pull.

In 2006 Emilio Fontela, surveying many European proposal stated:

"If alternative complex futures and their corresponding operational systems are to be properly understood, this diversity in socio-

[9] Lo Cascio and Virdis (1997)

technical systems demands extensive multi-disciplinary research towards a comprehensive 'science of design'. Such a science of design will probably require a new research structure devoted to multi-disciplinary futures. This will facilitate optimum synergies among social scientists, engineers, and scientists from other disciplines—all working together with entrepreneurs, public administrators, and representatives of civil society.

Research production structures

Research is, itself, a service-production activity that utilises a large proportion of productive agents who could be described as 'labour as product'. This productive sector is essential for an Sustainable Knowledge Society (SKS) and, because research is the main input for knowledge, this sector will represent a growing share of economic production. Research is performed in a variety of settings (corporate research departments, universities, private laboratories, public laboratories, and so on), and it requires particular forms of organisation and management that promote selfdevelopment and creativity. The productivity of research will be crucial to innovation in an SKS; indeed, such productivity should, itself, be the subject of research (so-called 'R²'). In view of the fact that an SKS attaches special importance to the development of public 'goods' in such areas as education, health, and the environment, it is essential that public research capabilities be strengthened in these areas—in accordance with the planned multi-disciplinary approach described above.

Cooperative processes

In an SKS, the market process is driven by both economic objectives and knowledge objectives. Economic wealth and knowledge thus provide a dual process of evaluation of human activity. In this context, it should be possible to find ways in which competition and cooperation can interact positively (Fontela, 1998). Competitive corporations and cooperative universities and administrations interact more positively in small territories that have strong cultural ties (such as regions and nations). The varying nature of these interactions (and the varying nature of the resulting processes of social capital accumulation) are already apparent in the territorial diversity of Europe. For the 'demand-pulled' aspects of new technologies, the required synergies

among corporations, universities, and administrations are best developed at the national and sub-national levels, whereas for the 'supply-pushed' aspects they are best developed at the supranational level (European, world).

Measurement issues

The post-war national accounting system was designed to measure an ageing industrial society, and it already has difficulties in accounting for the 'New Economy' model. When it comes to a proposed SKS model, the accounting system will be quite inadequate for the purpose. Key computations (such as constant price productivities and production aggregates) are rendered meaningless by the changing nature of outputs and inputs and by the emphasis on quality and environmental protection. The increasing recognition of the limitations of current accounting and the unsatisfactory results of partial solutions (for example, hedonic prices in the US and satellite accounts in Europe) are encouraging the use of 'indicators' of doubtful relevance that are usually unable to identify knowledge as a factor of production and value aggregation. An SKS requires a complete re-thinking of the economic, social, and environmental accounting framework. This represents another essential subject for research in coming years."

In this context the Ramsey-Stone model and that of Solari-Fontela model (see Chapter 1) requires a third step on which the group LCFH[10] is now working.

2.2.9. Alcantara, Latin America and the "Social market economy"

But Emilio was also a great "qualitative" economist. While he was not beholden to any systematic ideology or narrowly defined school he was a liberal and an intellectual entrepreneur who all his life worked in the market. He "practiced" the market economy much more systematically than most of the academic preachers of "all-market" doc-

[10] An informal research group, named after the initial promoters: Martino Lo Cascio (Rome), Alberto Cassone (Turin), Antonio Fazio (Milan), Otto Hieronymi (Geneva).

trines. He was familiar with large companies, large government organizations and international bodies. He was familiar with their resources and strengths: he knew that independent thinking is not one of them. While at ease in the largest and most powerful public or private organizations, he was sufficiently Swiss to know that small can also rhyme with strong. A fervent believer in European, Atlantic, Western and world-wide integration, he also knew that the tendency towards bigger and bigger companies was not due to the search of efficiency, but to the fear of competition. He cherished both his intellectual and economic independence.

He had no qualms about being a European, an Atlanticist, proud Spaniard, a Westerner, a friend and at times admirer of Japan (although not for the same reasons that Japan used to be admired in the 1980s). But he also believed that the "less developed countries" also could and should have a chance to develop and prosper. He did believe strongly that the quality of their "model", of their policies was an essential factor. He was at the opposite pole from the left-wing radicals of the type of a Jean Ziegler who preached world revolution and planning à la cubaine for the poor of the world while enjoying the freedom and affluence of "imperialist Switzerland".

Although an "all-round" European, his blind spot was German. Educated from the age of 12 in a Swiss boarding school he received a dispensation (we do not remember the reason) and could pass the "maturité fédérale" without having to learn German. He also enjoyed a good fight (a true fan of the *corrida*), and he enjoyed tremendously when he was the Director of the Department of Applied Economics at Battelle Geneva the infighting with the colleague/enemies at Battelle's Frankfurt laboratory.

Thus, it is all the more remarkable that one of our last "intellectual adventures" had to do with the German and Swiss concept of the "Social Market Economy".

Why the "Social Market Economy"? All his professional life Emilio was deeply engaged in the study and projection of economic and societal models – both at the macro and the meso levels. Studying and projecting within national economies, between countries and at the world level. Input-output analysis was an important tool in this line of work but far from the only one.

One of the growing preoccupations that we shared from the 1970s onward was what was happening to the successful mixed model of the advanced Western societies that combined the benefits of liberalization and competition with social concern and progress – in fact the most successful economic, political and social model in history. Different versions of this model had been developed in the United States, the various European countries and Japan.

We shared the deep concern that the most extreme forms of today's globalization theories represent a serious threat for this model. Yet he shared the belief that this model, constantly searching for a balance between government responsibility and market forces, between economic efficiency and social responsibility, represents the only valid model in the long run for the rich and the developing countries alike.

These ideas were reflected in the Alcantara conference and the Alcantara Manifesto of 2004 and the book that came out of the seminar hosted by Antonio de Miera on *Brazil and the Social Market Economy*.[11]

[11] Emilio Fontela Montes and Joaquin Guzmàn Cueva (Eds) (2005): *Brasil y la Economia Social de Mercado*, Cuadernos del Grupo de Alcantara, Madrid. The "Alcantara Manifesto" is discussed on more detail in Chapter 4 of this volume.

Chapter 3: The Erratic Wandering of Economic Facts and the Non-Theological Quantitative Analysis of the Future

Martino LO CASCIO

3.1 Introduction

In the period this chapter has been written, – August 2015 – important facts like the bursting bubbles in the Chinese asset markets, the third financial Greek crisis, the prolonged stagnation of the European Economy are shocking public opinion and policy makers, including Central Bankers and leaders of other international institutions. The incoming facts, i.e. the possible impact of Grexit or even no Grexit, induce a Knightinian sort of uncertainty. Economic (and social) facts of this type have been increasingly occurring over the last fifteen years. The academic world – if we do not consider the persisting mainstream career rules, with their induced obsolescence –, is at the edge of chaos, mainly in macroeconomics, economic and financial policy theory. The economic thought has evolved partially out of the many strains of neoclassical micro foundation along with works done by less orthodox mainstream and heterodox economists (i.e. Stiglitz, Krugman, for the former, Perez, Reinert for the latter), or totally out of the standard equilibrium analysis with a different approach to economics (the so called complexity economics, represented by scholars David Colander and Brian Arthur of Santa Fe Institute). It is not merely by chance that I refer to the so called complexity economics and not to the "New Era of complexity", like Colander (2010) does. After all, in 1902[12] Alfred Marshall wrote: "the work of economist is to disentangle the interwoven effects of complex causes"[13].

[12] In a letter to F.Y. Edgeworth, 28 August 1902

[13] Deep contributions on innovation, institution and role of history had been developed by economic scientists (Smith, Mill, Marx) before the great marginalist and the gen-

Even if I cannot be exactly in line with Brian Arthur's basic sentence that, "[With the so called complexity economics], we have a different framework for thinking about the economy…one where actions and strategies constantly evolve,..., where structures constantly form and re-form, and where a meso layer between the micro and macro become important", I appreciate some insights of this new complexity economics, mainly the:

- Focus on relevant phenomena – that are not fully captured by standard equilibrium analysis – of self-cumulating concurrent behavior of agents, from which market fluctuates, price fluctuates , trading arrangements fluctuate, industrial and institutional systems fluctuate; where meso-layers between micro and macro became important, as a different way to define *mesoeconomy*, a concept and a tool developed by Emilio Fontela and to be fully investigated by the economists of the XXI century in his perspective;
- Need to come back to earlier economic theories, in which the issue of *allocation* within the economy (how quantities of goods and services and their prices are determined within and across markets) has to be "disentangled" from the issue of *formation* within the economy (how the economy grows and changes structurally over time);
- Redefinition of what represents a solution in economy, no longer necessarily depending on a set of mathematical conditions, but a pattern, a set self-cumulating emergent phenomena like exogenous and endogenous technologies, and induced new role of finance, to be caught by trial and error simulations;
- Renovation of the statistical and econometric tools prevailing up to 1970's, with a sort of Colander's *craftsman approach*,

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eral equilibrium revolution. After Keynes' parenthesis, aside neoclassic triumph, cannot be forget the studies of Veblen, Schumpeter, Hayek and the main institutionalists and historians that followed.

coming back and developing the research lines, for instance, of Richard Stone and Emilio Fontela in economic questions of formation, exploration, adaptation and qualitative change.

Many times, I asked myself what Emilio Fontela would have thought on today wandering facts as pieces – yet envisaged by him – of an evolving new, never completed, puzzle. Together with Otto Hieronymi, co-editor and member of this virtual think tank of authors of this book, the following issues have been singled out:

i. The facts that once more puzzle the "dismail science" along lines of an *Empirically-Based Macroeconomics;*
ii. The market Saturation Era or the Finance Era?;
iii. The technology, energy, environment meso models and scenarios;
iv. Focus of nowadays EU turning point. ?

The first two items are no more than a list of controversial issues of mainstream economic debate combined with heterodox concepts that I argue to be in agreement with Emilio's thought. The third and fourth items include common built and not common built – but hopefully accepted – econometric models and scenarios. ?

On April 4th 2001 Emilio Fontela, speaking in a lesson at School of Humanities and Social Sciences (RENSSELAER)[14], on the "art of foresight", said: "As a praxeology, the main problem of economics stays in its deeply rooted short-sightness. With information technologies and the globalization of finance there is even an increase of short–termism in its most fashionable field of interest, financial economics". Richard C. Koo (2014), in a recent volume on the Quantitative Easing (QE) trap, subtitled "A Hazardous Road for the World Economy", puz-

[14] The title of the Conference was "From the Wealth of the Nations to the Wealth of the World"

zles some Standard Textbook Economic (STE) theorems, like the "Phillips' curve"[15], since the relationship between prices and un-employment no longer holds, with "a cascade" of quite a lot foregoing and following real economic facts and theories. On these lines, in 3.2, Part One, I subdivided the sketched controversial issues in two items, 3.2.1., on money, prices and exchange rates and 3.2.2., on capital, output and labour.

A second sentence of the "art of foresight", in Fontela's speech, was: "whether we like it or not, only the economic history deals with the past: economics, as such, deals with the future, and it is not so much what "should" the future be that is important; what society asks from economists is their assessment of what the future "could be", and what "could be" done is expected to relate to goals that often are beyond pure economic efficiency"[16]. Here is the room for the historical heritage of two hundred years of capitalistic society: is the market saturation in many productive activities of western countries a part of transitional long wave cycles of the world economy (Perez 2002) or a New Era of finance? The last one is at the core of the "Limits of Competition", volume co-authored by Emilio Fontela and other scientists and practitioners of the Lisbon Group in 1995, a think-tank that firstly approached the pass-through "from the Wealth of the Nations to the Wealth of the World". A few of these problems are discussed in Part 3.3, i.e. some features related to the need to link quantitative and qualitative analysis in a trans-disciplinary toolbox of socio-economics, meso economics, techno-economics lines of research.

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[15] Called by Kenichi Ohmae (2005): "The curve trap".

[16] In a brief essay on the methodology of history, John Lewis Gaddis leads a reflection on the whole epistemology of the social sciences, compared with that of the hard sciences. He raises the idea that the proper "ecological approach" of history methodology (which has at its center the interdependence of variables) is today increasingly popular among the social sciences - despite the inevitable simplification resulting from the need to provide the future - but even among the hard sciences. See GADDIS, John Lewis. The landscape of history: How historians map the past. Oxford University Press, USA, 2002, pp. 53-70.

In a society with free choices, looking into the future cannot be a science, but it can be an "art", using rigorous scientifically-based thought (Fontela 2001), another way to call the Colander "craftsmen approach". I found it interesting to recall my own and Fontela adventure in building and managing the " Interdependence Model (I.M.). The Development Through Cooperation" (1981), main object of part 3.4. The I.M. has represented a common thinking, common database, common 7 blocks of econometric models and common scenarios for representative producer and consumer countries of the energy/economy markets and societies.

Part 3.5 includes a zoom on nowadays E.U. economy and society. Starting from the characteristics of current Euro Zone turning point, a few insights for long term opportunities and risks in the New Social Market Economy landscape are advanced in part 3.6.

3.2 Once more facts puzzle "The Dismail Science"

Looking at the last twenty years of the world economy, the different economic areas, at various time and spatial scales, seem to fly through a period of turmoil, that John M. Mason (2008), a theorist and high level practitioner of economics and finance, describes as a "Bermuda Triangle". There seems to be some uncertainties among pilots on how and where to better drive the monetary plane and the same appears to happen to their companions of the real economy plane in the new global economy. The latter still **is a fact**, **not** a comprehensive and consistent **theory** (or competing theories) **yet**, because of their *nation-state based framework* and the *emerging growing fallacy* of *causality mechanism's* approach (Kenichi Ohmae 2005) vis à vis the *interacting* complex phenomena *vision*.

Money supply, Prices and Exchange Rates are the commands which the pilots of the first plane act upon; Capital, Output and Labour

are the commands of the second plane. The pilots of the two planes would interact, either to fly through the turmoil, either to get soft land. But weakness and disturbance in the communication with the Air Traffic Control persist or, out of the metaphor, with the Economic Theory.

Bearing in mind the six Major Puzzles in *International Macroeconomics* (Obstfeld and Rogoff 2000), that baffle the companion pilots of the second plane, they know the overshooting phenomenon (in the plane they fly) as the cause and/or the effect of higher levels of volatility of the exchange rate, when money supply is adjusted to keep under control inflation or deflation. They think to pass through the turmoil, following the Dornbusch Instructions on overshooting model, but they do not see clearly the Output of the other plane. On the other hand, they must take into account the Unholy Trinity (Mundell (1993) and Fleming (1962)) theorem by which Governments can only search two of the following three policy goals simultaneously: stable exchange rate, absence of capital controls, monetary policy autonomy. But, without a stable connection with the Air Traffic Tower and with the pilot of the other plane, it is very difficult to manage the rules (or even the absence of rules) that govern international capital flows.

3.2.1 Money, Prices, and Exchange Rates

Milton Friedman's (1970) famous sentence was: "Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in quantity of money than in output". Theorists and practitioners are currently engaged in a test of this proposition. In the period 2007-2012, the Federal Reserve (FED) has more than tripled the monetary base (the M2 aggregate), a key determinant of the United States money supply, but inflation - as it has been said by John C. Williams (2012) - "has been the dog that didn't bark", since prices rose by less than 2 percent/year on average over the same years. It appears relevant the emphasis placed by Williams on the distinction, in monetary base, between currency in circulation and bank reserves held at FED:

- The first one is linked, elastically, to internal demand and, more so, to the outside U.S. border demand (Dollar seen as a safe Haven);
- the second one is linked, up to late 2008, to meet only regulatory requirements and, subsequently, to the FED zero lower bound rate on Federal Funds and to the additional stimulus of long term securities purchases, paid to create bank reserves.

Incidentally, the relevance of Accuracy and Precision in financial series are further discussed in Part 10 of this Volume. The relevance of the institutional and policy changes and the FED's decision, in the late 2008, to pay interests on reserves proportionally to targeted Federal Funds Rates, tell us the story of 2009-2012 increased demand for long term Treasury and similar securities, their pushed prices, and thereby the reduced longer-term interest rates. In turn, "lower interest rates have improved financial conditions and helped stimulating (U.S.) real economy activities", rather than textbook process of reserve creation, leading to an increased money supply.

Of the Dual mandate: Monetary Policy and Long Term Unemployment, the two arrows in FED quiver, the latter is missing to European Central Bank (ECB). Nevertheless, the toolbox set in place in the EU, starting from 2014, is similar, though presenting two specific characteristics: i) persisting "transmission problems" within the Eurozone, as recalled by Draghi, ii) impressive impacts on exchange rate of the Euro.

Coming back to the U.S. current situation, the question is: have the U.S. improved sufficiently, have banks started lending more actively, so that the historical money multiplier will reassert itself? And can't the resulting huge increase in the money supply overhead the economy, thus leading to higher inflation? Some American commentators had sounded an alarm, in the last three or four years, underlining that the massive expansion of the monetary base will inexorably lead to high inflation *à la* Friedman. It is not hazardous to think, however, that these commentators have in mind, to some extent, the Greenspan – Clinton "golden age", when anticipated - but not realized - risks of inflation were the smoke screen to hide the U.S. absorption of liquidity

from the Rest of the World, by through interest rates (Kenichi Ohmae 2005).

Answering these questions requires:

i) a deeper analysis of past and foreseeable changes in the inner and outer workings of the U.S. monetary policy; it is not a chance that the International Monetary Fund (IMF) launches **light** but **persisting caveats** about the **liftoff of** foreseen **interest rates**[17];

ii) A view of structure and trends of the "real economy plane", that is the subject of the following 3.1.2 paragraph;

iii) A "*survol theorique*" of the exchange rates paradigms, that although largely questioned on empirical grounds, still are proposed as starting point in presenting one or another monetary policy measure.

The first paradigm (**Paradigm 1**) is the elegant Purchasing Parity Theory (PPT) of David Ricardo. The original model, linked to, alternatively, positive or normative theory of trade, says, in brief, that the exchange rates between two currencies are or should be proportional to their respective purchasing power. But this, in turn, implies a choice of "basket of goods (and services?)" by which one can measure the relative purchasing power by countries (and subsequently the cross-rates). Furthermore how to consider the relative Asset Prices? and Real Estate Prices? Among the well-known problems in the use of consumer price indices or Gross Domestic Product (GDP) deflators, here is the room to introduce the *Accuracy* and *Precision* items, in the sense Gilli and Schuman discuss in Chapter 9.

Even if PPT still remained a theoretical paradigm with many developments (linking cross-rates to the relative ratio of productivity and/or other "fundamentals"), an empirically based narrative tells us

[17] Main problems: i) the impacts on newly industrialized countries due to the financial outflows, disproportionate to returns, heritage of U.S.' Q.E.; ii) the expected impact on the volatility of the sovereign bonds, mainly for European Countries

that – until the Bretton Woods System, exchange rates– with few, even strong, exceptions – have been fixed by bilateral state agreements and anchored to relative reserves of Gold by countries. Under the Bretton Woods system, exchange rates were fixed at levels determined by Governments that all pegged their currency to the dollar, exchangeable with Fort Knox reserves. The advantages where stable expectations, no needs and no costs of insurance against exchange rates risks (futures, hedges), more trade and, probably, higher economic growth. The disadvantages were the risk of severe misalignment, the speculative attacks on exchange rate peg, reduction in monetary policy autonomy. Starting from the 1953 seminal paper of Milton Friedman, the **Unholy Trinity** makes its appearance, and triumphs in 1971, with the collapse of the Bretton Woods system. Under "floating" exchange regime, the cross-country high volatility was astounding: many economists and business men were surprised and astonished, as they did not expect the "floating" regime to create so much uncertainty.

Many political, institutional, technological driving forces went on, Forex secondary market progressively pushed up. The PPT paradigm evolved in the rational expectation of financial equilibriums (**Paradigm 2**), to which a vast audience of big and small operators and public decision makers would or should tend. Since it has emerged, after comparing many statistical and econometric models (as do, for instance Meesere and Rogoff (1983), Epstein (2005)), that exchange rates don't follow "fundamentals" in any predictable manner, and can deviate persistently from standard equilibrium levels, the classical dichotomy between real/trade and monetary/financial sides of international economics breaks down.

After the parenthesis 1985-1992 of *political power*, the **Paradigm 3**, that follows the 1985 *Plaza Agreement*, the impossible attempt to downsize the cross Yen/Dollar to overcome the U.S. current account deficits, the risk of bailout of Japan in 1994 with Yen/Dollar= 84.1 compared to a maximum of 235 in 1985, the Agent **Paradigm 4** emerges**,** searching for the leaders in the technical/trading landscape. Various attempts to link monetary approach and technical trading, even only for spot exchange rates, currently are "advanced", as for instance in Bask and Fidrmuc (2006). Many researchers do not believe that currencies' traders that use the Chartism can survive in the market, but since the invisible hand of the market has not, so far, clearly appeared, some of

these researchers shifted their interest to explain why these traders survive in the market, and more interesting, to understand the feedback effects of Chartism in currency trade. Conclusions, similarly to what can be obtained through a simple cognitive diagnostic, suggested that technical trading contributes significantly to the determination of spot exchange rates and likely increases the volatility in the market. Bask and Fidrmuc found also that the feedback effect of Chartism on currency trade is high, but the driving force towards fundamentals is low indeed.

The complex structure of different trader types, using both fundamentals and backward-lookingterm, documented for developed countries, shows increasing market shares also in newly industrializing countries because of the lack of internal macroeconomic and policy data combined with the availability of new information coming from U.S., E.U. and so on.

Large monetary areas coordinate actions, in regard to exchange rate, is a naïve Kosorioku[18] type vision, not a reality yet; thus, fiscal policies seem to lose effectiveness, while monetary policies seem to gain efficacy. But democracy, even in the form of the short-termism attitude of most of the current representatives, aims at managing national income, unemployment, and inflation or deflation. The trade-off and constraints created by Unholy Trinity still remain, together with a lot of systemic uncertainty.

Summing up, inner and outer workings of **Central Banks** in combination with **fiscal policies** and **hysteresis heritage** of **real economy** are now the most relevant items on the table in the short term. In a wider time and landscape horizon, the **innovating strength**, defined

[18] Quoting Kenichi Ohmae ("The Next Global Stage: Challenges and Opportunities in Our Borderless World") " Kosorioku is something like vision, but it also has the notion of concept, and imagination. However, unlike imagination, which sometimes has the overtones of daydreaming, "Kosorioku" is an ability to see what is invisible to shape the amorphous. It is a product of imagination based on realistic understanding of what the shape of the oncoming world is."

by Fontela as "**Kantian Optimism**", of technology, institution, and society, will prevail.

3.2.2 Capital, Output, and Labour

Capital, Output, and Labour are the controls the pilots of the *real economy* plane act upon. More precisely, Capital, Labour, Energy and raw and Materials, are the gears of the traditional K.L.E.M. production box (function[19]), coupled with relative prices, consumption, … that complete the feedback loops in the box.

Out of the plane, the pilots see the opportunities of technology and information paradigms to survive the turmoil, but also the risks of the society, the environment and life supporting diseases. The pilots get angry with the Air Traffic Tower (ATT) or, out of the metaphor, with the Standard Economic Theory. They lack the technology and information endogeneity in the box and the weakness and disturbance in ATT's control of societal and environmental risks of crash. The monetary plane's pilots suggest them to fly the turmoil using *expectations mode.* For B. Allen (2000), in fact, finance *"has had a huge influence on economic theory, stimulating much of larger and important literature on economics with uncertainty and asymmetric information, including the sub-topics of rational expectation and contract theory"*. Even if some useful theoretical and operational results may be expected in this perspective, it is necessary to recall R. M. Solow (2000) saying: *"Now is widely understood that Macroeconomics is at heart economics. But the intellectual construction remains shaky. It is uncomfortable to have so much in Macroeconomics depend on how one deals with a concept like expectations for which there is (inevitably?) so little empirical underpinning, and so much room for invention"*. The *evil darkness* of Representative Agent and subsequent problems in aggregation is also pointed out in the LCFH group project work (2010).

Remembering Solow, Fontela, in the a foreside speech, said: *"Microeconomics has developed as a fantastic deductive construction*

[19] See for the details "Renato Guarini, Scritti di Statistica ed Economia", Lo Cascio and Zelli eds., 2007

starting with capacity of Homo Economicus, up to reaching levels of sophistication, some of which may be progressively losing credibility."

More realism, modesty, and accuracy are now requested in utilizing theory and empirics: the simplest principle of precaution limits the extent of trial-and-error approaches to policymaking in favor of a serious prior evaluation of alternatives, leaving (and promoting) to the *consultants* a transdisciplinary craftsmen behavior.

R. Rossanda in her preface to the Italian version of *The Limits to Competitions* (the Club of Lisbon Volume has been translated in more than 20 languages) stated that at the end of the 20th century **the rise of Information Society**, the **triumph of markets** against state planning and the **Globalization of Finance and Trade**, had been three vectors of change that, at the time she wrote, had challenged the Mankind non yet for the better, being Competition the mainstream accepted goal of social strategy.

The unsolved challenge, up to now, persists, even with some heterodox views like that of M. and L. Lo Cascio (2007) "Technological Shift and Soft Competition". Furthermore, in a paper (*Economic Space Trajectories Through Different Regional Growth Models*) discussed on May 2008, Lo Cascio et al. found that *"the role of enlarged neoclassical production function, on empirical ground, has a limited weight, in the average of EU regions, with respect to social, and political factors or to some stock fundamental determinants"*.

In the K.L.E.M., Output and Cost box, all the components are changing for the best or the worst. It is difficult to imagine that the traditional *labour market* with a demand, supply and price for working time, will remain a key ingredient of the future economy if the Information Society pushes work towards active leisure (Fontela 2000). Here is the room for the discussion of the 20th century heritage for the so called ***Baumol disease***, further analyzed in Chapter 11 by G. Garau. The thorough pass from *labour as production factor* to *labour-product*, as a component of the New Social Market Economy is sketched in Part 3.6 of this chapter.

More could be said about the grey-zone between labour and capital, that is about human capital.

Raw materials, and energy inputs, or better, their prices, enter in grey-zone *purchasing power – exchange rate*. Environment and society diseases are asked to be endogenized.

Daniel Yergin, one of the most famous energy-environment researcher[20], in an interview with Rich Kirkland, senior managing editor of Mc Kinsey publishing, says that: "Unconventional - oil and gas – revolution – shale gas and *tight oil* – is the most energy innovation so far in the 20th century", but also that "we can be confident that there will be other innovation coming down the road", including the ones that may constitute the sixth episode following the previous five episodes of running out of oil. Each time in the past, "new technology, new knowledge, new territories" made the difference. "And something else that people forget: price. When we look at economic history we see a very powerful lesson that has to be learned and relearned: price matters a lot. Price encourages the development of new technologies and new ways of doing thinks". The impact of energy price as stimulus to innovation and social creativity, i.e. energy prices and technology that are endogenous and interdependent in the seven blocks of the I.M. (the common adventure with Fontela), is discussed in Part 3.4, together with other common and individual experiences in modeling energy, technology and environment.

3.2.3 The lateral thinking of the wandering facts of the future, heritage of the past

Defining it in opposition to the sequential way of reasoning, psychology suggests lateral thinking as a mean to capture the amorphous in an ill-defined situation, through indirect and multi-faceted

[20] Daniel Yiergin is the author of "The Quest: Energy, Security, and Remaking of the Modern World" (Pinguin 2012) and the Pulitzer Price –winning book "The Price: the Epic Quest for Oil, Money & Power" (Simon & Schuster, 1991).

(disciplinary or, more, trans-disciplinary) paths. Camilleri's very famous Inspector Montalbano adopts a lateral strategy by which a multitude of *per se* insignificant facts form all together a meaningful puzzle.

It is out of the boxes of the mainstream or heterodox economics the way followed by Fontela and by myself. It can be defined a lateral way to analyze economic facts, that is not disentangled by considerations based on other disciplines, mainly ethics. Thinking on the major current challenges to the society, in a larger time and spatial perspective, one cannot forget the words of the 1995 Lisbon Group cited Volume: "In addition to environmental problems, globalization is increasing associated with demographic explosion, mass unemployment, mass immigration flows, growing organized crime,…, ethnic and religious conflicts, … . Above all, globalization is nourishing the fear of a clash between the strictly limited number of "have" and "have not"". Naturally, this "scenario of doom" is neither unique nor mechanically determined, since there is the human action and, as Fontela suggests, "economic action, and economist have a deontological responsibility for providing diagnosis and prescription to all decision making agents". All these themes are discussed in the present Volume, starting from *craftsmen insights* in the next sections of this Chapter and in a more historical and political perspective in the following Chapter 4 by Otto Hieronymi.

3.3 The Markets Saturation Era or the Finance Era?

Moving towards the second stepping stone of the new century, theorists, practitioners, and peoples are witnessing deep changes in the functioning of the economic system of the advanced industrial countries as well as of the rest of the world. The past forty's years dominating ideology of **competition,** at national and of international level, is, now, though still slightly, questioned; however, the most of decision makers still consider, beyond their short-termism, free competition as the **ultimate goal for their constituencies and not an instrument** to provide to the levels of welfare requested by the peoples.

Technology, money, and finance are fundamental elements of any economic system, starting, at least, from Hamurabi's era, as noted by Reinert[21], passing through the industrial revolution, the economies

[21] The circular flow between Innovation and Production of goods and services " black box" and Money/Capital "black box" explains the Hamurabi Effect and "Debt Deflation". The last one is "The simplest model for understanding the disproportion between the real economy and the financial economy originated in Mesopotamia under Hammurabi (2030-1995 BC). Claiming that the roots of civilization were found here, is indeed more than an empty phrase. Hammurabi's economists calculated that, due to compound interest, the financial economy would increase far more than the real economy would be able to absorb….. Hammurabi and his descendants took the consequences of this, and irregularly cancelled all debt (except short run commercial debt) to avoid the death of the real economy due to ever increasing debt. In the Old Testament we still find references to this system. The years when debts were cancelled were called Jubilee Years. Money and gold are then conceptually different from the goods and services that can be acquired with their help. History is filled with warnings against what has been called chrysohedonism" or the varying purchasing power of coined money, and subsequent prices crisis in Roman Empire. "Through the whole history of Civilization we find as a red thread that the 'financial sector' is only useful when invested in the real economy. The Muslim prohibition against interest – riba – and the Christian prohibition against charging interest up until the 1600s must be seen in this perspective.". The ingenious and mischievous contract rules invented in Italian Republics, starting from 1300's and the rationalized views as Francis Bacon's of the importance of innovation, that requires risk capital and acceptance of lending out capital against interest. Here it is important to understand Schumpeter's theory of capital: if nothing new happens in the world (innovations), capital is theoretically without value. Interest in a world without innovations could be covered only by depreciation. In the word of Keynes capital is a "bridge in time". Financial crises occur when the financial sector stops functioning as a bridge in time for the real economy.

of the centrally planned Eastern World, the Post War Welfare State of western economies or even the Islamic economies and the other attempts made to establish alternative paradigms for the economic systems. The maturing process of the so called Manufacturing Era is probably undergoing such a deep transformation that one may expect to observe its end. The transformation is partly driven by the technologies of information that are giving the chance to the "alienated worker" of the Manufacturing Era to become labour-product in a grey zone with leisure time spending, and lesser constraints of a regulatory framework, that has become particularly stringent after the Great Depression of the 30's. All this still remains a not yet completely realized potentiality even in the Western industrialized countries. The modern Welfare State, in its various declinations, that are all looking to ensure a *middle class American way of life*, it is now being hardly questioned.

3.3.1 Markets Saturation

The position of my colleague Antonio G. Fazio (2006) in his contribution to the aforementioned *think-tank* project work LCFH, starts by making a clear distinction between *saturation* as a nature state or as a process. In the first sense, complete saturation is impossible in a market economy, since, under the STE paradigm of restless of consumer (decreasing marginal utility with a zero limit to infinity), the corresponding supply price would be zero at the limit (and the capital fixed costs are not covered).

When considered as a process, **saturation is a possible phenomenon**, that is linked to the growing declining degrees of satisfaction of a need. This is the saturation's thinking of business economy in the life cycle of a product: take off, expansion, maturity and decline. Along the life cycle, the production units ensure growing degrees of satisfaction to consumers, by lowering production costs, increasing quality, taking benefits of household's increased income. The steps of maturity and further decline or stationarity of demand, that, economic theory, in the complex, envisages, **is not linked to the total satisfaction** of consumer needs, but rather to the declining interests of businesses to further

reduce the unit costs or increase production. *Coeteris paribus* on income distribution, the concentration of business units is one way to ensure market shares and returns, being the decentralization and/or externalization of the upstream in the productive chains the second one, and the pressing the labour regulatory framework the third one. Increasing risks on asset prices and returns or even on bailouts, put, as determinant, the role and the power of finance.

In Macroeconomics, however, **saturation is impossible**, because of the non-demonstrated STE **axiom of restless of consumer**. In a more fascinating version, the axiom includes never ending new diversified ways to satisfy the same need or to create new needs, and the paradigm ends up with the scope economies combined with scale one. Thus, economic growth would be *aeternum*, with some conjectural troubles being only low weighting exceptions.

If the "restless paradigm" is rejected (i.e. saturation as a process is possible),then huge underemployment, deflation, underutilization of social overhead capital became possible in certain historical phases, like that of the Great 29's recession.

Explicit or implicit "a priori" assumptions matters. The independence of the time and the space was an implicit or unconscious assumption in the Newton's Universal Gravity Theory. After two centuries, Einstein's Theory of the Specific Relativity explained and experimented that time is different for two clocks with different velocity (i.e. different positions in altitude). Ten years later, carrying out *crazy* studies (C. Rovelli, 2015, p.14), making errors, writing wrongs articles (in a nutshell, after ten years of a sort of *lateral thinking*), Einstein published the General Relativity Theory that solved the puzzle of consistency between the Universal Gravity Theory (UGT) and the relativity. Out of this physics ingenuous digression, one may suspect that the last 2008 financial crisis, like the 29's one, is the final effect of the long term mechanics of the real economy. This is the argument of Fazio, as I understood it working with him in the *think-tank* project work LCFH.

Fazio argues that the possible generalized maturity of western industrialized countries needs not to be directly demonstrated , as it is sufficient to accept the possibility of saturation to more easily understand, describe and forecast the wandering facts of huge unemployment, deflation, …, as they occurred in the 29's Great Crisis.

Szostack (1995), in his study titled "Technological Innovation and the Great Depression", attempted to demonstrate that the general saturation of markets was the starting point of the explosion of 29's big financial crisis. Heavy qualitative and quantitative analyses were carried out by him to support this thesis. But his study was slushed by Woolf (1997) and this closed the debate.

In his work of 2006, Fazio advanced the hypothesis that in 2007 the world was going to face another big financial crisis, due to the general saturation of markets, although the general economic context was different from the 29's situation (higher levels of income, production and consumption).

In this debate within the LCFH group, my position was assume the hypotheses and the conclusions, non-theologically advanced by Fazio, as pieces of a puzzle in which many other pieces are still lacking. One of this pieces is to be found in the newly interacting process of technology and finance

3.3.2 The Finance Era

In preparing a provisional draft to be firstly discussed and thereafter merged with the other contributions of theorists and practitioners of "Lisbon Group", E. Fontela provided an analysis of the changing role of Finance, of financial globalization, and of its relation with the evolution of the real economy. His analysis moved along two lines: i) the historical paths of what I've metaphorically referred to as the flights of two planes of the Bermuda's Triangle and their mutual communication problems and those with ATC; ii) the *two-way* impact of technologies' new wave (at the end of 20th century and at the beginning of 21th century) on finance, that, in his perspective, was "taking increasing responsibility to fix new goals for the transformation process of the economic system", inside each one of the planes, and their connections in noised communications with the ATC. In his narrative, the system that emerged in the 70's and the 80's of the 20th century was featured by two elements in total discontinuity with the Bretton Woods system:

- The barely absolute freedom of capital movements, in particular of short term capital for liquid deposits or trading of finance products in all domestic capital markets;
- The system of floating exchange rates, subject to some Central Banks inter market interventions, for stabilization purposes.

At the same time, as an effect of the newly introduced Information Technologies, finance appeared to be replacing manufacturing as the most dynamic component of the economic system. Globalization of financial markets, as well as the new possibilities offered by computers and communications technologies, have encouraged this development of financial activities. The increasing freedom of capital finance and the technical feasibility of on-line financial operations all over the world, have opened "vast new avenues for human creativity, and, financial intermediation between savings and investment have been complemented by more sophisticated strictly financial operations dealing with the transfer and coverage of financial risks". Furthermore the values that dominated the manufacturing activities, had been "replaced by values associated with the financial world". A sort of a new model of economic development, mainly guided by financial criteria, has emerged, i.e. "the early stages of the ***Era of Finance***, a historical period characterized by the leading growth of financial activities and financial values".

Even if, it is clear that the globalization of finance is a theoretically necessary evolutionary path for the world economy, it is "needless to say that, as always happens in economics, reality always differ from theory and that the theoretical pamphlet supporting the ***Gospel of The Era of Finance*** describes a wonderland nearer to an idealistic utopia than to any real life situation. In the real world, with each human being, its real Governments and its real economy, practically nothing of what advocated by the Finance utopia even happens, and it is often difficult to find confirmation of the supposed efficiency gains deriving from financialization of the world".

In this provisional draft, Fontela advanced a set of proposal for the re-adaptations of regulatory mechanism of finance, and for changes in financial strategies in order to better meet the human welfare require-

ments at world level. These later recommendations were mainly orientated toward the design of possible new roles of finance in the practical implementations of the four world contracts suggested by the Group of Lisbon in its volume "Limits to competition", namely: the Having Contract ("remove inequality"), the Cultural Contract ("tolerance and dialogue of cultures"), the Democratic Contract ("towards global governance") and the Earth Contract ("implement sustainable development").

The second way of Emilio's thought, that of Limit to Competition, enhances the dialogue version of Fazio-Fontela controversy, being the way out to the current difficulties, that suggested by the former: a societal and policy comeback to lessen, though not to remove, inequality, and improve the quality[22]. His consciousness of the realms informs the title given to equality and quality proposal: "*stat rosa pristina nomina, nomina nuda tenemus*".

The Fontela's Kantian Optimism becomes more concrete when he suggests, looking at the European Union, for instance, to go beyond the Lisbon Strategy (established at the beginning of this century in order to pursue competition together with the cohesion), with a stronger effort to promote "**converging technologies[23]**" for the **"Sustainable Knowledge Society" (SKS)**, starting from the evidence that "*broad technological change is a long term affair".* He merges two alternative approaches to technology, respectively considered as exogenous or endogenous factors to the economy, into a frame in which a pool of technological opportunities emerged from Science, the **supply-push technologies** (coherent with classical economics) interacts cumulatively with the **demand-pull technologies** (conscious research investment by entrepreneurship with Schumpeterian temporarily monopolistic positions).

The "mainly supply pushed (in which creativity is driven from inside the discipline) includes: nanotechnologies; biotechnologies; info technologies; cognitive sciences; and the methodological area of complexity. Those that can be described as essentially *demand pulled* (in

[22] See also Fitoussi and Stiglitz J. (2009) and G. Zezza (2011)

[23] Alfred Nordmann et al. (2004) and Lo Cascio et al. (2012)

which the more creative aspects rely on the application of available knowledge) include: manufacturing; agricultural; service; environment; communication; transport; energy; health; and security." (Fontela 2005).

In this scheme, the social sciences and the humanities (which are characterized as part of the *cognitive sciences*) are expected to fulfill the difficult task of establishing bridges inside and between supply and demand of future technologies.

In the Nano- Bio – Info - Cogno (NBIC) and the SKS paradigm, Fontela includes among *objectives* (of integrative solutions),: the *innovation and the economic growth, and environmental protection and ecological balance*, also, the ***creativity*** and ***human development***. On the other hand, he includes among the *instruments*, the *prices* and *technologies*, also, the *values* (A. Pulido, E. Fontela 2004, see also Chapter 5).

3.4 The Technology, Energy, Environment Meso Models and Scenarios

The above discussions in paragraphs 3.2 and 3.3 brought the debate on the technology – economy – society long-waves. Two questions are on the table: i) are long waves real phenomena? ii) subsequently, what is the nature of the long term movement? A review of this debate is contained in a ten-years ago paper of A. Reati and J. Toporowsky (2004), which provides the reader for a reasoned review of the essential points of the theoretical debate about the long term development of capitalistic economies. In light of the persisting controversial issues, I am not in line with the final conclusions by Reati and Toporowsky, but I am in line with their sympathetic adhesion to the Freeman and Louçã's

model (2001) of "*reasoned history*". The last one keeps as useful the empirically based Macro-Meso-Micro economics but goes beyond it by adopting a complex determination approach, in which "the purely statistical evidence is put on the same footing as social, institutional, and political factors". To this "*reasoned history*" belongs the "*anomaly*" (statistical speaking) piece of the common adventure of M. Colitti, E. Fontela and myself in promoting, thinking, building, running, the **Interdependence Model** (Section 3.4.1). To the same history, with a focus on the Italian economy, it may be associated a typical Meso Econometric Model that explores technical changes in production and consumption, the related energy contents and waste emissions due to alternative structure of fiscal policies (Section 3.4.2).

3.4.1 The Interdependence Model Development through cooperation

In the post-war twenty years the absence of co-movement between price of oil and the "opportunity cost" of this fuel (real cost of production of alternative energy sources) was coupled with an overexploitation of resources with the size of the exhaustible reserves. The increased market share of oil, an aspect of a new wave of internationalization, and Bretton Woods agreement after the second World War, were the main factors of the so called golden age for the western economy. The increasing perception of limiting factor in the expansion of the others economic areas, and emerging scarcity of an exhaustible resource, the waste cycles of consumption and production[24], changed the energy economic landscape[25].

[24] See for instance "IRD with Special Emphasis on Environmental Components" (Lo Cascio, Scimemi e P. Fano), in AA.VV. The Strategy of Future Regional Economic Growth, Vienna, IIASA, 1978, pp. 75-83, and "Prima relazione sulla situazione ambientale del Paese" eds. Lo Cascio et al., Sansoni, Firenze, 1973, vol.s I, II e III.

[25] See Meadows et al. (1972)

In the light of the first oil crisis in 1973-74 and in view of the forthcoming oil prices jump in early 80's, OAPEC members (Algeria, Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia, Syria and U.A.E., a section of OPEC located in Kuwait), South European Countries and ENI, as non-technical representative of their state industries, engaged in a joint effort to develop: a common thinking, common database, common econometrical models and common scenarios for the next decade. The so-called "The Interdependence Model" (I.M) represents the main outcome of this process.

Development and cooperation among consumer countries and between the latter and the producer countries have been among the most important features of the I.M..

Marcello Colitti, Executive Vice President of AGIP, high theoretical skilled practitioner, the I.M. promoter, Emilio Fontela, the shadow thinker, and myself, scientific coordinator of an interdisciplinary and international team, were the driving forces.

The working group was composed by qualified experts from Arabian countries, ENI and other internationally renowned research centres, such as Batelle Memorial Institute of Genevra, Ististuto di Ricerca e Progettazione Economica e Territoriale (ECOTER) and Istituto Affari Internazionali (IAI). Other international experts contributed to set the methodological framework for the research and the evaluation of results.[26]

After a preliminary review of the structure and results of the model developed at OAPEC headquarter in 1980, a final version of the Interdependence Model was presented on April the 7th 1981 in Rome, during the seminar "Development through cooperation" that benefitted from the Italian Government, OAPEC and South European Countries sponsorship and participation.

The above-mentioned Japanese word "Kosorioku" (see footnote 10) can brilliantly summarize both the Seminar's and the Model's deeper significance and intention. The "*concept"* and "*imagination",*

[26] Among others: Domenico Tantillo, Peter Fano, Maria Chiara Turci (ENI); Renato Guarini, Giovanni Barbieri (ECOTER); Otto Hieronymi, Eugenia Sallin-Kornberg (Battelle Memorial Institute).

i.e. the aim of I.M. appear, up to now, as a lost dream. **Most of the "*realistic understanding*", however, still remains**. A strong interest in the rebuilding of I.M. type model has been shown by energy environment recent expert think-tank, renovating the request emerged during the 14th Fall Conference of the International Relations Program of Webster University in Geneva. From this Conference a draft of the presentation slides are, subsequently, reproduced.

Lessons From the
"Interdependence Model"

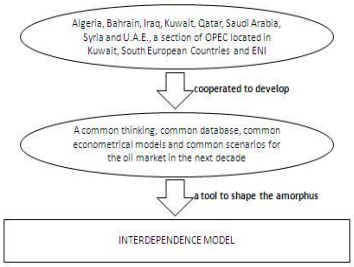
From the Oil Crisis to the Current Energy Outlook

Martino Lo Cascio

14th Fall Conference of the International Relations Program
Geneva, 29 November 2013

THE INTERDEPENDENCE MODEL (I.M)

(1979, pre-history)

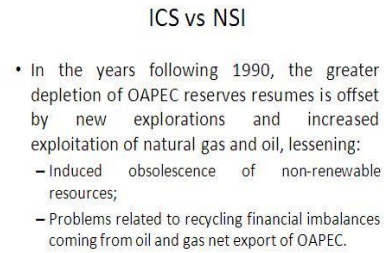


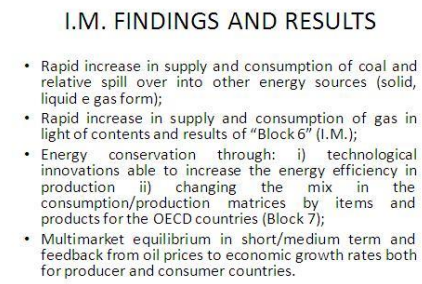
I.M. MAIN FEATURES

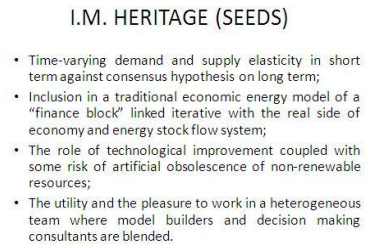
- Global approach
- Modular structure allows for country- and/or sector-specific data to be used.
- Great flexibility in the solution method and in the check on constraints, see as examples
  - changes in structural parameters inflation and growth rates for OECD countries (Blocks 3 and 7),
  - man power requirement and financial requirement for OAPEC countries (Blocks 5 and 6),
  - trade and capital imbalances, demand-supply elasticity and energy prices (Block 1, 2 and 4).
- Possibility to exclude some sub-models from the general solution when additional *a priori* hypotheses have to be included

I.M. BASIC RUNS

- Neutral System' Interaction (NSI)
  - OAPEC (and OPEC) countries continue their oscillating oil price policy;
  - The leading OECD countries react (or adapt) to this policy by reducing their production level.
- Interacting Cooperative Strategies (ICS)
  - Acceptance on behalf of industrialized countries of the terms of trade balance between the two areas accompanied by a small constant real price increase of oil overtime;
  - Smoothing co-movements between oil price and activity levels and promoting technologies transfers.







The I. M. was been designed with the specific aim of embracing, in a logical framework, the main problems connected with the existing relations between the industrialized countries and oil and natural gas producer countries, incorporating possible forms of cooperation between the group of nations, i.e.:

1. imbalances in international trade including hydrocarbons, the growth potential in Third World, financial requirements of countries with current payment deficits limits to international economic development deriving from trade and currency imbalances within industrialized countries' area and between major world economics area;

2. investment and development of possibilities of OAPEC countries;

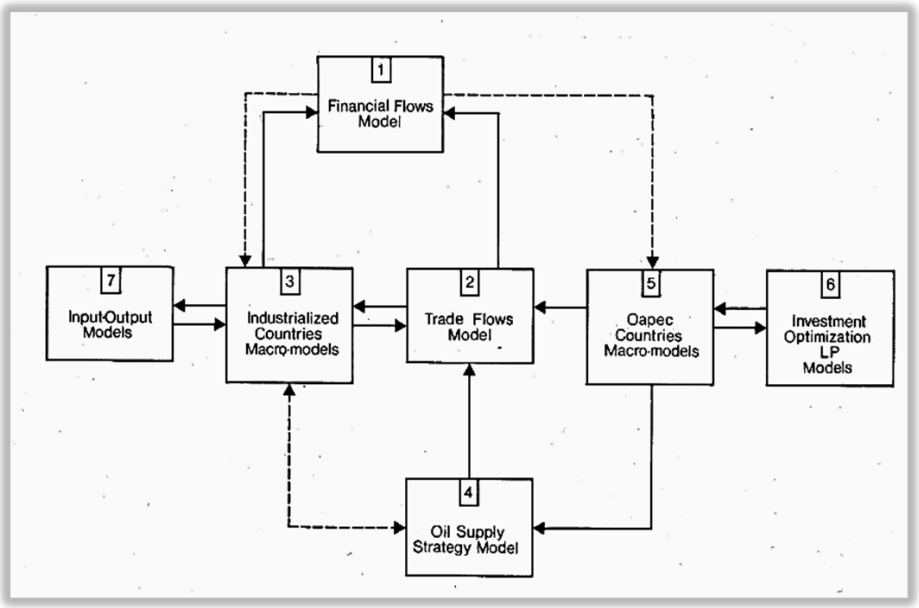
3. their import requirements of goods and services and technology; their surpluses and deficits, seen within the international capital flow system;

4. the direction of development in major industrialized countries; their energy production, the technical structure of their energy transformation process and the import demand for oil and other energy sources.

The translation of these items is a system of quantified models displayed in the second slide of the 2013's Geneva Conference. All the models are discrete time-dynamic and, with the exception of a number of relations in blocks 3, 4, and 5, linear.

The block's number of the following slide are an identification and cannot indicate a time-sequence solution.

I.M. STRUCTURE *



*** Numbers are not indicating a time sequence**

Block 1: the Financial Flow Model accounts for the capital flows between the OAPEC countries and the United States, Great Britain, the Federal Republic of Germany, Italy, Japan, the other OECD countries and the Rest of the World areas, starting out from an assessment of the single items of current accounts for each country and area, derived from the matrix of goods traded (Block 2 below) and from the results for the macroeconomic models for OECD countries and OAPEC countries (Blocks 2 and 5 below);

Block 2: the matrix of international trade accounts for the Trade Flow Model between the ten most important industrialized countries in the OECD, the rest of OECD countries and the Rest of the World subdivided in four major areas. On the basis of import functions, the model identifies the import requirement of each country and area, and their assignment to the exporting countries and areas;

Block 3: the Macro Economic Models for six OECD countries (U.S.A., Japan, France, Federal Republic of Germany, Great Britain and Italy); each model, although highly aggregate, includes a procedure for determining product origin and expenditure ad well as the cost/price loop.

The models are extremely flexible and have a procedure allowing for modification in values of some structural parameters in the solution algorithm. These changes are usually made in relation to the outputs of the countries' input-output models (Block 7). The final results of the simulations that are presented in the I.M. volume are obtained solving these models simultaneously with the trade flow model (Block 2), by way of an automatic linkage process;

Block 4: the Model for Simulating Price and Oil Export Trajectories is based on demand and supply time varying elasticity to price and quantity for big oil producers. Multi market equilibrium is accounted for. Key variables are: absorption capacity of oil rich countries, revenues and growth of OECD countries and others world countries area (see Figure 3.1 and 3.2);

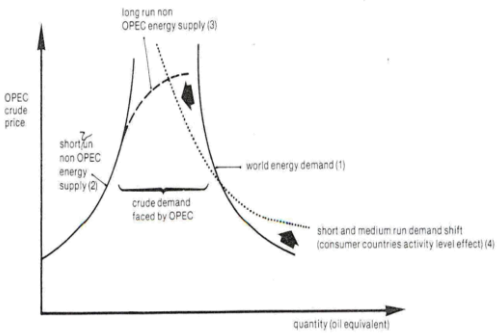


Figure 3.1 - Non OPEC energy demand and supply

Block 5: the Macroeconomic Model for seven major OAEPC countries are aggregate models, centred on the expenditures of hydrocarbon export surplus and on the growth possibilities of the modern sector of the economies', captured by the outputs of the Block 6.

Block 6: the Models for Optimal Intertemporal Investment Decision (mixed-integer linear program) in the OAPEC countries determine the development path of investment and production mix in the modern sectors of the economy, given the financial resource trajectories linked to

capital hydrocarbon exports and labour and physical capital absorption constraints.

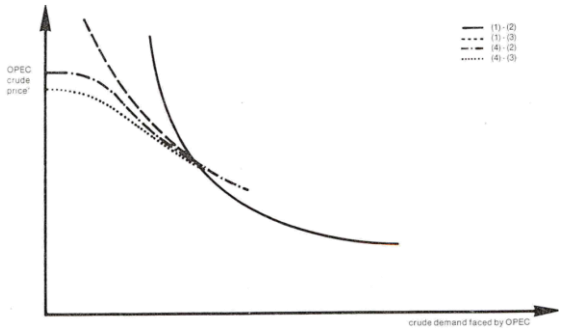


Figure 3.2 - Crude demand faced by OPEC

Block 7: the Input-Output Models for each of the six major industrialized countries evaluate outputs of the macroeconomic models (Block 3) for the different sectors of the economy and the interindustry consistency, relative to technological changes assumed for parameters and functions; this model allows incorporation and evaluation of the impacts of changes in energy transformation and consumption patterns in the single major industrialized countries.

Despite the model's global approach, its block connected structure allows for country- and/or sector-specific data to be used.

An important feature of the Interdependence Model is the great flexibility in the solution method and in the check on constraints (see Figure 10.7 in Chapter 10) like changes in structural parameters inflation and growth rates for OECD countries (Blocks 3 and 7), man power requirement and financial requirement for OAPEC countries (Blocks 5 and 6), trade and capital imbalances, demand-supply elasticity and energy prices (Block 1, 2 and 4).

Time-varying demand and supply elasticity (Block 4 and solution procedure)

The I.M.'s core is the crude-oil demand price curve for every point in time and its upward and downward shifts in relation to the activity level of consumer countries. After a period of low oil price, consumer countries activity level remaining equal, a big increase in oil price due to a contraction of OPEC supply brings about an increase of

total real earnings (the net price-quantity elasticity is far greater than unity). A strong gap between demand and supply, causing in the short term sharp price increases and therefore determining larger earnings, will concurrently, with a lag, cause a decrease in income and a growth of inflation in the consumer countries. An income decrease and an inflation increase in the consumer countries cause the demand price curve to shift downwards and alter its shape decreasing its elasticity to such an extent that for several years oil revenues will be less than in the case of a softer containment of supply (see Figure 1 and 2).

Moreover, a strict monopolistic behaviour (which implies that the supply price curve coincides with that of demand along its all significant tracts) for OPEC was not assumed as possible or realistic model. The limit of a similar behaviour for OPEC was represented, in the model, by the financial requirements for internal development of the various producer countries. The diversity of local situations in producer countries with respect to greater or lesser resource availability, absorption capacity and so on, were taken into account. In fact, the possibility of governing the market depended to a fair degree on the role played or that could be played by Saudi Arabia and, to a lesser extent, by the other Gulf countries, in reaction to changes in aggregate demand and supply. This explains the inclusions and the importance assigned in the model to changes in Saudi Arabia's market shares.

If those policies were to produce too strong shock in the world economic system, i.e. if OPEC chose to maximize oil revenues over the very short run, opposite results were obtained in the medium run, because the operation of automatic adaptive mechanism and the deflationary policies enacted the industrialized countries.

The description of this process is also a reference to some of the other problems that characterized the relations between consumer and producer countries.

First, the slump in the world economic, together with the vaster repercussion on the demand of oil that followed the slow-down in supply and the sharp price increase, was not only the result of reduced oil availability, but rather the results of the overall induced outcome in the other components of the international economic system.

A sharp increase in real oil prices, would imply, on the other hand, a transfer of real resources from consumer countries to producers countries and, on the other, readjustment in the consumer countries of relative prices (included wages and profits) to meet the crude oil increase.

Therefore the first type of effects was immediately deflationary. If producer countries were not in position to increase their import proportionally to their increased purchasing power, or they chose not to do so, in order to maintain sufficient leverage for their supply policies, surpluses built up, encountering increasing recycling difficulties.

Summing up: the seeds that I.M. puts on the table, even also nowadays, is the usefulness of short-medium term analysis, including, in oil and energy markets, feedback effects coming from the level and evolution consumer countries structural items, coupled with decisions on well-defined projects in manufacturing and services sectors of producer countries.

Common strategy in fast implementing high price stabilization and deep transfers of technologies were not realized and are not now realizing, with the exception of the two sides oil and gas state companies.

The role of Finance as a pendulum vis-à-vis real side of energy markets (Block 1 and solution procedure)

Following the I.M. simulations, aggregate net capital imports of the rest of the world – including short term financing, changes in official reserves, as well as long term loans and direct investment- during the 1980-1990 period could amount over $ 1,300 billion (1980's prices), based on the assumption that there will be no cumulative collapse of international credit structures, or massive cancellations of international assets and liabilities. Even if inflation is taken into account, the financing requirements and the capital movements would be on a much larger scale than what was experienced in the 1970's. Such capital movements could be absorbed without major problems only in an expanding world economy.

Even in the 70's, decision making (both in OECD and OPEC countries) discounted the high probability that potential lenders and investors would view the risk as excessive, whereas the deficit countries would insist on the cancellation of part of external liabilities and on transformation of capital imports into outright aid. Previous long term change in the development pattern of the industrialized countries were identified:

- In the saturation of market growth possibilities of manufacturing goods and increasing incidence of services on their final demand;

- In the change of the price dynamics: manufacturing cost started to increase faster in real terms as a results of higher energy and raw materials costs and slower growth in labour productivity;

- In the decline of the capital efficiency, taking into account the productive chains;

- In the instability of the international monetary system, with a strong capital movements occurring in a system of fluctuating exchange rates. The necessary recycling of the OPEC surpluses had heightened the fragility of this system, but could not be considered as the only cause of monetary instability. Fluctuating exchange rates, lack of coordination of monetary policies and a rapidly increasing amount of private liquid asset had encouraged speculative behaviours in the currency market and generated a climate of uncertainty detrimental to the development of world trade.

Increasing pressure for income redistribution within OECD countries coupled with increasing role of banks and finance lead both higher unemployment level and inflation or deflation pressures.

On the other side, we must remember the sentence of Adnan Shihab-Edin, (in 1981 Director General Kuwait Institute for Scientific Research) in Rome's seminar: "We must not forget, the OAPEC states are, despite their high per capita income, still developing. So, exclusive reliance on one rapidly depleting source of energy may not be a sound policy for the future."

On this aspect the Concluding Guidelines of Rome's seminar written by Abdul Aziz Al Wattari (at that time Vice President of OAPEC) and Romano Prodi (representative of Italian Government) stressed the advantages of agreements between OECD and OAPEC (big player in a sort of non-zero game) in improving substantially technology transfer and know-how against regular availability of fuel energy sources.

The "*concept*" and "*imagination*" of I.M. in factual cooperation strategies between countries, regions, firms etc… are up to now a lost dream. Most of the "*realistic understanding*" still remains.

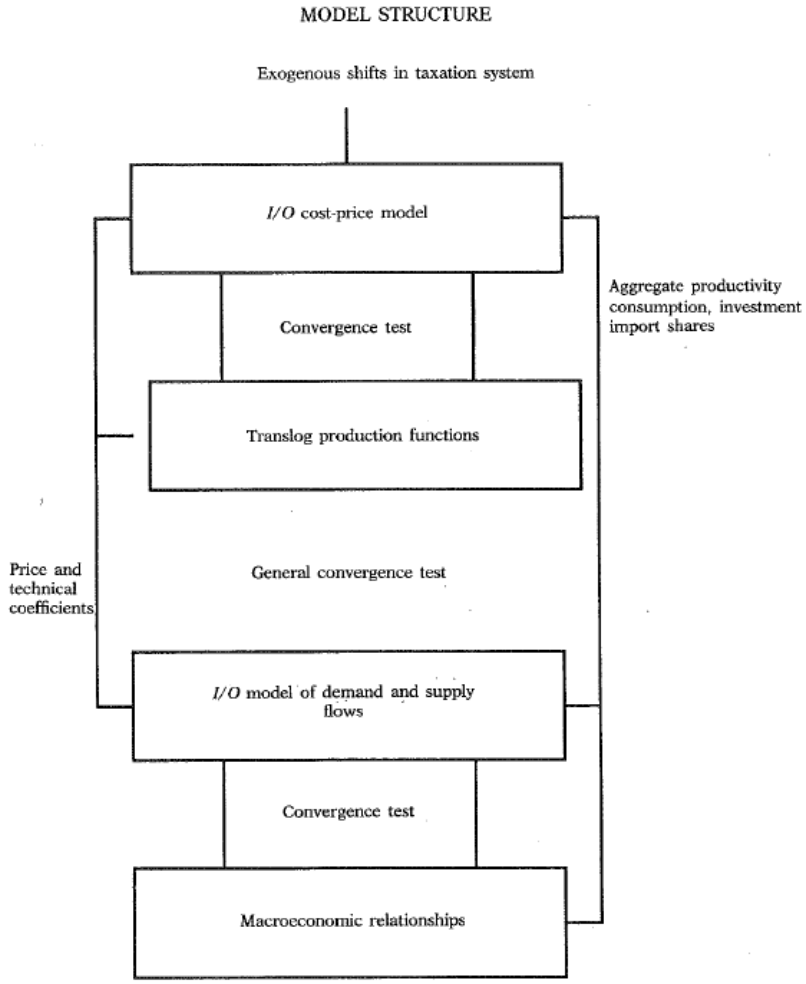
3.3.2 Economy – Environment impact of tax changes on Energy

The model has been firstly developed by Fontela and myself with two approaches: i) with a simple Leontief open partitioned input-output system using fixed technical coefficients (see Leontief and Ford, 1972); ii) with a partly closed Leontief model with changing technical coefficients and final demand.

The model, even in the second approach, has been specified **beyond** the context of Applied General Equilibrium (AGE) multi-sectorial models (as for instance in Shoven and Whalley, 1984), starting from the results of Diewert (1988), that showed that the entity of losses caused by a biasing taxation is such relevant as to explain part of the growth of total factor productivity occurring after 1973.

The aim of the aforesaid paper and the companion one (Lo Cascio et al., 1993) was "to evaluate the impact of alternative tax systems on long-term trajectories of the relevant economic aggregates, according to the *ex-ante* neutrality of public revenue. In particular, were analysed the effect of a fiscal discharge on labour costs together with an increase of tax on energy inputs."

Even if the theoretical background of the model could be related to the neoclassical general equilibrium approach, it could be better framed within the analytic schemes of the constraints to the achievement of potential product and activity level.



The model depicted in the above figure is made up of three blocks:

Block 1: cost-price model

The first block contains an input output cost price model in twenty-eight sectors, whose solution procedure includes 140 equations, relating to substitution elasticity to inputs prices by sector. Thus, the

convergence solution of Leontief's traditional cost-price model are rendered consistent with changes in technical coefficients induced by iterative declining loops in inputs prices;

Block 2: real I/O model

The real side of the I/O model includes behavioural relationship for output's demand and supply at twenty eight sectors' level, whose solution procedure is integrated with dynamic linear expenditure systems, sectorial import and export functions, bridge matrices for consumption and investment;

Block 3: linkage model

The linkage between the cost-price and the real model includes transfer functions to aggregate consumption, investment demand, productivity growths, as well as accounting identities.

A similar approach, related to technology, productivity and prices can be found in Lo Cascio et al. (1991).

Results

A huge substitution process of energy with labour occurs, in different degrees under each hypothesis of growing discharge on labour costs and parallel increase of taxes in energy inputs, involving also capital in take. The combined effect of relative price interdependence, change in aggregate demand and product-mix on one side, and factors' substitution process on the other, result in a reduction in energy content per unit of output, increasing with the amount of fiscal shift. It seems important to stress the resulted **influence the internal composition of fiscal draw on** the structure of **the economic system**.

In fact, the main findings of the simulations carried out were:

a) Time variability of ex post aggregates price elasticity of energy demand to price;
b) Positive overall impact on labour, energy saving and waste reduction, on aggregate production and consumption, that, over a fixed threshold (30-40%), more than counterbalances the negative effects of increasing energy prices;

c) Lowering, over the aforesaid threshold, accumulation needs per unit of output.

3.5 Focus on the current present EU turning point

In the following, my aim is to briefly sketch:

i) the theoretical background, the specification features and the results of the paper "Long term patterns of European accumulation and growth: Europe at a turning point" (Lo Cascio and Mauro Aliano presented at XXVII Villa Mondragone International Economic Seminar, in brief Mondragone's paper), including what emerged from Loc-Ali Model (Lo Cascio and Aliano 2015);

ii) Some insight to what, in the volume, has been called New Social Market Economy, on the basis of the content of 3.4.1 and 3.4.2 contents and, enlarging the scope, in light of the thought-lines of the overall Part 4 preceding sections.

M. Aliano and myself observe that: "The current transitional paths of the Euro Area countries can be seen as a turning point between two alternative scenarios: i) a low decline path (although not secular stagnation), where markets saturation features and trends dynamically interact with a growing share of finance disentangled from the real economy; ii) an evolution towards self-sustaining growth trajectories bundles, where feasible economic and institutional improvements are set in place".

In order to capture such a turning point, we adopted a new approach to understand the Saving-Investment Feldstein – Horioka puzzle, developing a model based on the investigation on the time-growth varying surfaces of the Average Propensity to Save (APS) and the Av-

erage Propensity to Invest (API). The related specification econometrics, a sort of Colander "Craftsmen approach", that includes *à la MIMIC* estimates of the real rate of depreciation of social overhead capital stock, requires only the hypotheses of adaptive behaviour and stock-flow feedback loops.

The results are consistent with the current instability of the Euro Area and show (and measure) to what extent small institutional changes and a limited set of operators can shift the overall trajectories of the EU system.".

3.5.1 The EU at a Turning Point

In the Mondragone's paper further estimates and discussions have been developed starting from those contained in "Exploring Patterns of real Saving and Capital Growth in Eurozone: the Impact of Financial Crisis" (Lo Cascio and Aliano, 2015). Focusing on the debate about the European Union economy, the introduction of Euro, the working of Euro's financial market, that paper aimed at providing some fresh insights in a bibliographic frame where the "outcomes are not completely terse" and, often, contradictory. However, what was - and now is- uncontroversial is the role of capital formation and saving coupled with other institutional, international and financial factors (Hieronymi 2013). In a seminal work Feldstein and Horioka (1980) found that, in an open economy, taking into account the imperfect mobility of world capital (due to home bias portfolio preferences and institutional rigidities that lessen the flow of long-term capital among countries), domestic Saving and domestic Investment correlation persists over time, even though with growing variability (and time lags) and reversing the direction of the relationship as it is in the traditional economic theory. This evidence is singled out by Obstfeld and Rogoff (2000) as one of the six major puzzles in international Macroeconomics. I think there is a new way to understand Saving-Investment puzzle, going over the Obstfeld and Rogoff's extended transport costs to include foremost stock flow loops.

The Reati and Toporowski (2004), Caverzasi (2014) and Perez (2005) fifth long waves and their links with the cycle, i.e. the finance

role as accommodating (easing saving towards investment and productive capital) or speculative (finance towards financial self-cumulating assets) represent the background of the work, coupled with the theoretical debate and that among the practitioners (the big players) before and after the introduction of the Euro. More specifically, the objectives of Loc-Ali were: i) To describe the 1990s and 2010s vision of the Monetary Union by theorists and practitioners; ii) To provide an understandings of the costs of the institutional delay and financial crisis (or crises).

Some insights of the so called "complexity economy" (Colander 2009) seemed useful for the econometrics and the evaluation of the results of the model that Aliano and myself developed. The complexity economy, beyond some theoretical and semantic ambiguities , looks at an economic system as an open system (properly to the current world economy), therefore suitable to better capture the globalization items, accepting only a partial overlapping between micro and macro aspects. Analysing the relation among variables-agents and trade arrangements, where the dynamic, and interactive adapting behaviour of various economic and financial agents, does not contradict the first order approximation of the relationships among macro variables proper of the APS (Average Propensity to Save)– API (Average Propensity to Invest) - based model.

From an operational point of view, this approach allows to evaluating in which way small changes and a limited set of behaviours of operators can shift overall trajectories of the systems, especially as in today transitional period.

Preliminary descriptive analysis ("soft theory" time series analysis) has been carried out on the Loc-Ali database. Results show autoregressive structural patterns between Real Saving to GDP ratio and Real Gross Investment to GDP ratio, for which, lagged variables parameters, their statistics and the impulse/response to innovation figures, suggest the Obstfeld-Rogoff's interpretative line of explanation of Feldstein-Horioka's puzzle. However, to raise consistency with the data, we consider as structural and exogenous, the rate of growth and the year momentum of surplus/deficit current account, instead of using some more or less extended trade relative costs by sector and country, like Obstfeld-Rogoff do.

Thinking the Monetary Union before the Euro

Starting from what might be called the "Mundell-Meade controversy", in the early 1990s, the thinking about a single European currency may have captured in the first volume "Building the New Europe" (Mundell and Baldassarri, eds, 1993). Mundell (1993) evaluates the options, in terms of a single currency for the EMU, in particular: i) the use of a basket of currencies, ii) the use of the U.S. Dollar, iii) the use of gold, iv) the use of an existing European currency; and he regards, as the best solution for the adoption of a single currency, the use of the Dollar or of the Deutschmark, highlighting that "On economic grounds, but rejecting the Dollar, the Europe would be the ghost of the Mark". Meade (1993) has serious concerns regarding the possibility of a/the "hard ECU" or of a common currency instead of common currencies for different sets of countries. Furthermore Meade worries about extending the European integration (and the single currency) to the eastern European countries. In the cited volumes, the integration of Eastern Europe countries was on the periphery of the discussions about the European Union and the Euro. Triffin (1993) considers Europe-wide monetary unification as the second best option to re-build a 'true international monetary system' in a paper entitled: "IMS: the International Monetary System or …Scandal?". From the institutional point of view Borner (1993) studies the trade-off between deepening and widening the European Union in view of the introduction of a single currency. The problems involved in widening the EU are accounted for in the paper of Kinderberger (1993). Market saturation as a long term structural problem and the impact of demographic transition in the richest countries are dealt with by Lo Cascio (1993 and 1987).

*"**The intellectual and policy effort of Jacques Delors' (1993)** envisioning an innovation-based Europe by channelling the common EU Real Saving towards Investments in Education and R&D, **seemed initially able to address**: i) **the structural heritage** of the so called Baumol's disease affecting the growth process in advanced industrial economies at the beginning of the 1970's; ii) **the challenge of a common currency** ("Hard ECU"); iii) the **political preference towards a widening EU process with respect to a deepening one**. However the Delors' approach was later criticized by mainstream economists, often closely tied to policy makers. The Lisbon strategy - launched in 2000 –*

represented a healthy theoretical shift towards a dual emphasis on innovation and social cohesion both within and between countries. The approach was based on the "new economy" paradigm defined by the convergence of the main schools of contemporary economic thinking (Fontela 2005): i) ***post Schumpeterian*** *(leading role of innovation and high priority to R/D policies); ii)* ***Neoclassic*** *("perfect market" idea for the allocation of the dividends of innovation); iii)* ***post Keynesian*** *(driving role of new demands and income multiplayers in an expansionary context). Learning from the experience of "white paper", observed Erik Reinert (2005), "the Lisbon process was carried through cautiously, avoiding the ministries of finance that had sunk the Delors' paper, and this saved it from falling into the same trap. A victory of this tactic, however, may have blaklashed, creating problems for the long run strategy". The SKS-NBIC (Sustainable Knowledge Society- Nano Bio Info Cogno) policies were envisaged, but substantially left to the responsibility (including expenses) of each Member State, while the Maastricht parameters were setting harder constraints to national fiscal policies. The integration of the former Eastern Germany was considered as a huge success that should be uncritically copied on a larger European scale, in spite of i) the destruction of Eastern Landers social overhead capital, ii) the not replaced industrial base and iii) the extremely expensive public transfers (Reinert 2005 and Giacchè 2013*[27]*).*

The EU enlargement went on, the geo-strategically policy towards trade surplus forcing, emerged and won, because of the alliance of policy makers, business leaders and influential intellectuals, up to 2008' big financial crisis originated in U.S." (Loc-Ali)

[27] Up to 2005 clustering European Regions by structural characteristics of economy, eastern *länders* (out of Berlin) were not clearly distinguishable from South Italy, Greece and Portugal regions (Lo Cascio et al., 2013)

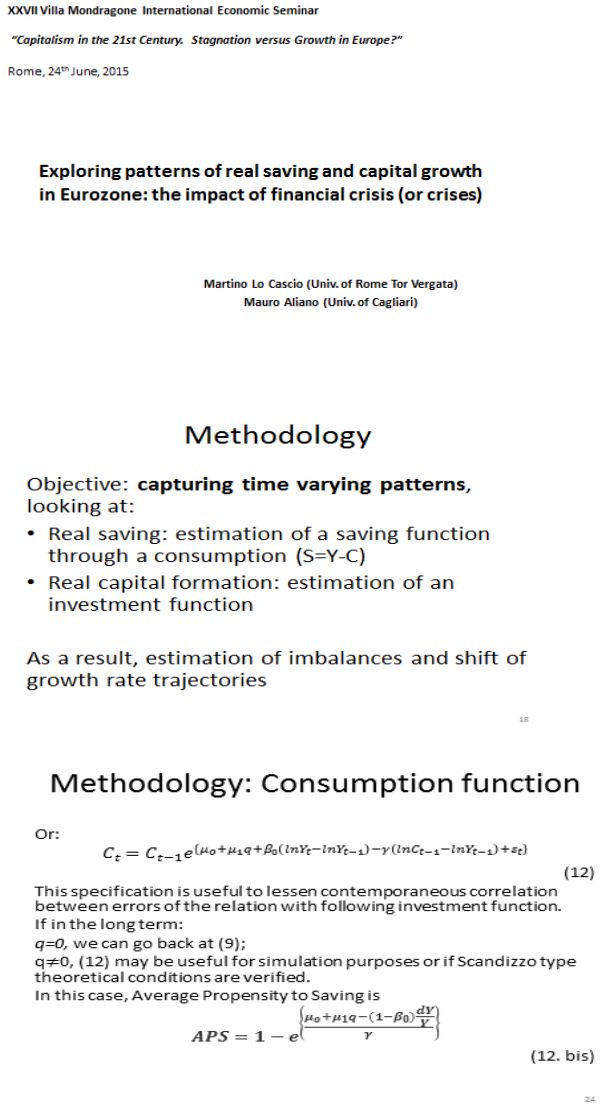
Thinking the Monetary Union after the Euro

Four issues at stake in the 1990s were expected to be solved after the introduction of the Euro: i) convergence in prices and in productivity among EU countries; ii) reversing the trend on public debt; iii) Reduction of current account imbalances and related capital account imbalances; iv) facing unemployment disease.

"To some extent, after more or less 20 years, only convergence in prices has been got, while the other three issues remained still open. Many authors have dealt with the topic. Among them, De Cecco Margiotta (2013) wrote: "Money formally without State (but with Germany as the latent leading state, that does not create liquidity, but that absorbs liquidity) does not dim the anomaly of a "currency in multinational circulation" built around a country like Germany, which is structurally a net exporter. Furthermore the cost of the permanence of the current account surpluses by Germany and their induced deficit on the other euro countries enhance the likelihood of a growing gap between potential and real income.

The lack of a harmonised fiscal policy, or at least of common rules against fiscal competition among 19 countries, is an open issue that has not been properly addressed yet. In this context, the traditional monetary policies tools have been less effective (the "transmission" problems recalled by Mario Draghi) and the growing risks for the real economy, connected with the emergence of the new technologies in finance, that couldn't be kept apart from their benefits.

Last but not least, the weight and role of increasing inequality in income distribution between and within large economic areas deeply emerged." (Loc-Ali)



XXVII Villa Mondragone International Economic Seminar

"Capitalism in the 21st Century. Stagnation versus Growth in Europe?"

Rome, 24th June, 2015

Exploring patterns of real saving and capital growth in Eurozone: the impact of financial crisis (or crises)

Martino Lo Cascio (Univ. of Rome Tor Vergata)
Mauro Aliano (Univ. of Cagliari)

Methodology

Objective: **capturing time varying patterns**, looking at:

- Real saving: estimation of a saving function through a consumption (S=Y-C)
- Real capital formation: estimation of an investment function

As a result, estimation of imbalances and shift of growth rate trajectories

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Methodology: Consumption function

Or:

$$C_t = C_{t-1} e^{(\mu_0 + \mu_1 q + \beta_0 (lnY_t - lnY_{t-1}) - \gamma (lnC_{t-1} - lnY_{t-1}) + \varepsilon_t)} \quad (12)$$

This specification is useful to lessen contemporaneous correlation between errors of the relation with following investment function.
If in the long term:
q=0, we can go back at (9);
q≠0, (12) may be useful for simulation purposes or if Scandizzo type theoretical conditions are verified.
In this case, Average Propensity to Saving is

$$APS = 1 - e^{\left(\frac{\mu_0 + \mu_1 q - (1-\beta_0)\frac{dY}{Y}}{\gamma}\right)} \quad (12.\text{ bis})$$

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The Mondragone methodology may be captured, sintetichally, by the slides presented at "*Capitalism in the 21st century. Stagnation versus growth in Europe?*" seminar.
In the third slide, equation (12) shows a partial adjustement model of Consumtpion, Ct, on Income, Yt, as an estimable specification of linear expected (logged) *latent* Consumption on (logged) *latent* Income.

Methodology: Real capital formation

Defining K_t, I_t respectively as capital stock, investment at time t and χ the rate of depreciation of capital, we can write the following algebraic accounting identities:

$$K_t = K_{t-1} + I_t - \chi K_{t-1} \quad (13)$$

$$K_t = I_t - (1-\chi)K_{t-1} \quad (14)$$

If K^*_t represents the desirable or optimal stock of capital, irrespectively to production function adopted, and

m is the capital/income ratio and

$\boldsymbol{\lambda}$ $(0 < \lambda < 1)$ is a coefficient of partial adjustement of current capital to desiderable capital, then we have:

$$K^*_t = mY_t \quad (15)$$

$$K_t - K_{t-1} = \lambda(K^* - K_{t-1}) \quad (16)$$

$$K_t = \lambda K^* + (1-\lambda)K_{t-1} \quad (17)$$

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Methodology: Real capital formation

If $\boldsymbol{r}$ is a stable rate of growth of investment, we can write the (21) as it follows:

$$I_{t-1}(1+r) = \lambda m Y_t - (1-\chi)\lambda m Y_{t-1} + (1-\lambda)I_{t-1} + \varepsilon_t \quad (22)$$

$$I_{t-1}(\lambda + r) = \lambda m Y_t - (1-\chi)\lambda m Y_{t-1} = \lambda m(Y_t - Y_{t-1}) + \chi\lambda m Y_{t-1} \quad (23)$$

We define API (Average Propensity to Invest) as

$$API = \frac{I}{Y} = \left(\frac{\lambda}{r+\lambda}\right)\chi m + \left(\frac{\lambda}{r+\lambda}\right) m \frac{dY}{Y} \quad (24)$$

If $\boldsymbol{r}$=0, i.e. strictly stationary API:

$$API = \frac{I}{Y} = \chi m + m\frac{dY}{Y} \quad (25)$$

If $\boldsymbol{r} \neq 0$, Scandizzo's theoretical conditions must be satisfied to obtain growth rates from (24) coupled with (9.b)

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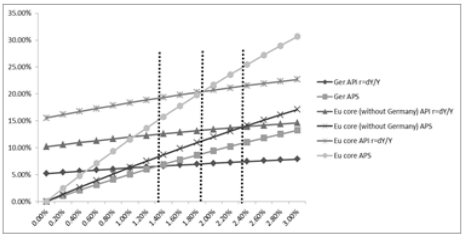
Results in one slide



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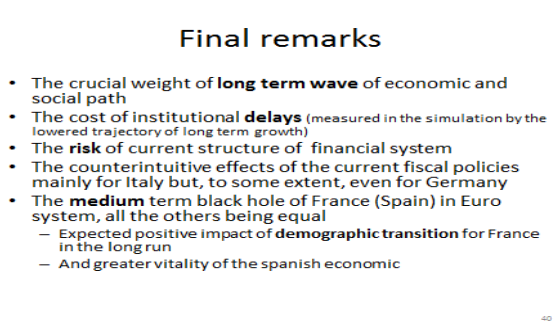
GDP growth (annual)

(API and APS as share of EU core GDP)

The (22) and (23) equations, in the slide, represent the estimable function for the real capital formation, where m is exptced capital/income ratio, λ is a coefficient of partial adjustment of current to desirable capital, χ is the rate of depreciation of capital, $\boldsymbol{r}$ is a random walk with drift type values of rate of the investment growth.

For rate of growth dy/y=0, the rate of depreciation on the GDP is equal to the firs term of right side of (24),



$\left(\frac{\lambda}{r+\lambda}\right)\chi m$. If r < $\frac{dY}{Y}$, as it is observed over the past twenty years, a downward shift in GDP growth and/or in quality of Real Capital stock is going to happen (in the limit Investment does not cover depreciation).

If r > $\frac{dY}{Y}$, condition improbable in the long term, in light of the historical experience, a solution emerges of increasing net positive inflow from outside the Eurozone. If q>0, export oriented policies will prevail; vice versa, if q<0.

All parameters are estimated with a SUR for the Euro Core (Germany, Spain, France, Italy) and for each countries.

The shapes of the APS-API time varying surfaces of equation (12) and (24), depend on the point of time we are referring to, and on the combination of *r* and *q* values.

The possible futures

In order to sum up the results, I think that it is useful to have a look at the Figure above, which presents two solutions: the first one, putting r=0, q= last historical trend; the second one, putting r=dy/y, and

q=0 and, averaging the results of France, Italy and Spain for the Euro core area net of Germany.

The current instability emerges for low shifts of r and q, so envisaging the Euro zone turning point consistently with the evidence of the data. In the Figure 4, the central dotted line point implies a **Myopic** based foreside **Current Policy** (**M.C.P.**): we may call this the turning point. The first dotted line on the left implies **Incoming High Risk** (**I.H.R**.) out a Hieronymi stage IV (2013), while the first dotted line on the right indicates an **Opportunity** of **Recovery** (**O.R.**).

As suggested in the slide graph above, given a rate of growth of GDP near 2.5 %, the excess of Saving over the Investment for Euro Core is equal to the excess of Saving for Germany, i.e. the excess of Saving for the economic area is given by the excess of saving for Germany (O.R.). For a rate of growth of GDP between 1.8 and 2% (M.C.P.) the imbalance of Euro Core without German is equal to the ex-cess of saving of Germany. Furthermore, an excess of Investment over Saving is presented for a rate of growth of GDP lower than 1.4% (H.I.R.), both for Euro core and, to some extent, surprisingly also for Germany.

The European Economy nowadays is extremely unstable, risky, and open to a large range of possible futures, even in the short term.

Europe at the edge of chaos

Commenting the Paul Krugman critics to the mathematical pyrotechnics that has produced what he called "Greek economics" in the last decade ("elegant but lacking of empirical validation"), Beinhocker (1997) introduces the term "strategy at the edge of chaos" for business theorists and practitioners, since prevailing national and international markets are complex adaptive systems.

Realms and strategies at the edge of chaos may be and have been extended from micro to meso and macroeconomic aggregates, coupled with corresponding political and societal entities. Starting from Beinhocker's approach, five critical aspects may be single out:

[1.] Short-termism vs robust strategies: in a complex adaptive system, points of strength are necessary for day-to-day survival, but they are not sufficient in long term;

[2.] Competitive advantage vs continuous adaptation;

[3.] Conservative policies vs radical strategies: in a complex adaptive system, a country or an area, that is resistant to change (Diamond and Lodge 2013), will have, in the long run, low benefits, and the same will happen to countries or areas that are oversensitive to shifts in its environment. But *between the extremes of stasis and chaos a region - the edge of chaos* - lies where economic and social benefits are maximized;

[4.] Routinized vs diverse strategies: to catch the opportunities in an evolutionary system, a rich pool of possible strategies is needed. The diversity by region, country, area represents a source of innovations to develop responses when the environment changes. But a certain level of standardization (e.g. evolving but common rules for Eu fiscal policy) in light of the cost of diversity (e.g. opportunistic fiscal behaviour) appears to be desirable;

[5.] Scale vs flexibility: the Brian Arthur convincing argument to explain increasing (as opposed traditional decreasing) returns to scale, may be translated in an Eu strategy simultaneously conservative and radical between deepening and widening policies.

Europe at the edge of the chaos is another way to understand the above Opportunity Recovery (O.R.) scenario.

3.5.2 Two sets of crucial questions

Two sets of crucial questions had been highlighted by Hieronymi (2013):

I. How and when will the main OECD economies return to "real interest rates" and, first of all, what will be the consequences of "soft-lending" for savers borrowers and economic activity?

II. What happens nowadays after the "40-year crisis" a period of recurring international debt crisis and after the corresponding 40 years interwoven long wave cycle stages of world economic areas? Will the

loss of momentum in the "real economy" aggravate the financial and monetary crisis? How EU will survive to the structural shortcomings of the Eurozone system and the political divergences through the Union?

To the first question, that exceeds my competence and therefore the aim, being, however, the shadow frame in which my "craftsman" approach moves, a starting but interesting reply may be found in Morais et al. (2015). This study identifies the final impacts of the United States' Q.E. on the real economies of newly industrializing countries, with a multiple three or four times higher than U.S.' Q.E. - induced financial inflows (rate of investment disproportionate to ex-post returns) and a final reduction of their rate of growth.

The Loc-Ali's paper conclusions and warnings, confirmed by Mondragone paper, were:

- The costs of institutional delay in the European landscape;
- The impact of the 2008 subprime and of the 2011 sovereign debt crisis in terms of deflation, growing gap between the individual countries, the so called "wake ones" and "strong ones", with counterintuitive long term effects, mainly for the case of South, but unexpectedly also for Germany;
- The break-up of Monetary Union, prevented up to now (ECB's Q.E.), does not appear to overcome the main last year' heritage, the "short-termism" view, prevailing in the most part of the private and public players.

As for question this chapter addresses: is the Eurozone at a turning point, the descriptive diagnostic and the statistical model carried out do not prevent me to reply: yes.

The Myopic Currently Policy (M.C.P.) in Euro zone, where the export oriented policy of Germany, the algebraic control of fiscal policy and related weakness of public Investments prevail, may be viewed as determining a sort of bifurcation to two alternative "strange attractors structure". The first one refers to the so-called stage IV of Hieronymi, and defined a High Risk scenario with particular concern for the rise in interest rates in U.S. and the Euro Zone (I.H.E). The Opportunity of Recovery (O.R.), whose underlying assumptions are, in part, those of

2013 OECD *deep structural reform scenario* (Johansson et al. 2013*)*, that imply more than 2% growth rate of GDP.

Starting from the turning point, it is more than an opinion that **small institutional changes** and a limited set of **operators** can **shift** the overall **trajectories** of the EU system from one to another options.

3.6 Concluding Remarks: some insights for the New Social Economy

Robert A. Mundell in a nice historical survey of the theoretical thought on "Debt, Deficit in alternative Macroeconomic models" (1993), wrote: "Economics draws its problems from the real world and seeks generalizations useful for policy. In this sense models are era-specific". His theoretical life is a metaphor of changing models with changing flow of time, an example: from the Mundell-Fleming to the Medzler-Mundell controversy and subsequently to the 1993 proposal to put together the existing official gold stocks of the Central Banks and the International Financial Institutions to work for social purposes, with various implementing alternatives.

I subscribe the last one worldwide general goal to reform the International Monetary System, of which a "Rosa", speaking in the Fazio's words, "nuda nomina tenemus", and leave the argument to Otto Hieronymi, absolutely more skilled than me in this field, , with its Röpke's lines of thought on the property rights as an essential part of "Human Economy" and of citizens welfare, even beyond the pure de-mand- supply market rules.

Furthermore I feel that models are era-specific, but I don't want to forget the Fontela sentence about the "Deontological responsibility of the economists for proving diagnosis and prescription to all decisions making agents", mainly when they are affected by short-termism. The diagnosis, in my views, starts from a deeper analysis of which was fore-seen as an incoming huge problem for society, facing with policy action where suggested; an example: the nowadays wandering increasing

problems linked to mass-immigration flows in Euro zone (over the ethnic and religious conflicts), correctly foreseen not only by the Lisbon Group, by the demographers, but also by the EC Monitor Fast scenarios addressed to policy decisions[28].

What lessons arise to the scientific debate, to the last one transmission noises towards the policy makers, and the decision systems?

A systematic survey of "diagnostic and prescription" rallies in the past relevant for today, is the **first insight** that I suggest, starting from the sketched lines in the above Part 4.

In the aforesaid Volume Mundell synthetically stated that, despite some important differences, the International Gold Standard Gold and the Gold-dollar Exchange Standard were all fixed exchange rate systems anchored by gold.

"The monetary and fiscal discipline is different under fluctuating exchange rates. An extra degree of freedom is available to the monetary authorities of other countries…Many countries, moreover, utilize the extra degree of monetary freedom to finance budget deficits and inflate".

This is one of the driving forces of the Sovereign Debt crises raised in the past, mainly in the past fifty years, in many countries and economic areas. The heritage, inside the Eurozone, were: i) the arising erratic large spreads among Bond Yields, few years after the Euro introduction (accounted for by Aliano and myself paper in 2013); ii) the narrow path for EU countries fiscal policy between algebraic common rules and diversity benefits (but also costs due opportunistic behaviour), described in 3.5.1 section.

The Mercantilism, in Mundell script, conceived of as a policy to generate export surpluses, was spawned by the bullion shortages and trade rivalries of the 17th century. The *classical confutation* to the Mercantilist theory, fails, in the Mundell opinion, because it does not allow for changes of the demand for money when its economy is growing,

[28] See also "Growth and Jobs: What Strategy for the EU?" Maria Eugenia Le Gourriérec, Events officer at Notre Europe – Jacques Delors Institute

allowing the equilibrium in the stock of money through a balance of payments surplus.

Hume[29], to some extent included among classic economists vehemently rejected the Mercantilistic view. They: "have, indeed, been told, that the public is no weaker of its debts; since they are mostly due among ourselves, and bring as much property to one as they take from another due among ourselves, and bring as much property to one as they take from another. It is like transferring money from the right hand to the left; which leaves the person neither richer nor poorer than before."

Mundell correctly overcomes the Hume and Classic Economist confutation, because, not allowing for changes in the demand of money, they do not account the need of liquidity to finance a growing economy. Coming back to the nowadays problems in Eurozone: *to what extent it is needed a policy towards trade surpluses*, beyond the precautionary goals to overcome the world financial uncertainties and the internal opportunistic fiscal behaviour? This is one of the contents of the above 3.5.1 section and represents the **second insight**.

The post 1989 years, that of the unification of Germany, may be considered as something like a post-war period and Schröder Government reforms may be looked as second step of the Erhard's thinking and governing.

Our time, however, requires an era-specific model, as previously envisaged and discussed in the Part 3.5.1.

This specific-model looks at trough path from the New Economy to SKS's models. Following Fontela and Pulido (2004) in the SKS to the mainstream objectives of society, Innovation and Growth, Environmental Protection and Ecological Balance, it is needed to add Creativity and Human Development. Technology and Prices are the instruments, but it is needed to add the term Values and rethink the term prices.

[29] Text reproduced by Mundell in 1993

"The term values refers to citizens' preferences for cohesion, public services, quality, security, and so on. The term prices refers to the relative prices of 'quality' and 'quantity', of 'green' products and 'dark' products, and of 'income' and 'leisure'. … Other essential features of an SKS include the following:

• labour as a product,

• knowledge as a factor of production, and

• public services as a dynamic driver.

…

To be successful, the orientation of the economic system will require conscious public policies in areas such as health, education, environmental protection, and security. Such policies should incorporate the potential benefits of the 'technological wave' induced by nano-bio-info-cogno (NBIC) convergence. What is often considered to be current European competitive handicaps—such as the lack of market size due to significant cultural diversity or the excessive weight of non-market activities in production and consumption—might turn out to be positive advantages for a post-industrial SKS–NBIC societal design." (Fontela 2006)[30]

These may be seen as **third insight**, directly coming from Emilio Fontela that I subscribe, if adopting his Kantian optimism, being myself a sort of a bridge from him to the future scholars and practitioners.

In viewing the above insights to the new social market economy, to which I add the seeds of the *Development trough Cooperation* of I.M. and the attention to be put on the structure of the public Balance Sheet (**further insights**), it cannot be forgotten the hysteresis heritage, after the huge phases of the crisis, of the European welfare state.

[30] http://ftp.jrc.es/EURdoc/eur22353en.pdf

"The biggest threat to social justice in Europe is not radical institutional change, but the 'frozen' welfare state landscapes where resistance to change is institutionalised."[31]

By the time this volume was printed, the 5 Presidents Report was made public (the President of the European Commission, in close cooperation with the President of the Euro Summit, the President of the Eurogroup, the President of the European Central Bank and the President of the European Parliament)

From it, the following excerpts have been extracted:

Five Presidents' Box 1

....Stat rosa pristina….

…"A complete EMU is not an end in itself. It is a means to create a better and fairer life for all citizens, to prepare the Union for future global challenges and to enable each of its members to prosper."…

…"Europe's Economic and Monetary Union (EMU) today is like a house that was built over decades but only partially finished. When the storm

[31] Diamond and Lodge (2013) pointed out: "the financial crisis appears to have reinforced the consensus for the 'traditional' welfare state, promising higher pension payments and public expenditure on health alone. Indeed, the crisis may be shoring up the 'old' welfare state edifice at precisely the moment when Europe's welfare states ought to be adapting in the light of major structural challenges, threatening future equity, growth and social sustainability. The argument of this paper is that a new 'trilemma' is emerging in the politics of European welfare capitalism between conservatism, targeting and social investment:

- First, the welfare state remains broadly popular among the electorate, despite the wave of neo-liberal restructuring in the 1980s and 1990s. However, this is accompanied by a considerable degree of resistance to change among key voter groups and an underlying 'conservative' bias.
- Second, support for the welfare state is anchored in the contributory principle, but in the light of the financial crisis, many voters accept the need for greater targeting which impairs equity in the long-term.
- Finally, equity and efficiency necessitate a shift from passive income maintenance and 'old' social risks to social investment strategies that address 'new' social risks. However, the preferences of voters reinforce the 'elderly bias' of existing social security and welfare state arrangements.

hit, its walls and roof had to be stabilised quickly. It is now high time to reinforce its foundations and turn it into what EMU was meant to be: a place of prosperity based on balanced economic growth and price stability, a competitive **social market economy**, aiming at full employment and social progress. To achieve this, we will need to take further steps to complete EMU."…

…"Today's divergence creates fragility for the whole Union. We must correct this divergence and embark on a new convergence process. The success of Monetary Union anywhere depends on its success everywhere. Moreover,in an increasingly globalised world, Member States have a responsibility and self-interest to maintain sound policies and to embark on reforms that make their economies more flexible and competitive."…

Five Presidents' Box 2

Nomina nuda tenemus

"The aim of this report is two-fold: to lay out the first steps that will launch this process today, and to provide a clear orientation for the longer-term measures."

"Stage 1 (1 July 2015 - 30 June 2017): In this first stage ('deepening by doing'), the EU institutions and euro area Member States would build on existing instruments and make the best possible use of the existing Treaties."

"Stage 2: In this second stage ('completing EMU'), concrete measures of a more far-reaching nature would be agreed to complete EMU's economic and institutional architecture. Specifically, during this second stage, the convergence process would be made more binding through a set of commonly agreed benchmarks for convergence that could be given a legal nature."

"Final stage at latest by 2025:

Economic Union:

- Formalise and make more binding the convergence process;

Fiscal Union:

- Set up a macroeconomic stabilisation function for the euro area
  - Convergence towards similarly resilient national economic structures would be a condition to access this mechanism

Democratic accountability, legitimacy and institutional strengthening:

- I ntegrate the European Stability Mechanism (ESM) into the EU law framework
- Set up a euro area treasury accountable at the European level"

With regards to the need for policy information base, the third edition of Bes ("*Rapporto sul Benessere Equo e Sostenibile in Italia*", Report on equitable and sustainable development in Italy), presented by Istat in Rome, on December 2, 2015, must be accounted for.

Furthermore, remembering the above described initial third steps of Ramsey-Stone (the first one), Solari-Fontela (the second one), the research trajectory on which the LCFH group is now working, a call to other craftsmen- type scholars is launched in order to participate to an out of two extremes (*stat rosa pristina, nomina nuda tenemus*) new lines of integrated Accounting System, particularly on multi-dimensional bridge matrixes between:

1) Demographic system and Lexis schemes;
2) Input-Output flow tables, including Consumption and Investment, by item and sector;
3) Energy Balance Sheet, from primary sources, to transformations and final uses, the associated energy losses and waste, waste disposal, and environment diseases;
4) Health administrative and physical accounts;
5) Transport administrative and physical accounts;
6) Education administrative and physical accounts.

Chapter 4: For A New Social Market Economy in the 21st Century

Otto HIERONYMI

4.1. Introduction

This book was written by a group of friends of Emilio Fontela. The objectives and the scope of this volume were explained by the two co-editors in Chapter 1 and 2. Martino and I had worked with Emilio sometimes on common projects, sometimes on projects and intellectual adventures the other one of us (Martino or I) was not involved in. Among our cherished intellectual memories of Fontela we have many that Martino and I share. Others are specific to each of us – different times, different topics and often even different continents. This is not only the case for the two us and for the other authors of this book but also for a very large number of people in Europe and around the world.

Martino and I have very different – but in many ways complementary – professional, intellectual and academic backgrounds, both in our studies and in our experience and what we want to tell our students and our readers. The principal message of this and the preceding chapter, in fact of the entire book, is that they are equally important and

relevant if one wants to try to understand who Emilio Fontela was and why his legacy is important not only for his friends and colleagues but also for a much wider circle of concerned citizens of the world.

Martino writes mostly from the perspective of the econometrician, a vocation he had shared with Emilio. I write about the Social market economy which has been in some ways directly or indirectly part of my personal and intellectual life ever since I arrived as a student refugee from Hungary in early 1957. While Emilio and I shared many topics, areas and experiences, the Social market economy was a relatively new subject for Emilio. But as it is explained later in this chapter, towards the end of his life it became more and more important for him as well. Hence the title of this book and of this chapter.

I would like to close this personal introductory note by sharing with the reader one of my dearest souvenirs of Emilio, a short dedication that he wrote inside of our book on *Brazil and the Social Market Economy*:

"Genève, Bruxelles, Madrid
le 21 septembre 2005

Pour mon ami Otto

avec qui j'ai parcouru
le chemin intellectuel
de ma vie, école de
Genève, école de Battelle,
école d'Alcantara…
tant d'écoles partagées
à l'aube de la
Société de la Connaissance.
Le Brésil c'est une
excuse. Le monde
c'est un espoir.

Affectueusement,

Emilio Fontela"

The rest of this chapter is structured under the following headings: 2. The current crisis of economic theory and policy and the search for a new consensus; 3. Globalization is the central issue in the debate on theory and policy; 4. How to overcome the crisis at the level of theory and policy?; 5. The Social market economy: the origins and the main features of the concept; 6. Germany, Europe and the social market economy; 7. Wilhelm Röpke: his relevance for the 21st century; 8. Money, inflation, the balance of payments and the future of the European Monetary Union; 9. Conclusion: developing a new Social market economy is the realist option for the 21st century.

4.2. The current crisis of economic theory and policy and the search for a new consensus

4.2.1. The economy, the role of the State and of markets

This chapter, and in fact this whole book, deals with this search primarily from the perspective of a successful theory and model, the so-called "social market economy".

The term "social market economy" was coined to describe the objectives, theories and policies related to the reconstructing of the German economy and German society after the horrors of the National Socialist regime and of the destruction of the German economy during the Second World War. At the start the concept of the social market econ-

omy was far from uncontested. However, in the light of the rapid recovery and the economic and social success of the policies of the Federal Republic, the "social market economy" was increasingly recognized as one of the most successful "models" of reconstruction and of economic policies in general, not only in the post-war period but in modern times as well.

The development and pursuit of the policies of the "social market economy" – as the term "German economic miracle" (Wirtschaftswunder) – were closely linked to the name of Ludwig Erhard. Most people – including economists in and outside Germany – remember Erhard only in connection with the liberalization of markets simultaneously with the German currency reform (Währungsreform) and the creation of the new currency (German mark, Deutschmark, or DM) and his years as Economics Minister throughout the Chancellorship of Konrad Adenauer. Many prefer to forget Erhard's tenure of the office of Chancellor during three years following Adenauer (reluctant) resignation. What is also less frequently remembered and acknowledged is that Erhard's ideas that came to be incorporated into the concept of the social market economy had matured during the 1930s and during the war.

4.2. 2. A century's struggle: the battle of ideas over economic and societal models and the victory of the Western liberal democratic model

The last 100 years have witnessed profound and dramatic changes, for both better and for the worse in economic, political and social order throughout the world. These changes were often connected to wars and revolutions and to the unprecedented development and diffusion of new technologies that fundamentally transformed the way people live and work in rich and poor countries alike. Science and technology have had a profound impact on health and the quality of life in general and they have also made wars more murderous and destructive than ever.

The changes in domestic and international order ever since the beginning of the 20th century have also been widely influenced by ideas, by the development of theories and by the imposition of ideologies aimed at changing human nature – creating a "new man" and a "new woman" – in the name of absurd doctrines ending up in subjecting millions and hundreds of millions of people to abject oppression.

The search for the right economic, political and social model – a century's struggle – has led to both enormous failures and even disasters and to outstanding results that brought lasting prosperity, social progress, freedom and peace to millions of people. [32]This search involved both often abstract theories and pragmatic and practical and analyses and policies. The "models" that emerged were always to a greater or smaller extent the result of a combination of ideas and of deliberate action and of material circumstances and of "trends and events". There were "good models" and "bad models". Sometimes the bad models failed rapidly, at other times they were maintained though force and tyranny for many years and even decades.

The end of the Second World War represented a victory over Nazism and Fascism and their murderous ideologies. It also marked the beginning, in at least part of the world of a new domestic and international order based on freedom and democracy, the market economy and economic integration and on "perpetual peace" among the members of the Western, community.[33] The (peaceful) end of the Cold War in 1990

[32] On the "paradox of the 20th Century, the profound contrasts between progress and destruction and tyranny and freedom see: Hieronymi, Otto (2002): "Political Order and Universal Values in the 21st Century", in Otto Hieronymi and Chiara Jasson (Eds.), *Humanitarian Values for the 21st Century*, UNHCR and Oxford University Press, *Refugee Survey Quarterly*, Volume 21 Number 3, Oxford and Geneva, p. 128

[33] Hieronymi, Otto (2007): "The Spirit of Geneva and Globalization" in Hieronymi, Otto and Intag, Kathleen (Editors): *The Spirit of Geneva in a Globalized World*, Refugee Survey Quarterly, Oxford University Press, Volume 26, Number 4, 2007, pp. 274-305

brought about the *de facto* collapse of the Soviet and Communist totalitarian model.

4.2.3. The shortcomings of the "ultra-liberal" model

Ever since the late 20th century there have been clear indications of a widening crisis of European and Western economic and social thought. The world-wide success of liberalism and of the market economy – witnessed by the collapse of the Soviet empire and of the Communist economic system – did not lead to the emergence of a new consensus around a stable and centrist economic and social model.

The defenders of the extreme versions of the concept of the market economy ("libertarianism", "market fundamentalism", etc.) denied the need for recognizing some the increasingly obvious shortcomings of the dominant doctrines and policies, and the need for corrections of the over-simplified, finance-dominated approach to globalization.

Among these shortcomings one may mention the following in the context of the present chapter: 1. the excessive role of finance (and especially of short-term financial criteria and decisions across the entire spectrum of the economy and society) at the expense of the "real economy" (including labor markets); 2. Oversimplifying the role of governments in helping assure the proper functioning of markets (this has included the severe narrowing of the room for decisions by elected government at the national and local and regional level, decisions that would take into account the specific conditions in these areas); 3. Disregarding or even denying the role of "social policies" both in the developing and developed world and spreading the doctrines and practices of 19th century exploitation as justified by neo-Darwinian doctrines; 4. Denying the importance of global international monetary stability and

the need for a world-wide rule-based international monetary order; 5. Systematically ignoring the need for an international economic and social order that would incorporate the costs and impact of economic activity on the environment; 6. Refusal to recognize the political and economic dangers of the growing gap in income and wealth within and between economies and the potential long-term consequences for freedom and peace and for the very survival of the market economy; 7. Last but not least, the emphasis on the central role of competition for an efficient economy, in practice turned out to be more lip service than reality as there have been few effective constraints on the trend of concentration and the emphasis on bigness both at the national and at the international level.

4.2.4. An "anti-market" backlash

As a result, as early as the 1990s there was a revival of anti-market, "anti-capitalism", etc. schools that instead of just correcting the shortcomings of the dominant doctrines (e.g. of the so-called "Washington consensus"), aimed at reversing and eliminating entirely the model of the free market economy and of liberal democracy. Some of these trends originated in the old, discredited Marxist-Leninist-Maoist-Trotskyist tradition of collectivism. Others came from the right-wing populist and protectionist nostalgia, or from the glorification of robber-capitalism by the Communist rulers of countries like China or Vietnam, or finally from the anti-economic fallacies of the environmentalist hard-liners.

In this new constellation there seemed to be less and less of a middle ground, of common sense and of the recognition for the need to learn from both history and from the lessons of theories and practices that failed or were successful in the course of the 20th century. [34]For those in this middle ground – and Emilio Fontela and the present writer

[34] See: Hieronymi, Otto (1998) "Agenda for a New Monetary Reform", in *Futures*, Vol. 30, No.8, pp. 769-781, Pergamon, Elsevier Science Ltd.

counted themselves as belonging to this minority – the dominant discourses about theory and policy were becoming increasingly a source of intellectual and moral frustration.

As noted above, the financial and monetary crisis that broke into the open in 2008 also brought about the demise of the dominant doctrines of the preceding 20 to 25 years. The world economy and the global world economic order were saved from virtual collapse in the last minute by a determined break of the leading authorities with their prevailing monetary and fiscal orthodoxy – in fact with their practices and doctrines that had been largely responsible for the suddenness and the extent of the crisis.

The crisis in economic and social thought that resulted from the deep crisis of institutions, markets and incomes across the so-called developed economies has had both positive and negative consequences.

Among the positive consequences has been the revival of solidarity and innovation among governments and a certain soul-searching about past errors and rigidities. Both officials and academic and other experts have become more open to criticism and more ready to reexamine some of their earlier assumptions and views of the past as well as about the current functioning of the world economy. [35]

At the same time, and this is among the major negative consequences in this context, the natural tendency of trying to restore previous dominant positions among pundits and for policy-makers to return to "business as usual" has been hard to resist. Also, we are far from having defined a new international and national model that would provide the same success story in the long run as was the case with the Western model during the period 1950-2000.

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[35] See Chapter 2 in Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke

However, despite the victory of the liberal, democratic model and of globalization, the search for "good models" and the debate about objectives and methods have never ceased. [36] They have gained a new interest and momentum since the economic, monetary and social crises – and the revival of ideological and religious extremism – since the beginning of the 21st century.

4.2.5. Are we at a crossroads?

The way the economy, the political system and society as a whole work is determined by a combination of change and existing structures: by trends (with greater or smaller "cyclical" fluctuations") and by smaller or larger structural and systemic changes including "turning points" and "crossroads".

One of the most challenging tasks in economic, political and social analysis is to know where we are in time. Are we today at a major turning point in domestic and international economic and political order? Are we at a crossroads where our decisions and choices of direction – by political leaders, other major decision makers and by ordinary citizens in their capacity of both voters and consumers – may have a decisive impact for better or worse for the long term outlook for domestic and international order. The question of "where are we"? as well as the answer to this question are highly relevant for the debate about theory and the search for a new consensus.

It is the conclusion of this chapter that today – similarly to the late 1940s and early 1950s and to the period immediately following the end of the Cold war – , we are once more at a major turning point or a

[36] Hieronymi, Otto, Bensky, Daniela and Stoyanova, Teofana (2008): "Quale Ordine Politico Interno e Internazionale Futuro per l'Europe et per il Mondo?" ("What Future Domestic and International Political Order for the World?") in *La Politica, Festival della Modernità,* Spirali, Milano, pp. ¨101-147

crossroads – in national and international order and in order to make the right choices we need a fresh approach at the level of theory and policies.

The current tensions and crises in the world economy are also a reflection of the crisis in economic theory and of the economic and social models and policies within the national economies and in the world economy as a whole.

Finding an equitable, balanced free and efficient economic and social model for the 21st century – at the national and international levels –is thus the principal political, intellectual and moral challenge of our time. This new model should incorporate both the freedom and efficiency of markets and responsible government action, both competition and concern for social progress and the common good.

The central thesis of this chapter and of this book is that in this search, between the renewed temptation of authoritarian and collectivist approaches, on the one hand, and of extreme libertarian dogmas and policies, on the other, the original concept and theories and the post-war experience and practice of the social market economy can provide the best source of inspiration and guidance despite the vastly changed economic, technological, political and demographic environment in the European and the world economy.

4.3 Globalization is the central issue in the debate on theory and policy

4.3.1. The challenge of globalization

Globalization is meant to be an international order under which large and small countries do (or should be) living in freedom, peace and prosperity and social progress.

Is globalization simply the extending of the borders of the "Western Community", of freedom and of the "free society" to the entire world community? A new international order that all countries can join which accept and apply the common organizing principles of freedom and competition and the market economy? Is it only an economic concept or does it or should it have a moral and ethical dimension as well?[37]

Today, globalization is one of the most frequently used terms in international political debate – both critically and approvingly: the term has moved in a short time from virtual inexistence to the center of political debate. There is no doubt that the 2008 world-wide crisis was rightly perceived as not only a crisis of the international monetary and financial system but also as the crisis of globalization itself. [38]

Globalization is both 1. the continuation of a trend (which had seen its ups and downs) that started in 1945 in the Western world in response to the experience of the preceding decades and to the imminent new threat to freedom and peace, and 2. a new quantitative and qualitative jump since the end of the Cold War.

Globalization represents the continuation of a trend towards a gradual opening of national economies to competition from abroad. Thus, international economic relations and competition in general are the primary elements of the concept. Globalization, however, also has

[37] See Hieronymi, Otto (2007): "The Spirit of Geneva and Globalization" in Hieronymi, Otto and Intag, Kathleen (Editors): *The Spirit of Geneva in a Globalized World*, Refugee Survey Quarterly, Oxford University Press, Volume 26, Number 4, 2007, pp. 274-305

[38] See Chapter 1 in Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke

an important domestic dimensions both in terms of the role of states and the functioning of markets.

Globalization represents the broadening, deepening and widening of trends that had started in the post-war period.

Two major factors gave a strong boost to this phenomenon: 1. the changes that led to renewed emphasis of markets, on private initiative and of limiting the economic role of the state in the 1970s and 1980s first in the United Kingdom and then in the United States followed by the large majority of the OECD countries and parts of the developing world and 2. The collapse of the system of planned economy in the Soviet Union and its European satellites.

The principal aspects of globalization include the following:

1. Liberalization of markets (including labour markets) and in particular of international trade, as well as of payments and services (the liberalization of the movement of people (migration) across borders receives less emphasis.

2. Deregulation, i.e. the reduction or elimination of government regulations for individual sectors, products, etc. For many it also means reducing or even eliminating legislation to enforce competition.

3. Privatization and the withdrawal of government from all "economic activities". This also means the replacement of traditional "public services" by profit-motivated private companies.

4. The prohibition of all forms of government subsidies and "industrial policies".

5. Prohibition of government intervention in foreign exchange or financial markets

6. A systematic effort to reduce "social expenses" and the rights of organized labor

The full implementation of the concept of globalization – which has not been attempted or achieved by any of the major developed or emerging economies – should result in achieve in principle a situation where cross-border economic and financial transactions would not encounter any more difficulty than economic or financial transactions by national actors on domestic markets.

Under globalization the scope of national government economic policies is increasingly more restrained by explicit international agreements and by the interpretation of what is and what is not compatible with a properly functioning market economy.

This rule and its implementation are at the heart of the perception of how "globalization" functions or ought to function. It is, of course, one of the principal sources of criticism of globalization: both from the side of "market fundamentalists" and from the enemies of the market economy.

It is obvious that there is a growing distance between this concept and practice, on the one hand, and the original concept developed by the late Wilhelm Röpke under the heading of "market conform" government policies and interventions.

Today, the concepts of von Mises (even Hayek recognized a larger role government than von Mises) still receive a widespread support in the debate on globalization and the market economy.

4.3.2. Globalization today: where is solidarity, diversity, social concern and the ethical dimension?

There are three main concerns about globalization today: 1. there has been no real consensus on what the "Western model" that helped win the war of ideas and of economic and social models was and is about, 2. the implementation outside the core OECD area of the

this successful "Western model" is often unsuccessful partly because of the ignorance and short-sightedness of Western experts and leaders, 3. there is a need for correcting and rebalancing the various features and objectives of globalization (de-emphasizing the primacy of global finance[39], correcting the prevailing "short-termism" and bringing back a more balanced approach to solidarity and competition).

Today some of the key questions about the record and the future of globalization are: *Where is the social dimension, the solidarity that makes globalization politically and socially acceptable? Where is the respect for diversity?* [40]

There is no doubt that the ethical and social dimensions of globalization have to be addressed urgently and in a positive way. There is no real alternative to globalization but there is a need for remembering

[39] The growing recognition in recent years of the shortcomings of the orthodoxy prevailing until 2008 by some their most vocal exponents and practitioners especially in central banks has been a major positive development. This radical shift of perception can be illustrated by the case of Martin Wolf, Chief Economics Commentator of the *Financial Times*. In 2004 Wolf a prolific, articulate and widely-read economist published a powerful treatise on globalization: *Why Globalization Works, The Case for the Global Market Economy*. Exactly ten years later he wrote an equally voluminous analysis on the shortcomings of unbridled globalization and the risks involved in the excessive weight of finance: *The Shifts and the Shocks: What We have Learned and Still Have to Learn from the Financial Crisis* Wolf M (2004) *Why Globalization Works. The Case for the Global Market Economy*. Yale University Press; Wolf M (2014) *The Shifts and the Shocks: What We Have Learned and Still Have to Learn from the Financial Crisis*. Allen Lane" in Otto Hieronymi: "The crisis of international finance, the Eurozone and economic growth", (Springer 2015)

[40] Hieronymi, Otto (1998) "Agenda for a New Monetary Reform", in *Futures*, Vol. 30, No.8, pp. 769-781, Pergamon, Elsevier Science Ltd.; HIERONYMI, Otto: "Wilhelm Röpke, the Social Market Economy and Today's Domestic and International Order", in Otto Hieronymi, Chiara Jasson and Alexandra Roversi (editors): *Colloque Wilhelm Röpke (1899-1966), The Relevance of His Teaching Today: Globalization and the Social Market Economy*, HEI-Webster University, Cahiers HEI, Geneva, 2002; Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke; Hieronymi, Otto (1990) *Economic Policies for the New Hungary: Proposals for a Coherent Approach*, Battelle Press, Columbus

the original challenge: *unity in diversity*. For globalization to be a success there has to be a balance between private interests and public interests. The denial of "public interests" is a mortal threat for the survival of individual freedom and for the respect of the private sector and the market economy. The systematic denial of economic freedom and initiative and declaring that there are only "common interests" is a well-trodden road to both tyranny and inefficiency and poverty.

What happens if globalization fails? There will be no new international order worth its name. At a first stage, there would be a world divided into two with a growing gap between the successful and those who fail to perform. At a second stage, if globalization fails, there will be a generalized backlash against not only against its shortcomings but also against recognized positive features with new crises along the lines.[41]

4.4 How to overcome the crisis at the level of theory and practice?

4.4.1. The priority today is to deal with the crisis at the level of ideas

Overcoming the crisis at the level of theory is without doubt the principal condition for overcoming the uncertainty and confusion that still reigns at policy level.

The "Great Recession" has led to an active reconsideration of the history of the "Great Depression" and of the theories and policies

[41] Hieronymi, Otto (2015): "Globalization, Economic and Social Order and Human Rights and Humanitarian Action", *The Hungarian Review*, Budapest

that had emerged in the 1930s both in Europe and in the United States in this context. [42]

The ultimate crises of the 1930s was the outbreak of the Second World War and the ground gained by totalitarianism and by collectivism. Collectivism – i.e. the all-powerful intervention and control of the economy by the state – characterized not only the Soviet Union and Nazi Germany (and their satellites), but gained enormous influence also in the Western democracies.

The economic and political situation in the world today differs – fortunately – in most respects from the situation in the 1940s following the end of World War Two. There is, however, an important similarity between "then" and "now": namely the necessity to find a new way, to develop new theories that will help develop a "new reality"– even if these new theories will also incorporate important elements of theories from the past –.

Thus, it is the conclusion of the present chapter and of this book as a whole that in the intensive debate to overcome the current crisis at the level of ideas and theories the lessons from the experience of the postwar period are directly relevant.
The first and most important point is that today, as in the wake of the Second World War, the task and the challenge – at the level of ideas and policies – are not a "revolution", but a "reconstruction" and "renewal". The task is not to destroy the liberal, democratic political and economic order, but to reform, renew and where needed reconstruct.

Key words in this search include:

- Market economy, individual responsibility and chances to succeed
- Diversity and integration

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[42] Hieronymi, Otto and Stephanou, Constantine, Editors (2013): *International Debt – Economic, Financial, Monetary, Political, and Regulatory Issues*, Palgrave Macmillan, London, pp. 63-80

- Recognition of multiple dimensions of the reality and of the need to provide a theoretical basis
- Federalism and international integration
- Freedom and human rights
- Security dimension
- Qualitative growth and the respect of the environment
- Promoting social progress and reducing excessive inequality
- Competition and checking excessive concentration of economic power

4.4.2. The role of theory and method

The principal functions of economic theory are *to explain, to assess, to guide and to improve (and even fundamentally transform) economic reality.* Explicitly or implicitly, theory is constantly present at all stages of research, even if the researchers or the users of the research results do not refer to specific theories. Theories are also linked, directly or indirectly, to values and value systems broadly defined.

There are fundamental differences between theory and research in economics, politics, international relations, and other social sciences, on the one hand, and theory and research in the natural sciences. These include the potentially and actually changing nature of the subject matter of economics and of the other social sciences and the interaction between this subject matter and the relevant theories. Theories are there not only to explain and to understand. They also have a normative dimension and they can and very often aim at influencing and even radically changing the very reality with which they deal. To put this succinctly: the principal objectives of “economic theory” is to eliminate the imperfections and mal-functions in the economic system.

The attached box illustrates how a given reality can influence policies, which in turn can change reality, which then can change our theories.

THE ROLE OF THEORY

Explain – assess – guide – improve
objectivesprojecting (forecasting)
objectives
Reality (a)

↓Values – Ideas – Observations – Analysis (a)

↓

Theory (a)

↓

Policy (a)

↓

Reality (b)

↓

Ideas (b)

↓

Theory (b)

↓

Policy (b)

↓

etc.

The links between "theory" and "reality" can be summed up (at the risk of oversimplification) in three steps:

a) From reality to theory: all theory is based on 1. a broader or narrower set of observation of structures, events and developments, current or past and 2. the insights and contributions of theoreticians broadly defined (observers, economists, philosophers, analysts, practitioners, etc.)

b) From theory to policy: theory, implicit or explicit theoretical views of the world, influence policies adopted by leaders, governments, states, etc. They shape our views on what we think are right or wrong policies

c) From policies to reality: policies (in the broadest sense of the word) influence and often permanently change economic as well as political and social reality. This new reality in its turn will influence (or should influence) our theoretical insights and hence policies.

The power of "conventional wisdom" (Galbraith) or of "dominant doctrines" or "paradigms" (Kuhn) to influence not only public policies and private behaviour and expectations but also to change "reality" is recognized by both scholars and "decision-makers". This intellectual and political power is what is ultimately at stake – for better or worse – in the battle of ideas and what is claimed to be right and or wrong in given theories.

4.4.3. Pragmatism or abstraction?

For many people who look at the growing complexity and abstraction of economic literature (as well as books and papers in other areas of the social sciences) it is easy to confuse the two closely related but still distinct concepts: theory and method.

This is all the more likely to happen because much of the debate and the research in economics in recent years and decades has shifted

from clear differences or agreements about theory to arguments, disagreement and innovations about method (and in particular about more and more sophisticated mathematical and statistical approaches and tools).

Sophisticated statistical methods have their place and role also in economics. Exploring and explaining theoretical issues with the help of mathematical logic has certain advantages, as compared with purely descriptive and historical analyses. Yet, the excessive use of mathematical concepts and of sophisticated statistical tools can also lead away from a better understanding of "economic reality" – as has been the case in the recent past – with negative consequences both for the science of economics and the world at large. This is why "practical economists" tend to have recourse simultaneously to multiple tools, in contrast to a majority of "academic" researchers.[43]

In their work economists deal with and have to make choices about method, tools, theory, data, observation, analysis, forecasting, to mention only a few aspects. There is a need for rigour and quantitative assessments, but also for non-abstract, non-econometric analyses and results. The importance of using different methods, different tools simultaneously and also according to the data and the objectives has to be recognized by the leaders of our field as well as by the coming new generation of professionals, unless we want to condemn our profession to growing irrelevance in trying to deal with the challenges of the present and the future.

Emilio Fontela, both an outstanding "pragmatic" and "academic" economist and researcher was very much aware of this problem. His unique gifts and experience made him both a great "tool-maker"

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[43] Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke, pp. 28-38

and "methodological innovator" and a student of theories and of the economic reality around us in all its complexity.

4.4.4 From induction and deduction to synthesis or Emilio Fontela, the fourth Master of the Geneva School of Economics

Shortly before the end of his life he gave us an important summary about what was essential for him about theory and method: the synthesis of induction and deduction and the constant focus on reality. He used this definition in describing the three "Masters" of the virtual Geneva school of economics:

"Jacques L'Huillier, Wilhelm Röpke, and Luigi Solari, (whom I consider to be the) 'three masters' of the Geneva School of Economics (are) Masters as the Japanese talk about the 'Sensei'. The Sensei is the master. The master is surrounded by disciples. All three of them had a number of disciples. What do these three curious people, outstanding Masters, have in common, if anything at all? Well, my feeling is that what they have in common is the scientific inquiring process, the methodology they use. The methodology of pure economics, as I have said, has been and is today purely deductive. Also, there is another mainstream today in quantitative economics, which is inductive, and most econometrics today is inductive. We try to devise laws from the observations of data. But there is a lack of synthesis. There is a lack of people, who integrate the deductive and inductive approaches. Now, the *three masters of Geneva are synthetic*. That's a very interesting proposition. That is, they are good at deductions. They are good at doing economics *per se*. But, they are good also at induction. They observe international organizations. They observe economic data. They observe the crisis of the economy and of the political order. They observe reconstruction processes. They are involved with the real world, "they are in practice". They are in the business. This is an important thing. So, they are mixing theory and practice. They are realistic. A lot of mainstream economists today are not realistic. If you are on the deductive side, you don't want to be realistic. As a matter of fact, most economists think that the real

world is just an error. The real world is an error. It is just wrong, because people are doing things the wrong way. If they did things right, then economists would be right. But unfortunately, the real world is wrong. This is the lack of realism. Now, these three people here are realists in the best sense of the word." [44]

The principal conclusion for the reader of this chapter and this book dedicated to the legacy of Fontela is that Emilio's work and influence can best be understood if we think of him as the *"fourth Master" of the virtual Geneva school of economics*.

4.4.5. Multi-disciplinarity and the Social market economy

The Social market economy is essentially an economic concept. However, the members of the original group that developed the theory and applied the policies did not become victims of a narrow economic view of society. They rightly saw the enormous importance of the correct choice of an economic model; they also understood the close connection between economic issues and other societal challenges. Both as scholars and as practitioners they had to take into account social (and sociological) aspects, legal and institutional questions as well as the domestic and international role of the state.

The question of values was an overriding theme: not only because of the personal background and preferences of this group of scholars, but because ideologies and evil "values" had played such a destructive role in the 20th century. A reformed liberalism ("neo-liberalism") was the strongest tie that brought them together and kept their

[44] Fontela, Emilio (2007): "The Geneva School of Economics and the Spirit of Geneva", in Hieronymi, Otto and Intag, Kathleen (Eds.): *The Spirit of Geneva in a Globalized World, Refugee Survey Quarterly, 2007*, UNHCR, Oxford University Press, Oxford and Geneva

academic writing, their public arguments and their political action on a common track.

Virtually all members of the small group had a strong theoretical background in economics, as well as a pronounced interest in contemporary economic issues, in economic systems, and in particular in the theories of economic crises and recovery. At the same time they also had various additional intellectual and scholarly interests (history, sociology, law, etc.).

The focus of their concern and work was Germany: but they were also to a greater or lesser extent familiar with the rest of Europe and the world beyond the European continent. (Röpke, Rüstow and Erhard in particular).

Among all of them, Wilhelm Röpke was the true pioneer of "multidisciplinarity" (although he would have disliked this neologism) and also had the broadest European and world-wide experience and outlook. Röpke was unique in his ability in linking general, regional (and sectoral) and local issues to problems and solutions. Röpke had a unique gift of writing, an ability to translate the most complex scholarly analysis into clear and even beautiful prose without oversimplification. His writings were "accurate" and "accessible" while also fully showing the complexity of the issues and solutions.

4.4.6. Forecasting and long-term visions

Röpke and most of his friends were "allergic" to quantitative models and forecasts. He tended to be suspicious of the risks involved in the "*fallacy of misplaced concreteness*", a term he tended to use almost as often as the warning by Rabelais that "*science sans conscience n'est que ruine de l'âme*".

Yet, Röpke was profoundly interested in the future and in particular the long term: not just what might happen, or what ought to happen but also in what will happen, if the *right* or the *wrong* ideas and policies prevail. For Röpke academic analyses and theories were interesting primarily to understand and to help shape the future. His extraordinary understanding and sense of history and of the recent past were put in the service of helping both experts and the general public grasp what could and will happen in the future if different options are followed. He also knew that it is essential to show differences in values, theories, policies as clearly as possible, rather than hide behind the argument that no one knows the future and anything can happen. Röpke also understood the importance of projecting the possible alternative future developments of theories. [45]

The concept of the "third way" that deeply marked his thinking and life's work (although he used the term sparingly) did not mean intellectual or moral neutrality and a lack of commitment to what were the correct views.[46] He was never reluctant to engage his intellectual reputation in defending what he thought were the right conclusions and recommendations, even if these were out of phase with the dominant or conventional wisdom.[47]

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[45] See the thoroughest study so far of Röpke's workdand legacy: Peukert, Helge (1992): *Das Sozialökonomische Werk Wilhelm Röpkes*, Two volumes, Peter Lang, Bern, Frankfurt am Main; also Rieter, Heinz und Zweynert, Joachim Editors (2010): *« Wort und Wirkung »*: *Wilhelm Röpkes Bedeutung für die Gegenwart*, Metropolis-Verlag, Marburg and in particular Helge Peukert's chapter in that volume on "Wilhelm Röpke als Pionier einer ökologischen Oekonomik", pp.163-203. It is worth mentioning here what Bertrand de Jouvenel, one of the political philosophers to have earliest and best understood the importance of "thinking systematically about the future" wrote in his pathbreaking book about the importance of "projecting ideas": "La prévision des idées est d'une extrême importance. Elle est indispensable à la prévision des changements concrets si l'on pense qu'ils procèdent de changements dans les idées : ce sera mon premier point. Mais si l'on croit que c'est l'inverse, la prévision des idées n'en reste pas moins un objet majeur : ce sera mon second point. " Jouvenel, Bertrand de (1964): *L'Art de la Conjecture, Futuribles*, Editions du Rocher, Monaco, p. 320

[46] Skwierz, Sylvia Hanna (1988): *Der Dritte Weg im Denken von Wilhelm Röpke*, Creator Verlag, Würzburg

[47] Rieter, Heinz und Zweynert, Joachim Editors (2010): *« Wort und Wirkung »*: *Wilhelm Röpkes Bedeutung für die Gegenwart*, Metropolis-Verlag, Marburg

4.5 The social market economy: origins and main features

Although in recent years there has been in both Europe and in the United States a certain revival of interest in the thought of Wilhelm Röpke – in the United States primarily from among libertarians who tend to claim him wrongly as one of theirs – on the whole there is still a wide-spread lack of knowledge and lack of interest about both Röpke and the Social market economy among professors and as a result among students as well. This is the reason why it seems important to discuss in some detail in the present chapter the main features of "original" Social market economy, its origins and in particular the thinking and the role of Wilhelm Röpke.

4.5.1. A "radically centrist" view of the world

The original concept of the Social market economy – both at the level of the theory and of the actual practice – was, according to the present writer, a *radically centrist one*.

It was developed before, during and after the war when Germany and German society and economy were at a political and moral low point that no one could have imagined before 1933. The Social market economy was to provide the way not only from the economic and social marasm but also from the moral and political depravation

brought about by the National Socialist regime. It was important to reject and to eliminate once and for all the potential threat of extremism on the Right or the Left.

The three objectives for the new economic and social order for Germany were summed up by Röpke as: 1. The return to a market economy; 2. Federalism; and 3. Integration with the West (rather than with the Communist East). [48]There was strong emphasis on ethical and moral reconstruction of German society and on the need for social concern by the Government (not to be confused with the concept of the "welfare state" developed by Scandinavian and English Socialists.)

The development and pursuit of the policies of the "Social market economy" – as the term "German economic miracle" (Wirtschaftswunder) – are closely associated with the name of Ludwig Erhard. Most people – including economists in and outside Germany – remember Erhard only in connection with the liberalization of markets simultaneously with the German currency reform (Währungsreform) and the creation of the new currency (German mark, Deutschmark, or DM) and his years as Economics Minister throughout the Chancellorship of Konrad Adenauer.

Many prefer to forget Erhard's tenure of the office of Chancellor during three years following Adenauer (reluctant) resignation. What is also less frequently remembered and acknowledged is that Erhard's ideas that came to be incorporated into the concept of the Social market economy had matured during the 1930s and during the war.

Wilhelm Röpke developed the distinction between government interventions in the economy that are compatible with the market ("Market conform") and those that are not, i.e. that threaten to destroy the advantages of the market economy. [49]

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[48] See e.g. Wilhelm Röpke: *Die Krise des Kollektivismus*, 1947

[49] Röpke, Wilhelm (1937): *Die Lehre von der Wirtschaft*, Eugen Rentsch Verlag, Erlenbach-Zürich, (in English *Economics of the Free Society*, Henry Regnery, Chicago, 1963)

No doubt, Erhard readily acknowledged the intellectual contribution of a small group (not more than half a dozen) before and after 1948 to the development of the concept of the social market economy (including to the coining of the term).

Erhard clearly was not one of the numerous academics (including many economists) who had fallen under the spell of Hitler and of his ideology and who were impressed by the recovery of the German economy during the 1930s, to a significant extent as a result of the massive spending on rearmament and ideologically motivated infrastructure projects. Erhard not only refused to join the Nazi party, he also refused to join professional associations that were dominated by Nazi ideology and explicitly supported the objectives and the methods of the regime.

Erhard had close contacts with many opponents to the regime including Goerdeler although he did not share Goerdeler's conservative economic and political philosophy.

The most important document about Erhard's thinking during the war is the study he prepared in 1943-44 about debt consolidation after the end of the war (with the unmistakable assumption that Germany was going to lose the war. (*Denkschrift: Kriegsfinanzierung und Schuldenkonsolidierung).*[50] The approach suggested in this detailed study for spreading the debt burden resulting from the approach that the National socialist regime had adopted for financing the war, influenced the solution followed in the 1948 currency reform.

4.5.2. The main features of the original concept

[50] Erhard, Ludwig (1944, 1977): *Denkschrift: Kriegsfinanzierung und Schuldenkonsolidierung, Faksimiledruck der Denkschrift 1943-44*, Propyläen, Ullstein, Frankfurt am Main

The term “Social market economy” was coined to describe the objectives, theories and policies related to the reconstructing of the German economy and German society after the horrors of the National Socialist regime and of the destruction of the German economy during the Second World War.

It was based on the clear perception that both capitalism in its extreme versions in which monopolies and cartels were combined with 19th century “laissez-faire” doctrines, and collectivism, that is state controlled economies (under National socialism or Communism in their most extreme versions) were among the root causes of the economic and social crises and catastrophes of the first half of the 20th century. They were both to be firmly rejected as the economic model for a new democratic Germany.

At the start the concept of the social market economy was far from uncontested. However, in the light of the rapid recovery and the economic and social success of the policies of the Federal Republic, the “social market economy” was increasingly recognized as one of the most successful “models” of reconstruction and of economic policies in general, not only in the post-war period but in modern times as well.

The components of the original concept can be summed up in the following points:

1. The liberal open market economy is an essential part of a liberal democratic political system. For the market economy, however, in the long run, the social dimension of society must not be neglected. Also, the government has important responsibilities to assure the proper working of markets.

2. Competition and the narrow pursuit of self-interest cannot be the only organizing principles of society. We need a set of meta-

economic values that assure that the interest of the community and not only of the individual will be respected. [51]

3. The freedom, dignity, and responsibility of the individuals – families, entrepreneurs, workers and employees, public official and politicians – had to be clearly understood and respected.

4. The state must not have unlimited powers, but it has economic and social responsibilities both with respect to the proper functioning of markets and encouraging people's confidence and trust in the future and in the betterment of their condition

5. The central element of the economic system are properly functioning markets and price system. Competition is an essential feature. But not all parts of the economy are subject to competition and private markets.[52]

6. Monetary stability, fighting inflation and the protection of savings are essential conditions for the proper working of the economy.

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[51] By the beginning of the 21st century, when the liberal market economy had triumphed beyond all previous hopes, points (1) and (2) were among the key elements of the social market economy that came to be most systematically forgotten and denied in our globalized world and world economy. Hieronymi, Otto (2002): "Wilhelm Röpke, the Social Market Economy and Today's Domestic and International order" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, p.11

[52] To repeat in English the passage also found by Blankart: "It cannot be said often enough that in the last resort competition has to be circumscribed and mitigated by moral forces within the market parties." Röpke, Wilhelm (1958): *Jenseits von Angebot und Nachfrage*, Eugen Rentsch Verlag, Erlenbach-Zürich, (latest edition in English: *A Humane Economy, The Social Framework of the Free Market*, Intercollegiate Studies Institute, Wilmington, 1998)

7. Fiscal discipline is important at all levels of government, but there are situations where the "no deficits" rule can be relaxed.

8. Protectionism is rejected for economic as well as political and social reasons.

9. The basic philosophy is a modern version of liberalism where economic prosperity and social progress are interdependent.

10. The division of labour between the private sector and individuals, on the one hand, and the government, on the other hand, is the subject of the political debate and decisions. [53]

4.5.3. Multiple Interpretations: ORDO vs. the Social market economy?

The concept of the Social market Economy has been the subject of multiple interpretations since the 1940s, both by its opponents and by its advocates. This was already the case through the first two decades following the Erhard reforms and the creation of the DM, and even more so during the subsequent decades up to the present day.

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[53] Hieronymi, Otto (2002): "Wilhelm Röpke, the Social Market Economy and Today's Domestic and International order" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, p.10; Röpke, Wilhelm (1947): *Die Krise des Kollektivismus,* Eugen Rentsch, Zürich and Verlag Kurt Desch, München; Röpke, Wilhelm (1958): *Ein Jahrzehnt Sozialer Marktwirtschaft in Deutschland und Seine Lehre,* Verlag für Politik und Wirtschaft, Köln-Marienburg; Müller-Armack, Alfred (1946, 1990): *Wirtschaftslenkung und Marktwirtschaft*, Kastell Verlag, München; Müller-Armack, Alfred (1974): *Genealogie der Sozialen Marktwirtschaft, Frühschriften und weiterführende Konzepte,* Verlag Paul Haupt, Bern; Müller-Armack, Alfred (1971): *Auf dem Weg nach Europa, Erinnerungen und Ausblicke*, Gemeintschaftsverlag Rainer Wunderlich, Tübingen und C.E. Poeschel, Stuttgart

The term "Social market economy" was originally coined by Alfred Müller-Armack. [54]While Müller-Armack fully recognized the contributions of Walter Eurcken [55] (and especially his sharp critique of cartels and monopolies) and of "Freiburg School" and what came later to be known "ORDO-Liberalism", he was much closer to the thinking of Röpke[56] and Alexandre Rüstow and Ludwig Erhard himself.

These different interpretations have made it difficult to "export and implement" this successful model to countries undergoing major changes in their economic systems. This had been the case for the so-called developing countries in general and for the Latin American countries in particular. This issue became even more acute after the collapse of the Communist system in Eastern Europe in 1990. There was virtually no intellectual or political, and even less material support to help or encourage the "transition countries" to adopt the Social market emonomy as a model. As the German Finance Minister at the time, Theo Waigel, summed up succinctly this attitude and policy in 1994: "the Social Market economy is not an export product". [57]

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[54] Müller-Armack, Alfred (1946, 1990): *Wirtschaftslenkung und Marktwirtschaft*, Kastell Verlag, München

[55] Eucken Walter (1959): *Grundsätze der Wirtschaftspolitik*, Rowohlts Deutsche Enzyklopädie, Rowohlt, Frankfurt am Main; Eucken, Walter (1940): *Die Grundlagen der Nationalökonomie*, Verlag von Gustav Fischer, Jena

[56] In his appeal in 1947 for restoring the market economy in Germany and Europe in order to end shortages and poverty Röpke defined a "supply side approach" *avant la lettre*. Röpke, Wilhelm (1947): *Die Krise des Kollektivismus,* Eugen Rentsch, Zürich and Verlag Kurt Desch, München. See also: Erhard, Ludwig (1957, 2009): *Wohlstand für Alle*, Econ Verlag, Düsseldorf, Anaconda, Köln

[57] Hieronymi, Otto (2002): "Wilhelm Röpke, the Social Market Economy and Today's Domestic and International order" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, 2002, pp.8-32

This was also the position of Otto Schlecht who had been a close associate of Ludwig Erhard and was State Secretary in the Ministry of Economics in Bonn at the time of regime change in Eastern Europe and subsequently became the Head of the Ludwig Erhard Foundation. The numerous publications of the Foundation (eg. periodical *Orientierungen*) showed very little interest at the time in the needs of the former Communist economies or were of an astonishing superficiality. This was also the case for the more than 800 page volume the Foundation finally put together in 1994 on this subject under the title *The Market Economy as a Task* (*Marktwirtschaft als Aufgabe*).[58]

Over the years one could observe a growing rigidity in the academic interpretation of the theory and practice of the Social market economy. Both the critics and the defenders of the Social market economy have tended to reduce the concept to the so-called "ORDO liberalism" and of the "Freiburg school".

The issues on which this narrowing of the focus of the Social market economy has been particularly evident included the "social dimension", the role of the State and the international dimension. Another issue was the issue of "bigness" and the concentration of private economic power, this time not through cartels, but through mergers and acquisitions (buying out the competition in the name of "greater efficiency").

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[58] Hermann-Pilath, Carsten, Schlecht, Otto and Wünsche, Horst Friedrich (Editors) (1994): *Marktwirtschaft als Aufgabe, Wirtschaft und Gesellschaft im Uebergang von Plan zum Markt, Grundtexte zur Sozialen Marktwirtschaft*, Band 3, Ludwig Erhard Stiftung, Gustav Fischer Verlag, Stuttgart. Otto Schlecht's concluding chapter in this volume entitled "Soziale Markwirtschaft für das ganze Europa!" (Social market economy for all of Europe!) was too little and too late. It did not represent a true roadmap to achieve this objective nor any reference to what role Germany could play in bringing about this transformation not only in Eastern Europe but in Europe as a whole.

The term "Social market economy" was originally coined by Alfred Müller-Armack. [59]While Müller-Armack fully recognized the contributions of Walter Eurcken [60] (and especially his sharp critique of cartels and monopolies) and of "Freiburg School" and what came later to be known "ORDO-Liberalism", he was much closer to the thinking of Röpke and Alexandre Rüstow and Ludwig Erhard himself.

A recent article on Wikipedia, quoting from a standard text for explaining economic policy to political scientists (2006)[61], compared the actual Social market economy (Müller-Armack) and ORDO Liberalism (Walter Eurcken). This comparison showed significant differences in seemingly common approaches. Without exception the ORDO version is more rigid and less pragmatic. It also de-emphasizes the reality and complexity of the "social dimension" is and less applicable to serve as a basis for effective policy decisions.

The following are the principal conclusions of this comparison: 1. The Social market economy (Müller-Armack) consists of both creating the required "framework of the market" (Ordnungspolitik)[62] and the choices and compromises in the actual "process of policy-making", whereas for ORDO (Eucken) all it takes is the "framework of laws and rules" (Ordnungspolitik); 2. The Social market economy requires both qualitative and quantitative objectives and parameters for economic policies, for ORDO only policies based only on qualitative goals and

[59] Müller-Armack, Alfred (1946, 1990): *Wirtschaftslenkung und Marktwirtschaft*, Kastell Verlag, München

[60] Eucken Walter (1959): *Grundsätze der Wirtschaftspolitik*, Rowohlts Deutsche Enzyklopädie, Rowohlt, Frankfurt am Main; Eucken, Walter (1940): *Die Grundlagen der Nationalökonomie*, Verlag von Gustav Fischer, Jena

[61] See: Schmid, Buhr, Roth u. Steffen: *Wirtschaftspolitik für Politologen.* UTB, 2006, S. 159–162. Quoted in Wikipedia: Ordoliberalismus

[62] "Ordnungspolitik" is one of the most difficult words to translate, and even more to explain in a few words, yet it is at the heart of the whole concept and the interpretation of the social market economy.

criteria are compatible with the market economy[63]; 3. For Müller-Armack, Erhard and for Röpke a successful Social market economy requires pragmatic, goal-oriented economic policies, flexible determination of what is and what is not compatible with the market economy and recognizes the importance also of government decisions dealing with specific situations. According to the strict ORDO doctrine all that is required of governments is to adopt policies that conform strictly to a narrowly defined theory and set of principles. Under ORDO all problems can be solved and policy issues decided by respecting the basic framework ("Ordnungsprincipien); 4. For Müller-Armack, Erhard and Röpke under the Social market economy the distinction between "economic" and "social" policies remains important: there is a continued need for government interventions to reduce inequality and to correct some of the social consequences of the workings of the markets. For the hardliners among the ORDO school, if the correct economic policy is adopted, i.e. one that provides for the competitive working of markets, the market outcome (rewarding the best), there is no need for explicit social policies. 5. The economic and societal model of the Social market economy as originally developed and implemented under the leadership of Ludwig Erhard, was and remains a dynamic concept, in constant evolution and adjustment to new challenges and developments. This is in considerable contrast to the more rigid or even static ORDO approach.

The 6th point that was not raised by the authors of the above comparison has to do with international and monetary economic relations in general and with European and world-wide integration. The architects and practitioners of the Social market economy were strong supporters of European integration: this support allowed them to try to make the European Common market as liberal and non-bureaucratic

[63] For example Müller-Armack was an outspoken advocate of adopting of an active "contra-cyclical" policy. with all the respect that he had for Erhard's achievements (for which he deserves a significant share of the credit also as a high ranking official in the Ministry of Economics during most of Erhard's tenure as Minister), he expressed satisfaction that such a legislation was adopted under the coalition that succeeded Erhard's chancellorship. Müller-Armack, Alfred (1971): *Auf dem Weg nach Europa, Erinnerungen und Ausblicke*, Gemeintschaftsverlag Rainer Wunderlich, Tübingen und C.E. Poeschel, Stuttgart

and open as possible and to minimize discrimination against third countries, including the United States as much as was politically possible. Chancellor Adenauer and his Minister of Economy often differed on this issue. [64]

4.6 Germany, Europe and the social market economy

4.6.1. Germany, Europe and the Western Community

The years following the 1945 defeat of the Axis powers were marked by a profound change in the domestic political and economic order of the war-torn countries and by the creation of a new international order among the Western countries in North America, Western Europe and in the Asia-Pacific Region. These domestic and international developments, carried out under the active initiative and continued leadership of the United States, led to the emergence and consolidation of the Western Community.

The three fundamental principles of the community were and remain the following: 1. Freedom and democracy and respect for human rights; 2. A functioning market economy and economic liberalization

[64] Müller-Armack, Alfred (1971): *Auf dem Weg nach Europa, Erinnerungen und Ausblicke*, Gemeintschaftsverlag Rainer Wunderlich, Tübingen und C.E. Poeschel, Stuttgart

and integration; 3. External and internal collective security (deterrence and protection) against external and domestic threats and political cancers. Respect for the autonomy and independence of large and small members of this community as well as solidarity across borders were also among the essential features.

This community has achieved unprecedented freedom, prosperity and social progress as well as peace and security over the decades. One of the key achievements of this ommunity was the emergence of "perpetual peace" among its members: virtually from the start, war among the members or the ommunity became unimaginable and remains so today. The principal members of this Community are the European democracies, Japan and the other democracies in the Pacific Region (Australia and New Zealand), the USA and Canada, as well as Israel.

The challenges in the immediate post-war period of the countries that became the members of this community were three-fold: external and internal security, political freedom and a functioning democracy and economic and social reconstruction. Restoring and developing a common value system was essential for achieving these goals and for preventing the recurrence of the catastrophes that had been caused by the authoritarian and totalitarian systems in the first half of the 20th century. These tasks were greatly amplified by the need for a profound "political and economic regime change" in a number of countries – with Italy, Japan and especially Germany at the top of the list.

During and at the end of the war, among a majority of the experts and the decision makers in the USA and Britain believed that "bringing *political freedom* and implanting and strengthening democracy" in the former Axis countries, and "restoring economic freedom and the market economy" were two distinct tasks. In fact, according to many they were not only distinct but also contradictory or mutually exclusive. Many argued that restoring economic freedom (the private sector) would be a mortal threat to the efforts to securing political freedom and democracy. Without securing the continued control of the economy, the resulting "economic chaos" would turn people not only against the market economy but also against democracy.

It was fortunate that there was a small group of liberals – inside and outside Germany and Italy – who had argued energetically and persuasively that while creating a free society on the ruins brought about by Nazism and Fascism it was also essential to restore the market economy. It is to the credit of the Western (democratic) occupying powers (especially the USA and Britain) that although they were on the whole sceptical about the potential success of the market economy in the war-torn continental countries, they did not attempt to suppress the efforts to develop a "Social market economy".[65] The linking of the currency reform and the liberalization of the economy was a theoretically correct and politically astute decision, essentially by Ludwig Erhard.

It was also one of the most fortunate developments in modern European and Western history that German reconstruction was carried out under the concept and policies of the Social market economy. This has greatly contributed to the economic success of Germany and Europe. It has been a major factor in strengthening not only the market economy but also appropriate social policies in continental Europe. At the same time Erhard's success and reputation helped him counter supra-national, inward-looking and discriminatory policies against outsider in Europe and the United States, to dominate the new European Community. Throughout his years in office – as Minister of Economy and as Chancellor – Erhard was a staunch supporter of close ties with the United States. For him the European Community was not a substitute for a strong Atlantic Community.

Today it is largely recognized that the success of German reconstruction and of the policies of the Social market economy had not only a positive economic and social impact but also played a major role in the profound transformation of the German political system and the lasting establishment of liberal democracy in the Federal Republic.

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[65] See the message of General Lucius D. Clay on the occasion of Erhard's 75th birthday in: Schröder, Gerhard and others (Editors) (1972): *Ludwig Erhard, Beiträge zu seiner politischen Biographie, Festschrift zum Fünfundsiebzigsten Geburtstag*, Propylänen Verlag, Frankfurt, Wien, pp. 39-41

It was also fortunate – but not the result of chance – that the theory of the Social market economy and the policies that the policies it had inspired were based on the principle of freedom, of the market economy and social peace and equity. Competition was meant to provide efficiency but also protection against cartels, monopolies and in general the excessive accumulation of economic power both by governments and in private hands. At the same time an open economy, the rejection of protectionism had both an economic and a political objective: welfare gains through trade and peace and cooperation with like-minded democracies and market economies.

The fathers of the Social market economy all agreed that the three most important conditions of success were the restoration of the free market, strong ties of Germany to its Western partners and federalism.

4.6.2. The Social market economy: a key objective of the European Union

It is not very common that the successful reconstruction and development and expansion of a large and important economy and its entire economic and social order should be identified over the decades with a single term, such as the "Social market economy" – a term that most people outside Germany have a hard time to recognize and can even less correctly explain what it means.

Among the European Union's Objectives, Article I-3/3 of the project of the Constitution of the European Union stipulated the "…the Union shall work for a Europe of sustainable development based on balanced economic growth, a social market economy, highly competitive and aiming at full employment and social progress, and with a high

level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance…"[66]

In the entire list of the objectives of the European Union, the term "social market economy" is probably the only one that many people (and in particular many economists) inside and outside the Union would have difficulty in defining. While the term is part of the Basic Law (Grundgesestz – Constitution) of the German Federal Republic, and now also of the Lisbon Treaty (what comes the closest to a Constitution of the European Union), most economists outside the German-speaking world are not familiar with the concept. In fact, even in Germany and in Switzerland, the two countries where the concept was first developed and contributed to the extraordinary successes of their economic and social policies, fewer and fewer students of economics or young professionals are able to give a clear definition of the concept.

4.6.3. Why the Emphasis on the German Experience?

The principal reason for the extensive discussion on the German experience is obviously the success of the original model of the Social market economy and its relevance for the desirable model of the future and for the new consensus in economic and social theory. It is the conviction of the present writer that this view would be shared today also by Emilio Fontela.

Secondly, as it was already mentioned, while Emilio Fontela came rather late to be interested in the concept of the Social Market economy, this interest was far from being a passing fad for him. It is true many aspects of Emilio's work and thinking over the years had been fairly distant especially from the approaches especially of the

[66] Hieronymi, Otto (2005): "The "Social Market Economy" and Globalisation: The Lessons from the European Model for Latin America", in Emilio Fontela Montes and Joaquin Guzmàn Cueva (Eds): *Brasil y la Economia Social de Mercado*, Cuadernos del Grupo de Alcantara, Madrid

ORDO liberals and the later representatives of the Freiburg School. Yet, there were also many features of his work where there was a potential for convergence both on issues and on general approaches. This was in particular the case with many aspects of the thinking and work of Wilhelm Röpke for whom he developed a very high regard.

The "Social market economy" and "Keynesianism" were among the most important competing schools and models in Europe after the Second World War. [67]Post-war "Keynesianism" originated in the theories of a single great scholar and policy adviser, and in fact largely in the interpretation of the analyses and conclusions of a single book (*The General Theory* published in 1936). This is undeniable even if many tend to argue that Keynes himself might not have become a "Keynesian" in the light of the new reality of the post-1945 world, and that "Keynesianism" was the result of the interpretation of Keynes' theories by a relatively large number of disciples and followers.[68] At the same time, there was no single policy maker in Britain or the US who could have been identified as the outstanding and authentic implementer of the "Keynesian model".

In the case of the Social market economy Ludwig Erhard was clearly the dominant figure in defining and pursuing the policies of the

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[67] Hieronymi, Otto (1980): "Wilhelm Röpke et la Crise de Notre Temps'', in *CADMOS*, Cahiers trimestriels publies par la Centre Europeen de la Culture et l'Institut Universitaire d'Etudes Européennes de Genève, Number 10, pp 33-46, Geneva, Hieronymi, Otto (1990): *Economic Policies for the New Hungary: Proposals for a Coherent Approach*, Battelle Press, Columbus, Hieronymi, Otto (2002): "Wilhelm Röpke, the Social Market Economy and Today's Domestic and International order" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, 2002, pp.8-32; Hieronymi, Otto (2005): "The "Social Market Economy" and Globalisation: The Lessons from the European Model for Latin America", in Emilio Fontela Montes and Joaquin Guzmàn Cueva (Eds): *Brasil y la Economia Social de Mercado*, Cuadernos del Grupo de Alcantara, Madrid

[68] Skidelsky, Robert (1989): *The Social Market Economy*, Social Market Foundation Ltd.,
Paper no. 1, London

social market economy. Also, Germany was clearly the country where the Social market economy originated and where it was most systematically implemented. Even in Britain, where Keynesianism was the dominant policy doctrine under both Labor and Conservative governments for well over a quarter of a century, there were policy elements in the policies of the Left and of the Right that were not directly connected with Keynesianism.

At the same time, as noted above, beside Erhard there was a group of fewer than half a dozen eminent scholars who had played a decisive role not only in the interpretation and the spreading of the concept of the social market economy but also in the very development of the concept and of its various key aspects. It is partly because of this multiple authorship that there is no single text that could be considered as the main "source book" of the social market economy. Also, the fact that Erhard willingly acknowledged the importance of the contributions of his friends and associates gave a more "democratic" and less intolerant and autocratic sense to the social market economy, at least in the early stages of its development.

Beside Erhard, the following were the principal thinkers who contributed the most to the development of the concept of the social market economy: Wilhelm Röpke, Walter Eucken, Müller-Armack and Franz Böhm and to a lesser extent Alexander Rüstow.[69] They had different backgrounds and life stories and emphasized different aspects of

[69] Stützel, Wolfgang, Watrin, Christian, Willgerodt, Hans, and Hohmann, Karl (Editors), (1981): *Grundtexte zur Sozialen Marktwirtschaft, Zeugnisse aus Zweihundert Jahre Ordnungpolitischer Diskussion*, Ludwig-Erhardt Stiftung, Band 1, Gustav Fischer Verlag, Stuttgart; Hermann-Pilath, Carsten, Schlecht, Otto and Wünsche, Horst Friedrich (Editors) (1994): *Marktwirtschaft als Aufgabe, Wirtschaft und Gesellschaft im Uebergang von Plan zum Markt, Grundtexte zur Sozialen Marktwirtschaft*, Band 3, Ludwig Erhard Stiftung, Gustav Fischer Verlag, Stuttgart; Hohmann, Karl Stützel, Schönwitz, Dietrich, Weber, Hans-Jèrgen, and Wünsche, Horst Friedrich (Editors), (1988): *Das Soziale in der Sozialen Marktwirtschaft, Grundtexte zur Sozialen Marktwirtschaft*, Band 2, Ludwig Erhard Stiftung, Gustav Fischer Verlag, Stuttgart; Lenel, Hans Otto and Others, (Editors) (1997): *Soziale Marktwirtschaft, Anspruch und Wirklichkeit Seit Fünfzig Jahren*, ORDO, Jahrbuch für die Ordnung von Wirtschaft und Gesellschaft, Band 48, Lucius und Lucius, Stuttgart

the Social market economy. As discussed in the preceding section there were some significant differences in their perception of the hierarchy of the issues at the theoretical and at the policy levels. Also, even under Erhard's ministership, not all objectives or principles of the core concept could be implemented either at the legislative or even at the executive level.

It is not the objective of this chapter nor of this book to focus exclusively on Germany or on the German debate on economic and social theories and models. At the same time there are a number of reasons that justify paying special attention to the German case. [70]

A first reason is the importance and the complexity of the so-called "continental" experience and societal and economic model(s) in the second half of the 20th century. The three main geographic areas of economic policy since the 1940s were the United States, Japan and Western Europe. In the American experience and in the American dominant doctrines there were major fluctuations s that were probably most closely linked to Britain, leading to the only partly correct expression of "Anglo-Saxon economics and policies". Information on what happens in Britain or in the United States travels much faster both among professional economists (including the principal international economic organizations such as the I.M.F. or the World Bank) and the general public, than about the continental economies: much about the German policy debate and the experience has been "lost in translation".

4.6.4. The most successful economic and social model in modern history

[70] See also Prodi, Romano (2015): *Missione Incompuita, Intervista Su Politica e Democrazia*, a cura di Marco Damilano, Editori Laterza, Roma

This is all the more regrettable given the weight of Germany in the European and in the world economy. While in Germany also there have been fluctuations in terms of economic performance since the late 1940s, on the whole Germany's record in terms of economic growth, social progress and monetary and fiscal stability is considered to be one of the best, if not the best among the major economies in the world. Since the 1950s there have also been periods when the original concepts of the Social market economy enjoyed greater or lesser acceptance in the academic community and among policy makers. Monetarism and also Keynesianism made important inroads at various times also in Germany. This was also facilitated by a growing rigidity of the second and third generation of ORDO liberals.

The weight of Germany and German concepts, for better or worse has been increasing in Europe and within the EU and its decision-making mechanisms, especially in the Council and the Commission. The role of Germany in the EMU and in the design and working of the European Central Bank has received particularly close attention in recent years in connection with the debt crisis and in particular the negotiations with Greece. While the ECB was created on the initial model of the German Bundesbank it is all the more remarkable that in recent years the Bundesbank has been in a minority and the ECB has been following a monetary policy contrary to the position of German monetary and fiscal hardliners. It should also be emphasized that Germany was and remains a strong supporter of both European integration and of the broader Western Community, and a strong advocate of world-wide liberalization. At the same time, Germany deserves considerable credit (some say blame) for the fact that Europe has the most advanced system of social legislation in the world.

Germany was the largest and most successful economy in Europe already well before the end of the Cold War and German reunification. It is one of the two politically most influential countries on the Continent and together with France played a key role in shaping the direction and the pace of European integration and the economic policies of the European Community. At the same time it was the policy of the Federal Government, established by Konrad Adenauer and more or less systematically followed by his successors, including the current

Chancellor Angela Merkel, to exploit Germany's economic power for political purposes against its partners. Political understatement was the hallmark of German policy both in Europe and in the broader Atlantic and Western Communities. This does not mean that Germany did not pursue national political and economic interests, but that it tried to reconcile these interests with community interests (European and Atlantic) more systematically than the other three major Atlantic countries: the United States, France and Britain.

Germany's economic and monetary policies and preferences, of course, had a significant impact on both common policies and what passed for "good" policies at the European and the Western level. Their impact, however, was far less evident than the policies of the Anglo-Saxons or on some areas of the French. This was the case not only with specific policies and decisions but also with the "economic models" underlying the policy debate and being used as guides for policy in common organizations, such as the Bretton Woods institutions or the common European agencies. (Japan was, of course, the country that tried to be even more discrete in international organizations than Germany.)

Thus, one would seek in vain for a reference to the theory of the "Social market economy" either in the work of the IMF and the World Bank, or in the Secretariat of the European Commission and other common European institutions, not to mention the UN Secretariat and the various specialized agencies and other UN bodies. Economists for example at UNCTAD, admittedly not a particularly pro-European or pro-Western organizations, have been proud to the present day to ignore the very existence of the model of the "Social market economy", despite its evident success both during and after the period of reconstruction of Western Europe. This was equally true for the new EBRD established after the collapse of Communism.

Also, many writers who are critical of the Social Market Economy, admit that "up until now a successful counter-concept to the (West) German social market economy has never been established.

The title of Horst Siebert's book published in 2005 in English as *The German Economy, Beyond the Social Market* and in German:

Jenseits des Sozialen Marktes, Eine Notwendige Neuorientierung der Deutschen Politik, is a *de facto* borrowing of the title of Wilhelm Röpke's last major book first published in 1958 – *Jenseits von Angebot und Nachfrage*, itself a wordplay on Nietzsche's *Jenseits von Gütem und Bösem*. The English version of Röpke's book carries the title *The Humane Economy*. [71]

Horst Siebert had been the President of the Kiel Economic Research Institute which among Germany's five long-established economic research institute has been the most marked by the switch to monetarism and also market fundamentalism. In 2005 Siebert wrote: "Im Laufe der letzten 40 Jahre is Deutschland in seiner wirtschaftlichen Steuerung einem Irrweg gefolgt." [72]

A book by A.J. Nicholls published in 1994 is one of the best histories (in any language) of the Social Market Economy. Its title *Freedom with Responsibility* is well chosen. [73] In fact, the essence of the Social Market Economy is the constant search between the free market and competition, on the one hand, and social responsibility and equity on the other hand. The theoretical and policy debate turns around the need to find the right balance at any given time between the role of markets and the role of governments, between government intervention and private initiative.

Many among the critics have argued that this search is bound to fail: either you have market economy or you have government interven-

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[71] Siebert, Horst (2005): *Jenseits des Sozialen Marktes, Eine Notwendige Neuorientierung der deutschen Politik*, Deutsche Verlags-Anstalt, München; Metzler, Gabriele (2003): *Der Deutsche Sozialstaat, Vom Bismarkischen Erfolgmodell zum Pflegefall*, Deutsche Verlags-Anstalt, Stuttgart

[72] "During the last 40 years German economic policy has been misguided" (or it followed the wrong road) Op. cit.: p. 515. See also: Ritter, Gerhard A. (2007): *Der Preis der Deutschen Einheit. Die Wiedervereinigung und die Krise des Sozialstaats.* C. H. Beck, München

[73] Nicholls, A.J. (1994): *Freedom with Responsibility, The Social Market Economy in Germany 1918-1963*, Clarendon Press, Oxford

tion – finding the balance between the two will lead to the worst outcome. However attractive this argument may sound for pure theorists or political propagandists on the right or the left, it is based on a misunderstanding of both the concept and policies of the Social Market Economy and of the constantly changing reality of the economy. [74]

At the heart of the Social market economy concept we find the recognition that 1. Free markets, competition and private initiative and the respect for private property are the best approach to economic growth and prosperity and 2. The market economy cannot function properly without social justice and protection and without the rules and institutions that will help prevent the abuse of economic power and corruption of free society. A stable balance between these two goals may appear utopic: but if all actors – private and public – agree that neither one of these two sets of goals and principles should be allowed to squash the other, the policy debate and the policy options become more pragmatic and realistic.

4.6.5. The Social Market Economy and the Swiss Model

The country that came closest to Germany in creating a Social market economy was Switzerland. In fact, if one has to identify a "real-

[74] Probably the longest study about Wilhelm Röpke available in French was published in 2015: Solchany, Jean (2015) : *Wilhelm Röpke, l'autre Hayek. Aux origines du néolibéralisme*, Paris, Publications de la Sorbonne. By the same author see also: Jean Solchany, Jean (21014): « Wilhelm Röpke as a Key Actor of Transnational Neo-liberalism after 1945», in Hagen Schulze-Forberg, Niklas Olsen (eds), *Re-Inventing Western Civilisation: Transnational Reconstructions of Liberalism in Europe in the Twentieth Century*, Cambridge:Cambridge Scholars Publishing, 2014, p. 95-116. Unfortunately Solchany takes a truly condescending approach to Röpke and his work and contribution to the Social market economy. The very title of his magnum opus *"Röpke, the other Hayek"*, is dangerously misleading. This scholarly work is likely to add to the long-standing confusion of the great majority of French readers and policy makers about what the Social market economy is about.

life" model that influenced most the concept of the Social market economy, from the 1930s onward there is no doubt that this model was and to a large extent remains Switzerland. [75]

This was most evident in the thinking of Wilhelm Röpke and in his publications beginning with the *Lehre von der Wirtschaft* and his famous trilogy where he often referred directly or indirectly to the Swiss tradition and experience. [76]He also came back time and again, in numerous articles, to the advantages of Switzerland over the "mass societies" prevailing in many larger countries and to the historic roots of these differences. Through his personal background and life-long attachment to his native region in Germany ("the Lüneburger Heide") and his rural and small-town upbringing he was well prepared to develop a close affinity with Switzerland and the Swiss. But beyond the

[75] See also Tschopp, Peter (2003): "Wilhelm Röpke, l'Europe et le modèle Suisse" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, pp.32-36

[76] The thinking of Luigi Einaudi, the principal neoliberal thinker and political leader in post-war Italy was also influenced not only by Röpke, but also the example of Switzerland. "L'influenza del suo (Wilhelm Röpke) pensiero sulle pensiero sulle correnti liberali del mio paese è stata profonda…La espeienza fascistica insegnò qualcosa; e molti li persuasero che sulla via delk falso liberalismo si era arrivati, senza saperlo, al totalitarismo. Röpke dimostrò che il liberalismo non è qualcosa di campato in aria, e non acetta la teoria che lo stato debba essere assente dalla politica economica, debba cioè lasciar fare e lasciar passare tutta ciò che ai privati piaccia di fare…Anche dopo la caduta del regime fscistico, la politica economica italiana contuna purtroppo ad essere interventistica, nazzionalizzatrice e corporativista. Fa eccezione la politica monetaria… » Einaudi, Luigi (1959) : « Message on the occasion of the 60th birthday of Wilhelm Röpke », in Röpke, Wilhelm (1959): *Gegen die Brandung*, edited by Arnold Humbold, Eugen Rentsch Verlag, Erlenbach-Zürich, p. 11. Einaudi wrote his important book on economic policy in Swiss exile from the Nazi-Fascist regime at the end of the war. Einaudi, Luigi (1958, 1972) : *Lezioni di politica sociale*, Torino, Edizioni scientifiche Einaudi Editore. Einaudi was also one of the eminent European liberal thinkers who, insisted both on the importance of economic freedom (as distinguished from Benedetto Croce for whom this was a secodary consideration), and on the importance of the social dimension of economic policy. See: Einaudi, Luigi (1924, 1997): *Le lotte del lavoro*, Torino, P. Gobetti Editore, Einaudi

emotional and even sentimental attachment, Röpke, the close observer and rigorous scholarly analyst of the modern world and its "diseases", also found much to like and find healthy and sound in Switzerland compared with much of the rest of the world. [77]

Even a partial and rapid overview of some of the outstanding features of the "Swiss model" can be helpful when searching for what should be included in the future concept of a "new social market economy".

This list includes: 1. federalism, decentralization, and respect for diversity, political cohesion based on common values and interests, including freedom, independence and the respect for diversity; 2. thrift, private property; 3. rejection of gigantism and of excessive concentration of economic power; 4. encouraging independent farmers, craftsmen, small and medium-sized enterprises; 5. support by the communities (municipalities – towns and villages) of their citizens who are in need; 6. monetary stability, freedom of capital movements; 7. distinction between neutrality and neutralism; 8. democratic values and traditions that have helped Switzerland avoid the temptations of the two great totalitarian ideologies of Europe in the 20th century: Communism and Fascism and National Socialism; 9. urbanism and protection of the environment; 10. balanced economic and social intervention by and role of the governments (local, cantonal, federal); 11. careful fiscal policies; 12. European, Western and global integration; 13. the importance and the limits of competition; 14. humanism, humanitarian action, peace and national security; and (15) the challenge of globalization.

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[77] See Blankart, Franz (2002): "Röpke: le role du visionnaire", in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, pp.37-41; also: Peukert, Helge (1992): *Das Sozialökonomische Werk Wilhelm Röpkes*, Two volumes, Peter Lang, Bern, Frankfurt am Main; Zmirak, John (2001): *Wilhelm Röpke, Swiss Localist, Global Economist*, Intercollegiate Studies Institute, Wilmington

4.6.6. Missed opportunities: the End of the Cold War, the Collapse of Communism, Regime Change and the "Social market economy"

The basic principles of the Social market economy increasingly influenced policy making also in other European countries even where the term was never used. Yet there were no efforts to help spread the term and the concept beyond Germany, Switzerland and Austria.

Hungary was the only former communist country that attempted to conduct its "regime change" using the model of the "Social Market Economy". Prime Minister Antall and his government received absolutely no intellectual or moral encouragement or recognition for choosing this approach from its new Western partners, not only from countries like Britain or the USA, but from the Federal Republic of Germany either. [78]

There is an unfortunate tendency, especially in the United States, among "experts", political leaders and in the general public to attribute virtually all of the credit for the peaceful victory at the end of the Cold War almost exclusively to the United States and to its strategic and economic strength. (This was logical for those who saw the Cold War as an essentially geo-political power struggle between the two "super powers", the United States and the Soviet Union, with the other

[78] See Hieronymi, Otto (1990) *Economic Policies for the New Hungary: Proposals for a Coherent Approach*, Battelle Press, Columbus; also: Hieronymi, Otto (2001): "Du Communisme à l'Economie du Marché Sociale", *Du Socialisme à l'Economie de Marché*, sous la direction d'Andras November, Nouveaux Cahiers de l'IUD, No. 12, Genève. Hieronymi, Otto (2013): "Regime Change in Hungary – 1990-1994: The Economic Policies of the Antall Government", *Hungarian Review*, Budapest

countries – in particular the European countries – as interested but more or less passive bystanders.) It was, in particular, in the United States that a widespread triumphalism got hold of both "the establishment" (including professors of international relations) and the electorate: this led to a wide-spread underestimation of the contribution of the Europeans and of the Japanese to the victory of the Western system over the communist system and to neglecting the Western Community in the name of "American national interests". While stillclose allies, the Europeans and the Japanese began to be perceived mainly as economic competitors.

4.6.7. No need for foreign aid or for debt-forgiveness for the former Communist countries (except for East Germany): the stinginess of the tenors of the Social market economy

In Europe there was also a tendency to see the United States as a "hyper-power". Concentrating on expanding and strengthening the institutional structure of European integration left little time for the European countries to bother about initiatives to renew the Western Community and to develop a common "Grand design" for helping the former Communist countries (including the major successor countries of the USSR, such as the Russian Federation and the Ukraine) in the difficult and costly process of transformation from planned economy to market economy and from authoritarian and totalitarian regimes to solid liberal democracies.

In fact, the task was not only "transformation" (or to use the unattractive but widely used term "transit"), but also "reconstruction". This need was reflected in the name of the specially created common institution (the European Bank for Reconstruction and Development).The EBRD never had the resources needed or the mentality to carry out true reconstruction tasks, just like the IBRD (the International Bank for Reconstruction and Development), of the two principal Bretton Woods Institutions, never got truly engaged in the process of postwar reconstruction.

What was lacking in the EBRD and in the whole Western approach to the challenge and opportunities inherent in the collapse of the

totalitarian system were not only resources but even more importantly a coherent concept. The lack of historical perspective among Western experts (including especially the cream of the economist profession) was one of the great disappointments of the people (political leaders and the general public) in the new democracies in Eastern Europe. There was only superficial talk about a potential "Marshall Plan" for the former Communist economies. The arguments that there were no budgetary resources available or that private capital would be sufficient for rebuilding the run-down and heavily indebted economies of the new democracies, did not correspond to the realities of the Western economies (resources could have found), nor to the onerous task of building competitive market economies on the ruins of the Communist economies. Politicians who were reluctant to ask for straight aid (non-debt creating resource transfers) from their electorate, found a surprizing justification among the great mass of economists who all of a sudden all became "experts" in how to build market economies. This was one of the most inglorious periods of the representatives of "conventional wisdom" among the elite of the Western economist profession. It should be pointed out that the market fundamentalists, libertarians, ORDO liberals, the spokesmen of the original Social market economy as well as Western Socialists expressed the same views: we cannot afford it, and any way there is no need, and finally they (the former Socialist countries) could not "absorb" major foreign aid to speed up the transformation of their economies. [79]

When confronted with the argument that the "West German economy (the old Federal Republic) was transferring mainly in public funds every year $100 to $150 billion to help the transformation of the economy of the "New Länder" (the former East Germany with only 17 million inhabitants), while there was virtually no direct aid forthcoming neither from the Federal Republic nor from the rest of the OECD countries for the other former Communist countries: the answer from economists and officials tended to be a variation on the theme "Germany is

[79] On the Marshall Plan and European integration see: Hieronymi, Otto (1973)*: Economic Discrimination against the United States 1945-1958, Dollar Shortage and the Rise of European Regionalism*, Librairie Droz, Geneva.

a special case", "Sonderfall Deutschland". There are no official statistics of the total transfer from West to East in Germany (a politically extremely delicate topic) for the transformation and reconstruction effort. According to various published estimates the number for the period 1990-2015 is between Euro 2000 and 3000 billion.

These "experts" and decision-makers in national governments or central banks, or in the European Commission in Brussels, or in the BIS in Basel or in the IMF and the World Bank systematically refused to remember that in the case of the European Recovery Program (the Marshall Plan) there was no "Sonderfall Deutschland" – Germany benefited fully from American aid and from participation in the OEEC and EPU.[80]

4.6.8 Emilio Fontela and the evolving interpretation of the social market economy

Why was the concept of the "social market economy" relevant of for Emilio Fontela's thinking? What is the relevant interpretation of this concept for today and for the search for the future economic and social order in Europe and in the Western market economies?[81]

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[80] On Germany and post-war American aid see the biography and the memoirs of Hermann Abs. Abs who had been a prominent banker already during the National Socialist period, became the head of the Kreditanstalt für Wiederaufbau (the institution that was created to channel Marshall Plan funds to the Germany economy). He also led the German delegation that negotiated the 1955 London treaty on the reduction of Germany's pre-war debts. Subsequently he became the head of Deutsche Bank and for many years was considered to be Europe's most influential banker. Abs, Hermann J. (1991): *Entscheidungen 1949-1955, Die Entstehung des Londoner Schuldenabkommens*, v.Hase und Koehler, Mainz-München; Gall, Lothar (2004): *Der Bankier, Hermann Josef Abs, Eine Biographie*, C.H.Beck, München

[81] An overview of the literature on the Social market economy – primarily in German but also in English and other languages – has to include three major types of publications: 1. The writings of the "fathers" of the Social market economy and of some of their liberal friends, such as Hayek or von Mises, who disagreed with them on some

The perception of the Social market economy – as of other major schools and models – evolved both because of the changes and relevance in this concept itself and because of the shifts in the dominant position of other schools of thought. Over the years German economic and policy making also evolved and the relation with the original theory and practice of the Social market economy became more tenuous. At the academic level and in research organizations other, competing theories and models gained temporary or lasting popularity or influence.

It is interesting to recall briefly the shift in perception of the nature of the Social market economy between the periods when Keynesianism was dominant and when monetarism and libertarianism prevailed.

In the first half of the 1960s Keynesianism was the beginning and end of all economic wisdom. In America in particular, the Social market economy was seen as a "conservative and even anti-social" line of thought or economic model (which it was not), wholly irrelevant for economics students and policy makers. Even those who were impressed with the performance of the German economy showed little or no interest in the concept of the Social market economy. From the early 1970s onwards, when the monetarist revolution and the libertarian counterrevolution (the two were related but not identical phenomena) rapidly discredited and displaced Keynesianism and the welfare state as dominant doctrines a radical change could be observed. Many people (including "experts") believed that the Social market economy was some kind of a Socialist model (opposed to free markets) and a continental version

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key points but were nevertheless their intellectual allies on many other important issues; 2. Favorable, "neutral" and critical analysts, commentators and historians who wrote about the Social market economy; 3. Documents related to actual policies carried out under the label of Social market economy, primarily in Germany but also in other countries, mainly in Continental Europe. It is clear that the references included in the bibliography of this chapter and of the volume as a whole represent only a small selection from the three categories of sources on the theory and practice of the Social market economy.

of the welfare state – a clearly leftist model inferior to capitalism and in particular "global capitalism" – which were really understood only in Britain, the United States and perhaps in Chile.

4.6.9. The Alcantara Manifesto: 2005, 2015 and beyond

The Alacantara Manifesto was initially prepared following a three-day conference/seminar on Brazil and the Social Market Economy held in 2004 at Alcantara[82] in Spain in the province of Extramadura near the Portuguese border, and was finalized a year later, in October 2005. [83]

It was prepared by Emilio Fontela (at the time Professor at the Universidad Antonio de Nebrija, Madrid), Professor Joaquín Guzmán, Universidad de Sevilla, and Otto Hieronymi, professor and Head of the International Relations Program at Webster University, Geneva. It was endorsed by a group of about 20 economists (the "Alcantara Group") from Europe and South and North America.

The objective of the Manifesto was to generate debate around two "lists of principles". "The *first list*, entitled **'**Towards a 'new' development policy for a Social market economy', referred to internal policy issues… (whereas) the *second list*, entitled "Towards a 'new' globalisation for the wealth of the world**"**, was related to the necessary redesign of the globalisation process".

The Introduction of the Manifesto noted that "the first list was largely inspired by the work of Wilhelm Röpke… The writings of Röpke and other European economists were essential in formulating early neo-liberalism and the concept of the Social market economy after the catastrophe of the Second World War. This successful combination

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[82] Hieronymi, Otto (2005): "The "Social Market Economy" and Globalisation: The Lessons from the European Model for Latin America", in Emilio Fontela Montes and Joaquin Guzmàn Cueva (Eds): *Brasil y la Economia Social de Mercado*, Cuadernos del Grupo de Alcantara, Madrid

[83] Fontela, Emilio, Guzmàn, Cueva and Hieronymi, Otto (2005): *Manifest of Alcantara* http://manifiestoalcantara.blogspot.com/

of an efficient market economy with social equity and responsible government led to unprecedented prosperity and social progress in Europe, and became the basis for successful European integration." The second list was "inspired by the work of the Group of Lisbon, under the leadership of Ricardo Petrella, as published in *Limits to Competition*."[84]

The authors of the Manifesto defined the Social market economy "as an institutional framework that allows markets to be efficient under the constraints of sustainability and equity…operating in a democratic context."

The basic principles and tasks were defined under 12 headings: *1. Social cohesion; 2. Subsidiarity; 3. Excellence in public administration; 4. Justice; 5. Education; 6. Science and technology; 7. Resources and the environment; 8. Entrepreneurship and cooperation; 9. Business-friendly regulation; 10. Tax justice; 11. Infrastructures; 12. Stable monetary policies.*

As a conclusion we argued that "these 12 policy principles for the development of a Social market economy are all equally important. Macroeconomic stabilisation is only one component of a broader economic policy that should include policy with respect to microeconomic matters and mesoeconomic elements (institutional and territorial design)."

The second list of principles and challenges called for the reform of "globalization" and a move from the concept defined by Adam Smith in the 18th century as the "wealth of nations" towards an effective search of the "wealth of the world". The central idea here was to develop corrective and compensating mechanisms at the international and global level for dealing with the negative aspects of the purely competition and finance and short-term profit maximization driven model of globalization. A safety net for the poorest (which in fact would also provide incentives for job creation and community cohesion), avoiding the marginalization of those left behind by the "winners" and effective

[84] Group of Lisbon (1995): *Limits to Competition*, MIT Press, Cambridge, Mass.,

global "contracts" to deal with the long-term challenges facing humanity and the world economy: resources, the environment, as well migration democracy and peace and human rights and humanitarian values.

The Alcantara conference took place and the Manifesto was drafted a few years before the outbreak of the world-wide international monetary and financial crisis, which was in fact the crisis of the dominant model of globalization.[85] There is no doubt, that the two lists of principles to be studied and implemented are as relevant as they were 10 years ago. as much as in 2005 they are a powerful summary of the domestic and international dimension of developing a new model of the Social market economy not only for Europe and the rest of the Western Community but for the world economy as a whole.

4.7. Wilhelm Röpke: his relevance for the 21st century

4.7.1. Wilhelm Röpke: against the current

In many respects Röpke was the earliest and internationally most prominent among the fathers of the Social Market Economy having spelled out, already in the early 1930s, some of the essential components of the this concept. [86]

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[85] Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke

[86] Röpke, Wilhelm (1932): *Krise und Konjunktur*, Verlag Quelle&Meyer, Leipzig; Röpke, Wilhelm (1937): *Die Lehre von der Wirtschaft*, Eugen Rentsch Verlag, Erlenbach-Zürich, (in English *Economics of the Free Society*, Henry Regnery, Chicago, 1963); Röpke, Wilhelm (1942): *Die Gesellschaftskrisis der Gegenwart*, Eugen Rentsch Verlag, Erlenbach-Zürich, (in English: *The Social Crisis of Our Time*)

Wilhelm Röpke was a rigorous thinker and a bold advocate of what he believed were the right causes and the remedies for the economic, political and social cancers of his time. [87]

Through his speeches and writings, in particular his contribution to the report of the so-called Braun Commission he warned against the "pro-cyclical" policies of the German government, and in particular of Chancellor Brünning, that were going to deepen the crisis in the German economy and contribute to the rise of the extremists on the Right and the Left. While critical from the start of some of the key aspects of Keynesianism, in the 1930s Röpke also advocated an active fiscal and monetary policy in order to deal with what he called the "secondary recession" (the depression) and to provide an initial push for the recovery "Initialzündung"). (*Krise und Konjunktur*, 1932, p.104)

Röpke's single most important contribution to theory and policies is the systematic critique of both Socialism and of doctrinaire liberalism. An articulate and fervent defender of the market economy and a major liberal thinker, Röpke condemned both collectivism and extreme capitalism for economic and political as well as social and ethical reasons.[88]

The first volume of his famous trilogy, *The Societal Crisis of Our Time (Die Gesellschaftskrisis der Gegenwart)* carried the subtitle *The Third Way* (*Der Dritte Weg*). This book together with the second volume of the trilogy *Civitas Humana*, provided not only a systematic and profound analysis of the origins and the nature of the crises that had led to the totalitarian ideologies and regimes and the great depression and the two world wars that marked the first half of the twentieth century, but also a program for a way towards a freer and more humane

[87] Röpke, Wilhelm (1950): *International Economic Disintegration*, William Hodge, London

[88] Skwierz, Sylvia Hanna (1988): *Der Dritte Weg im Denken von Wilhelm Röpke*, Creator Verlag, Würzburg

society: a program that in many respects contained what came to be known as the model of the Social market economy.

Röpke was among the first group of professors who were fired when the National Socialists came to power. He managed to leave Germany in early 1933 and lived and taught in exile first in Turkey (until 1937) and then in Geneva until his death in 1966. His books had to be smuggled into Germany. This is also how Erhard discovered Röpke's thinking already during the war.

4.7.2. Why Wilhelm Röpke?

Classical economics originated and primarily developed in Britain in the late 18th and in the course of the 19th centuries – although numerous Continental economists had made significant contributions to theory before and after Adam Smith and David Ricardo. For a long time, however, there was a tradition among economists to judge the validity and importance of continental economists against the question: "what do the English say"? "how does this stand up against English theory?" English economics acquired and maintained the reputation for well over a century that it was both "comprehensive" and "modern".

This was largely recognized by some of the leading continental economists and historians of the 20th twentieth century such as Schumpeter or von Mises, or the French Gide and Rist in their classic *History of Economic Doctrines*. (At the same time, many if not all the major British economists recognized the importance of continental economists to the progress of economics as a science.) By the late 19th century and early 20th century the importance of contributions of continental economists was recognized, although they did not enjoy an international impact comparable to the British economists.

This situation was turned in favor of Britain once more with the appearance of John Maynard Keynes, the most glorious name in view of many in the history of economic theory next to Adam Smith, and certainly in the history of British economic theory.

The seizure of power by Hitler and the World War II that he provoked lead to probably the most important flight of intellectuals in modern history (the migration from Fascism and National Socialism had been preceded after 1917 and followed after 1945 by the flight from Communism). These refugees from tyranny included a large number of economists. For many of them Britain represented a first stop with the United States becoming their final destination. This inflow gave a huge boost to the teaching of economics in America and was one of the factors (not the only one, however) in helping to turn American economics into the "standard of the world" for many years. (The fact that "American economics" fully absorbed Keynesian economics after the end of War – despite the intellectual opposition of many of the prominent immigrants from the Continent) – helped give a quasi-insurmountable edge to "Anglo-Saxon" economics over "European economics or political economy" during decades.

It is symptomatic that two among the leaders of "continental economics" Ludwig von Mises and Friedrich von Hayek both ended up in the United States (Hayek after a first halt in England, where he became a British citizen). The recognition that Hayek and Mises received during their life time in America from in the academic (and policy) community did not match the reception and position obtained by some of their European colleagues (e.g. Haberler or Machlup) and even less the influence their ideas have achieved more recently in the United States and in the world at large. (The cold shoulder treatment received by Hayek even from fellow liberal Milton Friedman induced Hayek to return to Europe: England, Austria and Germany.)

One of the central themes of the Social market economy and of Wilhelm Röpke, Alexandre Rüstow and Alfred Müller-Armack in particular, was the need to reverse the trend of growing poverty of the majority of population. This was an issue that Röpke extensively warned about already in the late 1920s and during the Great Depression. It was a central preoccupation in his path-breaking *Social Crisis of our Time* According to his close group of friends and fellow liberals – Erhard, Rüstow and Müller-Armack this was the one text that provided at the

earliest date not only a clear analysis of the origins and the nature of the German and world-wide societal crisis, but it also indicated the conditions and elements of a reversal and of a necessary and possible healing process. [89]

"Proletarisierung", economic insecurity and hopelessness, moral and social rootlessness, led also to political disorientation that could be and was systematically exploited by destructive ideologies on the left and the right. "Class warfare", racism, extreme and violent nationalism were fed by reckless propaganda aimed at destroying the existing political and social order and ultimately Western society.

Röpke saw clearly that this had happened in the Soviet Union, and after 1933 in Germany (and to a lesser, but still dangerous extent also under Mussolini in Italy and in Franco's Spain.)

Communism and National Socialism and the various forms of fascism destroyed economic freedom simultaneously with the destruction of political and moral freedom. Pervasive central planning and nationalizing all private property (and the wiping out of the middle class and of all the savers and property owners), were not only issues of "economic efficiency" but essential attacks on individual freedom and the fundamental values of the Western liberal tradition. The essential elements of this liberal tradition were at least 2000 years old and are not to be limited and confused with the 19th century free-trade doctrine and even less with "robber capitalism".

Thus accepting and advocating Socialism in the name of its alleged efficiency or in the name of alleged greater "distributive justice" without regarding its political consequences, i.e. the loss of political freedom and the emergence of an oppressive state and ultimately full tyranny, was short-sighted and irresponsible, both for political leaders and for scholars (especially economists). This was also the message of Hayek's *Road to Serfdom*. There was, of course, an important degree of convergence between Röpke's and Hayek's thinking, and early and

[89] Peukert, Helge (1992): *Das Sozialökonomische Werk Wilhelm Röpkes*, Two volumes, Peter Land, Bern, Frankfurt am Main;

continued analyses of Socialism by Ludwig von Mises. No doubt that Mises was the one who had provided the earliest and most systematic analysis of the nature and shortcomings of Socialism, of government planning and of government ownership of enterprises and of government controls.

The point, however where Röpke (and to a certain point also Hayek) parted company with the arguments of Mises as early as the 1920s and 1930s and especially after 1945 (although they remained friends and recognized their common belonging to the community of of liberalism) was that especially Röpke argued strongly that to heal society "the market was not enough".

Röpke was the most systematic critique of what happened in Germany and he offered also the most complete alternative. Also, Röpke provided the international dimension and the international vision along with a systematic view of the "German problem": in this respect he was unique among the numerous German scholars who escaped from Hitler's regime.

Röpke's described his political philosophy and his projections of the desirable economic and social model of the future as "the third way", "der Dritte Weg" – the road between the "classical capitalism" and "collectivism".

"*Der Dritte Weg*", was the subtitle of one of Röpke's most important books, *Die Gesellschafts Krisis der Gegenwart* (*The Social Crisis of our Time*) published in 1942. It was the first volume of the trilogy (the other two were *Civitas Humana* and *International Order*). The title of the Hungarian translation of the Gesellschaftskrisis der Gegenwart was *A Harmadik Ut* – or *Der Dritte Weg* in Hungarian – published in 1943.

The central theme of the *Social Crisis of Our Time* was the analysis of the origins and nature of the world-wide trends in anti-liberal values, and tensions in social, political and economic structures and pol-

icies that gathered momentum in the 19th century and ended up in destroying peace, freedom and cooperation within countries and among nations. The result of these trends was the Great War, the emergence and implementation of Communist and National Socialist (and Fascist) totalitarian ideologies and regimes. The Great Depression was a logical consequence of the societal crisis.

The "way out" is neither a return to ultra-liberalism nor the acceptance of a collectivist social and economic order.

Thus, as early as 1937 Röpke defined in detail what this "third way" meant in terms of desirable objectives, values and necessary policies.[90] Much of that found its way into the concept and the policies that were to be carried out in Germany as of 1948 under the name of "Social market economy" under the leadership of Ludwig Erhard.[91]

4.7.3 Neoliberalism and the revival of interest in the work of Wilhelm Röpke

For Röpke and his colleagues "neoliberalism" was the new approach to liberalism embodied in the social market economy: equally different from radical Manchester type "laissez-faire" liberalism, and from the mid-20th century American and English usage where "liberals" were close to social democracy and certainly not opposed to extensive and growing government intervention in the economy and to "social engineering". The "welfare state", the invention of English and Scandinavian Socialists, was a fully acceptable model to British and American "liberals". One of the key points on which the "founding fathers" of the

[90] *Die Gesellschaftskrisis der Gegenwart* (1942) pp. 278-291.

[91] See Ludwig Erhard in *In Memoriam Wilhelm Röpke*, p.10 see Gegen die Brandung; Röpke, Wilhelm (1958): *Ein Jahrzehnt Sozialer Marktwirtschaft in Deutschland und Seine Lehre*, Verlag für Politik und Wirtschaft, Köln-Marienburg

Social Market Economy, and their later followers, fully agreed was the importance not to confuse the "welfare state" (with its egalitarian philosophy and interventionist policies) and the "social market economy" based on a balance between a socially responsible government and a free market economy.

The term "neoliberalism" was gradually resuscitated from the 1970s onward but with a fundamentally different meaning that had led to its creation and use by its original intellectual and political fathers. With Keynesianism and the welfare state on the defensive the expression "neoliberalism" came increasingly associated with Thatcherism, Reaganonomics and even libertarianism: all intellectual and political doctrines and policies from which the original neoliberals sought to clearly mark their differences.

At the level of economic theory and also of policy, three major trends could be associated with this new "1970s" use of the term liberal or neoliberal: Friedrich Hayek, Ludwig von Mises and Milton Friedman.

The one that was probably the most influential at the level of economic theory was Friedman, together with the so-called "Chicago School", whose alumni and and current and former faculty members received the highest percentage of the Nobel Prize in Economics (established in 1968) compared with any American or non-American university. [92]Friedman's name and influence was associated with monetarism, a fairly primitive "laissez-faire" political and social philosophy and a heavy reliance on econometrics and statistical sophistication. In terms of their views of the world economy, despite their liberalism Friedman and the leaders of the Chicago school represented the most inward-

[92] In 1974 the Nobel Prize Committee of the Swedish Central Bank showed a remarkable (and for many on both the Left and Right unwelcome) sense of humour by awarding the 1974 Nobel Prize in Economics jointly to Friedrich Hayek and Gunnar Myrdal – two great scholars who could hardly have been more opposed to each other on virtually all economic, political, and social issues.

looking and in a sense provincial trend among the major dominant schools in the post-1970 period.

Ludwig von Mises whose pre-1914 monetary theories used to be more sophisticated than post1950s American monetarism, was and remained the symbol of hard-core 19th century laissez-faire liberalism. He was the true intellectual father of American libertarianism (and according to many responsible for the renewed respect for the so-called Austrian school of economics). At the same time the Ludwig von Mises, although a life-long liberals "hardliner" would probably disown many of the element of the current extreme Libertarian ideology.

In many respects Hayek was in many respect the least extreme among the three. Also, Hayek the writings of Hayek cover a very broad range of topics and issues and theories, many of which were much more nuanced than the interpretation of some of his subsequent followers and even admirers. Hayek played an important role in the revival in the post-war years of the intellectual tradition of liberalism among leading Western economists and political philosophers. Hayek rightly argued that the core values of liberalism and especially individual freedom, t had been systematically attacked not only by the 20th century totalitarians[93] but also by important 19th century thinkers and doctrines (and not only by the Marxists) [94] and neglected or underestimated by many main-stream academics and politicians. Harold Laski of LSE and of American and British academic fame argued that the oppression of freedom and human rights in the Soviet Union and the crimes committed in the name of "building Socialism" were overshadowed by the creation of a "socialist economy": it was worth the trouble and the Western European countries should be inspired by the efficiency and the results of Lenin's and Stalin's regime. [95]

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[93] Hayek, F.A. (1944): *The Road to Serfdom*, University of Chicago Press, Chicago
[94] See e.g.: Hayek, F.A. (1955): *The Counter-Revolution of Science, Studies on the Abuse of Reason*, The Free Press of Glencoe, London; and Hayek, F.A. (Ed.) (1954): *Capitalism and the Historians*, University of Chicago Press, Chicago
[95] Laski, Harold J. (1943): *Reflections on the Revolution of Our Time*, Viking Press, New York

Hayek's major contributions to the liberal cause included the founding in 1947, together with Wilhelm Röpke, of the so-called Mont Pélerin Society (named after the mountain resort above Montreux in Switzerland where the scholars met and where they agreed on the creation of the society).

Röpke and Hayek were close friends but there was an important difference in their interpretation of liberalism and an even more significant one concerning the whole concept of the social market economy. Although Hayek was less radical than von Mises who felt that the Mont Pélerin society harboured too many quasi-Socialists and interventionists who did not deserve to be called liberals. Yet, Hayek was also critical of the concept of the social market economy, and preferred to speak and write only of the "market economy". [96]

These differences came to the surface already at the first meeting, founding meeting of the Society. The important position of Röpke along with that of Hayek in the creation of the Society was clear not only from the program of the meeting, but also from the fact that at the time Röpke was the most influential thinker in Europe (and of course in Germany) and in the world promoting and defining the concept of a "modern" liberalism that would be suitable not only for the period of reconstruction but for the long-term future of the free world. In this double role of both visionary and pragmatic observer and critical adviser in the actual policy tasks and decisions in the construction and consolidation of the "social market economy", Röpke's contribution vastly exceeded the influence of Hayek as well as those of von Mises and Friedman.

Not only did Röpke make a decisive contribution to a "liberal model" that was actually implemented – the social market economy that

[96] On the Mont Pélerin Society and on the Institute of Economic Affairs founded by Antony Fisher, see: Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke pp. 48-52

he and Erhard and their colleagues advocated and built was a much more "liveable" liberal market economy than the out-dated 19th century laissez-faire capitalism. It is also the conclusion not only of the present author but also of an increasing number of scholars that the legacy of Röpke is also more relevant today and for the future than the teachings of Hayek, von Mises or Friedman.

During the 1950s and 1960s intellectually, academically and politically had a minority position both in the United States and in Europe: they were part of a small opposition to the dominant Keynesian and "liberal" (quasi socialist) schools and policies. This was a very different situation from Germany and some of the other continental European countries such as Switzerland or Austria. This "traversée du désert" [97] contributed to the radicalization of the followers of all three fundamentalist liberal trends, and of the statements and policy advice especially of Friedman himself.[98]

With the crisis of the Keynesian demand management policies ("stagflation") and self-defeating tendency of dealing with the crises of the 1970s through more and more government interventions, price and wage controls and nationalizations, the influence and reputation of the Friedman, Hayek and von Mises increased exponentially in Britain and the United States but also in continental Europe and world-wide.

For the promoters and converts to the doctrine this new "neoliberal", purely market-driven economy and society, there was no room for the concept of the Social Market Economy and especially not for the deeper and more balanced long-term view of liberalism of Wilhelm Röpke.

This evolution on the world scale was foreshadowed and later further confirmed within the microcosm of the Mont Pélerin Society.

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[97] Audard, Catherine (2009): *Qu'est-ce que le libéralisme? Ethique, politique, société*, Folio, Paris, p. 350

[98] Hieronymi, Otto, (1983): "In Search of a New Economics for the 1980's: the Need for a Return to Fixed Exchange Rates", in Hieronymi, Otto, Editor (1983): *International Order: A View from Geneva*, Annals of International Studies, Volume 12, Geneva, p.121

Tensions between Hayek and Röpke kept rising over the years on the very issue of the "social market economy".[99] Despite efforts by Ludwig Erhard to help bring about reconciliation between the two principal founding members and their respective groups of followers, a final break came in 1961: Wilhelm Röpke resigned from the office of the President and gave up his membership in the Mont Pélerin Society to the creation and development of which he had contributed so much through his ideas and intellectual prestige. [100]

Today the name of Wilhelm Röpke seems to have been completely eradicated from the history of Mont Pélerin: his name does not appear in the list of the principal founders on the website nor in other contexts. The veritable cult of personality devoted to the late Friedrich Hayek that dominates in the Society's electronic and other communications would certainly not be conform to the taste of Hayek nor is it very becoming to an allegedly still liberal institution that was originally created to promote debate and reflection (and respect diversity) among liberal thinkers.

4.7.4 A unique success story – ignored by today's economists

While even non-economists are familiar with the names of Keynes, Milton Friedman, F.A. Hayek, or Marx, Lenin and Mao, very few even among professional economists, let alone in the general public or among students know or remember the names of the architects of one of the most successful economic and societal model of the entire 20th

[99] See: Plickert, Philip (2008): *Wandlungen des Neoliberalismus. Eine Studie zu Entwicklung und Ausstrahlung der "Mont Pélerin" Society*, Marktwirtschaftliche Reformpolitik, Schriftenreihe der Aktiengemeinschaft Soziale Marktwirtschaft, Lucius & Lucius, Stuttgart; Hennecke, Hans Jörg (2005): *Wilhelm Röpke, Ein Leben in der Brandung*, Schäffer-Poeschel Verlag, Stuttgart

[100] Röpke, Wilhelm (1962): *Opening speech delivered at the Turin Meeting of the Mont Pèlerin Society*. In: Mont Pèlerin Quarterly, III, 1.1962, N°4, p 8-10

century. Ludwig Erhard's name may sound familiar, as the father of the "German economic miracle" (an expression incidentally that Erhard never liked), the others whose ideas played a crucial role in the development of the concept of the Social Market Economy and its successful implementation, such as Wilhelm Röpke or Alfred Müller-Armack seem never to have existed. [101]

This was so (and probably still is) even at the Graduate Institute of International Studies in Geneva where Röpke was a professor from 1937 until his death in 1966 and where he developed his theories and wrote his books and articles that played such an important role in the history not only of Germany and Europe but of the world economy as well.

As was noted in 2002 by Alessandra Roversi, a student at both the Graduate Institute and Webster University: "To be honest with you, I had no idea who Röpke was until Dr. Hieronymi approached me for the conference. Talking around people here at HEI, I realized that nobody knew about him even though his name is mentioned at the entrance to the library as one of the great professors at the Institute. Röpke has never been mentioned in any of the economics books I have used in my classes, nor was he ever quoted by my professors… (as I was) discovering Röpke's teachings I would like to share with you (my fellow students at the Institute) my first striking impressions and thoughts. I would like to encourage all of you to read Röpke with the hope that

[101] This point can be illustrated with the example of two recent scholarly books but which are also destined for a broader interested public. One was published in France the other in Italy. The first one is study by a French Professor at the London School of Economics. She mentions once Röpke, but in the wrong context and the "wrong label". Audard, Catherine (2009): *Qu'est-ce que le libéralisme? Ethique, politique, société*, Folio, Paris. The Italian book simply ignores Röpke altogether. Bedeschi, Guiseppe (2015): *Storia del Pensiero Liberale*, Rubbettino, Soveria Mannelli

some of his thoughts will challenge your views on economics and economic thinkers." [102]

The late Professor Peter Tschopp, at the time Director of the Graduate Institute, was one of the few at the Graduate Institute who knew and remembered the importance of the teachings and legacy of Röpke for the Institute (which Röpke had helped to "put on the map" from the late 1930s until the mid-1960s), for Switzerland and liberal cause in Europe and the world. It was thanks to Tschopp as Director, that we could organize the "colloque Röpke" on the 75th anniversary of the foundation of the Institute as a joint initiative of the students of Webster and the Institute and its alumni and of the students of the two schools. It is appropriate to quote from Tschopp's comments about Röpke on this occasion:

« A un moment où dans la mouvance d'une globalisation gérée par des Etats-Unis omni-puissants, la doctrine unique est redevenue à la mode, le message de Röpke est, à nouveau, d'une extraordinaire actualité. Que l'on se réfère à son *Jenseits von Angebot und Nachfrage*[103] ou aux innombrables témoignages que recèlent les archives de l'Institut, une chose éclate à l'évi- dence: le danger fondamental qui hante l'humanité depuis bientôt

[102] Roversi, Alessandra (2002): "The Teachings of Röpke and Today's Students", in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, p.44

[103] Röpke, Wilhelm (1958): *Jenseits von Angebot und Nachfrage*, Eugen Rentsch Verlag, Erlenbach-Zürich, (latest edition in English: *A Humane Economy, The Social Framework of the Free Market*, Intercollegiate Studies Institute, Wilmington, 1998). For a recent Italian re-edition see: Röpke, Wilhelm (2015): *Al Di Là Dell'Offerta e Della Domanda, Verso Un'Economia Umana*, Rubbettino, Soveria Mannelli

200 ans est celui des régimes totalitaires, que ceux-ci soient d'essence gouvernemen- tale ou privée. Des dérives de l'importance d'*Enron* n'ont rien à envier aux dérives de n'importe quel conglomérat d'un Etat. » [104]

Chiara Jasson, another speaker at the same conference (at the time a graduate student at Webster) spoke about the humanist and humanitarian dimension of Röpke's legacy:

"I believe that it is only if humanism and humanitarian values are our guiding principles that we will be able to achieve lasting peace, prosperity and justice in the world. If we fail to do so, the very future of humanity may be threatened. This is where I see the relevance of Röpke's example today. Röpke was an economist, a political philosopher and a sociologist. In all these capacities, he was above all a *fighter for a more humane society*."[105]

Peter Tschopp called Röpke the last great European "Vordenker" or guiding light in his paper at the conference. Franz Blankart in his paper also focussed on Röpke's role as a "visionnaire", a great intellectual and moral leader both before and after the War[106]:

"C'est dans la crise que l'intellectuel fait ses preuves. Ce sont la perspicacité, le courage, la crédibilité et le sens de la responsabilité qui lui permettent de montrer le chemin à ceux qui errent dans le brouillard…Röpke était d'une *perspicacité* visionnaire. Dans son appel…du 11 septembre 1930, il exprime les propos terrifiants suivants: 'Aucune personne, qui vote le 14 septembre pour le Parti national-socialiste, ne

[104] Tschopp, Peter (2003): "Wilhelm Röpke, l'Europe et le modèle Suisse" in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, pp.32-36

[105] Jasson, Chiara (2002): "Wilhelm Röpke and Humanism and Humanitarian Values Today"; in in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, p.52

[106] Blankart, Franz (2002): "Röpke: le role du visionnaire", in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, p.37

pourra dire plus tard qu'il n'a pas su quelle en sera la conséquence. Il doit savoir qu'il choisit le chaos à la place de l'ordre, la destruction à la place de la construction. Il doit savoir qu'il opte pour la guerre à l'intérieur comme vers l'extérieur, pour une destruction insensée."

And Blankart continues as an « architecte de la politique économique de la République Fédérale at de la 'soziale-Marwirtschaft »…Röpke's message to the German people was that 'une économie de marché basée sur la concurrence ne peut pas flotter librement, mais doit être tenu et protégée par des cadres sociales, politiques et morales.'[107]

4.7.5. Emilio Fontela and his discovery of the Social market economy and of Wilhelm Röpke

One of the reasons for recalling in some detail the 2002 Röpke conference is that the sixth speaker at this event, who has not been mentioned so far was Emilio Fontela. In his brief presentation which carried the title of one of the early works of Röpke, a book he found enlightening and an important source of ideas for the future, these were some of the key messages of Emilio:

« Derrière l'économie sociale de marché à laquelle nous devons le nouveau grand projet européen, on ne peut pas entrevoir l'image de Wilhelm Répke. Entre le libéralism dogmatique et le communisme totalitaire, Röpke, dans son *Explication économique du monde moderne* [108](un livre honoré par une siasie et la destruction par la Gestapo à

[107] The quotes by Blankart are from Röpke, Wilhelm (1965): *Fronten der Freiheit, Eine Aslese aus dem Gesamtwerk,* Stuttgart-Degerloch

[108] Röpke, Wilhelm (1937): *Die Lehre von der Wirtschaft*, Eugen Rentsch Verlag, Erlenbach-Zürich, (in English *Economics of the Free Society*, Henry Regnery, Chicago, 1963)

Vienne), défend un juste milieu pragmatique et solidaire, qu'il appelle le 'tiers chemin'…Nobreux sont seux qui ont affirmé que, comme les artistes, les grands économistes ont surtout de l'influence après leur mort. Röpke a eu une grande infuence de son vivant, mais de nombreux problèmes du présent auraient aussi besoin d'être repensés aujourd'hui à la lumière de ses enseignements…Le passage délicat entre théorie et réalité est plus qu'une science, c'est un art. C'est la grande faiblesse de l'enseignement de l'économie d'aujourd'hui ; on s'efforce de former des scientifiques, en les dépouillant de leur éventuelle capacité artistique, au sens de leur capacité de perception de la complexité sociale. Le réductionnisme académique conduit inexorablement à une pensée 'mutilée et mutilante'…Espérons un retour rapide à la recherche interdisciplinaire, à la multiréférentialité académique, au monde de Wilhelm Röpke. L'économie globalisée, mondialisée, en a de plus en plus besoin. »[109]

It was also this discovery by Emilio Fontela relatively late in his life through our discussions and through his readings of the thinking of Röpke and of the Social market economy. Tthat led him to share my long-standing conviction that the concept of the Social market economy had an important role to play in the future and beyond the borders of Germany as well. He expressed this conviction in our joint "Alcantara Manifesto" (2004-2005) and in his presentation on the "Geneva School of Economics" in 2007 at the 12th Annual Webster Humanitarian Conference on *The Spirit of Geneva in a Globalized World* shortly before his illness and death.[110] This is the reason why the working title of the

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[109] Fontela, Emilio (2002): "Wilhelm Röpke et l'Explication économique du monde moderne", in Otto Hieronymi, Chiara Jasson, Alexandra Roversi (editors): *Colloque Wilhelm Röpke: The Relevance of His Teaching Today*. HEI-Webster University, Geneva, pp.42-43

[110] Fontela, Emilio (2007): "The Geneva School of Economics and the Spirit of Geneva", in Hieronymi, Otto and Intag, Kathleen (Eds.): *The Spirit of Geneva in a Globalized World, Refugee Survey Quarterly, 2007*, UNHCR, Oxford University Press, Oxford and Geneva; Fontela, Emilio, Guzmàn, Cueva and Hieronymi, Otto (2005): *Manifest of Alcantara*. I discovered with great sadness, at the time when we were preparing the project for the present volume, that Professor Guzmàn, who had been

book planned since 2007 to commemorate Emilio, and of the present chapter, had been "From Econometrics to the Social Market Economy".

4.8. Money, inflation, the balance of payments and the future of the European Union

4.8.1. The fear of inflation and currency reform

It is one of the paradoxes of our time that currently the principal preoccupation of the European Central Bank and of its President Mario Draghi is not only to keep the spectre of deflation outside the door, but to revive by virtually all means that are legally within their power. Only not so long ago the conventional wisdom was: "deflation: we will never experience it again", and "inflation: we can never fully ban it, you cannot be vigilant enough, because with the slightest inattention, it will return and destroy our present and future prosperity."

It is fair to assume that today Röpke would also be concerned about the risks of deflation and of the ineffectiveness of massive central bank liquidity creation to jump start the European and Japanese economies. [111] He would, however, probably also be worried about the potential long-term problems created by the artificially low interest rates and

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significantly younger than Emilio and I, passed away in 2012. It should also be mentioned that in 2009 Professor Guzmàn had edited a special issue of the *Revista de Economia Mundial* to the memory of Emilio Fontela.

[111] In the 1930s was one of the leading advocates on the European continent of monetary and fiscal measures to counter depression. See: Bombach, Gottfried and Others (Eds) (1981): *Der Keynesianismus III. Die geld- und beschäftigungs-theoretische*

the large volumes of unused liquidity floating around. [112]To round out this chapter on the Social market economy some of the questions which were at the center of interest and preoccupation of the founding fathers and of their present-day followers: inflation, money, the balance of payments and the role of the central bank.

A central feature of the concept of the Social market economy was a deep concern about threat and consequences of inflation. This applied to both open inflation and to the even more pernicious form of inflation, the so-called "repressed inflation". [113]

The critical neo-liberal attitude towards Keynesian theory and practice was strongly influenced by the lesser preoccupations of Keynes and the Keynesians with inflation and the fact that they even considered a certain degree of inflation as necessary for maintaining full employment.

The rejection of the Socialist model was also clearly linked to the economic distortions resulting from the systematic interference with the price mechanism by government agents through price and wage controls and subsidies.

Diskussion zur Zeit von Keynes, Springer Verlag, Berlin, Rieter, Heinz und Zweynert, Joachim Editors (2010): *« Wort und Wirkung »*: *Wilhelm Röpkes Bedeutung für die Gegenwart*, Metropolis-Verlag, Marburg; Röpke, Wilhelm (1932): *Krise und Konjunktur*, Verlag Quelle&Meyer, Leipzig,

[112] See Chapter 1 in: Hieronymi, Otto and Stephanou, Constantine, Editors (2013): *International Debt – Economic, Financial, Monetary, Political, and Regulatory Issues*, Palgrave Macmillan, London

[113] Röpke was one of the first to have recognized and developed the phenomenon of "repressed inflation". The first issue of the international scholarly journal Kyklos founded in 1947 at the University of Basdel, contained an article in German by him on this subject, and the third issue, one in English. See: Röpke, Wilhelm (1947): "Offene und zurückgestaute Inflation", in *Kyklos*, Vol. 1, No.1, Basel, pp.57-71; "Repressed Inflation", in *Kyklos*, Vol. 1, No.3, Basel, pp.242-253.

German liberals were greatly affected by the the economic, social and political consequences of the "great German inflation" which also paved the way for the seizure of power by Hitler in the midst of the great depression. [114] The "fear of inflation" by generations of citizens of the new Federal Republic became one of the most broadly held traditions of Germany.

In his Foreword to the Bresciani-Turroni's seminal book on the German "Great inflation", Lionel Robbins wrote: "the depreciation of the mark…was the most colossal thing of its kind in history: and next to the Great War itself, it must bear responsibility for many of the political and economic difficulties of our generation. It destroyed the wealth of the more solid elements in German society: and it left behind a moral and economic disequilibrium, apt breeding ground for the disasters which have followed. Hitler is the foster-child of the inflation." (p.5)

To remember the impact of the Great inflation it is worth quoting at some length from the concluding paragraph of Bresciani-Turroni's famous study: "The inflation …exercised an increasingly disadvantageous influence, disorganizing and limiting production. It annihilated thrift; it made reform of the national budget impossible for years; it destroyed incalculable moral and intellectual values. It provoked a serious revolution in social classes, a few people accumulating wealth and forming a class of usurpers of national property, whilst millions of

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[114] Bresciani-Turroni, Costantino (1937): *The Economics of Inflation, A Study of Currency Depreciation in Post-War Germany*, George Allen & Unwin LTD, London; Italian edition (1931): *Le Vicende del Marco Tedesco*, Università Bocconi, Milano. As of 1945 Bresciani-Turroni was also one of the leading thinkers and political leaders advocating the Social Market Economy in Italy. See his program written in 1945 on "Il programma economico sociale del liberalismo", in Bresciani Turroni, Costantino: *Liberalismo e politica economica*,
Editore: Il Mulino, 2007

individuals were thrown into poverty. It was a distressing preoccupation and constant torment of innumerable families; it poisoned the German people by spreading among all classes the spirit of speculation and diverting them from proper and regular work, and it was the cause of incessant political and moral disturbance. It is indeed easy enough to understand why the record of the sad years 1919-1923 weighs like a nightmare on the German people." (p.404)

Repressed inflation was the method by which the National Socialist regime was able to create the illusion of "price stability" and the "regular flow of income and the absence of excessive taxation". The essential feature of the system, however, was the rigorous imposition and implementation of strict price controls and of rationing of consumer goods as well as of all raw materials and intermediate goods.[115] Those who were accused of "hoarding" or "black market activities" had to face the full force and cruelty of the Nazi police state, including being sent to concentration camps and often the death penalty. The system was one of a pure "war economy" where neither the production nor the consumption of goods, nor wages and money incomes were determined by the market mechanism. One of the most paradoxical features of this system was that up until the very end of the war, most people were never short of cash – but both households and companies had the greatest difficulty to find the goods needed to survive. The system was very similar to the one that had been introduced in the Soviet Union at a very early date and that survived there for decades under various forms up to the very end of the Communist regime.

[115] Müller-Armack recalls in his memoirs the differences in the degree of enforcement of rationing in Germany on the one hand, and some of Germany's allies such as Hungary that he observed with surprise and amazement during a "study trip" he undertook with a group of representatives of the German textile industry in the Summer of 1943 in Eastern Europe Müller-Armack, Alfred (1971): *Auf dem Weg nach Europa, Erinnerungen und Ausblicke*, Gemeintschaftsverlag Rainer Wunderlich, Tübingen und C.E. Poeschel, Stuttgart, pp. 19-35.

The continuation of repressed inflation after the collapse of the Nazi regime was one of the principal reasons for the even greater shortage of essential goods than during and before the war. The fall of the regime brought to an end the totalitarian enforcement of the price controls and of the rationing system. The fear of the police diminished, but the market incentives to produce more were lacking as shortages continued as a result of the price controls. This explains also that whereas eliminating excess liquidity (and savings primarily in the form cash hoardings) was the classical and traditional objective of the German currency reform, without ending the system of price controls and of repressed inflation, it would not have had the expected beneficial effect.

The currency reform was planned by and carried out under the authority of the Western Allies. The credit for the simultaneous liberalization of prices (attacking the system of repressed inflation at its very core) belongs essentially to Ludwig Erhard and the small group of his close advisers. The creation of a stable currency and of a large degree of liberalization of the price and wage system were an essential condition for returning to a market economy. At the same time, maintaining certain selective controls and seeking to prevent abuses of market positions, were equally important for making the "Social market economy" a credible and increasingly popular concept.

The currency reform and the restoration of the market economy in the parts of the country under the control of the three Western Allied powers (including West Berlin) deprived the Soviet Union of a lever to undermine the new free economic, social and political system that was emerging West Germany and West Berlin. The Soviet response was the blockade of Berlin: an attempt to roll back through starvation democracy and the market economy through starvation. Thus, the American airlift, a powerful but peaceful demonstration of solidarity with the population of Berlin, was a key element in the consolidation of democracy and of the Social market economy in Germany.

4.8.2. The Balance of Payments, Exchange Rates, Convertibility and the European and International Monetary Order

Ever since the 18th (and even the 17th) century the balance of payments of national economies has been one of the central issues for both economic theory and for economic policy makers. It has tended to be the principal justification for protectionism next to the protection of local producers. The debate about the balance of payments focused on the responsibilities of public authorities (governments and central banks) to prevent imbalances (primarily deficits but also surpluses) as well as on the exchange rates of national currencies, convertibility and the scope and institutions of international cooperation in this important field. Key words in this debate included stable vs. flexible exchange rates, exchange controls and limited or full convertibility, and link between domestic fiscal and monetary policies and the state of the external accounts. The degree of freedom of short-term (and very short-term) cross-border money flows has been a recurring issue that has assumed an enormous importance in today's age of global finance, and brought to "the brink of collapse" the entire international financial system (and the national banking system of some of the most advanced market economies).

The problems of the balance of payments also marked profoundly the thinking of the leading economists of the inter-war period. In fact, balance-of-payments issues and crises were at the core of some of the major crises of the 1920s (including the great German inflation and the burden and the financing of German reparations), and even more so of the period of the Great Depression of the 1930s and the collapse of the international monetary and trading system. This was true both for the architects of the new post 1945 international economic and monetary order (Bretton Woods and GATT) and the "fathers" of the Social Market Economy.

There is no need nor room to discuss here the details and the ups and downs of the debate on the balance of payments and on the rules

introduced under the IMF or the actual workings of the so-called gold-exchange standard (or the dollar standard as the system has been called especially after gold and its price were banned as part of international monetary order). [116] It should be noted, however, that after the whole concept of the balance of payments was "written out of the books" by American officials[117] and world class economists and after the Euro was declared to have eliminated the balance of payments among the members of the European Monetary Union: the balance of payments has returned once more with a vengeance. This is the case for the United States (in particular in its relations with China), and this is the case in the Euro zone where there are desperate attempts to try to solve the debt crisis through the balance of payments.

4.8.3. Monetary policy, the role of central banks and the future of the Euro

[116] On this issue see for example: Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke; Hieronymi, Otto (1998) "Agenda for a New Monetary Reform", in *Futures*, Vol. 30, No.8, pp. 769-781, Pergamon, Elsevier Science Ltd.; Hieronymi, Otto (October 2009): "Rebuilding the International Monetary Order: the Responsibility of Europe, Japan and the United States", *Revista de Economia Mundial*, Madrid, No. 29, pp. 197-226

[117] Lamfalussy, Alexandre (1987): "Current-Account Imbalances in the Industrial World: Why They Matter" in Kennen, Peter B. (Editor) (1987) *International Monetary Cooperation: Essays in Honor of Henry C. Wallich*, Essays in International Finance, No. 169, December 1987, International Finance Section, Princeton University, Princeton, N.J. pp. 31-37

Both hard-core monetarists and the ORDO liberals observed with distrust the progress of the idea of a full monetary union in Europe. Even for those who claimed to be in favour of free trade and globalization total monetary independence – in fact extreme monetary nationalism – was an essential element, or even the single most important component of their ideology. [118]

After the destruction of the Bretton Woods system beside the American authorities, the German Bundesbank was the principal Western institution to oppose most strongly and systematically a return to a global international monetary order based on stable exchange rates. This opposition has survived to the present day.

The Bundesbank was and remains also sceptical about a more limited – European – system of fixed exchange rates and its realization under the Maastricht Treaty and the European Monetary Union.

[118] On monetary nationalism and flexible exchange rates and on Milton Friedman's monetary nationalism see: Hieronymi, Otto, (1983): "In Search of a New Economics for the 1980's: the Need for a Return to Fixed Exchange Rates", in Hieronymi, Otto, Editor (1983): *International Order: A View from Geneva,* Annals of International Studies Volume 12, Geneva, and Hieronymi, Otto, Editor, (1980): *The New Economic Nationalism*, Macmillan, London. In this same volume Robert Mundell wrote: "The final point I want to make is that the experiment with floating has, in my opinion, been a failure. This has been evident since 1971 and the experiment should be abandoned as soon as the international monetary authorities agree on a common monetary unit…" Mundell, Robert (1980): "Monetary Nationalism and Floating Exchange Rates", in: Hieronymi, Otto, Editor, (1980): *The New Economic Nationalism*, Macmillan, London, p.49. This volume contained the edited proceedings of a conference held at Battelle-Geneva under the same title as the book in 1978.

[119]In the view of the leading Bundesbank officials and economists[120] the Euro, the common currency that would be and was adopted by countries "less virtuous", less concerned about inflation than the Federal Republic, would be a threat to German monetary stability and German prosperity. [121]

This view was and is shared by many leading representatives of the ORDO school as well by German monetarists (and even Social Democrats). It is especially paradoxical that the ORDO liberals who are so strongly support legal rules in the implementation of the market economy, consider a ruled based international monetary system an anathema.

The European Monetary Union, the Euro were made possible by the economic and political reasoning and determination of two leading German Statesmen: Chancellor Helmut Kohl in the first place and of the Bavarian leader Theo Waigel. Both Kohl and Waigel were firmly

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[119] Sarrazin, Thilo (2012): *Europa braucht den Euro nicht: Wie uns politisches Wunschdenken in die Krise geführt hat;* Bandulet, Bruno (2011): *Gebt uns unsere D-Mark zurück: Fünf Experten beantworten die wichtigsten Fragen zum kommenden Staatsbankrott*

[120] Issing, Otmar (22 October 2004): "The New EU Member States: Convergence and Stability", EU Enlargement and Monetary Integration, Speech by Otmar Issing, Member of the Executive Board of the ECB, Third ECB Central Banking Conference, Frankfurt am Main

[121] On this issue see: Hieronymi, Otto and Stephanou, Constantine, Editors (2013): *International Debt – Economic, Financial, Monetary and Regulatory Aspects,* Palgrave Macmillan, Basingstoke and Hieronymi, Otto, Editor (2009): *Globalization and the Reform of the International Banking and Monetary System*, Palgrave Macmillan, Basingstoke; on the political negotiations see the excellent and detailed study: Dyson Kenneth, and Featherstone, Kevin (1999): *The Road to Maastricht: Negotiating Economic and Monetary Union*, Oxford University Press, Oxford

committed to the principles and tradition of the Social market economy, including the independence of the Bundesbank. They were, however, also convinced that the European Monetary Union was compatible with the Social market economy and that the Euro was indispensable for a strong, stable and prosperous Germany and Europe. They claimed to be and in fact were in line with the legacy of both Ludwig Erhard and Konrad Adenauer.

The independence from political interference of the new European Central Bank was one of the central features of the project. This was not only because it was a "non-negotiable" condition set by the Federal Republic, but also because among the high level experts who were directly involved in the process (e.g. Alexandre Lamfalussy or Tommaso Padoa-Schioppa) there was a consensus that this was in the interest of all the European economies and not only of Germany. [122]

The conclusion of the present section is twofold: 1. the Euro is essential for the future of the European Union and in fact also for the Western Community and for the prosperity of the world economy. It is certainly compatible with the concept of an evolving and dynamic social market economy. Keeping Greece within the Euro was an act of wisdom; 2. at the same time, one cannot warn too strongly about the grave dangers inherent in the idea of turning the "Euro issue" into a Trojan horse for trying to transform the European Union into a European super state. This is short sighted not only from a political point of view, but also from an economic perspective. The founding fathers of the Social market economy, Erhard, Röpke and Müller-Armack, would be rightly worried if they read some of the pamphlets that are coming out these days from Brussels and from some of the European capitals on this subject.

[122] For a critique from the "Left" of central bank independence see: Leaman, Jeremy (2001): *The Bundesbank Myth, Towards a Critique of Central Bank Independence*, Palgrave, Houndsmills, Basingstoke

4.9 Conclusion: developing a new social market economy for the world economy is the realist option for the 21st century

The underlying theme of this chapter and of the entire book has been that the search for a new economic and social model for the 21st century could and should be inspired by the original basic principles and experience of the Social market economy. In this concluding section the key issues and tasks of this approach can be summed up in the following points:

In developing the concepts and implementing a new model and approach it is essential to take into account the economic, political, social aspects and the ethical and moral dimensions. This is not just a technical "methodological" requirement. It has to do with the goals and the chances of success of the "good society".

The economic model has to be based on economic freedom: the market economy, private ownership and competition, with a properly functioning price system.

The 20th century has amply demonstrated that one of the most complex issues is the distribution of responsibilities between public decision-makers (Government) and the private sector. The broad distinction between a "market economy" and a fully "government-controlled economy" is fairly clear and straightforward. Today, there is a broad consensus that the market economy is superior to a government-controlled economy.

Also, there is an equally general acceptance of the idea that in the free, market economy there is a need for common rules and for government action. The real challenge and the core of the debate is "about

the limits of government and of the private sector" and "the responsibilities" of government(s), and "the instruments and how they should be carried out".

But the Social market economy does not call for uniformization, for homogenization, for more rather than less centralization. Bigness for the sake of bigness is an anathema for its true supporters as is concentration of economic and financial power whether it is by governments or private companies and individuals.

Many have argued that one of the main reasons why the concept and policies of the Social market economy have not found the attention that they deserve outside Germany (and the German speaking part of Switzerland) and have not become a more important part of the worldwide academic debate and teaching is that a very large part of the theory is "imbedded" into specific analyses in time and space or in other words into "Germanic culture". This fallacy of seeking a "cultural" not to say "ethnic" definition for who can and who cannot adopt successfully the model of the Social market is truly pernicious. It may be the result of the misreading of the original concept by the "second generation" of neo-liberals, especially those of the ORDO school, who have been trying to define very strict moral and legal parameters to distinguish what is and what is not compatible with the "social market economy".

In a narrower, more "technical" sense there is also a widespread misconception that the Social market economy, its basic theory and method – including the legacy of Röpke – are not compatible with "modern economics" This is also where the question or the challenge of the "method" can be seen as both an obstacle and as a bridge or tool for achieving a new consensus. Emilio Fontela was among those who clearly recognized the importance of this issue. In the past it had been assumed that there was an insurmountable chasm between mathematical economics and econometrics (and other trends in "modern economics") and the concept of the Social Market Economy. This perception tended to prevail on both sides.

Can mathematical abstraction and econometrics become useful in better understanding what the social market economy is, or ought to be, about? How can the cult of abstraction and simplification and the distance from what actually happens in the economy be eased through most systematic learning and observation of the specificity of markets, of decisions and of the human condition? How can econometricians be induced to make accessible their thinking and conclusions to those who do not think, who are not trained in abstract mathematical formulas? How can the wall between "data mining" and actual empirical qualitative and quantitative analysis be lowered? At the same time, how can the "literary economists", the "legalistic" (ORDO type) rule-makers be induced to accept the need and usefulness both of more formal analyses and presentations and of more systematic use of data that is today so richly available both for the present and the past?

This is the challenge faced by the current and future generations of economists (and this was the meaning of the initial draft title of the present chapter "from econometrics to the Social market economy").[123] This has to be a two-way street, a two-way highway: this is the road on which Emilio Fontela engaged his work and thinking especially in the last decade of his productive life.

[123] There has been a gradual discovery over the years that the rift between the Social market economy and other "modern" schools is not as deep as it is often assumed. Among the principal authors of the school of the Social market economy, it is once more recognized that Wilhelm Röpke had the broadest vision and is the most relevant for the future. Rieter, Heinz und Zweynert, Joachim Editors (2010): *« Wort und Wirkung »*: *Wilhelm Röpkes Bedeutung für die Gegenwart*, Metropolis-Verlag, Marburg; Peukert, Helge (1992): *Das Sozialökonomische Werk Wilhelm Röpkes*, Two volumes, Peter Lang, Bern, Frankfurt am Main. On Röpke and Keynes see: Bombach, Gottfried and Others (Eds) (1981): *Der Keynesianismus III. Die geld- und beschäftigungs-theoretische Diskussion zur Zeit von Keynes*, Springer Verlag, Berlin,

Chapter 5: The Legacy of Emilio Fontela

Antonio PULIDO

5.1 Introduction

The intellectual and human legacy of Emilio Fontela has reached worldwide popularity, leaving his mark on students, friends and all those who are familiar with his work.

He was born in France during the years of the Spanish Civil War. He lived in Seville until the age of 14. He then moved to Switzerland where he later earned his Licence and Doctorate in Economics at the University of Geneva. Between 1958 and 1980 Fontela lived and worked in Geneva. There he was primarily associated with the Battelle Memorial Institute and the University of Geneva. At the same time, his professional work included constant travels in Europe and throughout the world, as a researcher, as an adviser and as a professor, including at the Case Institute of Technology in Cleveland, and at the Institute of Business Administration and Management in Tokyo. He was engaged in various expert projects and missions in Latin America and the Maghreb Region for The World Bank, the United Nations, OCDE or the European Community.

At Battelle-Geneva he was Director of the Department of Applied Economics between 1967 and 1973, and continued his professional association with Battelle and former Battelle colleagues for many years thereafter. Fontela was appointed Professor at the University of Geneva's Department of Econometrics from 1974 where he would eventually become Director between 1978 and 1983.

As of 1980, much of his professional activity progressively began to shift to Spain through his collaboration in different research projects and his integration into the Universidad Autónoma de Madrid, the L.R. Klein/Ceprede Institute and the Universidad Antonio de Nebrija (2003-07). At the same time he carried on his international career engaging in many projects focused on Europe and other major countries and regions including Japan and Latin America.

Personally, I had the good fortune of working with Emilio for 30 years. As I wrote in the publication *Cartas a Emilio Fontela* (Letters to Emilio Fontela), published after his untimely death, *"*we have shared professional activities, travels, family gatherings, hopes and concerns. He has been – and will be – my brother and my academic and personal guide as well".

Without forgetting his wide-ranging international activities, in this Chapter I am going to focus on the work he developed in our 30 years of collaboration, during which we shared projects and wrote together numerous books and articles.

Among the different lines of work he developed, three topics that seem to me especially relevant will be outlined here:

- His social, global, forecasting and interdisciplinary vision
- His contribution to a flexible and multilevel modelling
- His strategic approach, integrating RDI (Research, Development, Innovation).

The present Chapter is my modest contribution to the work of Emilio Fontela, a free spirit, a socially responsible innovator, specialized in multiple fields of economics and business but with a background in social sciences.

5.2 A social, global, forecasting and interdisciplinary vision

5.2.1 Social and global economy

The social dimension of the market economy became an important feature in Emilio Fontela's work. In the bibliography established by André Gabus and Gabrielle Antille, there are 12 titles about this topic, 10 of which were published in Spanish between 1982 and 2008. (See Annex 2 of this volume.)

In the *Alcantara Manifesto* (Fontela, Guzmán & Hieronymi, 2005), the social market economy is presented "as an institutional framework that allows markets to be efficient under the constraints of sustainability and equity". In this sense, Emilio's thinking is characterized by a strong social commitment without sacrificing market efficiency rules.

In the rest of this section I will focus on two Fontela's important contributions the preparation of which I had followed closely. The first one is a collective work published in 1993 by The Group of Lisbon of which Fontela was a member (*Limits to Competition*, Gulbenkian Foundation). The basic idea here was that competition must be considered as a guide to market efficiency, but its excess can produce adverse effects and this could be detrimental to the social element. "The most striking result of the competition ideology is that it generates a structural distortion in the functioning of the economy itself, not to mention its devastating social effects" (op. cit, pg. 124).

However, a social market economy can be understood only in the frame of a global world moving towards cooperative governance, based on a participatory process involving civil society and respectful of cultural diversity. The Group of Lisbon sums up its proposals in four global contracts of a social character with the objective "to stimulate the growth of world wealth in the most sustainable manner from a human, social, economic, environmental and political perspective" (op. cit. pg. 160).

The four proposed contracts were:

- Contract for basic needs. Removing inequalities.
- The cultural contract. Tolerance and dialogue of cultures.
- The democratic contract. Towards global governance.
- The earth contract. Sustainable development.

The last contract links up with the second work I want to refer to: "*Principios del desarrollo económico sostenible* (Principles of sustainable economic development, Fontela y Pulido, 2004). The first part is devoted to sustainability as an essential element:

"*Economists, or at least a non-negligible part of them, are increasingly searching for an approach to economic growth for countries, regions, enterprises or people which can be compatible with a reasonable use of natural resources, environmental preservation in a broad sense and a fair distribution of economic welfare on a global scale, even among future generations*." (op. cit., pg. 10)

The second part of the book goes into detail about the basics of sustainable development, then refers to the global contracts of the Group of Lisbon we have already mentioned and ends up with a forecasting approach about possible future scenarios for global sustainable development. Fontela identifies three possible future situations:

- The triumph of the markets (which corresponds also to the title of one of the five scenarios analyzed by The Forwards Studies Unit of the European Commission);
- The new international economic order (whose definition is linked to the international organization of the world *after* the Cold War);
- Another world is possible (in reference to the slogan of the World Social Forum held in Porto Alegre).

5.2.2 Interdisciplinary economic forecasting

If global and social economics became one of the most significant areas of Fontela's work, the single most important dimension of

his work has to do with forecasting and the interdisciplinary. In the bibliography by André Gabus and Gabrielle Antille we find 105 references about forecasting that can be classified as follows:

- Forcasting tools: models (5)
- Forecasting tools: scenarios (8)
- Forecasting tools: structural analysis (8)
- Forecasts of population, employment, consumption (8)
- Forecasts of energy (6)
- Forecasts of foreign trade (3)
- Global forecasts (13)
- Forecasts of Europe (19)
- Forecasts of Spain (28)
- Forecasts of Switzerland and other countries (7)

Among these numerous publications, his extended works, I have selected five significant documents both for their importance and because of my involvement in their preparation.

In 1970, during his Batelle period, Fontela established what became a long-lasting contact with the Spanish economy and economists.[124] He directed for the Instituto de Desarrollo Económico his prospective study "*La economía española en 1975" ("*The Spanish Economy in 1975*")*. Even if the publication dates back to 1970, the research was carried out in the first half of the 1960's in the framework of the prospective program of the Batelle Foundation called ACT (Aids to Corporate Thinking) and developed for the United Kingdom, France, Germany, Belgium, Holland and Spain.

This research represents a milestone for its methodology and its forecasting approach (taking a 15 year long-term prospective) in the

[124] It should be mentioned here that Fontela's Doctoral dissertation, prepared under the direction of Professor Jacques L'Huillier, dealt already with the Spanish economy: *Commerce extérieur et développement économique : l'Espagne, cas particulier*, Paris, Droz, 1962, 180 p.

context of the Spanish economy during the dictatorship when deep social and economic changes were still unresolved.

Fontela defined a three-level model:

1) Employment and household consumption; 2) final demand and inter-industrial sales and 3) prices and productivity.

These three levels integrate into a single circular model. With more than 10 consumption categories and around 50 productive sectors included in this analysis, it represents a highly innovative approach for that period. Furthermore, the model incorporated technological projections and sensitivity analysis, at a time when information technology was in its early stages, meaning a remarkable innovation for developing and solving big econometric models and new forecasting methods.

Twenty years later we find another important work related to Spain: *España en la década de los ochenta. Un estudio de prospectiva económica* (Spain in the 80's. A Prospective Economic Study), sponsored by the Instituto Nacional de Prospectiva. It was conceived along the lines of the OECD Interfutures Project and the FAST Research Programme developed by the European Economic Community.The last sentences of its Preface highlight Emilio's emerging ideology during those first years of democracy in Spain: “Exploring the future means try to understand the ancestral dissatisfaction for the present and the longing for the past, in order to take responsible decisions. Exploring the future is one of the biggest assignments for every participatory democracy”. In those years, Spain had not entered the EEC yet, the Constitution was still to be developed as we know it today; and the territorial structure of the Autonomous Regions had still to be set up.

Starting from 1980, the project develops a prospective horizon of 10 years ahead envisaging two possible international scenarios and two internal scenarios for Spain.

As for the international scenarios, we find:

I.1.- *Lack of understanding*: Strategic conflicts within the OECD, North – South fragmentation and the toughening of the Soviet Union. Europe with different economic equilibria and inequalities.

I.2.- *Understanding strategy*. Shared awareness of the challenges of the decade, with OECD countries gathering together for joint action. North-South concentration, European integration and strong growth in Latin America and the Mediterranean Region.

As for the Spanish scenarios, conceived in a period of social, political and economic changes, we find:

E.1.- *High level of conflicts.* More aggressive demands from trade unions, reduced social confidence and decrease of public intervention in comparison with the current high level.

E.2.- *Low level of conflicts.* More realistic negotiations with trade unions, rising confidence in the future and decrease of public interventions, but with a more active role of public administrations.

As a result of their combination, three more likely scenarios were eventually selected:

A = I.1+E.1 **B = I.1+E.2** **C = I.2+E.2**

The possible outcomes for the Spanish economy were estimated through a medium-sized econometric model (the Batelle Institute SIM-II model, built on 145 variables and 99 interactions, including 35 related to behavior and a five block structure: population and technology; consumer expenditure; final demand and capital stock; income and functional distribution; sectorial added value).

In any of the three estimated scenarios, the situation seemed undesirable: The first scenario (A) was incompatible with Spain's accession to the European Common Market and with the creation of the Spanish Autonomous Regions. The second (B) was not a stable one because of the external instability that it could generate. The third one (C),

the most favorable of the three, depended essentially on the international environment and the internal understanding of economic agents, which seemed very unlikely.

Given these circumstances, the project adopts a methodology deriving from a systems analysis Fontela called "interpretative structural modelling" which examines structural problems obstructing an economic and socially acceptable future in the most probable scenarios.

Fourteen structural problems were detected, some deriving from the previous growth model (technology dependence, deficient financial structure, ineffective entrepreneurial dimension and lack of competitiveness); some others emanating from the international environment and linked to two key elements of the expected future: slow growth and inability to create full employment.

From this point on, the report switches from simple projections of the future to the a "big project for the future", a project that must change those trends that lead the Spanish economy towards unsustainable situations. In particular, the interventions should focus first of all on a new framework for enterprises and the performance of companies. This should include public intervention in favor of the creation, expansion, diversification, restructuring and conversion of enterprises. The second item envisaged in the report concerns the social objective of reducing income inequality. Finally, the report highlights the necessity of a long-term policy for an advanced industrial society.

Seven years later, I had the chance of working with Fontela in the project *España 2000-2025,* as part of the *Etude de prospective du Plan Bleu de la Méditerranée* (Prospective Study on the Blue Plan for the Mediterranean). The important methodological challenge here was to define the future objective for the evaluation of economic determinants in the potential role of Spain in Mediterranean pollution in a 25 years long-term horizon.

The research was structured in three successive stages:

1. Identifying trends and alternative scenarios that matched with the international and Mediterranean situation for all the countries involved;

2.Quantifying these scenarios with the help of a long-term econometric model and calculating the country-related indicators;

3.Estimating the impact of the scenarios on environment and pollution through the indicators previously identified, the exploitation rate of strategic resources (land and water) and pollution emissions.

In order to define all the possible scenarios, four variables were considered for Spain. The outcome was combined then with five other scenarios for the Mediterranean Region. A total of 20 possible scenarios were identified, only five of which were selected as the most probable.

Mediterranean common scenarios		**Spain specific scenario**	
T1	Tendential (slow growth)	S1	Spanish “boom” (as in the 60’s)
T2	Negative (deterioration)	S2	Mezzogiorno (extended 70's crisis)
T3	Positive (improvement)	S3	Rebalancing (radical change in regional policy)
A1	Mediterranean (joint interventions)	S4	California (displacement of growth clusters towards South)
A2	Regional (differences between groups of countries)		

Selected scenarios	
E.1 = T1 + S2	Tendential-Mezzogiorno
E.2 = T2 + S2	Negative-Mezzogiorno
E.3 = T3 + S3	Positive-Rebalancing
E.4 = A2 + S3	Regional-Rebalancing
E.5 = A1 + S4	Mediterranean-California

To determine the macro-economic variables and the growth indicators needed to calculate pollution, the Wharton-UAM model was employed, still in use at present. For each selected scenario, a long-term evolution of GDP is predicted – horizon 2025 – considering the demand, its distribution between four big sectors (agriculture, industry, construction and services) and its outcomes at a Regional scale for the Mediterranean Spanish regions (Andalucía, Baleares, Murcia, Valencia

and Cataluña). The demographic estimations were jointly developed for all the countries involved. Incidentally, it can be noted that those forecasts calculate an annual growth of GDP rate for Spain corresponding to 2,5% in the first two scenarios, 3% in E.3/E.4 and 3,5% in E.5.

For Emilio Fontela, the forecasting approach was to integrate all economic fields (and society). As for the Autonomous Regions themselves, Fontela made individual studies as well. One of the most significative was the study he directed in 2004 for the *Comunidad de Madrid, Prospectiva 2015* (Community of Madrid, 2015 Prospective) in which I had the opportunity to collaborate again with him. Ten years earlier he had presented his achievements about a forecast study on European regions to a seminar held in the framework of the Hispalink Project, of the Universidad Internacional Menéndez y Pelayo (Fontela, 1994).

In this research, the focus was on the interdisciplinary dimension of the analysis – a main trait of Fontela's approach. The main assumption from which the research started was an analysis of present and future factors influencing the future of the Region, from a political/legal, economic, sociocultural and technological point of view (method known as PEST- Political, Economic, Social and Technological analysis).

Some key aspects analyzed were present and future developments of globalization in the Madrid regional context, the impact of information society, the role of the European Union and the Spanish Autonomous Regions, ending with a classical SWOT analysis.

From this point on, the analysis focused on demographic, macro-economics, sectorial and entrepreneurship trends, as well as education, RTD (Research and Development and Technology) applied to infrastructures and the quality of life. Some changing factors were integrated into these trends to end up with the initially represented scenarios interacting in an environment of changing opportunities and of negative or positive influences (social-economic factors with an unequal level of dynamism and cohesion).

However, given these circumstances, three types of final scenarios emerged: the first one represented the orthodoxy, while the other two can be considered as “alternatives”: 1) endogenous decline (mainly in social contexts through the fall in construction, rising employment,

conflicts and loss of social cohesion); 2) exogenous decline (deceleration of the construction of Europe, oil shortage or international financial crisis).

I think it is hard to find another forecast as realistic as this one by Fontela, in which the potential risks of the Great Crisis that Spain and Europe are experimenting at present, are as clearly foreseen.

In line with his proactive forecasting approach which Fontela always believed in, the research concludes with the presentation of different intervention programs (social cohesion, public services' quality, spatial planning, productivity/innovation, education/life-long learning, global projects attraction capacity) and two main big projects (Madrid Cosmo-Region and Madrid City of Sciences).

The last example of his work I will analyze in this section refers to a prospective vision applied to enterprises that Fontela presented in his book *El empresario del siglo XXI* (The XXI Century Entrepreneur). This book was published in the Pirámide-Economía XXI collection I was in charge of during those years at the beginning of the new century.

Without going into great detail, I will only refer here to the final chapter of the book, whose title is: *El empresario como prospectivista* (The Entrepreneur as a Prospectivist). He argued:

> *"While the enterprise in the industrial revolution had as immediate objectives production, sale and profit, Information Society enterprises assume more social, intellectual and cultural responsibilities. As a result of their leadership over other economic and social agents, those in charge of Information Society enterprises also have the responsibility to forecast and evaluate alternative ways of reacting to social and economic developments, in short to carry out economic and social strategic prospection."*

Emilio establishes three minimum requirements for this forecasting function to be assumed by business leaders: 1) the observation of market trends and of the evolution of demand as a consequence of technological, social and economic changes; 2) the need to forecast the

moves of competitors and; 3) the analysis of plans and programs of economic agents, and, generally speaking, of public administrations. This is only possible in a future world: "in opposition to reactive enterprises, who moves in response to unexpected events and under incumbent circumstances, proactive enterprises know where they are going and act with promptness and without being derailed by sudden shocks." (op.cit.pg. 134).

5.3 Multi-level flexible Modelling

Emilio Fontela was an econometrician, a prospectivist, a builder of deterministic or stochastic models, as well as of quantitative and qualitative models. Moreover, his integrated approach goes far beyond economics including multiple conditioning factors like social, political and technological components, ranging from a global scale to the peculiarities of each country, region, sector or enterprise.

The econometric models Fontela worked with during his time in Geneva (Explor, Dematel, Causor) or in Spain (Wharton-UAM, Hispalink) prove the importance he attributed to this approach. Nevertheless he always defended its limited use to specific circumstances, beyond the limits of the strict norms of an alleged structural stability. In the note about "Klein y la previsión económica" (Klein and Economic Prospection, 1980) he remembered that at a Congress of Econometrician, he had the chance to debate with Klein about the possibilities and limitations of econometric models. His stance (generally shared by Klein) was that "econometric models allow studying in a clearer way the regularity of economic system evolutions and, in some cases, identifying some causal mechanisms. Nonetheless, these mechanisms have a limited stability in the long-run, and the creator of an economic model who relies blindly on its predictive capacity simply because in the past it matched with some figures, risks being constantly misunderstood...Neither institutions nor behaviors are steady....The econometric

instrument loses its validity progressively (as the prediction period extends), the mental model gains ground and methodologies shift towards heuristic approaches" (pg. 667/668).

At the University of Geneva, Fontela joined a team directed by Luigi Solari, until Solari's premature death in 1997 (see Stone, 1978). There he tried to deepen his research into the "qualitative structural dynamic" and the causal structure of models (Fontela and Gilli, 1980). For further details, we can refer to the chapter by André Gabus and Alexandre Hawthorne about "Qualitative Structural Analysis" in this volume.

Without ignoring strict econometric models, Fontela presents himself as a prospectivist and shows his support of Keynes' words when facing the challenge of imagining the economic possibilities of future generations (Keynes, 1930 and Fontela, 2003): "My purpose is not to examine the present or the near future, but to disengage myself from the short view and take wings into the future".

And that is how Fontela used the wings of imagination to analyze the future.

5.3.1 Meso economics

But if it is true that Fontela defended a flexible modelling and forecasting approach, he also claimed as well a multi-level method integrating the macro, meso and micro dimension. In particular he defended the role of meso-economics (sectors, regions, groups) in opposition to macro-aggregates and the micro detail for business companies and households. Meso-economics must fulfill "an interpretative gap related to the nature of economic sectors, territories and institutions.....this interpretation is still not integrated into neoclassical economic science which seems rather to search for direct connections, lacking any realism, between microeconomic models of individual agents and aggregated macroeconomic models" (Fontela, 2006).

This meso-economic preoccupation in Fontela's thought brought his attention to input-output analysis, as confirmed by his numerous studies (18 references in Gabus's and Antille's bibliography) in which I participated through various experiences, including our book *Análisis input-output. Modelos, datos y aplicaciones* (Input-Output Analysis. Models, Data and Applications. Fontela and Pulido, 1993). The purpose here is to complete the mainly "short-run macro-dynamic" approach proposed by Tinbergen and widely developed by Klein, with a "long run meso-static" perspective characterizing Leontief's and Richard Stone's works and the Cambridge Growth model.

Without entering into details, I will mention about 10 documents I co-authored with Fontela. These works cover a long period, from 1986 to 2005, thus encompassing a wide range of topics linking input-output with technological progress, cycles, measuring, productivity, structural change, inter-sectorial innovation transfers, world models and future trends.

The documents of the first period (1986-1991) focused on structural change, technological innovation and productivity gains. The starting point was a proposal for the variation of technical coefficients through new approaches other than purely statistical extrapolation techniques or direct estimation by experts:

> *"The rapid survey made above of the present knowledge in the area of changes in technical coefficients and of forecasting methods already shows the limitations of purely statistical techniques, and at the same time the practical limits of processes relaying only on expert opinion. Valuable approaches therefore will always imply some mixed method of expert assessment of some key technological trends and statistical adjustment of some minor trends.*
>
> *Obviously such an ideal method for the exploration of future technological change of macroscopic magnitude, implies a careful communication procedure between technical experts and model builders, and scenario generation appears as a key instrument of «la prospective» central to this communication process.*
>
> *Scenarios obviously will be related to the alternative future behavior of the environment and to the possible decision paths of the main actors in the economic scene. But they will have*

also to deal with important factors affecting the speed of diffusion of new technologies and the changing conditions of the International Division of Labour and the resulting country specialization". (Fontela and Pulido, 1986, pg.11)

The consequence of this proposal of changing technical coefficients was its connection with the large cycles in the neo-Schumpeterian approaches, related to the generation and diffusion of innovations supported by new technologies, where the input-output analysis could play a fundamental role. "It should be necessary to establish the existence of clusters of innovations and further to demonstrate that they occupy a strategic position in the economy in terms of backward and forward linkages; he is convinced that there is an inter-industry flow of new materials, components and equipment generating a vastly disproportionate amount of technological change, productivity improvement and output growth in the economy" (Fontela and Pulido, 1986 II, pg. 4).

The next step was to link technical coefficients of an input-output matrix with the evolution of global productivity, its share between different sectors and the transfer of the eventual profits through relative prices. The *Total Factor Productivity Surplus* (TFPS) of each sector has to be calculated, according to Fontela's proposal, following Courbis and Templé's method (1975) as a "difference between an industry´s output at constant prices and the primary and intermediate input used by the industry, also at constant prices". Depending on prices evolution between two considered periods, it can be determined if "the industry is transferring part of the gain from innovation to its consumers (intermediate producers or final users), to its suppliers (to other industries providing intermediate input), to labour through increased wages, or to capital through greater returns".

In Fontela and Pulido (1987 and 1990) the analysis focuses on the results for France and Spain. In Fontela, Pulido and Lo Cascio (1989) profit distributions in Spain and Italy are compared.

The next step was the development of a global model proposal integrating alternative scenarios where the input-output methodology

has a fundamental role. This model was presented in October 2002 during the XIV Internacional Input Output Association Conference (Duchin, Fontela, Nauphal and Pulido, 2002).

> *"The purpose of this paper is threefold: First it discusses the case for building an IO-based model of the world economy, second, it discusses the type and the necessary characteristics of such a model and finally it highlights a road map for its construction. In the process it argues for the following set of propositions: a) the necessity of reviving the notion of world models b) the need to take on simultaneously the social-economic and environmental challenges and their interdependence c) the suitability of the IO framework as the basis of the next generation of world models d) the importance of bringing theory to bear on the development of the model and on policy analysis e) the importance of community for the development of the model and on policy analysis e) the importance of community for the development, support and diffusion of the model and its uses f) asserting the importance of the role of IIOA in building that community g) a focus on interdisciplinarity rather than on the export of economic logic alone to the social and environmental dimensions h) the importance of a scenario-based approach and i) the need to develop and integrate the financial side along with the real side of the economy".*

In the introduction to the monographic publication of the *Revista de Economía Mundial* (World Economy Journal, Pulido, 2005) I analyzed this proposal in the context of world models. Fontela and Rueda Cantuche (2005) provided a new proposal about linking cross-impact probabilistic scenario to input-output models.

In 1993 and 2005 we presented an assessment of research trends in input-output analysis. In the first article we focused on three fields of application: the use of SAM (Social Accounting Matrix), of Social Accounting Systems and of the information flow models (innovation, patents or sectorial productivity surplus). In the 2005 work, we developed an analysis of the published articles concerning input-output in the *Journal of Economic Literature* between 1960 and 2004 (188 articles);

we analyzed as well the works published by the International Input-Output Association in *Economic System Research* (ESR) between 1990 and 2004 (374 articles), on the basis of a classification by topics and by countries; finally we focused on the papers presented during the last three edition of the Input-Output Conferences (330 papers).

The results showed a constant focus on this topic, as well as a great variety of approaches, methodologies and applications (we identified 30 categories). The collected data revealed a significant change from the first period in ESR (1999-93), when the main interest was on empirical considerations related to construction and the processing of statistic information, to the following periods when the interest shifted to applications. It is possible that this shift was due to important changes in the editorial policy (we must remember that the double-blind evaluation principle is adopted at the beginning of the first period) but it surely reflects as well a global change in the research model. Input-output as a modern approach and field of scientific analysis seems to be increasingly recognized as a tool to deal with concrete issues in the economy.

However, it is interesting to observe that the recurrence of European contributions, compared to North-American ones, increases in theoretical and methodological fields, where it represents the 73% of the articles related to the dynamic model, and the 67% of the articles about econometrics and mathematic models, which confirms - as many research systems analysts affirm – that in Europe the basic aspects have more importance than the applied ones.

5.4 RDI as a central element of economic and social future

The Fontela bibliographic selection by André Gabus and Gabrielle Antille includes 25 references for Research and Technological Innovation. No doubt, this was one of his Emilio's favorite fields of research also reflecting the importance of the Battelle experience (essentially a technology research organization) in his professional evolution.

His theory about the need for a European policy fostering innovation has three main axes: 1) enlarging markets in order to broaden the division of labour and to encourage innovation; 2) the creation of "technological opportunities" that would eventually launch dynamic innovation process towards the implementation of important R. and D. projects; and 3) the large corporation as an important centre for the diffusion of the innovation, but preventing monopoly and the abuse of dominant positions, which must not prevent the the inevitable internationalization of European companies. (Fontela, 1987, pg. 285)

For their great modernity, I choose to mention here four examples of Fontela's work concerning R. and D., two of which have been published posthumously:

- Long-term Perspectives and the New Economy (1996)
- Technology change prospective in the XXIst century (2004)
- Innovation and scientific policy (2008)
- The future of the University (2009)

According to Fontela, the New Economy makes it possible to envisage a virtuous circle of economic growth where two main forces drive this evolution: great innovations, mainly in the Information Society, following the predictions of the Schumpeterian long wave theory, and a process of liberalization of production, markets and factors globalizing the mechanism of the neo-classical economy.

But Fontela's clear-sighted analysis and forecasting ability induced him to warn already in 1996 about the risks of such a development that would eventually become reality a decade later: "Supported by the real economy, and by the evolution of meso-economic structures, it is true that the New Economy conveys a strong anti-cyclical message. But we must never forget the other side of the coin: the financial economy does not assure stability in growth... Therefore, the fulfillment of

the promises of the New Economy and its long boom will always depend on the financial system. And the financial system is basically crisis prone." (Fontela, 1996, pg. 10-11)

In his prospective analysis of technological changes in the XXI century (Fontela, 2004) Fontela affirms that nano-bio-info-cogno convergence is the key factor for its future evolution: "it is the backbone of development". As a consequence, he asks for a scientific and technological policy in order to: 1) reasses the big socio-technical systems (health service, environmental quality, etc) through design science, complex systems, individual and social cognitive processes. 2) provide infrastructures and projects fostering the connection between scientific disciplines and the development of knowledge integration mechanisms for these disciplines to assure even a micro-scale level analysis.

These ideas are developed in Fontela and Pulido (2008), in particular in the chapter "*Reflexiones sobre el futuro de la política científica (*Reflexions over the Future of Scientific Policy), in which interventions in Europe and Spain are analyzed.

According to Fontela, the R. and D. has a long way to go to integrate into an ecosystem in which the infrastructures producing new knowledge intervene, conditioned by already available infrastructures and political and strategic bias.

His wide-ranging experience within the University led him to consider it a key strategic element. Our many conversations throughout the years and the reading of his numerous writings about the present and future of the University, inspiredme to write a fictitious interview, months after his death, about his thoughts on this important issue. (Pulido 2009)

I think that ending this chapter paper by citing his forecasting vision for Europe, in the framework of the STRATA-ETAN Expert Group (2002), can be considered as an appropriate tribute to his memory. Fontela projected three types of future scenarios:

"*A melting pot scenario could be the result of a passive attitude before present changes. A mixture of public and private, of demand and supply forces dominating, seems a low stability scenario which is not desirable.*

The "triumph of the market" scenario, lately referred to as "riding the wave", represents a situation where prevail privatization predominance, decline of public assistance, a reactive attitude towards market-oriented changes, fiscal accountability, competitiveness and efficiency. It could seem to me a possible scenario but not a desirable one from the European integration point of view.
I would rather lean towards the "creative society" scenario or "Second Renaissance", which is characterized by a proactive attitude in political elections and in the determination of objectives that match some of the observed trends but selecting them in order to avoid those who do not fit as a pattern for the future.
In this scenario of desirable future, universities are a proactive element towards competitiveness and social cohesion, essential components of public policies and key factors for the development of a creative knowledge society.
Public Universities produce public goods in the fields of education and research, although sometimes these are not always recognized as compatible with their traditional objectives" (page 151).

Chapter 6: Applied Economics and Econometrics: Models and Accounting Systems, the origin and future trends

Ana M. LOPEZ

6.1 Introduction

The Nobel Memorial Award in Economics has been given since 1969, often in connection with studies relating to the convergence between theoretical and empirical models. Special interest is devoted in this chapter to the development of modelling applied to economics (recognized with the Nobel for Frisch and Tinbergen, 1969, Klein, 1980, Haavelmo, 1989, Engle and Granger, 2003) and the development of the input-output method applied to the economy and national accounting systems (Leontief, 1973, Stone, 1984). The main scientific contributions by Professor Fontela have precisely been developed in researching the field of econometric modelling, input-output analysis and national accounting systems, contributing to the progression and culmination of quantitative research in economics. We review the development and evolution of applied econometrics from its origin to the current situation characterized by new methodological developments and the variety of the fields for their application. Accessibility to data sources and estimation using ad hoc software have enabled the development of applied econometric models. We also point out the importance of national accounting models and input-output analysis in the context of Applied Economics. The growing need for quantitative analyses referring to the economic situation of each country has led to the boom in econometric models built for the purposes of forecasting and simulating economic policies. Despite their limitations, there is no doubt about the usefulness of the major econometric models for the quantitative analysis of economic reality.

The work of Emilio Fontela, possibly the "Spanish economist best known abroad", is extremely extensive and varied in terms of subjects studied and analysed and in the approaches used in the sphere of Applied Economics. Among his more than 250 books and articles dealing with issues as diverse as sustainable development and globalization, the potential of nanotechnology, the new economy, energy sources…, his most important scientific contributions have arisen in his research into the field of econometric modelling, input-output analysis and national accounting systems. On these subjects, Professor Fontela has built up a huge corpus of theoretical and applied economics, contributing to the furtherance and improvement of quantitative research in economics, and he collaborated closely with economists as significant as the Nobel Prize winners Wassily Leontief and Richard Stone, not easily attainable for mere mortals. Forecasting and prospecting were also two areas in which Professor Fontela showed true mastery, independently of the methodological approach used, with a predilection for crossover impact analysis and probability scenarios. It is precisely this element that differentiates the figure of Professor Fontela, always interested in the future, in contrast with the cliché of economists aiming more at explaining the past as a justification of the present rather than exploring the future.

In connection with Professor Fontela's work, we review the development and evolution of applied econometrics from its origin to the current situation characterized by new methodological advances and a variety of fields in which to apply them. We also refer to the importance of national accounting models and input-output analyses in the context of Applied Economics.

6.2 The origin of Econometrics and the dichotomy between Theoretical econometrics and Applied econometrics

In December, 1930, during the annual meeting of the American Economic Association and the American Statistical Association, a group of sixteen American and European researchers urged upon the foundation of the Econometric Society in Cleveland (USA) (Christ, 1983; Bjerkholt, 1995). In its Memorandum of Incorporation, its declared corporate purpose is "to promote studies that aim at a unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking similar to that which has come to dominate in natural sciences".

In the first issue of the Econometrica journal published by the Econometric Society in 1933, the economist Ragnar Frisch provided an initial definition of the meaning of the term "econometrics" focusing on the quantitative relations in economic life. "Econometrics" is the unification or combination of statistics, economic theory and mathematics. As Frisch put it "...econometrics is by no means the same as economic statistics. Nor is it identical with what we call general economic theory, although a considerable portion of this theory has a definitely quantitative character. Nor should econometrics be taken as synonymous with the application of mathematics to economics. Experience has shown that each of these three view-points, that of statistics, economic theory, and mathematics, is a necessary, but not by itself a sufficient, condition for a real understanding of the quantitative relations in modern economic life. It is the unification of all three that is powerful. And it is this unification that constitutes econometrics".

Since its origin, subsequent definitions of the term "econometrics" (Haavelmo, 1944, Samuelson, Koopmans and Stone, 1954, Malinvaud, 1966, Intriligator, 1978) point at the same direction, the integration of economic data with mathematics, statistics and the verification of economic theories. In this context, the three key ingredients of

econometrics are economic theory, economic data and statistical methods. Klein (1962) is more precise as he has always emphasized the integration of economic theory, statistical methods and the practice of economics. For Klein, the definition of econometrics comes closer to its usefulness "The main goal of econometrics is to provide the empirical content for the a priori reasoning of economics". Therefore, neither theory without measurement nor measurement without theory is sufficient to explain economic phenomena. Hendry (1980) stressed the function of econometrics: "the three golden rules of econometrics are test, test and test; that all three rules are broken regularly in empirical applications is fortunately easily remedied. Rigorously tested models, which adequately described the available data, encompassed previous findings and were derived from well based theories would enhance any claim to be scientific". For Granger (2006) "Econometrics began as an offshoot of the classical discipline of Mathematical Statistics because the data found in economics had unusual properties". Louçã (2001) points out that "econometrics was born as a programme for the exhaustive mathematical representation of models as the legitimate form of theorizing, and for computation to serve as the practical procedure for corroborating the model".

We can differentiate econometric theory from applied econometrics. In the first case, econometric theory focuses on the development of the tools, methods and properties of econometric models. Applied econometrics refers to the development and use of econometric methods for the production of quantitative economic models and the application of econometric methods to these models using economic data. As Hendry points out (2009), "at the superficial level, applied econometrics is any application of econometrics," so all applications of econometrics implying the use of real economic data are considered to be applied econometrics, synonymous with empirical econometrics and unlike theoretical econometrics.

6.2.1 The role of Applied Econometrics in Applied Economics

Applied econometrics can be considered as a discipline within the field of Applied Economics. Although there is no clearly defined

frontier between theoretical and applied economics nor it is clear at which point one begins to separate from the other, the relevance of this differentiation between theory and application lies in the acceptance of its existence in the academic arena, thus distinguishing between the various schools of thought on the subject. Theoretical economics is based on deductive development whereas the empirical style of applied economics adopts the indications of the inductive method . The fact of the matter is that both approaches, deductive and inductive, present deficiencies when considered in isolation as to rule them out as a source for the study of the economy in general terms. In the case of deductivism, it is possible to base oneself on theories that roam really quite far from reality, implying the adoption of mistaken economic decisions. Similarly, the same would happen with a purely inductive approach, based solely on historic regularities without any underlying reflection on the behaviour of the agents. From the deduction-induction binomial, econometrics is presented as an instrument capable of combining the reality of the data with theoretical hypotheses.

Schumpeter (1971) describes Applied Economics as a way of doing economics considering the applied fields as a mixture of facts and techniques inherent to the interrelation between four branches: economic history, statistics, economic theory and sociology. For Fontela (1990), economics is a praxeological science that generates scientific knowledge as a mean for effective action in the real world in which it is developed and not knowledge for its own sake. Professor Fontela advocates for Applied Economics as combining both the deductive and the inductive approaches, respecting both the deductive method of logic as well as the knowledge obtained from the observation of statistical regularities. An Applied Economics that studies existing economic theories, and contributes with the data available to the re-alignment and advancement of current scientific knowledge. Pulido (1998) maintains that "an econometrist … must preferably opt for the inductive rather than the deductive approach, seek regularity in the facts in order to build up a new idea instead of using the principles of rational logic to infer ideas from others". In the words of the British economist Richard Stone "...the ultimate aim of applied economics is to increase human welfare by the investigation and analysis of economic problems of the real world" (Pesaran and Harcourt, 1999).

In the area of econometric models and their development in the field of applied econometrics, Klein (1971) provides an interesting narration of the pioneering works of Moore (1914) on economic cycles or those referring to the production theory of Cobb and Douglas (1928), among others, pointing out that: "the works… mark the beginnings of formal econometrics. Their analysis was systematic, based on the joint foundations of statistical and economic theory". The modern era of applied econometrics, at least as we know it today, began in the early 1940s, as acknowledged by Klein (1971), who attributes the formulation of the econometric problem in terms of Haavelmo's statistical inference theory (1943). Since its origins, applied econometrics has experienced considerable development, especially after the recognition of the work done by Lawrence R. Klein, Nobel Prize winner for Economics in 1980 "for the creation of econometric models and their application to the analysis of economic fluctuations and economic policies".

Although it is true that the discipline of econometrics has grown rapidly, and in many different directions, how has applied econometrics contributed to the development of economics as a science? The use of econometric models is normal practice to understand economic phenomena from the standpoints of structural analysis, policy assessment or focusing on forecasting. According to Kennedy (1998) "some would argue that empirical work frequently uncovers empirical regularities which inspire theoretical advances ... and that as a result econometrics has shifted from being a tool for testing theories to being a tool for exhibiting/displaying theories". Hoover (2006) defines four roles for econometrics, explaining: "the most obvious is that econometrics is used to test an implication of a theory… theory proposes, evidence disposes". In the paper by Gilbert and Qin (2006) reviewing the development of modern econometrics, the authors indicate that "a major theme which dominated much of the debate through the century was whether and how econometric models can reflect theory-generated economic structures". They maintain that social and governmental demands for economic predictions has implied a stimulus for the increase in macroeconometric modelling.

A clear example of the recognition for econometric models by the international community can be found in how international bodies, such as the United Nations, the Organization for Economic Cooperation

and Development (OECD), the European Commission, … foster , disseminate and highly estimate this methodology. In particular, the UNESCO considers the use of models in decision making processes as one of the main features defining a highly developed country in science and technology. Over the last 50 years, the main contributions in the scope of econometrics and applied econometric models have been collated, besides numerous scientific journals, in the six volumes of the "Handbook of Econometrics" published to date by Elsevier over several years, the first in 1983 and the last in 2007, and in the Palgrave Handbook of Econometrics (2006 and 2009), reflecting the recent advances in econometric methods and models, covering both issues related to the evolution of theoretical econometrics as well as those referring to applied econometrics and the data types used (time-series, cross-section, panel data) and the models applied (simulation method, Bayesian approach, spatial econometrics, …).

One of the most significant advances in econometrics in the last twenty years has been precisely the increase in the number of econometric applications implying cross-section data and panel data models. The early days and subsequent development of econometrics are closely linked to the attempts to find the most appropriate empirical scientific methodology for the economy. "To prevent econometrics from becoming alchemy" (Boumans and Dupont-Kieffer, 2011), authors such as Hendry, Leamer and Sims developed their own econometric methodologies in the mid-eighties: the general to specific approach, the Bayesian approach and the VAR (vector autoregression) approach, respectively, thus inciting further discussion.

More recently, the Nobel Prize for Economics awarded in 2003 to Granger and Engle for their progress in financial econometrics "for methods of analysing economic time series with time-varying volatility (ARCH) and for methods of analysing economic time series with common trends (cointegration)", and in 2000 to Heckman and McFadden with developments in micro-econometrics "for his development of theory and methods for analysing selective samples and for his development of theory and methods for analysing discrete choice" have highlighted their major contributions to applied econometrics. It is therefore

clear that the discipline of economics has acknowledged the influential role of both theoretical and applied econometrics in the advance of economic understanding.

Accessibility to data sources and computer software for the estimation of models have contributed to the development of applied econometric models. As Baltagi (2002) pointed out, "a lot of the recent growth reflects the rapid advances in computing technology. The broad availability of micro data bases is a major advance". Nonetheless, certain problems persist in the practice of econometrics and the information available, as already identified by Griliches (1986): "three data related topics in econometrics: errors of measurement, missing observations and incomplete data sets, and missing variables". In this same line, Hendry (2000) explains that "time-series data samples are short, highly aggregated, heterogeneous, non-stationary, time-dependent and inter-dependent. Economic magnitudes are inaccurately measured, subject to revision and important variables not unobservable". The quality of statistical information is still a source of problems when one moves into the field of synthetic methodologies and the application to specific problems of economic policy (Fontela and Pulido, 2005). Even clearer is Hollanders (2011) "to deal with misspecification error and being aware of sampling error distinguishes good econometrics from bad econometrics. Nonetheless exclusively focusing on these two sources of error suggests there are no other possible sources of error".

The growing need for quantitative analyses referring to the economic situation of each country and their reaction to external stimuli has led to the development of econometric models, constructed for forecasting purposes and the simulation of economic policy. In the specific area of econometric models applied to specific countries, we can find multiple references in specialist journals. For instance, in Economic Modelling and in the Journal of Policy Modeling over the last ten years, we can find contributions on econometric models applied to Euro-economy, Italy, Kenya, Lithuania, Malawi, Nigeria, Norway, Philippines, United Kingdom among others.

Despite their limitations, there is no doubt about the usefulness of the great econometric models as a particular approximation to a complex reality for the quantitative analysis of economic reality. As indi-

cated by Fontela (2004), "in a world in which the market economy extends to cover the entire globe, in which the new technologies of the Information Society induce a new long-term upswing for the world economy, and in which new unexpected events challenge these expectations, it is apparent that future research in the area of world modelling, with quantitative interdependent models, is again urgent and necessary".

6.3 The development of relationships between input-output analysis and models of national accounts

During the 19th century, the economic sciences grew with an essentially deductive methodology based on the tenets of classical economists. At the beginning of the 20th century it is possible to speak of the start of quantitative economics. The development of multi-equation models in different areas, whether for economic relationships (Tinbergen, 1935) or for meso-economic sectoral relationships (Leontief , 1936), marked a connection between deductive qualitative economics and inductive quantitative economics (Fontela and Pulido, 2005).

In an alternative, complementary approach to the modelling described in the section above, an input-output analysis based on Leontief's model (inter-industry relationships) and national accounting have provided the main technical instruments for the preparation of economic models. The drafting of national economic accounts and the estimation of detailed national revenue are considered to be the direct result of the emphasis given by the economist Keynes on the major macro-economic determinants of employment and aggregate demand. National accounting systems make it possible to prepare international comparisons of national income as they facilitate the presentation of the corresponding statistics in a unified format. The greatest boom in National Accounting as such possibly occurred in 1984 when the Nobel

Prize for Economy was awarded to Professor Richard Stone "for having made fundamental contributions to the development of systems of national accounts and hence greatly improved the basis for empirical economic analysis". Stone, a disciple of Keynes, considered input-output analysis to be an integral part of econometrics (Pesaran 1991).

In his work for the OECD and the United Nations, Stone promoted the systematic use of a growing volume of statistical information in an organized system. This system constituted the basic framework for the System of National Accounts (SNA) currently in use around the world as the basis for modern macro-economic analysis (Stahmer, 2002; Vanoli, 2005).

The SNA is based on a double-entry scheme with four agents: consumers, businesses, government and foreign nations. Stone's interest in the measurement of macro-economic variables is reflected in numerous papers, although the most recognized are possibly: "The construction of tables of national income, expenditure, savings and investment" (Stone and Meade, 1941) and "The precision of national income estimates" (Stone, Champernowne and Meade, 1942). In 1960, he set up the Cambridge Growth Project (Stone and Brown, 1962) in order to achieve in a single model the interdependence between expenditure and production to conduct medium- and long-term monitoring in different potential scenarios. A multi-sectoral model for the British economy combines social accounting, input-output analysis for production and consumer's expenditure behaviour. The construction of the Cambridge Growth Project Model (Stone, 1965) added Social Accounting Matrices (SAM), a later foundation for computable general equilibrium models developed later at the World Bank.

The extension of the input-output model for the development of meso-economy descriptive models was strengthened by the systematization of the input-output tables in connection with the development of national accounts and the improved fit in social accounting matrices. In the context of meso-macro or micro-meso-macro models, the input-output tables are a discrete but essential element of a wider system of observation and modelling (Fontela and Pulido, 2005). Fontela (2004) insists on this point when stating that "Leontief's world model has been one of the most ambitious methodologies ever attempted to explore the long-term future of an infinitely complex system subject to continuous

deep structural changes." As indicated by Vaneli (2005), "theoretical models are often quite far from the conditions of actual economies that statistics and national accounting have the charge to observe" … "because of the growing complexity of economies, it will be difficult for national accounting to completely fulfil its original Project".

6.4 Final comment

Econometric modelling has undergone notable progression since its origins and the initial thrust of the first economists awarded the Nobel Prize for their contributions to the field of econometrics: Ragnar Frisch, Jan Tinbergen, Lawrence Klein. Starting from the initial theoretical posits, many of the theoretical econometric developments have been fostered by technological advances in the processing of economic information (data) and their analysis with specific computer software. As shown by Hollanders (2011), "there remains a valuable role to play for econometric models; they are able to describe historical events in a systematic way no qualitative researcher can hope to do".

It is practically feasible nowadays to call on an econometric model for the analysis of the evaluation and formulation of policies or the preparation of forecasts in the majority of countries, as demonstrated by the multiple sources and references available for consultation. Many different types of data, estimators, new inference methods and diagnostic procedures co-exist alongside with many specific computer programmes (Ooms, 2009) to facilitate the advance of applied econometrics, such as Gauss, Stata, Matlab, Ox, R, Limdep, Shazam, EViews, TSP, RATS, PcGive, Microfit, Gretl, …. In the years ahead, a gradual change can be expected in the traditional macro-econometric approach and the analysis of time series, shifting towards a greater boom in micro-econometric applications and panel data research. The

paper by Pagan and Wickens (1989) already referred to the growing distinction between macro- and micro-econometrics.

The field of input-output analysis has been characterized by the quality of the initial impulse given by the two Nobel Prize winners Wassily Leontief and Richard Stone, who stressed modelling and statistical development on the meso-economic level (sectors, territories, institutions). The official incorporation of the origin and destination matrices (main information source for input-output matrices and models) in modern national accounting systems has encouraged their development but the process still entails certain difficulties. As Stone (1981) put it, "building an economic or social model is a complicated activity involving many ingredients". To model the real world, it is necessary to have data available, first of all, so that the variables we want to consider can be measured. Secondly, we need theories, hypotheses about how certain variables relate to others. As the third component, we must have estimation methods, i.e. a means to derive from the data the estimations of the unknown parameters in the model. Fourthly, we need solution methods to resolve the sets of equations constituting the corresponding model and, lastly, control methods to ensure that our solution satisfies certain conditions or restrictions.

Nowadays, there are multiple focal points of research excellence in input-output distributed around the world. Together with the more traditional British (Cambridge) and North American references (Harvard and New York), today the strength of input-output research is consolidated in Japan, India, Germany, Austria, the Scandinavian countries and in the Netherlands. Input-output is a global product of applied economics (Akhabbar et al, 2011).

Finally, a thought on Applied Economics and its frontiers quoting Professor Fontela (1990), to whom we pay tribute in this book, "Applied Economics requires, above all, a good dose of common sense, a lot of modesty and, of course, the best statistical and mathematical techniques so that the contrast between theory and reality, while never reaching impossible perfection, is always the best that can be achieved. Quantitative methods applied "cum grano salis" are, in the end, indispensable in Applied Economics".

CHAPTER 7: Emilio Fontela: a Pioneer of Qualitative and Quantitative Structural Analysis, Forecasting and Scenarios[125]

André GABUS and Alexandre HAWTHORNE

7.1 Introduction

Emilio Fontela was an economist and researcher of the highest caliber, indeed one of the great economic researchers of our time. He was a "technical" economist in the broadest sense of the term. He was an expert in economic theory and analytical methods-in fact he was an innovator in analysis and forecasting methodologies. However, for him these methods were intimately linked to statistical, quantitative data, qualitative elements and an understanding of what really went on in the economy and in society in general.

This Chapter is centred on DEMATEL method, firstly invented by Gabus and Fontela, but the frame of its applications covers a vaste range of research objectives and most of other econometric interlinked models that enlarge the scope to the overall Fontela's quali-quantitative analyses.

[125] Part of the text of this Chapter is reprinted from an article published by André Gabus in 2008 to the memory of Emilio Fontela in the French periodical *FUTURIBLES*. The editors of the present volume are grateful for the kind authorization to translate and publish excerpts from the 2008 article.

7.2 Quali-quantitative analysis

7.2.1 A pioneer of structural analysis and forecasting

Emilio Fontela's professional career began in the period of the 1960s when systematic economic forecasting was first undertaken in Europe (America was only a few years ahead of Europe in this area). This was a fortunate context for him given the growth both of interest in the field in Europe and elsewhere, and in the level of understanding of the tools and methods necessary to conduct meaningful forecasts. The exploration of the future became and remained Emilio Fontela's predominant area of interest, and the focus of his activities for more than forty years, the area where his extraordinary capacity for intellectual innovation would find its richest expression.

Much of his scientific reputation, in the strictest sense, was earned by his work in the areas of structural analysis and econometrics. But his real, distinguishing strength was his capacity to combine the precision of econometrics and quantitative analysis with insights from qualitative and multidisciplinary considerations. The social aspect of economics always interested him. In the course of his career he became more and more concerned with ethical and political considerations as they impacted the economy.

7.2.2 Structural analysis and the role of relative prices

As Emilio Fontela pointed out so pertinently, the interaction between economics and technology, between the society of today and that of tomorrow, is expressed by prices. He liked to underline that when a

phenomenon of scarcity appears and becomes more marked over time, its course is steered above all by the evolution of prices. When prices demonstrate, by their increase, that supply will not satisfy demand, the economy calls upon technology to step in; nothing stimulates scientific and technological creativity as much as the perspective of increasing scarcity. We observe this today with rising fossil fuel prices and the boom in alternative energies, particularly renewable energy sources.

Prices, initially and fundamentally the *consequence* of supply and demand, can thus become a part of the causes of change. This paradox -effects which become causes and vice versa –did not escape his attention, and became a focus of his insights in his research and application of structural analysis, one of the tools which Emilio Fontela, the thinker, brought to bear, together with mathematics, in his reflections on the world around him.

The relative prices of different goods, and between goods and services, were at the heart of many of Emilio Fontela's analytical works, his reflections about the future and of the questions with which he confronted his colleagues. One of his first articles, written some 50 years ago in the context of the ACT program[126], was devoted to this issue. At that time, J. Fourastié had stimulated the profession with his vision of the burgeoning service economy. As incomes rose and the prices of manufactured goods declined, consumers would devote more and more of their incomes to services in every form.

With respect to environmental issues in general and clean energy in particular, he considered that prices have a central role, given

[126] *Aids to Corporate Thinking (ACT),* a program forecasting changes in the business environment, conducted in 1965-1969 with the support of the most important corporations in the United States and Europe by the Columbus and Geneva research centers of the Battelle Memorial Institute. This program continued in Europe as the *Explor* project, complemented by *Invest* and *Sociometrica* (the latter project analyzing the profile of consumers in the future) and, subsequently by *Multitrade* (future orientations of international trade).

that regulation by legal means is ineffective or simply inapplicable in the current state of the globalized economy. In its absence, regulation through taxation or imposition of contingents with tradable pollution permits has the effect of shifting to cost of pollution back to the polluter and consequently to modify the relative prices of goods: the price of a given product compared to another will better reflect the pollution its production engenders. The demand for goods, the production of which is associated with high pollution levels, will be held back by the "invisible hand" of the market.

Emilio Fontela participated in numerous international meetings on the subject of national accounting and contributed to the discussions on techniques for measuring added value at constant prices. From this he developed a complete system for measuring overall factor productivity based on technical progress and its impacts on each sector, which are transmitted through changes in relative prices and spillover effects. These insights found their application in the analysis of input-output systems, another area which was a focus of his research activity, but there again he introduced a new dimension to this method, often limited to identifying production inputs, by introducing the potential to demonstrate the impact of gains from innovation.[127]

These contributions to economic science were preceded by, or conducted in parallel with, projects for industry or for service sectors such as tourism.

7.2.3 Input-Output Models, Consumption function and forecasting

The development of so-called multi-client research projects under contract with groups of major companies, government agencies and

[127] Citation from Gabrielle Antille Gaillard

international organization became one of the hallmarks of the research activity of Battelle-Geneva in the 1960s and 1970s under the leadership of Fontela. This success was preceded and inspired by advances in applied econometrics. Thanks to the development of detailed statistics on household consumption, which became generally available in the 1960s and particularly to the joint efforts of the Nobel laureate Richard Stone, Emilio Fontela, by then director of the department of applied economics at Battelle-Geneva, and André Duval, who at that time directed the center for calculation and numerical analysis at the Geneva research center, it was possible to set up equations and resolve a complex model of consumer expenditure which proved robust and credible.[128]

Among these projects, *Explor,* using input-output models of the European economies to generate macro-economic and sectorial (or meso-economic) forecasts was one of the first truly multi-disciplinary projects at Battelle; the engineers used the sectorial forecasts as a framework for their projections of demand for industrial goods and services, and the economists used the output of market studies, feasibility studies or observations on the evolution of particular technologies to adjust the 'technical coefficients' in the input-output matrices of their meso-economic models.[129]

Thus, thanks to the initiative of Emilio Fontela, the first attempt to quantify using input-output methods the meso-economic and micro-economic evolution of a highly integrated industrial sector, in the event the chemical industry, was initiated. The forecasting model, 'Input-Output chemistry' (*I/O chimie*) was conceived to show inter-industry exchanges in physical units, in contrast to more traditional meso-economic models, expressed in values; thus in this model of a single sector

[128] Linear Expenditure System (LES). For more details about LES, see Chapter 13 of this Volume. For more details on I/O Models and Macro-Models see Chapter 3 and 10.
[129] Interviews with Michel De Vos and Claude Massetti

the technical coefficients are “doubly” technical, and the model generates results in physical terms which decision-makers can interpret directly.

Apart from general guidelines, each client of *I/O chimie* benefitted from a coherent framework in which to evaluate strategies of investment, sourcing and marketing in differing economic environments and contexts, which they could simulate.

The inputs to the sub-sectors of the chemical industry comprised both raw materials serving as energy sources (coal, petroleum) and supplies of energy as such (including nuclear energy). The introduction of prices and conduct of simulations based on their possible variation meant that the economic impacts of the later petrol price shocks were less damaging than that of the initial crisis. Earlier reflections on the consequences of changes in relative prices of intermediate products and the diffusion of new technologies demonstrated their value at this time.

7.2.4 Trends and Events

After the first oil crisis-that collision between events and trends-it became necessary for forecasters to take account of multiple scenarii, and thus to have available forecasting tools which permitted their simulation. More generally, a rapidly changing international environment demolished the criteria of reference which had served economists for a generation and rendered existing prediction models obsolete. These treated only some of the factors which were changing the face of society. Aids to decision turned away from simple extrapolation of the events of the past and sought to incorporate the insights and opinions of experts on how world events influenced each other, through a better understanding of the underlying factors at work and their modes of interaction.

This "oil shock" of the 1970s brought about profound changes, not just in the economic, social and technological systems as they had hitherto functioned but also political changes affecting national economies, business sectors and international governance. It was also a turning point, where economists were challenged to reconsider the theories and policies which had guided their actions over decades, and use the new analytical tools, both quantitative and qualitative, at their disposal, to attempt to comprehend the new trends and new risks impacting on the world economy. The 1970s were the decade which saw the shift from the dominance of Keynesianism to the doctrines of monetarism and Friedmanism, both marked by the intolerance of their proselytizers towards the prevailing orthodoxy, from the practice of state intervention to an uncritical faith in the virtues of untrammelled markets, and from cooperation between developing and developed countries to a policy of confrontation (as in the oil crisis) and to the debt crisis. Emilio Fontela, professor of national accounting, had never been an uncompromising "macro-economist". As a result of numerous conversations with Otto Hieronymi, who was at the time responsible for a program of short-term macro-economic and sectorial forecasts at Battelle, Fontela soon became skeptical of the reductionist prescriptions of the monetarists who sought to limit the role of public authorities and of central banks in particular, to a fixation on the basic equations of monetary theory.

His principal efforts and theoretical contributions during the period of the "paradigm shift" at the end of the 1970s and beginning of the 1980s were made in the context of "*Interdependence",* a major project initiated by ENI and carried out over some four years with the participation of Battelle's Geneva research center. The purpose of this study was to analyze and describe all consequences (economic, social, technological, foreign trade effects, balance of payments etc.) of different scenarios for the price of energy, both for petroleum importers and exporters. Dozens of researchers and a small army of experts contributed to this ambitious project. Numerous models were used, adapted for the project or designed specifically to fit its requirements. Qualitative approaches were also used. The project's thesis and its principal conclusions, supported in great detail by the results of the simulations, was

that there existed a dynamic interdependence between exporters and importers of petrol and that the optimal strategy for both groups was a combination of *competition* and *cooperation.* A development of petroleum prices characterized by long periods in which prices were "too high" or "too low" was damaging to the long-term interests of both groups and to the world economy. These conclusions, which fell on deaf ears 30 years ago, appear once again to be of great relevance. [130]

It was also during this period that the Club of Rome mobilized some of the most outstanding minds. It attained notoriety thanks in particular to the application of systems dynamics, as developed by J. Forrester, which led to the identification of limits to growth; for the first time, the question of how the world's natural resources should be managed was clearly formulated. Through the contribution of H. Ozbekhan the Club of Rome confronted forecasters with a less well-publicized precondition for meaningful reflections about the future: the consideration of the "world problematique", the non- correspondence between desirable and probable futures for the planet.

Emilio Fontela chose to follow this second path, focusing more on understanding problems and their interrelations than simply forecasting them. At his instigation, the Battelle foundation launched the Dematel enquiry on the perception of major issues by decision-makers worldwide[131]. For the analysis of the results of the enquiries he proposed a method of structural analysis based on Warfield's *Interpretive Structural Modelling* (1982) to determine which among the problems could contribute, if resolved, to a general solution and which were rather objectives or aspirations. Emilio Fontela's approach was subsequently applied to regional development issues in France and in

[130] Participants from ENI were in particular, Martino Lo Cascio, scientific coordinator of the team, and Marcello Collitti, ENI high executive and promoter of the Project, Emilio Fontela, Eugenie Sallin and Otto Hieronymi (of Battelle Institute) and Ibrahim Ibrahim (OAPEC).

[131] *Futuribles* published a report on this project. See Fontela, 1978

Spain[132]; it has more recently been further developed and applied in Japan and Taiwan.

In the area of regional development, Emilio Fontela made meaningful and significant contributions to reflections and programs for regional development. He was frequently invited to contribute to the work of the Collège des Techniques Avancees et de l'Aménagement du Territoire, under the direction of Jacques Bloch-Morhange, where he contributed to the methods and theories which have shaped French regional development policies over several decades.[133]

7.3 The DEMATEL Program

In the marvelous kaleidoscope of Emilio Fontela's multiple reflections on society and the economy, special mention should be given to his initiatives, notably of a methodological nature, in favor of structured qualitative analysis.

What was this all about? A picture is worth more than a thousand words, it is said. And yet canteen-tabletop sketches usually stay with individuals or little groups, as attempts to capture the complexity of issues they are confronted with or developing. If particularly effective, such sketches sometimes become teaching aids. For their part, publications increasingly use computer-generated visual supports for their reporting, referred to as infographics.

Less widely used, the oriented graph, associated with a matrix of relations, has yet greater explicative power. It is a method which is at once logical and visual, through which the driving factors and the causal relations in a system can be highlighted.

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[132] In particular by his friend and ex-employee Eric Morand
[133] Interview with Gérard Bloch-Morhange

7.3.1 The Method

Ill-defined elements that are related in complex systems are difficult for the human mind to grasp. However, it is possible to improve the quality of rational decision-making by using appropriate "think-tools" – that is, techniques that help to sharpen perceptions of the complex system. Researchers such as Harary (1969), Simon (1969), and Warfield (1976) have pioneered the development of such tools. These tools and techniques can be categorized by formalized logic, and can usually be expressed in mathematical terms (such as Boolean algebra, vectors and matrices, graph theory, fuzzy sets, and neural networks). The simplest and most frequently used tools deal with complexity that can be reduced to components (elements, items, variables) and their binary relations.

From an initial inspection of relations between pairs of components, the formalized logic tools facilitate an exploration of higher-order interactions that go well beyond the capacity of conscious bounded rationality. Although they are oriented towards the handling of qualitative data (mainly individual perceptions), these tools have also been used in quantitative modelling of large-scale sets of interdependent equations (Fontela & Gilli, 1977).

Through a synthesis of the applications of structuring methodologies, Warfield (1994) defined several possible structural types, and demonstrated the many elemental classes that can be considered (such as goals, budget items, problems, and so on). He also demonstrated possible types of relationships that can link these elements – such as definitive relationships, comparative relationships, influential relationships, temporal relationships, spatial relationships, and mathematical relationships).

As an example, in an ‘intent structure’, an individual observer might use the following words to express the fact that objective *a* ‘influences’ objective *b*:

‘Attaining objective *a* helps to attain objective *b*.’

This information can be translated into one element of a binary matrix of influence (as shown in Figure 7.1).

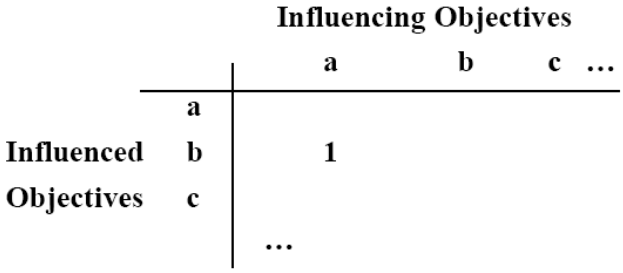

Figure 7.1

The value of 1 at row *b* and column *a* shows the influence of *a* upon *b*.

The meaning attached to the relationship depends upon the context. For example, according to Broome (2002), a similar cell in a binary matrix corresponds to a statement that ‘obstacle *a* significantly aggravates obstacle *b*’ (with the term ‘obstacles’ referring to barriers to communication). According to Fontela & Gilli (1977), a similar cell in a binary matrix corresponds to a statement that ‘variable *a* is a mathematical cause of variable *b*’ (in the context of an econometric model). According to Fontela & Gabus (1976), who presented the Dematel project on the world problematique (see below under 2.1 Applications), a similar cell in a binary matrix corresponds to a statement that ‘the solution of world problem *a* will help bring a solution to world problem *b*’.

Interpretive structural modelling (ISM), as applied in Broome (2002), is an advanced interactive planning methodology that allows a

group of people, working as a team, to develop a structure that defines the relationships among elements in a set. The structure is obtained by answering simple questions. The elements to be structured (such as objectives, barriers, problems, and so on) are defined by the group at the beginning of the ISM planning session. The group also specifies a relational statement that defines the type of relationship desired (such as 'aggravates', 'enhances', 'contributes to', 'precedes', and so on). The initial matrix of information is directly derived from these data – either from consensus after discussion or simply from individual answers.

To extract the knowledge content of the perceived matrix of binary relations, several analyses can be performed. These lead to the preparation of an ordered structural graphic. Whereas Warfield (1976) suggested that Boolean algebra be used, Fontela & Gilli (1977) used graph theory and Fontela & Gabus (1976) used matrix algebra. Nevertheless, the purpose was the same – to be able to permute the initial matrix optimally to obtain either a fully triangular form or a block triangular form.

Respondents to the survey on world problems were given several problems and were asked to indicate their assessment of the direct influence that each problem exerted on each of the others (according to a scale from 0 to 3 where 0 = no influence, 1= low influence, 2= high influence, 3=very high influence). In addition to being asked their opinion of how a problem *aggravates* another, they were also asked to consider the *positive* influence of *a* on *b* – that is, the contribution that a solution to problem *a* might have in producing a solution to problem *b* (a 'solution' being defined as any improvement in an unacceptable situation).

The answers of each respondent were arranged in a matrix X^*. A typical element in this matrix, x^*_{jk}, indicated the direct influence that the respondent believed problem *j* to exert on problem *k*. If $x^*_{jk} = 0$, *j* was believed to exert no direct influence on *k*; in contrast, if $x^*_{jk} = 3$, *j* was believed to exert the strongest possible direct influence on *k*.

The respondents were requested to indicate only direct links. Empirical observation suggests that there are transitive properties in the system such that most problems are indirectly related.

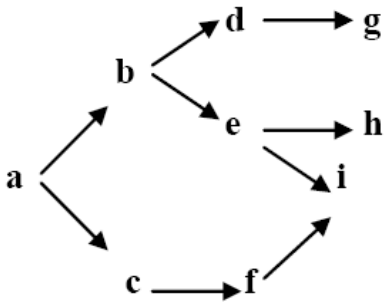

Figure 7.2

In the hierarchical graph portrayed in Figure 7.2, problem *a* has a direct influence only on problems *b* and *c*. It also has indirect effects – first on *d, e, f*; and secondly on *g, h,* and *i.*

In a matrix notation, the direct links (*a–b, a–c, b–d, b–e, c–f, d–g, e–h, e–i, f–i*) are recorded on a binary matrix A (see Figure 7.3; empty cells = 0).

A =

	a	b	c	d	e	f	g	h	i
a		**1**	**1**						
b				**1**	**1**				
c						**1**			
d							**1**		
e								**1**	**1**
f									**1**

Figure 7.3

The first-order indirect links (*a–d*, *a–e*, *a–f*, *b–g*, *b–h*, *b–i*, *c–i*) are recorded in the square of the matrix A^2 (see Figure 7.4). The second-order indirect links (*a–g*, *a–h*, *a–i*) are recorded in the next power of the matrix A^3 (see Figure 7.5). In this process, matrix multiplications are used — by which the element in the *j*th row and *k*th column of A^2 is the sum of the product of each element in the *j*th row of A with the corresponding element of its *k*th column.

A^2 =

	a	b	c	d	e	f	g	h	i
a				**1**	**1**	**1**			
b							**1**	**1**	**1**
c									**1**

Figure 7.4

The second order indirect links (*ag*, *ah*, *ai*) are recorded in the next power of the matrix A^3 (Fig. 7.5).

$A^3 =$

	a	b	c	d	e	f	g	h	i
a							**1**	**1**	**1**

Figure 7.5

Given a configuration such as the one described above, the influence exerted indirectly by problem *a* on problem *h* can assumed to be smaller than the influence that problem *a* exerts on problem *e*, and again smaller than the influence exerted on problem *b*.

A process compatible with this assumption can be obtained without distorting the respondents' pattern of responses. This is achieved by multiplying each element of x^* by λ λ (the reciprocal of the $\lambda = max\{max \sum_j X^*_{i,j}, max \sum_i X^*_{i,j}\}$)

$$X = \lambda X^* \qquad (1)$$

and by then defining the elements of a matrix X^2 as being the sum of the products of each element in the *i*th row of X with the corresponding element of the *j*th column of X (and so on for the following powers of X).

This definitional assumption was required by the fact that the respondents were asked to give their evaluation of direct effects only. It assumes a continuous decrease of the indirect effects of problems along the chains and, therefore, guarantees convergent solutions to matrix inversion. This being so, the infinite series of direct and indirect effects has a finite sum given by the following expression:

$$X + X^2 + X^3 + \ldots = X\,(I\text{-}X)^{-1} \qquad (2)$$

where X is the normalised matrix defined in (1), I is the unit matrix and $(I–X)^{-1}$ the inverse matrix of (I–X).

This expression measures the direct and indirect effects of the problems as implied by the answers of the respondents, under the assumptions described above.

The analysis of the matrix of direct-indirect links $(X\ (I-X)^{-1}$ shows that, in many cases, there is an influence of problem *i* on problem *j*, together with an influence of the same problem *j* on problem *i*. If both links are also found in the direct matrix X, there is a *loop* between problem *i* and problem *j*. If one of the links is indirect, there is a *cycle* connecting problem *i* and problem *j*.

If all the cells of the matrix $X\ (I-X)^{-1}$ containing a relation are given a value 1, and all of the empty cells are given a value of 0, a new binary matrix (B) is obtained.

By adding to B its transposed matrix (B'), a matrix P is obtained. Using both B and P, a matrix C can be constructed in which the elements are:

$c_{ij} = 0$ — if no link exists between *i* and *j* ($b_{ij} = b_{ji} = 0$);

c_{ij} = nd — if problem *i* does not influence, directly or indirectly, problem *j*, but problem *j* does influence problem *i* ($b_{ij} = 0$, $b_{ji} = 1$);

$c_{ij} = 1$ — if problem *i* influences problem *j*, but problem *j* does not influence problem *i* ($b_{ij} = 1$, $b_{ji} = 0$); and

$c_{ij} = 2$ — if problems *i* and *j* are related in a cycle ($p_{ij} = 2$).

By appropriate permutations of matrix C, it is possible to identify groups of problems in different connected interactive cycles. These groups are constituents between which there are no feedbacks. The information allows for the use of structural graphics that show the cycles and the relations between them.

Thus, from 1973 onwards, Emilio Fontela developed this program which made it possible to analyse the individual responses to the enquiry referred to on perceptions of the "world problematique"[134] and the way in which one issue influences another. A much more complete presentation is contained in the unpublished document issued as *The DEMATEL Observer* [135]. This tool was developed a few years later by a team under his direction for application to corporate issues. An iterative calculation system, based on Excel, was set up. For the best overview of qualitative structural analysis the reader should however consult the most recent text, entitled *About Qualitative Structural Analysis* [136].

A first objective (and product) of DEMATEL (*DE*cision *MA*king *T*rial and *E*valuation *L*aboratory, a Battelle Institute, Science and Human Affairs programme, started in 1971) has been to study the changing nature of this problematique. Hence the references below to the Dematel survey.

To consider actions as a function of problem perceptions seems a sensible working assumption. In 1973-74 this worldwide survey was conducted to analyze the perceptions of those individuals with a position in society which enables them to synthesize a large amount of information on world issues and to exert influences on actions related to those issues.

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[134] Fontela, E. and A. Gabus : " Current Perceptions of the World Problematique ", in : C. West Churchman and Richard A. Mason, eds., *World modelling: A dialogue*, Amsterdam / Oxford and New York, North-Holland and American-Elsevier, 1976, pp. 81-88

[135] Fontela, E. and A. Gabus : *The DEMATEL Observer*, Dematel 1976 Report, Battelle Institute, Geneva Research Center, 1976, p. 87.

[136] Bolaños, R., E. Fontela, A. Nenclares and P. Pastor: "Interpretive Structural Modelling in Strategic Decision-making Groups", *Management Decision*, 2005, Vol. 43, Issue 6, pp. 877-895

7.3.2 Scenarios

The 1960s were beyond doubt the golden age of medium and long term forecasting. Steady growth, the spread of American consumption patterns to the Northern European countries and the efforts of the South to catch up, allowed quite reliable forecasts to be made. In the 1970s, shifts in consumption patterns of the richest segment of the population, technological changes and most notably the world petroleum crisis changed everything. The forecasts were requalified as simple projections. Econometric models became tools for exploring different futures. Even before the massive increase in petroleum prices, preliminary simulations of the effects of their possible change on the economy were conducted (in particular, an oil company among the sponsors of the ACT/Explor multi-client study [137]asked Battelle-Geneva to conduct such a simulation).

In the United States and at Battelle-Columbus in particular, these questions about the future were translated into scenarios, worked out by task forces; appropriate procedures were developed. After a short training course with Olaf Helmer and Selwyn Enzer at the *Institute for the Future* on the East Coast of the United States, André Gabus brought two tools back to Battelle-Geneva: the Delphi method and cross-impact (X1) analysis.

The Delphi method compares the viewpoints of experts by questions posed in an iterative process, where the participants' anonymity is assured. It is used in the first stage of cross-impact analysis to estimate the likelihood that a sequence of events will occur. It is then up to the experts to estimate the conditional probabilities of the events under study if one of them should occur. A calculation then gives sequences of events, which constitute likely scenarios. The use of mathematical tools thus allows a better grasp of the complexities involved in projecting alternative visions of the future.

[137] See the bibliography of Emilio Fontela

The reference to experts' judgments calls for some explanation. A decision-maker either relies on intuition, or to professional opinions on a given subject. One can observe that persons who are particularly interested in a particular subject, be they engineers, researchers or economists, are constantly and unconsciously reflecting on the future. These projections, continually being made under circumstances which vary constantly, form a learning process. These specialists have valuable resources of knowledge in a form which has not yet been structured. The cross-impact method makes the individual, or groups of individuals, reflect on their own thought processes so as to formulate their views of the future.

At Emilio Fontela's suggestion, the cross-impact method as formulated in the United States was passed on to André Duval, by then director of the Department of Physics and electronics at Battelle-Geneva. He revised it to take better account of probability theory and extended it, notably by introducing the concept of sequential applications (or at least, dating the events), taking account in addition of the indirect relations between events and making it possible for the user to participate in the calculations using a console showing each stage of the calculation and the range of conditional probabilities.[138]

7.4 Multiple interests and further developments

The increased importance accorded to experts' opinions in the decision-making process, described above, led Emilio Fontela to take a personal interest in these tools for generating alternative scenarios of future events. Together with André Duval he further developed the method of cross-impacts between likely events (*cross-impact analysis*

[138] Duval, A., E. Fontela and A. Gabus (1975) "Cross-impact analysis: a handbook on Concepts and Applications" in Maynard M. Baldwin. *Portraits of Complexity: Applications of Systems Methodologies to Societal Problems"*

initiated by O. Helmer and S. Enzer)[139] both on the conceptual and practical levels, notably to identify exogenous and instrumental variables for econometric models. For these independent variables, the modeler steps back and leaves their formulation to the experts consulted. One of Emilio Fontela's more recent publications (Fontela, 2000) discusses the importance of the relationships between scenarios and prospective models.

The complementarity between the elaboration of scenarios (or likely sequences of events) and the use of models (which generate trends) came fully manifest at the beginning of the 1980s when Emilio Fontela worked with Martino Lo Cascio in designing the "Interdependence Model" (this involved linking a large number of individual models to simulate and project the complex interdependencies between petroleum exporters and importers, see also Chapter 3, section 3.3).[140]

Both in the application of cross-impact analysis to the most likely development scenarios (for instance, for Spain[141]) or to the structural analysis of world problems, Emilio Fontela devoted much attention to those elements of the systems studied which were shown to be both consequences and causes and thus were the source of circularities which could both provide insight into reality and cloud understanding of the real sequence of events (on this issue, see Fontela 2003). He and André Duval then realized that the introduction of a time dimension or of a new causal element not so far included in the model could unravel

[139] Cross-impact analysis, like the Delphi method which preceded it, is an instrument based on the assumption that experts have a repository of ill-structured knowledge in their minds which can potentially be accessed to help predict future events and the likelihood of their occurrence.

[140] Statement by Otto Hieronymi, Webster University, Geneva at the Round Table in memory of Emilio Fontela, on the occasion of the 6th annual international seminar on "Ethics, finance and Responsibility", Geneva 14-15 September 2007

[141] As a part of the SIM SPAIN program, carried out in 1972 for the Spanish national Planning Agency by J. Burle de Figueirdo, J.-M. Belloy and A. Gabus, and subsequently further developed in 1980 at the request of the Office of the President of the Spanish government, for the *Instituto Nacional de Propectiva.*

these loops[142]. This was particularly the case for the apparent ambiguity in the role of prices, referred to at the beginning of this article.

His curiosity both about the methods themselves as for their applicability to understanding reality and projecting the future, knew no limits. In more recent years the growth of the new information and communication technologies drew his attention. He worked closely with Gerold Bloch-Morhange on these subjects. One of the more original products of their collaboration was "the cube", a study of the forms and patterns of third-generation mobile telephone use[143]

During the last years of his life, up until the onset of the illness to which he was to succumb in 2007, Emilio Fontela taught at the Nebrija University, in Madrid, where he was dean of the Faculty of law, economics and business. He left concrete proposals for the future in three areas

-energy

-the geo-strategic relations between Europe and the Mediterranean countries

-the emergence and dissemination of innovative technologies in a new and stable knowledge-based society [144].

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[142] This approach corresponded to the constraint then identified, according to which for a cross-impact analysis which takes account of conditional probabilities, the events analyzed should be defined in such a way that only one causal effect can occur between each pair of events. Dating the events facilitates such definitions. (Duval, 1975)

[143] Conducted by the Airtel foundation and taken up by several telecommunications research institutes

[144]From the memorial address of Fernando Fernandez Mendez de Andés, rector of the University of Nebrija, in Madrid, given on the occasion of the Round Table in memory of Emilio Fontela, held during the 6th annual conference "Ethics, finance and responsibility" organized by the Observatoire de la Finance, Geneva, 14-15th September 2007)

In the case of energy, his approach played a decisive role in negotiations of the Community of Andean Nations. As margarine had been proven to be the "butter of the poor" he perceived that petroleum might become the "fuel of the wealthy", both on account of its increasing scarcity and of the costs of its deleterious effects on the climate, which would eventually have to borne by its users. On this subject he wrote on of the authors: "Your article on biofuels derived from tropical forest plantations interests me. I am now advisor to president dos Santos of Angola and I am trying to convince him to develop alternative energies for domestic consumption, leaving petroleum for export. In this context your project (developing forest plantations on the wet savannas of the Batéké plateau) near Kinshasa interested me greatly". Petroleum for export, and, in another context, olive oil for export…the classical economic principle of comparative advantages among countries was reexamined by Emilio Fontela in the light of the guiding theme which was one of his central interests, changes in the structure of relative prices. In effect this theme left its mark on all his reflections about today's realities and their likely evolution.

Regarding the development of relations among the Mediterranean countries, he proposed a treaty to complement their agreements with the European Union. He saw such a treaty as dealing with issues of the environment, urbanism, adult education, energy and the promotion of the knowledge-based economy.

He expressed his conclusions at the final presentation of the "Morocco in the Maghreb in 2030" project, in March 2007. This prospective study, on which he worked for three years with the High Commission for planning of the Kingdom of Morocco, developed scenarios on the Moroccan economy in the context of economic integration of the Maghreb countries. His comments, on questions of tourism, energy and agriculture, and in particular his brilliant summary, attracted much attention.

Emilio Fontela devoted much attention to studying the future interaction of nanotechnologies, biotechnologies, information technology and cognitive research (NBIC), which he regarded as the central driving force of the knowledge economy. He followed and promoted the research activities on these subjects conducted by Juan A. de Castro,

professor and coordinator of the group for futures research and international economics at the University of Nebrija, promoting the use of structural analysis, critical path analysis, structured graphs etc, the tools described above.

This homage should not be limited to Emilio Fontela's contribution as a "thinking machine", however complex and subtile he may have been. Awareness of intangible values, intuition and idealism was as much a part of his makeup as was rational thought. As a thinker, Emilio Fontela believed that futurology must go beyond the exercise of the rational. For him, creating visions of the future required teamwork and the pooling of individual talents (see Fontela 2006)

Central to this teamwork, the analysis and extrapolation of trends was the basic tool extensively referred to in this article, which describes his contributions to developing econometric models. The consultation of experts and the use of tools to structure their judgements on the likelihood of future events was an essential complement to trend analysis, allowing the possibility of shifts or indeed ruptures in existing trends to be identified. His implication in the development of cross-impact analysis has already been referred to.

Among the human talents, he was particularly fascinated by the role of intuition. He considered that intuition deserved a place in patterns of logical reflection. Although knowledge about the sources and nature of intuition are still very limited, he regarded it as a perception of value for exploring the future, as an indispensible element in anticipating otherwise "unthinkable" events. He shared M. Godet's view that futurology is "…an art which requires many talents, including intuition, non-conformity and common sense" (Godet, 2001, p. 258).

To this he added creativity-both a process and a gift[145]. Neither did he exclude value judgements-far from it. Although he concentrated on forecasting the future, he also accorded much importance, though more discreetly, to normative visions of the future, to utopias based on defined values, and to ideal states of the world. This very open, not to say artistic, approach to forecasting did not hinder him from making

[145] He wrote "*..il prospettivista è un artista dotato di rigore scientifico*" in Fontela 1997, p.10

full use of rigorous methods, such as the structural or morpho-logical analytic techniques referred to. He considered these tools in particular as aids to deciphering the complexity of each issue.

With regard to our society's values, Emilio Fontela had expressed in various contexts his disquiet about the threats which theory and the current practices of globalization represent to the optimal development model, which is characterized by a constant search for balance between responsible government and market forces, between economic efficiency and social responsibility.[146] He expressed these preoccupations explicitly at the conference of Alcantara at the conclusion of which he participated, as co-author, in the publication of the Alcantara Manifesto in October 2005. In short, he became an exponent of the social market economy. As such and in many other ways, Emilio Fontela deserves to be classed among the economists of the Geneva school, which he himself recently proposed to recognize.[147]

The multiplicity of Emilio Fontela's contributions to forecasting are well summarized in the following testimonial: "(…) he was able (…) to communicate to everyone who worked with him his driving urge to extend the range of the possible, to rise above the circumstances of the present and to limit his prospections of the future only by his ideas of right and wrong. For him the exploration of the future was above all

[146] From the memorial address of Otto Hieronymi, Webster University, Geneva, on the occasion of the Round Table held during the 6th annual conference "Ethics, finance and responsibility" organized by the Observatoire de la Finance, Geneva,14-15th September 2007

[147] In his presentation on "The spirit of Geneva and the Geneva school of economists" given on 14th February 2007 at the 12th annual humanitarian conference at Webster University on the spirit of Geneva in a globalized world, Emilio Fontela spoke about three economists: (i) his colleague and friend Luigi Solari, a pioneer in econometrics at the University of Geneva; (ii) his mentor Jacques l'Huillier who introduced him to political economics and from whom he learned much about the theory and practice of international economic cooperation; and (iii) Wilhelm Röpke, the principal exponent of the social market economy.

an act of faith in the ability of mankind to control its destiny. 'Prospection is above all, rationalized emotion (the rationalization of hope?)' as he liked to say." [148]

This side of Emilio Fontela was not evident to those who knew him less well. But it is certain that for all of us who dealt with him, he remains the architect of thought who rendered complex issues accessible to a wider circle.

In the 1990s Emilio Fontela began to take an interest in the "social market economy" and its important contribution to the success of the post-war recovery[149]. The importance of this concept, based on a balance between a liberal and competitive free market on the one hand, and a conscience and social policies which prevent the weakest from being marginalized, become apparent at the end of the Cold War when the countries of Central and Eastern Europe which had finally thrown off the communist yoke were confronted with the choice of an economic model: should they adopt "shock therapy" (the option promoted by Anglo-Saxon economists in particular) or rather a "social market economy" (an option proposed in a study conducted by the Battelle Institute, Geneva)?[150]

The direction which globalization has taken, but also that taken by the *debates* about globalization from the 1990s onward, became a growing source of preoccupation for Emilio Fontela. He had worked all his life in an environment of competition, and had, all his life, been a

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[148] From a statement by His Excellency Ahmed Lahlimi Alami, High Commissioner of Planning of the Kingdom of Morocco, contributed for this article.

[149] He commissioned an article of this subject for the review ARGUS, Barcelona, of which he was then editor.

[150] Cf. Otto Hieronymi: *Economic Policies for the new Hungary: Proposals for a Coherent Approach.* (Prepared with the participation of an International Group of Experts), Battelle Press, 1990. Emilio Fontela belonged to this group of experts. The conclusions and numerous recommendations concerning the social market economy were incorporated into the program of the government (1990-1994) of Jozsef Antall in Hungary, the only ex-communist country which attempted to make the transition to a free economy according to the model of the "Social market economy"

"liberal" in the best sense of the term. As an economist and forecaster whose major contributions concerned the international consequences of economic phenomena, he was deeply disquieted by the extremism of free-market advocates who denied that the State had any role to play in the economy and by the inability of the economists of the "neo-liberal establishment" to make any meaningful contribution to analyzing and proposing solutions to the problems with which the world is confronted, be it the short or in the long term. These preoccupations emerge from the *"Manifesto of Alcantara",* published after a symposium held in 2005 on the social market economy and Latin America.[151]

For Fontela, neither pure theory nor econometrics based on ever more sophisticated analyses of statistical series can, on their own, provide a satisfactory explanation of economic reality, nor serve as a solid basis for forecasts or for policies. With biting irony, he qualifies the arrogance and narrow-mindedness of each of today's dominant schools, both of which refuse to-or are incapable of- looking for a meeting point between rigorous theoretical hypotheses and the observation of reality, between quantitative methods and the qualitative approach. He believed it vital to combine theory with practice, analysis with synthesis, and integrate the results of the deductive and inductive methods:

«A lot of mainstream economists today are not realistic. If you are on the deductive side, you don't want to be realistic. As a matter of fact, most economists think that the real world is just an error. The real world is an error. It is just wrong, because people are doing things the wrong way. If they did things right, then economists would be right. But unfortunately, the real world is wrong. This is the lack of realism"**.**[152]

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[151] FONTELA, Emilio, GUZMAN, Joaquin, HIERONYMI, Otto: *Alcantara Manifesto* http://manifiestoalcantara.blogspot.com/, FONTELA, Emilio Montes and GUZMAN, Joaquin Cueva (Eds): *Brasil y la Economia Social del Mercado,* Cuadernos del Grupo de Alcantara, 2005

[152] FONTELA, Emilio: "The Geneva School of Economics and the Spirit of Geneva" in HIERONYMI, Otto and INTAG, Kathleen (Editors): *The Spirit of Geneva in a*

Chapter 8: Complex Systems Bibliographic Survey: from DEMATEL to TOPSIS. A Preliminary Overview

Isabella CARBONARO

8.1 Introduction

The DEMATEL method (Decision Making Trial and Evaluation Laboratory) was developed by the Battelle Geneva Institute: (1) to analyze complex 'world problems' dealing mainly with interactive man-model techniques; and (2) to evaluate qualitative and factor-linked aspects of societal problems (Gabus and Fontela, 1972, Huamg et al. 2007). It is an effective procedure for analyzing problem structure and developing causal relationships between factors or sub-systems (Fontela and Gabus 1974).

The methodology, according to the fields of applications , can be viewed as a way to capture the interdependence among the variables/attributes. The main lines of theoretical thought may be found in Chiu, Chen, Tzeng, & Shyu (2006); Hori & Shimizu (1999); Tamura, Nagata, & Akazawa (2002) Tzeng et al. (2007.

In the recent years a novel MCDM (Multiple Criteria Decision Making) literature and practice combines DEMATEL and MCDM procedures (referred to as hybrid MCDM models) and especially

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Globalized World, Proceedings of the 12th Annual Humanitarian Conference of Webster University, Refugee Survey Quarterly, Volume 26, Number 4, UNHCR, Oxford University Press, 2007

DEMATEL with compromise methods (TOPSIS, Technique for Order of Preference by Similarity to Ideal Solution, and VIKOR, from Serbian: VIseKriterijumska Optimizacija I Kompromisno Resenje), referred as DEMATEL-COMPROMISE hybrid models.

A pure TOPSIS approach as the one I followed in my papers in 2007 and 2012.

The aim of this chapter is to provide a survey of literature connected to DEMATEL-COMPROMISE hybrid models, through a proposal of a specific taxonomy focused on the journal articles published between 2010 up to the time of writing that are organized following the lines of a possible taxonomy: . i) highlighting how the DEMATEL - COMPROMISE hybrid models exploits the outputs coming from DEMATEL; ii) introducing these models within a critical general framework.

This synthetic contribution constitutes the first result of a wider research project, that will be published, on the effectiveness of DEMATEL-COMPROMISE hybrid models to solve decision-making problems in several complex systems.

8.2 Research issues

As mentioned above, DEMATEL-COMPROMISE hybrid models are widespread, in the last decade, in theoretical and empirical research but their use has exceptionally increased in the last five years.

For setting taxonomy the literature survey was conducted with the aim to answer the following questions:

1. In the field of hybrid models, how many are the applications that combine DEMATEL with MCDM compromise methods (DEMATEL with TOPSIS o VIKOR)?
2. What are the methodological frameworks of the applications (certain decision environment or fuzzy formulations)? In other

words, if the methodology of DEMATEL is the original one, or instead models are using a modified version of DEMATEL; and also is the methodology of the compromise methods traditional or modified?

3. Which is the role of DEMATEL within MCDM methods regarding criteria weights? The criteria "*weights"* are computed by utilizing DEMATEL or the results obtained by DEMATEL are integrated with other methods to calculate the weights? (DEMATEL with Analytic Hierarchical Process (AHP) or Analytic Network Process (ANP) or DEMATEL based ANP (DANP))?

4. Assumed the interconnection of criteria, which are the more appropriate aggregation methods?

5. What are the fields of application of DEMATEL-COMPROMISE hybrid models?

The literature survey, here proposed, is based on the following keywords (descriptors) "Hybrid models", ''DEMATEL and TOPSIS","DEMATEL and VIKOR", DEMATEL and ANP and two different search engines: the first one from an academic databaseavailable on line at University of Rome Tor Vergata, (mainly WEB Of SCIENCE, Elsevier, Taylor & Francis and so on), the second one the Google scholar.

136 international journal articles are published between 2010 and 2015 and they were classified by: source, Author(s) ,Year, Core technique and Application area. Starting from this 136 papers, only 45 ones are suitable with the research questions. Moreover, in this phase, for control purposes, reviews on MCDM methods, fuzzy MCDM methods, on TOPSIS technique and concerning specific topics were examined: surveys on Total Quality management, cloud service selection methods (both using MCDM techniques), and on supplier selection methods, since often applications of hybrid models refer to these themes.

8.3 Taxonomy

The selected papers are organized in Table 1 following the the criterion: paper number, Author(s), Year, Core technique/methodologies and Application area..

Furthermore, , the items are classified into four categories (*taxonomy clusters by techniques methodologies*): :

- ✓ NO FUZZY - Certain (or crisp numbers) framework for all the techniques (referred as no fuzzy DEMATEL-COMPROMISE hybrid models);
- ➢ ALL FUZZY - Linguistic variables and fuzzy numbers for all the methodologies (named all fuzzy DEMATEL-COMPROMISE hybrid models);
- o PARTIALLY FUZZY - Mix of certain framework and fuzzy theory approach, where uncertain environment is limited to only one methodology (partial fuzzy DEMATEL-COMPROMISE hybrid models);
- ▪ OTHER APPROACH - Mix of additive/non-additive measurements approach (Grey relational analysis or/and λ-fuzzy measure and fuzzy integral) combined with DEMATEL- COMPROMISE hybrid models (referred to as other DEMATEL- COMPROMISE hybrid models).

Table 1 Taxonomy of selected papers

N.	Taxonomy cluster	Author (s), year	Core techniques	Specific area of application (purpose)
1	○	○ Jui-Kuei Chen, I-Shuo Chen (2010)	DEMATEL, fuzzy ANP, and TOPSIS	Support system for Taiwanese higher education
2	✓	✓ Wen-Hsien Tsai , Wen-Chin Chou, Chien-Wen Lai (2010)	DEMATEL, ANP and VIKOR	Evaluation model and improvement analysis for national park websites
3	✓	✓ Chia-Li Lin a, Meng-Shu Hsieh, Gwo-Hshiung Tzeng (2010)	DEMATEL, ANP and TOPSIS	Evaluating vehicle telematics system
4	✓	✓ James J.H. Liou, Yu-Tai Chuang (2010)	DEMATEL, ANP and VIKOR	Selection of outsourcing providers
5	✓	✓ Wen-Rong Jerry Ho, Chih-Lung Tsai, Gwo-Hshiung Tzeng, Sheng-Kai Fang (2011)	DEMATEL, ANP and VIKOR	Portfolio selection based on CAPM
6	✓	✓ Cheng-Hsiung Chen, Gwo-Hshiung Tzeng (2011)	DEMATEL, ANP and VIKOR	Creating the aspired intelligent assessment systems for teaching materials

7	✓	✓ Hung-Yi Wua,, Yi-Kuei Lin, Chi-Hsiang Chang (2011)	Balanced scorecard (BSC), DEMATEL, ANP and VIKOR)	Developing a set of appropriate performance evaluation indices for extension education centers in universities
8	▪	▪ Ming-Shin Kuo, Gin-Shuh Liang (2011)	Fuzzy Grey Relation (FGR) and DEMATEL, fuzzy ANP, λ-fuzzy measure, fuzzy integral, fuzzy TOPSIS	To solve location selection problems (Selecting locations of international distribution centers (IDC))
9	▪	▪ Ming-Shin Kuo (2011)	Fuzzy DEMATEL, ANP, λ-fuzzy measure and fuzzy integral and TOPSIS	Location selection for an international distribution center
10	➢	➢ Doraid Dalalah, Mohammed Hayajneh, Farhan Batieha (2011)	Modified fuzzy DEMATEL, ANP and modified TOPSIS	Supplier selection

11	✓	✓ Wen-Hsien Tsai, Wen-Chin Chou, Jun-Der Leu (2011)	DEMATEL, ANP and VIKOR	To evaluate model the web-based marketing of the airline industry
12	○	○ Ming-Lang Tseng (2011	DEMATEL and fuzzy TOPSIS	To evaluate the service quality expectation
13	▪	▪ Gwo-Hshiung Tzeng · Chi-Yo Huang (2012)	DEMATEL, ANP, VIKOR and Grey relational Analysis	Creating the aspired intelligent global manufacturing & logistics systems
14	➢	➢ Gulcin Buyukozkan, Gizem Çiftçi (2012)	fuzzy DEMATEL, fuzzy ANP and fuzzy TOPSIS	To evaluate green suppliers
15	➢	➢ Doraid Dalalah, Mohammad Al-Tahat, Khaled Bataineh (2012)	fuzzy DEMATEL and fuzzy TOPSIS	Numerical Example: Optimal Sore Throat Treatment in primary care unit
16	✓	✓ Yung-Lan Wang, Gwo-Hshiung Tzeng (2012)	DEMATEL, DANP and VIKOR	Brand marketing
17	✓	✓ Safar Fazli and Hadi Jafari (2012)	DEMATEL, ANP and VIKOR	Investment in stock exchange
18	✓	✓ Chui-Hua Liu, Gwo-Hshiung Tzeng, Ming-Huei Lee (2012)	DEMATEL, DANP and VIKOR	Improving tourism policy implementation

19	○	○ Yao Feng Chang, Junzo Watada and Hiroaki Ishii (2012)	Fuzzy DEMATEL, ANP and VIKOR	Building a model of high performance project team
20	✓	✓ Meng-Jong Kuan, Chia- Chun Hsiang and Gwo-Hshiung Tzeng (2012)	DEMATEL, DANP and VIKOR	To manage quality of new product development
21	✓	✓ C.-H. Hsu, Fu-Kwun Wang, Gwo-Hshiung Tzeng (2012)	DEMATEL, DANP and VIKOR	Vendor selection for conducting the recycled material
22	✓	✓ Yu-Ping Ou Yang, How-Ming Shieh, Gwo-Hshiung Tzeng (2013)	DEMATEL, ANP and VIKOR	Information security risk control assessment
23	➢	➢ Adil Baykasoğlu, Vahit Kaplanoğlu, Zeynep D.U. Durmuşoğlu, Cenk Şahin (2013)	Fuzzy DEMATEL and fuzzy hierarchical TOPSIS	Truck selection
24	✓	✓ Wan-Yu Chiu, Gwo-Hshiung Tzeng , Han-Lin Li (2013)	DEMATEL, DANP and VIKOR (VIKOR modified)	To improve e-store business
25	✓	✓ Chui-Hua Liu, Gwo-Hshiung Tzeng & Ming-Huei Lee (2013)	DEMATEL, DANP and VIKOR	Improving cruise product sales

26	✓	✓ Selcuk Cebi (2013)	Delphi method, DEMATEL and TOPSIS	Determining importance degrees of website design parameters
27	✓	✓ Ming-Tsang Lu, Shi-Woei Lin, Gwo-Hshiung Tzeng (2013)	DEMATEL, DANP and VIKOR (VIKOR modified)	Improving RFID (radio frequency identification) adoption in Taiwan's healthcare industry
28	▪	▪ Kua-Hsin Peng & Gwo-Hshiung Tzeng (2013)	DEMATEL, DANP, VIKOR and Fuzzy integral	Problem-improvement in economics and business
29	✓	✓ Chih-HsuanWang, Chih-Wen Shih (2013)	Conjoint analysis (CA), quality function deployment (QFD) DEMATEL and TOPSIS	To carry out customer-driven concept development for ultrabooks
30	➢	➢ Akbar Alam-Tabriz, Neda Rajabani, Mojtaba Farrokh (2014)	Fuzzy DEMATEL-Fuzzy ANP-Fuzzy TOPSIS	Supplier Selection Problem
31	✓	✓ ÖzerUygun, Esra Kurt Tekez, Hasan KAÇAMAK, Fuat ŞİMŞİR (2014)	DEMATEL, ANP and TOPSIS	Evaluating Research & Development Projects

32	➢	➢ Snežana Tadić, Slobodan Zečević, Mladen Krstić. (2014)	Fuzzy DEMATEL, fuzzy ANP and fuzzy VIKOR (not modified)	City logistic concept selection
33	➢	➢ Ifeyinwa Juliet Orji, Sun Wei, (2014)	Fuzzy DEMATEL and fuzzy TOPSIS	Sustainable supplier selection
34	▪	▪ James J.H. Liou, Yen-Ching Chuang, Gwo-HshiungTzeng (2014)	DEMATEL, DANP, VIKOR, λ-fuzzy measure and fuzzy integral	Supplier evaluation and improvement
35	✓	✓ Shin Liao, Ming-JennWu, Chi-Yo Huang, Yu-Sheng Kao, and Teng-Hsiang Lee (2014)	Modified Delphi, DEMATEL, ANP and VIKOR	Evaluating and Enhancing Three-Dimensional Printing Service Providers for Rapid Prototyping
36	✓	✓ Hu-Chen Liu, Jian-Xin You, Lu Zhen, Xiao-Jun Fan (2014)	DEMATEL. DANP and modified VIKOR	Material selection with target-based criteria
37	✓	✓ Kao-Yi Shen, Min-Ren Yan, Gwo-Hshiung Tzeng (2014)	DEMATEL, DANP and VIKOR (modified)	Glamor stock selection and stock performance improvement

38	✓	✓ Shu-Kung Hu, Ming-Tsang Lu, Gwo-Hshiung Tzeng (2014)	DEMATEL, DANP, and modified VIKOR	Exploring smart phone improvements
39	✓	✓ Alireza Irajpour, Ali Fallahian-Najafabadi, Mohammad Ali Mahbod, and Mohammad Karimi (2014)	DEMATEL and TOPSIS (weight using Shannon Entropy Method)	To Determine the Effectiveness of Maintenance Strategies Lean Thinking Approach
40	✓	✓ Shin Liao, Ming-JennWu, Chi-Yo Huang, Yu-Sheng Kao, and Teng-Hsiang Lee (2014)	Modified Delphi Method , DEMATEL, ANP and modified VIKOR (DEMATEL based Network	Evaluating and Enhancing Three-Dimensional Printing Service Providers for Rapid Prototyping
41	▪	▪ Chiuh-Cheng Chyu and Ying-Chieh Fang (2014)	Fuzzy Kano Model (FKM), fuzzy DEMATEL, Similarity Aggregation Method (SAM), fuzzy ANP and modified TOPSIS (using weighted L_1 metrics and gray relation analysis (GRA))	New Product Development Selection Problem
42	✓	✓ Fu-KwunWang, Chen-Hsoung Hsu, and Gwo-Hshiung Tzeng (2014)	DEMATEL, DANP and modified VIKOR	Six Sigma Project Selection

43	○	○ AbdolrezaYazdani-Chamzini, Shahram Shariati, Siamak Haji Yakhchali and Edmundas Kazimieras Zavadskas (2014)	AHP, DEMATEL and fuzzy TOPSIS	Prioritizing the investment strategies in the private sector of Iran
44	✓	✓ Tsai Chi Kuo , Chia-Wei Hsu, and Jie-Ying Li (2015)	DEMATEL, DANP and VIKOR	Green Supplier Selection
45	✓	✓ Ah-Taur Yan, Mei-Jung Lai, Chiu-Yue Lin (2015)	DEMATEL, DANP and VIKOR	Environmental Assessment Model for The Green Building

Chapter 9: Accuracy and Precision in Finance

Manfred GILLI , Enrico SCHUMANN

9.1 Introduction

Emilio Fontela's scientific approach was essentially pragmatic; it avoided complex formalisations and focused instead on how the research could contribute to an understanding of the problem under consideration. We are convinced that this essay is in line with the spirit of Emilio Fontela.

Being precise – being clear and unambiguous – is a desirable property of many things: time schedules, cooking recipes, directions given to a traveller, physical measurements. Yet, precision alone is not enough. Time schedules are worth little when the scheduled events do not happen; travel directions are useless when they lead to the wrong place. In other words, just because something is precise does not mean that it is correct.[153] (Even everyday language makes this distinction: one cannot be accurately, but only precisely wrong.)

In this essay, we will use the word *precise* in the meaning of exact and often in the sense of numerically exact. We will use the word *accurate* to indicate that something is both correct and precise enough to be useful. It is the distinction between the two words that we want to discuss. More concretely, we will discuss how researchers and practitioners in finance often mistake precision for accuracy.

To be sure, accuracy and precision are related, and a certain degree of precision is necessary for being accurate. But there must be limits. Ask a runner what the marathon distance is, and the answer will be 42.195 km. But when you think about it, that is a surprisingly precise answer. Why not 42.2 km? That would be just 5 meters off, or 0.01 % of the total distance. Curiously, few people seem to consider this precision strange. But perhaps we have asked the wrong question. Better would

[153] See Porter (2007) for more on the history of precision in the sciences.

have been: what distance does the average marathon participant run? The answer: very likely more than 42.195 km. That is because in professional running, a so-called 'short course prevention factor' is used. From http://www.bcathletics.org/main/rr_iaff.htm:

> To prevent a course from being found to be short on future remeasurement, it is recommended that a "short course prevention factor" be built in when laying out the course. For bicycle measurements this factor should be 0.1 % which means that each km on the course will have a "measured length" of 1001 m.'

So, it is certainly part of marathon culture that the marathon distance is 42.195 km. Just as it is part of marathon reality that runners have to make a (slightly) longer distance.

For the marathon runner, the difference between perception and reality – between precision and accuracy – entails little cost. But our thesis is this: the difference between precision and accuracy should receive more attention in finance and economics, because researchers, investors, regulators and other participants in financial markets routinely confuse precision with accuracy, mistaking the former for the latter. And such confusion is costly. Investors may be fooled into overpaying for small advantages, which cannot be replicated in future. They may even fool themselves, for example by being overly reliant on so-called quantitative risk management or by believing that they can fine-tune the risk and reward of their portfolios.

Researchers may give up many opportunities for better research by insisting on precision. In fact, we think that researchers have given up accuracy in favour of precision, and that this is both unwarranted and unfortunate. Instead, because the accuracy of many financial models is low, researchers should give up precision. Through an example, we will illustrate that nothing substantive is lost when alternative, less-precise methods are used. On the contrary, much is gained, since these methods make essentially no assumptions about the data or model and have no requirements when it comes to model specification.

Our essay is not a survey.[154] Instead, we will concentrate on a single topic, investment management. Even more concretely, we will narrow down our discussion on quantitative portfolio management. Managing financial assets is at the heart of financial economics, and hence it is natural to start here. Importantly, as well, it is the area of finance that is most closely related to practical life, and it is here where we feel that ignorance about precision and accuracy can do harm.

Our essay is structured as follows. In the next section, we will discuss models and how errors may enter them. We will focus on one model, that of Markowitz. The key point will be that empirical errors – those resulting from modelling assumptions and parameter inputs – are much greater than numerical errors. That will lead us to heuristics (Section 3) and an illustration of the accuracy of portfolio models (Section 4). Section 5 concludes.

9.2 Models and Errors

Financial economics, it has been said,[155] is about two questions: (i) how much to save?, and (ii) how to save? It is hard to overstate the importance of these questions, both on an individual and on a macroeconomic level.

When it comes to 'how to save?', it is fair to say that work on an answer began with Harry Markowitz in the 1950s. Markowitz argued that risk should receive much more attention by investors than it had by

[154] Neither is anything we say really new; much of what we say has been said before: just read Morgenstern (1963). Nevertheless, we feel that it helps to repeat.

[155] In Constantinides and Malliaris (1995).

then, and he argued that the portfolio matters more than single assets. These insights lead him to the one-period mean–variance model.

Over the decades, mean–variance optimisation has developed into the cornerstone of quantitative portfolio management. Yet it remains, of course, a model; it is not the actual problem. The problem is how to save: how to identify assets that give, loosely speaking, much reward with little risk. Markowitz's model is one attempt at solving the problem, by assuming a simple investment process (buy-and-hold) and fixing the notions of reward (mean return) and risk (variance of return).

In general, modelling is the process of putting the actual problem into a form that can be understood by a computer.[156] The modeller has to define vague notions such as 'risk', and often needs to simplify and approximate. This, in turn, means errors. Not in the sense that something went wrong or did not work as expected. Approximation errors originate from the very practice of modelling.

Following a classic discussion in von Neumann and Goldstine (1947), we group these errors into two categories: empirical errors (model errors), and numerical errors. The challenge is not only to acknowledge such errors, but to evaluate them. We are fortunate in finance because we can often measure the magnitude of errors in meaningful units, namely euros, dollars or another currency. Some errors are simply bigger than others and so matter more. Such an evaluation is often case-specific, imprecise and may require interpretation and judgement. But carefully exploring, quantifying and discussing the effects of model choices etc. should always be preferred to dismissing such analysis as 'out of scope'.

Empirical Errors

A portfolio in Markowitz's model is, in essence, a return distribution, which looks good or bad according to an objective function. How we define this objective function determines what portfolio we choose. The word risk for instance is often used synonymously with

[156] A computer is actually not necessary for modelling. Yet, today, it is hard to conceive an investment model that would not rely on a computer.

return variance, but that is by no means the only possible definition. A typical objection against variance is that it penalises upside as well as downside. And indeed, already in the 1950s, Markowitz thought about using downside semi-variance instead, which corresponds much better to the financial practitioner's notion of risk (Markowitz, 1959). To quantify how relevant these differences in model specification are, we need to empirically compare[157] different models with respect to how they help to solve the actual problem.

There are other factors than the objective function that affect the quality of a model. Transactions costs for instance may be relevant. A model that includes them may be better – more accurate – than a model that does not. That does not mean that we should put every detail into the model. Less can be more. Simple back-of-the-envelope calculations may convince us that particular details cannot matter. For instance, modelling a portfolio with actual positions sizes (integers) instead of weights will make a difference only for very small portfolios. It also matters little that we do not know the prices at which we actually open or close positions, which implies that we cannot really know the weights of assets. But more often, whether a certain aspect should be modelled or not is not clear from the start. Thus, we will need to run different models and evaluate and compare their results. In any case, whether a particular aspect becomes part of the model or not should be motivated from the view point of the actual problem; an aspect should not be neglected because it would make the problem unwieldy or difficult to solve.

Once a model is established, it requires a link to reality, which comes in the form of forecasts and expectations, which often enter as parameters. We can, for instance, only minimise portfolio variance if we have a variance–covariance matrix of the assets' returns. Such model inputs may be good or bad, and we have another source of error. The difficulties in forecasting the required variables are well-described in the literature; see Brandt (2009) for an overview. And it is not only the forecasting problem: results are often extremely sensitive to seemingly minor setup variations; for instance, the chosen time horizon

[157] This essentially means careful data analysis and replication. See, for example, Cohen (1994).

(LeBaron and Weigend, 1998; Acker and Duck, 2007; Gilli and Schumann, 2010). That makes it difficult to reliably compare models, and hence it becomes difficult to reject bad models.

Numerical Errors

Once the model and its inputs have been fixed, we need to solve it. For this, we use a computer, and with it come two sources of error: round-off error, because we cannot represent all numbers within finite memory; and truncation error, because all computations that 'go to the limit', be it zero or infinity, must stop before the limit is reached.

Round-off error should rarely be a concern in financial applications (see also Trefethen, 2008). It can cause trouble and, more likely, can be a nuisance. But its impact, when compared with the empirical errors described above, is many orders of magnitude smaller.

Truncation error is more relevant to our focus on financial optimisation. In principle, we could solve any optimisation model through random sampling. If we sampled ever more candidate solutions, we would – in principle – come arbitrarily close to the model's solution. But clearly, in most cases that would be an extremely inefficient way to handle a model.

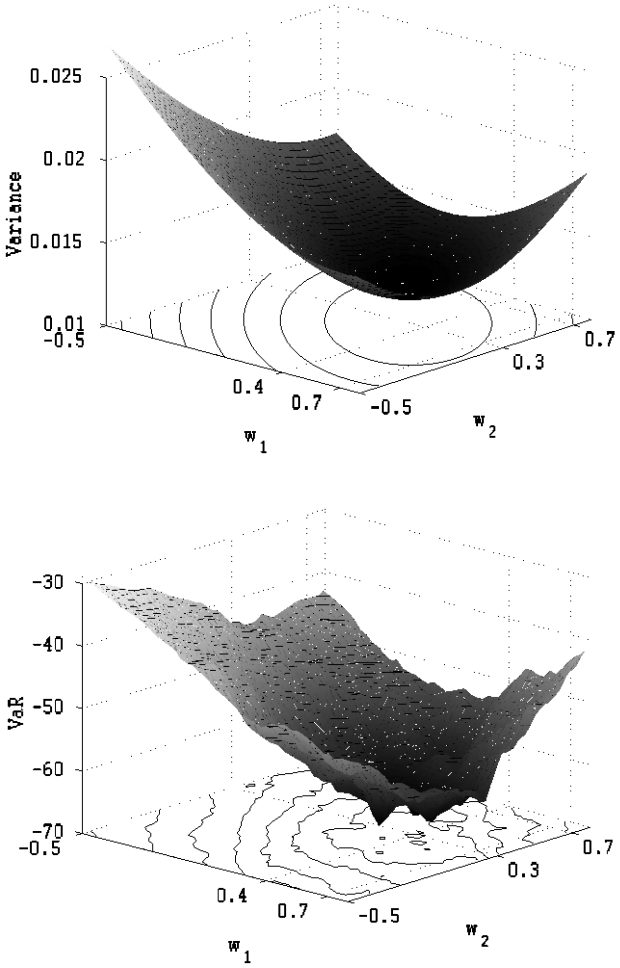
With heuristics, the methods that we want to advocate in this essay and that we describe in the next section, we face a variant of this truncation error. We have not yet explained what heuristics are, but it suffices to say that they are iterative numerical methods for solving optimisation models. The truncation error results because heuristics only provide an approximation to the model's solution. The quality of this approximation is a function of the computational effort we make. With more effort – most easily measured as elapsed computing time –, we obtain better solutions.

Of course, only obtaining an approximation of a solution is not satisfactory from the standpoint of optimisation theory. After all, a model's solution is the optimum; theoretically, there are no better or worse solutions, only *the* solution.

Within the context of our discussion, this truncation error that comes with heuristics is simply a lack of precision. Yet imprecise solutions may still be preferred, namely when they belong to more-accurate models – models that would be too difficult to solve precisely. And it turns out that in portfolio selection most models are difficult to solve. As an example, Figure 1 shows, in its upper panel, the variance of a portfolio consisting of three assets. (Actually the square root of the variance. The third asset's weight is fixed through the budget constraint.) This is Markowitz's objective function. In the lower panel we use the same dataset, but this time the objective function is Value-at-Risk, a quantile of the return distribution. The function for Value-at-Risk is not smooth and a classic method that uses the gradient may become stuck in a local minimum. But Value-at-Risk and similar functions that treat risk asymmetrically are more accurate in the sense that they are conform more closely with the notion of risk. But such models are often rejected simply because they cannot be solved precisely. In finance, many models were written the way they are only because they can be solved precisely. Markowitz himself preferred variance over semi-variance because he could solve the model.[158]

Figure 1: Objective function values for a portfolio selection model with three assets. x- and y-axis show weights for two assets; the third weight is fixed through the budget constraint. Upper panel: objective function is variance. Lower panel: objective function is Value-at-Risk.

[158] Markowitz (1959, ch. 9) compares variance and semi-variance in terms of cost, convenience, familiarity, and desirability; he concludes that variance is superior in terms of cost, convenience, familiarity – but not desirability. To be fair, Markowitz in the 1950s lacked the computing power that alternatives models require; today, we have this computing power.



This brings us to heuristics, since they were designed to overcome such local minima, as we will discuss in the next section. However, let us provide a short summary first. The key point that we wanted to make is that selecting a financial portfolio is much more than running an optimisation algorithm. Rather, we move from the actual problem to a model, and from there to the model's solution. (And, of course, we may finally want to implement the model-solution.) During this process, errors will be introduced, but what matters is how large these errors are, and which type – numerical or empirical – matters more. At least on the latter question, we have a clear view: empirical errors – in particular, anything related to data – are much more important than numerical difficulties. In other words, researchers and practitioners should concentrate on empirical errors, not on numerical issues.

9.3 Good-enough Methods

The upshot of the view that empirical errors matter more than numerical errors is good news for any researcher who ever felt that he lacked the tools to solve a model. Those tools are called heuristics, and we will describe them in this section.

Different people mean different things when they speak of heuristics. In a general sense, a heuristic is a decision rule or *modus operandi* that (i) often helps to solve a problem or to make a good decision, and that (ii) is simple. This is roughly the definition of Pearl (1984), and it is also how computer scientists and programmers use the word: heuristics as simple rules that provide good solutions in many cases. Not perfect, but good enough, and often the best that is available.

In the discussion that follows, we will define heuristics in a narrower sense: as a class of numerical methods for solving optimisation models. Such models are typically written as

$$\text{minimise}_x \ \varphi(x, \text{data})$$

in which φ is a scalar-valued function and x is a vector of decision variables. (With a minus in front of φ it becomes a maximisation model.) Often there will be further constraints in the model.

We find it helpful to not think in terms of a mathematical description, but a computer programme:

```
solutionQuality=function(x, data)
```

That is, a programme that maps a solution into its quality, given the data. There is no need for a closed-form mathematical description of the function. Indeed, in many applied disciplines there are no closed-form objective functions. The function φ could include an experimental

setup, with x the chosen treatment and $\varphi(x)$ the desirability of its outcome; or evaluating φ might require a complicated stochastic simulation, such as an agent-based model.

Several properties, or requirements, describe an optimisation heuristic further (Zanakis and Evans, 1981; Barr et al., 1995; and Winker and Maringer, 2007, list similar criteria):

The method should result in a 'good' approximation of the true optimum, with 'goodness' measured in computing time or solution quality.

The method should be robust when we change the model – for instance, when we modify the objective function or add a constraint – and also when we increase the problem size. Results should not vary too much for different parameter settings for the heuristic.

The technique should be easy to implement.

Implementation and application of the technique should not require subjective elements.

In a broad sense, we can differentiate between two classes of heuristics, constructive methods and iterative-search methods.

For a constructive method, an algorithm starts with an empty solution and adds components step-by-step; the procedure terminates when it has completed one solution. An example: a reasonable low-variance equity portfolio of cardinality N can be constructed by (i) obtaining forecasts for the marginal variances of all eligible assets, (ii) sort the assets by forecast variance and (iii) keep the N assets with the lowest forecast variances in the portfolio (equally- weighted); see Schumann (2013).

For iterative-search methods the algorithm moves from solution to solution, that is, a complete existing solution is modified to obtain a new solution. Such a new solution may be quite different from previous ones, as some methods, such as Genetic Algorithms, create new solutions in a rather discontinuous ways. But still, a new solution will share characteristics with its predecessor (if that was not the case, we would

be doing random-sampling). In the remainder of this essay, we shall concentrate on iterative-search methods.

Principles

The following pseudocode makes the idea of an iterative method more concrete.

generate initial solution x^c

while stopping condition not met do

create new solution $x^n = N(x^c)$

if $A(\varphi, x^n, x^c, \ldots)$ then $x^c = x^n$

end while

return x^c

We start with a solution x^c, very often a random draw. Then, in each iteration, the function N ('neighbour') makes a copy of x^c and modifies this copy; thus, we get a new candidate solution x^n. The function A ('accept') decides whether x^n replaces x^c, typically by comparing the solutions' objective function values. The process repeats until a stopping condition is satisfied; finally, x^c is returned.

This skeleton of an algorithm applies to standard methods, too. In a gradient-based method, for instance, x would be a numeric vector; N would evaluate the gradient at x^c and then move minus the gradient with a specified stepsize; A would evaluate x^c and x^n, and replace x^c only if x^n is better; if not, the search is stopped.

Heuristics use other, often simpler, mechanisms. More specifically, two characteristics will show up in one form or another in most methods. First, heuristics will not insist on the best possible moves. A heuristic may accept a new solution x^n even if it is worse than the current solution. Second, heuristics make use of randomness. For instance, a heuristic may change x^c randomly (instead of locally-optimally as in a Gradient Search). These characteristics make heuristics inefficient for well-behaved models. But for difficult models – for instance, such with

many local optima as in Figure 1 –, they enable heuristics to move away from local optima.[159]

As a concrete example, suppose we want to select N assets, equally-weighted, out of a large number of assets, in such a way that the resulting portfolio has a small variance. We assume that we have a forecast for the variance–covariance matrix available. Then a simple method for getting a very good solution to this model is a Local Search. For a Local Search,

the solution x is a list of the included assets;

the objective function φ is a function that computes the variance forecast for a portfolio x;

the function N picks one neighbour by randomly removing one asset from the portfolio and adding another one;

the function A compares $\varphi(x^c)$ and $\varphi(x^n)$, and if x^n is not worse, accepts it;

the stopping rule is to quit after a fixed number of iterations.

Note that Local Search is still greedy in a sense since it will not accept a new solution that is worse than the previous one. Thus, if the search arrives at a solution that is better than all its neighbours, it can never move away from it – even if this solution is only a local optimum. Heuristic methods that build on Local Search thus employ additional strategies for escaping such local optima.

And indeed, with a small – but important – variation we arrive at Simulated Annealing (Kirkpatrick et al., 1983). This variation concerns the acceptance rule A: If the new solution is better, accept it, as before. If it is worse, however, do still accept it, but only with a certain

[159] Because of these mechanisms a heuristic could, in principle, drift farther and farther off a good solution. But practically, that is very unlikely because every heuristic has a bias towards good solutions, for instance by always accepting a better solution, but accepting a worse one only if it is not too bad. Since we repeat this creating of new candidate solutions thousands of times, we can be very certain that the scenario of drifting away from a good solution does practically not occur.

probability. This probability in turn depends on the new solution's quality: the worse it is, the lower the probability of being accepted. Also, the probability of acceptance is typically lower in later iterations; that is, the algorithm becomes more select over time.

Random Solutions

The most common objection against using heuristics is that because they explicitly rely on random mechanisms, their solutions are also random. It is then difficult, it is argued, to evaluate the quality of a solution. (The discussion in this section builds on Gilli et al., 2011.)

A naïve approach to solving an optimisation model could be this: randomly generate a large number of candidate solutions, evaluate all solutions and keep the best one as the overall solution.

If we repeated this process a second time, our overall solution would probably be a different one. Thus, the solution x we obtain from this sampling strategy is stochastic. The difference between the solution and the true optimum would be a kind of truncation error, since if we sampled more and more, we should in theory come arbitrarily close to the optimum. Importantly, the variability of the solution stems from our numerical technique; it has nothing to do with the error terms that we may have in models to account for uncertainty. Stochastic solutions may occur with non-stochastic methods, too. Think of search spaces like the one in Figure 1. Because of the many local minima, even a deterministic method such as Gradient Search would result in different solutions when run from different starting points.

We can treat the result of a stochastic algorithm as a random variable with some distribution D. What exactly this result is depends on our setting. We will want to look at the objective function value (ie, the solution quality), but we may also look at the decision variables given by a solution (ie, the portfolio weights). All these quantities of interest we collect in a vector ρ. The result ρ_j of a restart j is a random draw from D.

Of course, we do not know what D looks like. But for a given model, there is a simple way to find out – we sample. We run an algorithm a reasonably-large number of times and each time store ρ_j. From these realisations we compute the empirical distribution function of the $\rho_j, j = 1, \ldots,$ number-of-restarts as an estimate for D. For a given model

or model class, the shape of the distribution *D* will depend on the chosen method. Some techniques will be more appropriate than others and give less variable and on average better results. The shape of *D* will typically also depend on the particular settings of the method, in particular the number of iterations – the search time – that we allow for.

Unlike classical optimisation techniques, heuristics can walk away from local minima; they will not necessarily get trapped. So if we let the algorithm search for longer, we can hope to find better solutions. For minimisation problems, when we increase the number of iterations, the mass of *D* will move to the left and the distribution will become less variable. Ideally, with ever more computing time, *D* should degenerate into a single point, the global minimum. There exist proofs of this convergence to the global minimum for many heuristic methods (see Gelfand and Mitter, 1985, for Simulated Annealing; Rudolph, 1994, for Genetic Algorithms; Gutjahr, 2000, Stiglitz and Dorigo, 2002, for Ant Colony Optimisation; Bergh and Engelbrecht, 2006, for Particle Swarm Optimisation).

Unfortunately, these proofs provide little help in practical applications. They often rely on asymptotic arguments, and many of such proofs are nonconstructive. Fortunately, we do not need these proofs to make meaningful statements about the performance of specific methods. For a given model class, we can run experiments. Such experiments also help to investigate the sensitivity of the solutions with respect to different parameter settings for the heuristic. Experimental results are of course no proof of the general appropriateness of a method, but they are evidence of how a method performs for a given class of models; often this is all that is needed for practical applications.[160]

[160] Our favourite illustration of 'no theoretical proof, but empirical evidence' is Goldbach's conjecture. In its best-known form, it states that every even number greater than two is the sum of two prime numbers. It is a conjecture because to this day, it has not been proved in all generality. But it has been brute-force–tested for even extremely large numbers, and it held up. Thus: one can have empirical evidence that a method works well, even if one cannot prove its optimality.

9.4 Evaluating Accuracy

In this section, we will, by way of an example, illustrate two aspects of the preceding discussion. First, that financial models are sensitive, meaning that small changes in assumptions lead to sizeable changes in the results. Second, that the additional randomness that is introduced by using heuristics is minuscule when compared with the effects of model sensitivity.

Minimum Variance

As a model, we use the long-only minimum-variance (MV) portfolio. Ignoring expected returns altogether, as this model does, is equivalent to assuming equal expected returns for all assets. This assumption is motivated by the difficulties of predicting future returns; see Brandt (2009) for an overview of analytic and empirical results. In consequence, if we cannot really control the return of a portfolio, then lowering portfolio risk may still lead to better risk-adjusted performance (Chan et al., 1999). In fact, there is evidence that low-risk stocks even yield higher returns than justified by asset-pricing models (Blitz and van Vliet, 2007). In any case, even a low-risk portfolio is a risky portfolio and should command a risk premium. Altogether there exists convincing empirical evidence that such a purely risk-based approach leads to portfolios that perform well in out-of-sample tests. See, for instance, Chan et al., 1999, for variance minimisation, or Gilli and Schumann, 2011b, for alternative risk functions.

The data set consists of daily prices (adjusted for splits, etc.) of the 30 stocks that comprise the main German stock index, the DAX.[161] The data span the period from January 2004 to mid-September 2015.

A Walkforward with an Exact Solution .....

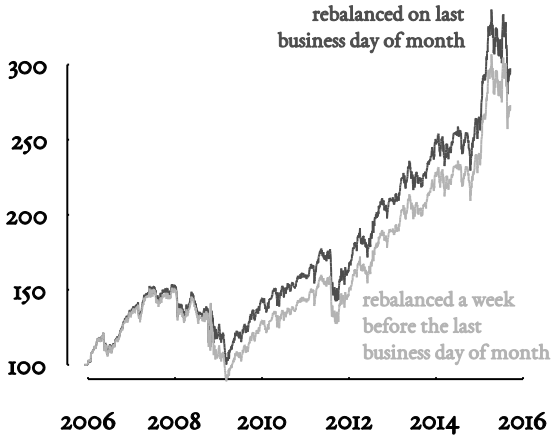
[161] The data and code are available from `http://enricoschumann.net/data/gilli_accuracy.html`

We compute a rolling-window backtest (a 'walkforward') to evaluate the MV strategy. On the last business day of a month, the algorithm computes a MV portfolio, based on historical data of the past year. Weights are constrained to lie between zero and 10%. The resulting portfolio is then held until the next month-end and its performance is recorded. The overall result consists of those one-month out-of-sample periods, chained together.

We solve the optimisation models with a quadratic-programming (QP) solver. Hence, given the data and our assumptions, there is no element of chance in the setup.

The strategy would have returned a respectable 11.8% per year over the period December 2005 to mid-September 2015. It is pictured in Figure 2.

Figure 2: Performance of MV over the period Dec 2005 to Sep 2015



. . . but What a Difference a Day Makes

In many publications we would find this performance number to more digits. It is, for instance, unfortunate practice in the industry to

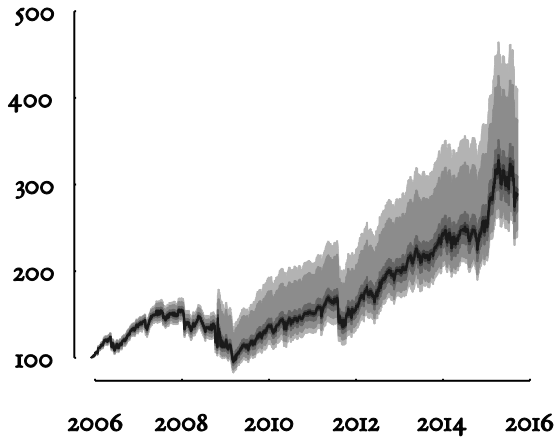
compute returns to two decimal places. But such precision is not warranted. To show why, we run the same backtest again, but this time rebalance a week earlier every month. In this test, the overall return drops to 10.8% per year – one whole percentage point less.

Our point is certainly not that rebalancing on the last business day of a month, or on any other particular day of the month, is a good idea. Rather, we wanted to demonstrate what difference a small change in the assumptions of the model can make. This influence of the choice of reference days is documented in the literature (Acker and Duck, 2007); yet, it is widely ignored.

Random Windows

To see the effect of the rebalancing days more clearly, we run 10,000 walkforwards with random windows and random rebalancing days. The rebalancing dates are randomly spaced between 20 and 80 business days apart; the historical windows span between 120 and 500 business days. The results are shown in Figure 3. The graphic shows a wide variation of outcomes: the 10th quantile of annualised returns is 10.6%, the 90th quantile is 12.3% (the extremes are 8.8% and 15.8%).

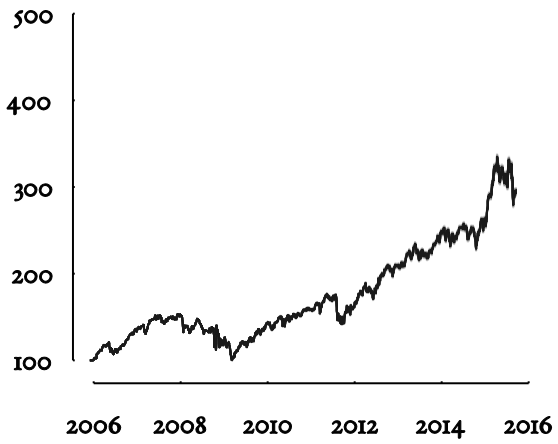
Figure 3: Performance of 10,000 walkforwards with randomly-chosen window sizes. The grey shades indicate different quantiles. Historical windows have a length of between 120 and 500 business days; rebalancing dates are between 20 and 80 business days apart. *All randomness in the results comes through the model and its assumptions; there is no numeric randomness*.



Local Search

To demonstrate the effect and magnitude of uncertainty that a heuristic introduces, we re-do the original walkforward. So we re-balance on the last day of the month and use a fixed historical window of 260 business days. But this time, we do not optimise with QP, but with a Local Search, the method we described in Section 3. Thus, all the randomness that we may see now comes from our numerical method; there are no other random elements in the setup. Figure 4 shows the results. Compared with the uncertainty introduced by the assumptions on windows, the uncertainty that comes with Local Search is negligible: the grey band that represents the range of outcomes it barely visible.

Figure 4: Performance of 10,000 walkforwards with a fixed window size, but performed with a Local Search. As in Figure 3, the grey shades indicate different quantiles; but note that they are barely visible. *All randomness in the results comes through the randomness inherent in Local Search; there are no other elements of chance in the model.*



9.5 Conclusion (and Some Suggestions)

In this essay we have summarised our view on financial models, their accuracy, and the precision with which they are handled.

Our thesis is that researchers and practitioners in finance should pay more attention to accuracy and precision, and, in particular, they should not mistake precision for accuracy. In our view, too much time is spent on making models and their solutions precise in the sense of numerically exact; too little effort is made to really evaluate the accuracy of models.

To some extent, this can be blamed on division of labour. Academics, one might argue, merely develop theoretical models; it is up to the user to properly evaluate them. This argument, however, does not hold water. For one, as we have said above, exploring or just making visible the effects of model choices has always been better than not even attempting any analysis. The good news is that this attitude changes, and in many different disciplines people turn more and more into polymaths rather than narrow specialists, largely because computers and software have become so much better (Gilli and Schumann, 2014).

The lack of accuracy in financial models is good news when it comes to optimisation. Optimisation is an applied discipline; optimisation algorithms are tools. No tool requires ‘exact’; ‘good enough’ is all that is needed (Gilli and Schumann, 2011a). Perversely, a numerically-precise solution to a model may not just not add quality, but also give an unwarranted feeling of being on the safe side. But such a feeling is misplaced: after all, a numerical solution only relates to the model, not to the actual problem.

But then, is there anything we can do to improve financial models and the way they are used? Certainly: analyses should be much more qualitative, relying on non-mechanical insights and research. That means, notably, more exploratory statistics and replication. Findings should be accepted when they are empirically replicated.

That does not imply that single studies do not mean anything. In particular, even a single study can be made more robust. Resampling methods can go a long way to serve as robustness and sensitivity checks.

Chapter 10: The Battelle Experience of International Modelling and Forecasting

Eugenia SALLIN-KORNBERG

10.1 Introduction

This chapter encloses a brief narrative of my experience, as a Battelle researcher, scholar and friend of Emilio Fontela, passed through many common studies and projects performed for private and public institutions. This works, quantitative and qualitative analyses, at national and international level, carried out in always renovating and refining ways, may be summarized in the following type-models:

i) EXPLOR MULTITRADE (Part 11.2)
ii) FORSYS (Part 11.3)
iii) ENERGY ECONOMY (Part 11.4)

10.2 The EXPLOR-MULTITRADE MODEL

The EXPLOR programme of Battelle-Geneva was the follow up of the ACT[162] programme started in 1962 which was the basis of the continuous development and applications of the EXPLOR model[163] and

[162] Aids to Corporate Thinking (ACT), a prospective programme on the environment of the firm carried out by Battelle Columbus and Battelle Geneva Memorial Institute.

[163] ACT directed by E. Fontela, EXPLOR 1975 by A. Gabus, EXPLOR 80 by G.McNeil, EXPLOR-MULTITRADE by E. Sallin-Kornberg

finally of EXPLOR-MULTITRADE. Over the years, this overall programme required the research and effort of more than 600 person-months (men and women) mainly from Battelle-Geneva but also from the other Battelle Laboratories (Columbus, Northwest and Frankfurt). The large team of researchers included economists, econometricians, mathematicians, and technico-economists of different nationalities.

The programme benefited from the methodological support of Prof. Richard Stone (Nobel Price of Economy) and K.J. Wigley of Cambridge University, Prof. L. Solari of University of Geneva and André Duval[164], head of the Centre of Programming of Battelle Geneva.

The EXPLOR programme was sponsored by major private international corporations:

Akzo, August Thyssen, Basf, BP, DSM, Dunlop, Essochem, ENI, Fiat, Gutehoffnungshütte, Henkel, Hoechst, Honeywell Bull, Imperial Tobacco, Mitsubishi, Mobil Oil, Monsanto, Pechiney, Phillips, Pirelli, Shell, Siemens, Rhône-Poulenc, SIR, SNPA, Unilever, INI and ITT. At the final stage, the European Economic Commission, the French Ministry of Industry and the DATAR, the US Department of Commerce, the Canadian Department of Trade and Industry and The Century Research Centre of Japan joined the programme.

The EXPLOR model was of the input-output type and reminded simple in interpretation. The model and its data were aimed and primarily orientated towards the use and applications to be made by the participating organisations to meet specific needs in their national planning or corporate strategies. This was the case of the improvements made in the model to facilitate uses with a view to analysing particular problems areas pertinent to each sponsor. Every company or organisation had a team or a responsible person following the programme. Therefore, EXPLOR benefited from constructive criticism and suggestions made by the representatives of the participating companies and governmental agencies to build an operational model for medium term planning through a happy combination of practical business requirements and econometric tools. In such a perspective, the

[164] A. Duval solved and programmed the complex system of consumer spending (LES system) used in the Explor Model

model was also used to derive particular scenario forecasts and specific analysis and/or modelling in the fields of interest of the sponsors.

The liberalisation of exchanges, the international monetary and oil crisis as well as the interdependence of the different economies render the 70's and 80's an era of fundamental trade specialisation. Therefore, international trade flows became an important factor influencing economic growth. This was the reason to integrate in the EXPLOR modelling approach a trade model and to take into consideration several uncertain political, institutional, social and economic factors that could only be introduced into the analysis in a coherent way. That was the role of cross-impact (X-I) analysis used to generate scenarios for world trade, which constituted a major innovation in the evolution of the EXPLOR programme. This global approach remains until now one of the few exceptions in the modelling approach addressing the combination of events and their translation into a given set of variables of the models[165].

Characteristics of the EXPLOR Model

The EXPLOR model is a multi-sector static equilibrium model of the input-output type for medium term forecasting giving consistent forecasts of the evolution of demand and production under price and technological constraints. It may be presented as a simultaneous system of equations. An iterative procedure is used to find the solution to the equilibrium of the system. All activities are interdependent and influence each other, so that each variable is taken into account and influences the outcome of the whole procedure.

The model has been operational for 10 industrialized countries (France, West Germany, United Kingdom, Italy, Belgium, the Netherlands, Spain, USA, Canada and Japan) broken down into 50 to 80 industrial sectors.

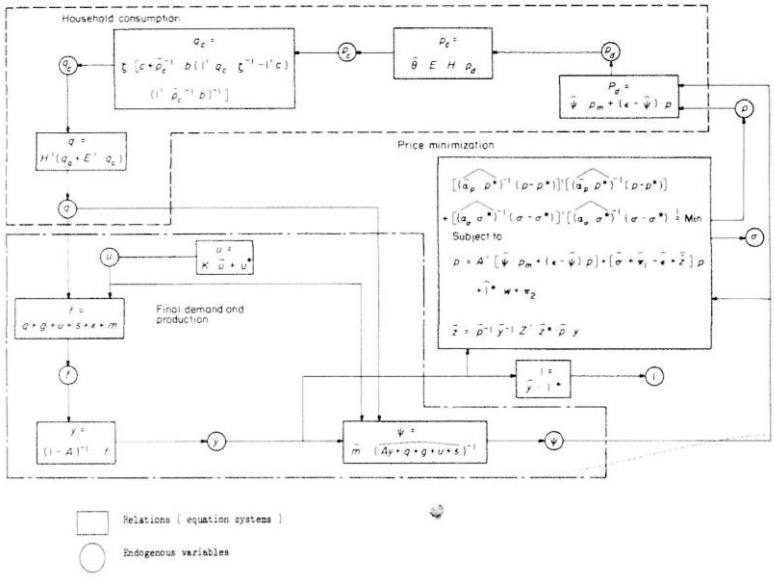
[165] E. Fontela, J.M. Rueda-Cantuche, Linking Cross-Impact Probabilistic Scenarios to Input-Output Models, EU-US Seminar, Seville, May 2004

Figure 1 shows a flowchart of the EXPLOR 85 model. The model can be partitioned into main blocks: household consumption, final demand and production, price minimization.

Household consumption by spending functions is endogenous and estimated through the use of the linear expenditure system (LES). The aggregate is given exogenously. The parameters of the LES are estimated on the basis of historical series of household consumption by spending function. The function evaluates private consumption as a function of income, price levels and population.

The components of final demand - except for household consumption and investments, determined via an investment allocation matrix between production and commodity sectors - are given exogenously. Exports and imports will become endogenous with the development of the world trade model in Phase II of EXPLOR-MULTITRADE.

Figure 10.1 Flowchart of the EXPLOR Model



Y Domestic production (1xn)	x Exports (1xn)
g Public expenditure (1xn)	m Imports (1xn)
P_d Nominal domestic price index (1xn)	s Stocks (1xn)
P_m Nominal price index for imports (1xn)	f Final demand (1xn)
P_c Nominal price index by spending functions (1xm)	g Public expenditure (1xn)
Ψ Share of imports on domestic market (1xn)	u* Dwellings (1x1)
A Direct technical coefficients matrix (nxn)	l Labour force (1xn)
θ Private consumption price adjustment ratios (1xm)	l* Labour productivity (1xn)
H Transition matrix between private consumption by commodities and spending functions (m+1xn)	σ*Extrapolated profit rates (1xn)
q_c Private consumption by spending function (1xm+1)	σ profit rates (1xn)
c Committed expenditure by spending function (1xm)	e Ad valorem subsidy rates (1xn)
b Supernumerary income allocation ratios (1xm)	Z Product transfer matrix (1xn)
E Aggregation vector to position spending functions with adjustment (1+m+1)	π_1Ad valorem indirect tax rate (1xn)
q_a Adjustment vector on private consumption (1+m+1)	π_2Indirect tax rate on volume
û Investment by production sector (1xk)	ζ Total population (1x1)
K Investment allocation matrix between production sector and commodity sector (kxn)	z* Negative product transfer coefficients (1xn)
α_p Confidence weights attached to p* (1xn)	u Investment by commodity sector (1xn)
α_σ Confidence weights attached to σ* (1xn)	

Adding up the components of final demand and using the well known Leontief input-output equation, the production of the commodity sectors at constant

$y = (I - A)^{-1} f$

The fundamental problem in input-output models is hence to determine production (y) given demand (f) and the technological conditions. This technological matrix has given rise to original forecasting methods developed by Battelle[166] combined with the RAS method approach. Forecasting techniques such as RAS are very powerful tools if combined with specific analysis of the most essential direct technical coefficients. This approach permits conciliation of both forecasting techniques and, at the same time, emphasizes those sectors of direct interest to participants in the programme, as well as those which are more

[166] E. Fontela, A. Duval, A. Gabus, M. Börlin and C. Velay, "Forecasting Technical Coefficients and Changes in Relative Prices", in Applications in Input-Output Analysis. A. P. Carter and A. Brody (Ed.), North-Holland, Amsterdam 1969.

sensitive to the outcome of the forecasts[167]. In EXPLOR, RAS was sufficiently flexible to permit introducing independent forecasts of specific coefficients affecting therefore the remaining coefficients subjected to the adjustment process. The fundamental interest was that those important coefficients were analysed and fixed in collaboration with Battelle techno-economists through international comparisons analysis, prospective market research and modelling, feasibility studies or technological intelligence in major fields such as construction materials, energy consumption, input/output chemicals model, automobile industry, future market and processing in iron and steel.

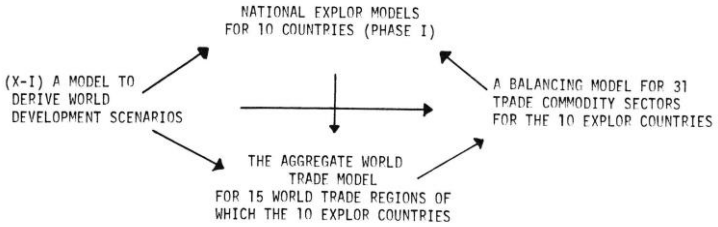
The price minimisation routine is based on a minimisation procedure between commodity prices and profit mark-up (expressing profits as a ratio on total outputs at current prices) constrained by the price formation of commodity prices for each productive sector. Then, the commodity price is transferred to the demand system including private consumption. And then, the model is closed by working through the various systems or subroutines making it up. The final results of the whole system is reached through an iterative process, normally after 3 or 4 iterations when production and labour levels between two iterations become significantly the same.

EXPLOR-MULTITRADE and scenario building

Schematically the integration of the different subsystems in the EXPLOR-MULTITRADE programme can be represented as follows:

[167] The sensitivity analysis of the coefficients on the productive system required building a submodel into the computer programme. The criterion adopted was a minimum 1% change in total output resulting from a 5% change in each technical coefficient (around 60 coefficients out of the 2,500 coefficients on the average present in matrix A.

Figure 10.2



Scenario Building

The study aimed at the identification of the most stable and probable trade flows and the main factors affecting their development in the periods under consideration. This included:

- Constructing data for the 10 EXPLOR countries and 5 other regions of the world. Trade flow matrices were set at a 31 level for which trade flow matrices were developed.
- Setting up time series on prices, exports and imports and other indicators that will be used and support future results.
- Developing a sound knowledge and background of the foreign trade patterns as accounted for by recent data as well as by international experts and other existing trade models.

The collection of views on future developments and their aggregation into most probable scenarios was, as already mentioned, a major innovation in the prospective analysis of the entire model. This was done with the use of Cross-Impact (X-I) analysis, one of the methods developed to draw on and profit from information of international specialists and which complexity had not yet proved possible to organize. For EXPLOR-MULTITRADE, 35 word trade modellers, planners and forecasters in a number of national and international organizations (of which World Bank, IMF, UNCTAD, FAO, OCDE, CEE, US and Canadian Departments of Commerce) were

consulted on their own views and insights about the process of future world trade developments.

Their opinions were used to select, for the periods 1975-1980 and 1980-1985, a set of future events and developments and their subjective probability assessments (probability of events and their cross probability). Finally, most likely scenarios were computed using the X-I procedure and resulted in scenario writing. The X-I procedure, events and estimate of probabilities, impact matrices and results of the X-I analysis are documented in a paper presented at the IIIe International Conference of Applied Econometrics, Brussels 1976[168].

The scenarios (events and hypothesis) derived were integrated and translated in terms of variables and parameters in the trade model as well as in the national models in order to ensure global consistency of the system.

The International Trade Model

The final aim was to revise the foreign trade results of the EXPLOR national models taking into account the world trade balance and consistency between growth of exports/imports and their impact on domestic market growth. The international linkage is consistently made in interrelating export-import flows of each country or economic area. However, intra-trade flows between the non-EXPLOR countries were not considered, due mainly to the lack of information.

The model was articulated (see Figure 10.2) into a two-level model.

1. An aggregate world trade model was developed for 5 macro-sectors (agriculture and food products, raw materials, basic products, equipment goods, other manufacturing products) and 15 world trade regions including the 10 EXPLOR countries and 5 other regions of the

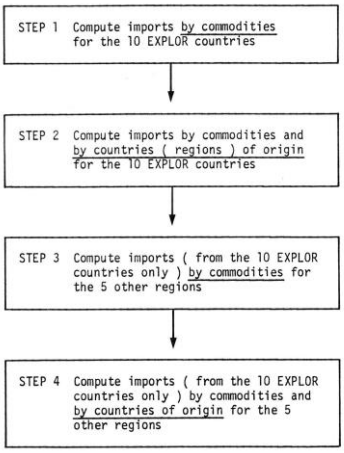
[168] E. Sallin-Kornberg, E. Fontela , Scenario Building with the Explor-Multitrade 85 Model, p. 309-325, Economica 1981, reproduced from the Explor-Multitrade 85 Model, IIIe Conférence Internationale d'Econométrie Appliquée, Brussels, 1976.

world (other developed countries, North Africa and Middle East, other developing countries in Africa, Oceania and Asia, developing countries America, Centrally Planned Economies in Europe and Asia). In subsequent applications, the model was extended to include two OAPEC (Oil Arab exporting countries) regions.

The exogenous variables (volume index of private consumption, gross investment and gross domestic product, agricultural and industrial output index, population, GDP deflator in national currency, US dollar exchange rate indices, export index prices by commodity group, energy production) were derived from the analysis of the world development scenarios. These general indicators were then translated in terms of composed explanatory variables required at the modelling level and used to evaluate future estimated import prices in dollar terms for each country or area. Using these variables, the demand equations for imports by sector for the 10 EXPLOR countries were evaluated in constant and current dollars. The functions of the model will not be described here.

The model proceeded to the following step computations:

Figure 10.3



The final output of the model was a trade flow matrix (f.o.b basis) with 75 rows and columns for 1980 and 1985, both at constant (1970) and in current prices, in US dollars.

2. The balancing trade model for 31 trade commodities for the EXPLOR countries finally computed trade (exports and imports) at

constant and current prices in US dollars and national currencies by disaggregating the results of the macro-trade at the 31 sectoral level with a distribution model for each of the countries.

10.3 The FORSYS Model

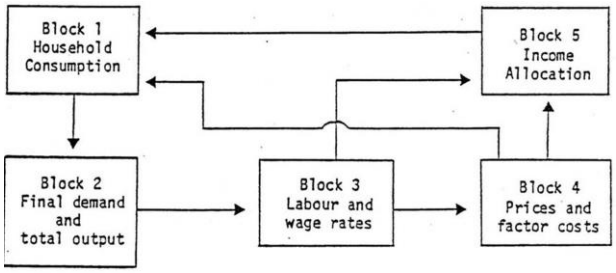
The FORSYS MODEL was the third generation of disaggregated sectoral models of the input-output type developed by Battelle Geneva[169]. It was presented at the Innsbruck International Input-Output Conference in April 1979. It was only tested for France as the French Statistical Office INSEE was publishing every year since 1970, together with the national accounts, intermediate consumption matrices disaggregated into 43 sectors both at current prices and prices of the previous year[170].

The model belongs to the econometric type of models which use lagged explanatory variables to introduce the dynamic element, coupled with the static input-output approach. The coupling allowed achieving a full set of sectoral forecasts for each year from the starting point of the simulation to the ending one, thus obtaining an annual path for each sectoral variable. The model was built also on a set of annual balanced macro-economic accounts. For a given year, the block structure of the model is presented in figure 4.

Figure 10.4: The Block structure of FORSYS

[169] The model was developed by E. Baranzini under the guidance of E. Sallin-Kornberg and E. Fontela

[170] A more disaggregated matrix was available for 92 sectors together with tables describing the equilibrium between resources and uses for about 500 products.



Note: Arrows indicate only the major dependencies between blocks

The model was solved by an iterative procedure for each year. Lagged endogenous variables and projected coefficients generate the values required for starting the iterative procedure for the following year. The FORSYS model is an interdependent set of relations and as such was to be solved simultaneously for the whole set of variables. In practice, the dimensions of the model (several thousands of variables and equations) and its non-linearity prevent from a computation of the solutions in terms of a simultaneous set of relations and force to resort to an iterative (or circular) method of computation. The 5 blocks structure represents the circular process of computing the retained year-by-year solution of the model.

One of the main differences in FORSYS with respect to EXPLOR was the forecasting method for the input-output coefficients at constant prices. In FORSYS, they are projected by a semi-automatic method for each year, from 1977 to 1990, introducing a logistic curve as the basic shape of the evolution of the coefficients with a well-marked trend (50%), the others being kept constant.

In fact, the timing for FORSYS was premature, first as statistical annual input-output data was missing for most of the EEC countries, and second, because companies and government agencies which had sponsored EXPLOR where still using it for national planning purposes or for corporate strategies in particular related to the energy field. Therefore there was no market for it.

Long-term simulation models

Long-term dynamic macro-economic (and energy demand) simulation models were developed to be used for particular country uses or to be integrated as sub-models into more complex systems of models (see 10.4 and 10.5). When looking at the long-term perspective, the

explanatory approach with quantitative models has to be flexible enough to allow for testing very different growth paths.

The SLT model[171] was first developed and applied to France. Economic, accounting and technological relations were introduced in the form of definitional, structural and behavioural equations. The model was circular and was solved through an iterative procedure. The parameters of the functions retained could always be interpreted, so as to be modified permitting alternative simulations. First, the model was long-term in the sense that it allowed for the full capital deepening effects of the investment process using a flexible accelerator type of approach. The relationships retained involved several variables subject to dynamic adjustments, in particular the evolution of expectations for production and labour input, the accumulation of physical capital and the determination of private consumption.

Besides the demographic sub-model, it contained 28 behavioural or technical equations, 25 definitional equations and 53 endogenous variables. Some of the features of the model can be summarized as follows:

- The sectorial block for value added provided for the future structure of the economy (public, construction, industry, intensive energy and tertiary sectors).
- The system of final demand consisted in behavioural demand equations incorporating relative or real prices.
- Labour in man-hours in the private sector and wages, with expected productivity gains as the major explanatory variable, allowed for the calculation of employment and labour income.
- Real personal income was calculated as the sum of real personal income, real gross profits of the self-employed, net company transfers to households and exogenous net transfers from government and the rest of the world.

[171] E. Sallin-Kornberg, The Long-Term Simulation Model SLT (France) (p. 114- 119), An Energy Policy Special, IPC Science and Technology Press Ltd, 1979 and Report of the Description of the Complete SLT Model prepared for EC, 1978.

- Endogenous gross national savings, current trade balance, unemployment rate and income from taxes helped to constrain the system.

For the future, the model was extended to include some monetary variables such as inflation, monetary mass and interest rates.

A particular application of this type of models was used to develop the SIM-II model for Spain[172] under my direction. It was part of a large project leaded by E. Fontela with the aim to consider and think over the major problems facing the future evolution of Spain.

10.4 Integration of Battelle Modelling and Forecasting in the Field of Energy

Energy Models for the EC

Battelle Geneva was involved as experts and through a large project directed by E. Fontela and E. Sallin-Kornberg in a programme of systems analysis and modelling in the energy sector which was carried out as part of the European Community multi-annual energy programme. The aim was to obtain a better understanding of the role of energy and its influence on economic, industrial and social development.

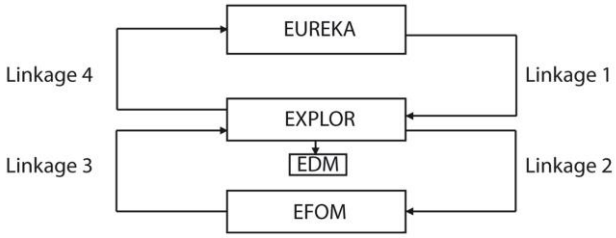
In the first phase of the programme (medium-term approach), a multinational dynamic macro-economic model (EURECA[173]) aimed at

[172] Emilio Fontela, España en la década de los ochenta, un estudio de prospectiva económica, Instituto Nacional de Prospectiva, 1980.

[173] A. Dramais and F. Thys-Clement, Department of Applied Economics, University of Brussels

predicting aggregate final demand and aggregate costs for the EC. It was intended to generate inputs to the EXPLOR medium-term inter-industry model (already used by other EC Departments and available for five countries). Linked to the sectoral EXPLOR projections, an energy demand model (EDM) derived energy demand for 14 aggregated main consuming sectors and about 9 energy products, using energy efficiency and energy substitution analyses[174]. Easy handling of the overall model EXPLOR/EDM required an interactive software developed by Battelle. The results were used as an input to a multinational flow optimization model (EFOM[175]) using linear programming to minimize the costs of satisfying total energy needs of a nation. The whole system was tested for France.

Figure 10.5. Linkages between the models



The second phase of the programme was dealing with the elaboration of long-term models. In fact, during the first phase, application of the models to all EC countries faced major delays because the workload was higher than expected. Moreover, when looking at the long-term perspective, the explanatory approach with quantitative models needed to be flexible enough to allow for testing of very different growth paths. It was then decided to use the long-term simulation model (SLT) to replace the EXPLOR and EURECA sub-

[174] Different modelling approaches were used for different countries, developed by Battelle, IIASA and M.S. Macrakis (MIT).

[175] D. Finon, Institut Economique et Juridique de l'Energie, Grenoble

models and to determine long-term energy demand with the help of the energy demand model MEDEE[176].

The SLT model was first applied to France, the final aim being to implement the model for the various countries and finally to the Nine together.

The SLT-EUR 9[177], like SLT-national is an annual, dynamic macro-economic and sectoral model. The main difference is that the model is on two levels: national and supranational. A number of variables are studied at the national level - the Community being the resultant – while others are evaluated only at the global level. Yet the two levels are interdependent. This approach enabled national structures, policies and economic performances to be reconciled with a Community overview. All the variables required by the MEDEE model were determined at national level.

At the EUR 9 level, the model included a demographic sub-model and a socio-economic model. The equations of the later were combined into 5 blocks:

1. Household consumption (by function and sector)
2. Final demand (government spending; housing, business and government investments, changes in stocks, exports and imports).
3. Employment and technology (stock of private capital, employment in number of hours, productivity of labour, real wage per hour and person, employment of government and in the private sector, working population, labour/capital ratio, unemployment rate)
4. Income and distribution (disposable income, national savings, trade balance per year and cumulated, value added at factor cost, wages and salaries, household disposable income net of direct taxes, total government tax revenue…)

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[176] B. Château and B. Lapillone (IEJE, Grenoble), Long-Term Energy Demand Simulation (p. 120-128), An Energy Policy Special, IPC Science and Technology Press Ltd, 1979

[177] E. Sallin-Kornberg, with F. Bolla and al., Final Report on the Long-Term Simulation Model SLT-EUR 9, Report, Commission of the European Communities, Luxembourg, 1982.

5. Sectoral equilibria (government, agriculture, construction, industry, intensive energy consuming industries, services).

The Interdependence model[178]

The Interdependence model was developed by ENI to simulate and evaluate outcomes of alternative cooperative strategies between oil and gas exporting and consumer countries. Battelle Geneva[179] and a large ENI working group within the ENI planning Department were major contributors to the elaboration of the model. Martino Lo Cascio was responsible for the definition and operation of the model's global framework.

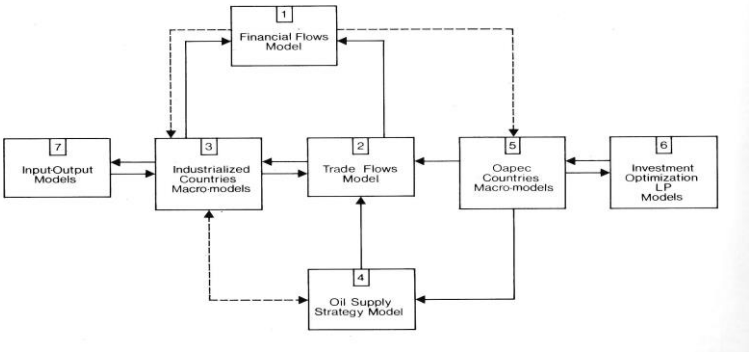
Model structure and methodology

Despite a global approach, the Interdependence model was developed by building a system of models, each of which covers specific aspects of the problem. The choice of interconnected system of models guarantees a high degree of flexibility in the solution procedure, transparency in the assumptions of each stage of the exercise and check on constraints (trade and capital imbalances, demand/supply elasticity and energy prices, inflation and growth rates for OECD countries, etc).

[178] Development Through Cooperation, Seminar between OAPEC and South European Countries, ENI, Roma 1981

[179] E. Fontela, E. Sallin-Kornberg, O. Hieronymi and F. Bolla.

Figure 10.6 Blocks of the Interdependence system of models



Input-output models (EXPLOR) for six OECD countries (USA, Japan, France, Federal Republic of Germany, United Kingdom and Italy) evaluated the outputs of the macroeconomic models[180] at the sectoral level, the inter-industry consistency relative to technological change and the impacts of energy consumption and transformation patterns in each single country.

The Trade Flow Model (MULTITRADE), through the matrix of trade accounts (10 OECD countries and 7 other areas the world of which 2 OAPEC regions and 5 commodity groups) and on the basis of estimated import functions allowed to identify the import requirements of each country and area and therefore their exports.

The Financial Flows Model developed by Battelle Geneva accounts for the capital flows between the OAPEC countries, OECD countries and the Rest of the World, starting out from an assessment of the current accounts of each country and area derived from the Trade Flow model and the results of the macroeconomic models for OCDE and OAPEC countries. It plays a crucial role in checking the consistency of the overall model solution against the balance of payments constraints at national and international levels.

[180] These models developed by E. Sallin-Kornberg and F. Bolla from Battelle Geneva are quite similar to the SLT models used in the EC Energy programme: econometrically estimated, dynamic and annual.

The model for simulating oil supply strategies is based on the dynamics of the OPEC supply strategies and the level of industrialised countries economic growth.

The great flexibility of the INTERDEPENDENCE model allowed to exclude some sub-models from the general solution when it was desirable to add other *a priori* hypothesis. This was the case of the oil supply model in interacting cooperative strategies simulation. In this perspective, one of the main results of the model is that it defines the limits within which OPEC oil supply and price strategies can operate during upward periods of the international economic cycle.

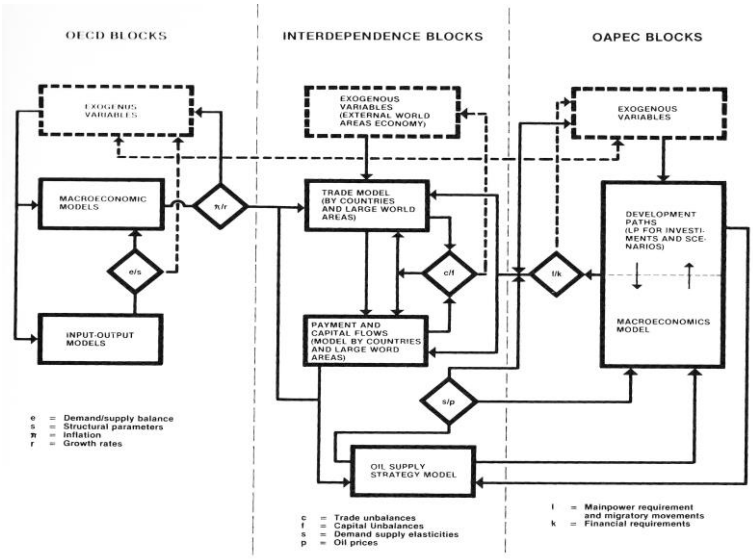
For the following ten years, different scenarios[181] of OAPEC supply and development strategies were made considering the fact that the world economy would still depend heavily on petroleum. Given the elasticity of demand for other sources or in other areas, the global oil demand for OAPEC countries would depend on the overall level of development of the world economy. This establishes the limits of OPEC adopting price and quantity policies to maximize revenues on the short run in view of their vulnerability to reduction in oil demand on the medium term in the consumer countries and the consecutive fall in oil prices.

Feasible solutions of the model were made by stages taking into account indicative scenarios on exogenous variables and the interactions between the variables of the different sub-models. The two basic runs considered:

- A neutral system interaction where OAPEC continues its oscillating oil price policy and OECD countries react by reducing energy demand.
- Interacting cooperative strategies where OAPEC and OECD countries find a compromise between oil prices, growth and trade balances.

[181] Cooperative versus non-cooperative scenarios and its impact on OAPEC and OECD growth and international economic development.

Figure 10.7 Solution of the INTERDEPENDENCE model



Scenario building for corporate strategy in the oil and gas field

With a team of ENI, Battelle[182] was conducting Cross-Impact (X-I) analysis to develop world most probable scenarios for the year 2000 on the political, institutional, economic, technological and energy environments. The results of the scenarios were used, together with a model of energy demand for 11 industrialised areas (of which the 10 EXPLOR countries), as inputs to ENI corporate oil investment strategies.

[182] E. Fontela and E. Sallin-Kornberg

Remembering Emilio

Emilio has been my mentor and research advisor during my professional working years at Battelle Geneva. He has been also, in some way, my protector in promoting me as a Senior Research Scientist, a very special management position within the Battelle structure. I appreciated and learned so much from him through the many projects and research we conducted or carried out together in Geneva as well as in Paris, Brussels, Madrid and Rome. His intelligence, creativity, global views and appraisal on all aspects of the problems to be approached were incredible. I deeply admired the way he conducted working round tables and summarised so easily the content of the discussions. He was really gifted and had a natural authority! But Emilio was also a lovely person to be working with and a very close and special friend to me. We had the opportunity in Geneva and during our frequent travelling periods to share special moments and confidences about our personal lives. In particular, we celebrated together in Madrid his 40th birthday dining in his preferred restaurant, went to cinemas or nightclubs after long working meetings, attended football world cup matches. I was honoured to be his witness at his second marriage.

E.S.K

Chapter 11 Total Factor Productivity and Relative Prices

Giorgio GARAU

11.1 Introduction

Fontela in his seminal work (1989) set up the distributional rule of productivity gain in the input output context (Total Factor Productivity Surplus, TFPS). In 1993, at the end of our PhD period in Geneva, under the supervision of Fontela and Lo Cascio, we propose an extension to identify a measure of surplus, called Purchasing Power Transfer (PPT). This measure is given by the productivity gains and the market surplus generated by extra-profits conditions derived from rental position detained by agents. Such a decomposition is very useful from our point of view since it would provide information about the degree of non-competitiveness in different markets. In our paper, we summarize the drawbacks of using the double deflation method and we compute and explain Fontela's TFPS comparing it with Garau's PPT.

11.2 Theoretical framework

During the 70s and the 80s most of the industrialised countries experienced a fall in productivity. However, this phenomenon did not affect the USA that, especially in the 90s, has seen a growth in productivity and a bigger economic growth, thanks to the development of ICT and to the rise of the 'New Economy'. Fontela (2002) argues that this is a typical mesoeconomic effect, whose dimension lies between the impact of structural changes in the technology of production (effects on

efficiency) and what has been observed at a macroeconomic level (effects on the growth).

To better understand these processes it is useful to refer to Baumol (1967) and to his model of unbalanced growth. The model considers two sectors, one is increasingly more productive and the other is in a situation of stagnation. In an economy characterised by perfect mobility of labour, the unbalance determines a reduction of costs and prices in the first sector, especially if there is substitutability between goods, and this could determine the disappearance of the sector whose productivity is not growing. Often, sectors with a stagnant productivity produce goods with an inelastic price (e.g. the artistic activities), and therefore the surplus transfers end up subsidising these activities. If instead the production of the two sectors is held in a fixed proportion, one would observe a progressive spill over of labour towards the less productive sector. This hypothesis have been empirically tested in different works (Baumol, Blackman and Wolf, 1985, Appelbaum and Schekatt, 1994).

Another cause of this differential evolution can be found in the structure of the market which characterises the different sectors. Fontela, Lo Cascio e Pulido (2000) found that in general there is an inverse correlation between prices and productivity, except for those sectors, such as agriculture, for which prices are distorted by the intervention of the Government. In short, their analysis allows to state that one of the principal causes of the unbalanced growth is the structure of the market, therefore the existence of imperfect competition, where prices do not adjust according to technical changes.

The relation between technical changes, market structure and prices has been analysed by Anne Carter (1990) in a model where, similarly to Baumol, it is considered an economic system composed by subsets of sectors, innovative sectors and sectors where no change in technology is observed. Results clearly show that the distribution of the innovation gains strongly depends on the structure of the market, and determines both an increase in profits, in the case where the advantages go to the capital holders, and a reduction of prices, in the case where the benefits go to the consumers under the form of increased purchasing power. All the cited studies underline the necessity of under-

standing what happens to prices and income when the effect of the innovation begins. For instance when at a certain time a productivity gain is observed, it is still not possible to say whether it would be preferable to obtain a long run price reduction, an income rise of different factors, or a combination of the possible effects.

In this case, it is clear that an answer can be provided by using CGE models. For instance, the FSD model (Fontela, Solari and Duval, 1971) that links the demand function and the production function, cited in Fontela (2002) constitutes a sort of precursor. This will be also our proposal, specifically mentioned in paragraph four.

The cited contribution by Baumol and Carter allow to better understand the mechanism of unbalanced growth which has characterised the New Economy in the following way (Fontela, 2002). The 90s productivity growth in the USA is certainly based on the introduction of ICT in most of the productive sectors. In fact, as one would expect, in a situation of perfect competition, this should produce a reduction of prices of all the goods that incorporate the new technology, and this process can be accelerated by the intervention of the Government for the dismantlement of public monopolies (e.g. telecommunications). At the same time, wages of specialised workers would rise, and possibly the surplus would be partially absorbed by those sectors who owning patents in the ICT. What happens now to the demand will depend on the elasticity of consumption with respect to prices and income, and, if the elasticity of goods and services with high technological content is high, one should see a chain effect where a rise in demand stimulates innovation, prices fall and the demand rises again. This dynamic, typical of the New Economy, will end up when the system is saturated of high tech goods, and, in any case, in the final phase, only a high rate of innovation would allow the system to keep growing. Because the growth mechanism here described is highly unbalanced, it is necessary to try to govern them through public policies capable of avoiding social and financial global crisis. (Fontela 2002).

These last words of Fontela seem to predict the big economic/financial global crisis of 2008, whose effects are still perceived nowadays. His analysis is truly precious to understand why currently, a world that evolves at different speeds is still unable to firmly restart and leave stagnation behind. It is important to study the effects of innovation to understand what the public sector can do to help firms innovating and

therefore to stimulate economic growth, as well as what could be done to avoid that the benefits of innovation, when existing, are entirely allocated to private sector and enterprises (Mazzucato 2014). This topic is linked to a correct design of cluster policies (those policies called smart specialisation strategy at an European and regional level) and to subsidies to the firms. In general when government resources are used, especially when its use can produce distortions, it would be opportune to perform an *ex ante* impact evaluation of the interventions, in order to better define the implementation and to report to the population costs and benefits of such policy. On this point, clearly explained by Mazzucato (2014), Fontela's contribution on the nature of surplus redistribution generated by technological progress between firms/sectors composing the economic system is extremely important.

The Emilio Fontela lesson, who began studying these issues in the 80s applying surplus distribution measures based on macroeconomic accounting systems (national states) or microeconomic ones (enterprises), is fundamental to understand, today, the distribution dynamics that trigger once the progress and innovation benefits appear. In his seminal paper (1989), the principal finding was that "a growth process does not only imply a path of generation of TFP, it also includes an internal transfer between industries of the gains of TFP". Moreover, in Fontela (1993), he states that "the rule of distribution will finally be dictated by the structure of the different markets … with perfect competition in all markets for products and primary factors, consumers will benefit immediately following price decrease but in all cases of more or less imperfect competition, the results will be less clear". In his work, Fontela qualifies his results relating to Spain as a demonstration of the appearance of an unbalanced growth path between manufacturing and services sectors (Baumol and Wolff, 1984). It is now clear which is the fundamental contribution of Fontela in providing valuable insights into the nature of productivity growth in order to design structural policies adequate to foster economic growth.

Our personal research path, started in 1989 in Geneva with a PhD in Econometrics and Statistics, where I had the privilege to be supervised by E Fontela and M. Lo Cascio, is configured as an attempt to develop the TFPS measure by Fontela. From Emilio I certainly took the intriguing theme of the relation between relative prices and produc-

tivity, while from Martino, who had also supervised our degree dissertation in Italy, the passion and the desire to improve this system, by using price indexes consistent with flexible production functions (translog). Results from our PhD are therefore the result of the cooperation between these two great researchers of the input-output analysis, to which I have humbly given a contribution by trying to translate their ideas into figures and later into synthesis indicators. Our contribution considers different market surplus configurations and relative processes of adjustment that can be observed as the consequence of innovative shocks (Garau, 1996).

The Chapter is organized as follows. Paragraph two contains illustration and theoretical justification of the Fontela system of surplus distribution other than comments about our exercise. Paragraph three propose the same exercise using the Garau's PPT distributional rules. Both these paragraphs are based on the data base reconstruction performed on the occasion of mine and two other colleagues participation at a research group working on double deflation and productivity measures whose results are contained in Biggeri and Ferrari (2010). Finally, in the last paragraph I try to show three possible way of extend TFPS/PPT analysis in order to support the dissemination of Fontela's idea and to make its approach a more useful tool for economic analysis and policy evaluation.

11.3 Fontela and the TFPS Transfers

The double deflation method is widely used but it could hide some important processes behind economic growth such as technical progress. An equilibrating system of accounts could not be produced at a constant price without the loss of some important effects concerning economic growth such as efficiency, rent spillovers and all those elements that may concern disembodied technical change. A single deflation procedure, instead, would allow one to determine a measure of productivity gains (Flexner, 1959, Fontela, 1989, Babeau, 1994 and Garau, 1996) and to understand the generating process of economic growth.

Moreover, the use of a constant price method not only gives us the opportunity to obtain information about the internal generation process of productivity but also the external determinant of growth that are behind the effect of change in the terms of trade, if, of course, proper index prices are used to deflate imports and exports. This would yield quite interesting results since the literature on economic growth has now recognized the role of knowledge spillovers as the most important driving forces behind economic growth. As knowledge is incorporated in commodities, trade with high technological countries means high quality and sophisticated inputs (either intermediate or capital goods), that improve efficiency and, in turn, the competition among regions. Such a potential finding has been identified in Flexner's (1959) original paper and estimates of external rent spillovers may be found for the Swiss economy in Antille and Fontela, (2003).

Let us suppose to have for a given period *t*: $\mathbf{X}$ and $\overline{\mathbf{X}}$, $\mathbf{l}$ and $\bar{\mathbf{l}}$, $\mathbf{k}$ and $\bar{\mathbf{k}}$, $\mathbf{m}$ and $\overline{\mathbf{m}}$, $\mathbf{f}$ and $\bar{\mathbf{f}}$, $\mathbf{e}$ and $\bar{\mathbf{e}}$; the matrix of intermediates flows, a vector of labour income, the capital return, the import flows, the final demand and export demand respectively in current and constant prices. According to the accounting constraint, both the following equations must hold:

$$\mathbf{X}'\boldsymbol{\iota} + \mathbf{l} + \mathbf{k} + \mathbf{m} = \mathbf{X}\boldsymbol{\iota} + \mathbf{f} + \mathbf{e}$$

(1)

$$\overline{\mathbf{X}}'\boldsymbol{\iota} + \bar{\mathbf{l}} + \bar{\mathbf{k}} + \overline{\mathbf{m}} = \overline{\mathbf{X}}\boldsymbol{\iota} + \bar{\mathbf{f}} + \bar{\mathbf{e}}$$

(2)

where $\boldsymbol{\iota}$ is a unit vector. Now, as we cannot observe $\bar{\mathbf{k}}$, the value added $(\bar{\mathbf{l}} + \bar{\mathbf{k}})$ must be of course obtained as a residual. However if we were able to deflate every single item of eq. (1) including $\mathbf{k}$ or at least to find a proper deflator for the value added as a whole, it would be quite plausible that the equilibrating relationship represented in eq. (2) does not hold.

As pointed out by Flexner (1959) even though we were able to remove all the statistical discrepancies due to calculation and statistical approximations, eq. (2) would be inadequate to represent constant price relationship since whenever productivity change arises between base year values and current values; this must be reflected in a balancing item in eq. (2).

Accordingly, we may argue that a well-defined system of account may provide a measure of productivity resulting from the difference between the amount of goods produced and the amount of inputs of production used. Such a measure will take positive value only if the quantity variation of the output is greater than the variation of all the inputs. Therefore, the relationship in eq. (2) must not hold and the balancing term has a precise economic meaning, which is called by Fontela (1989), Total Factor Productivity Surplus (TFPS):

$$\left[\overline{\mathbf{X\iota}} + \bar{\mathbf{l}} + \bar{\mathbf{k}} + \overline{\mathbf{m}}\right] + \mathbf{TFPS} = \overline{\mathbf{X}} + \bar{\mathbf{f}} + \bar{\mathbf{e}} \qquad (3)$$

Fontela (1989) calls the differences between output and inputs, both measured at constant prices, TFPS:

$$\mathrm{TFPS}_{i,t} = \sum_j p_{i,j,0} \cdot q_{i,j,t} - \sum_j p_{j,i,0} \cdot q_{j,i,t} \qquad (4)$$

where $TFPS_{i,t}$ corresponds to the amount of real resource flows between time *t* and time 0, $q_{i,j,t}$ is the flow of output of sector *i* towards sector *j* and $p_{i,j,0}$ is the market price to its base year value. Since $\sum_j p_{i,j,t} \cdot q_{i,j,t} = \sum_j p_{j,i,t} \cdot q_{j,i,t}$, the expression (4) can be re-written in terms of price variations as follows (Fontela, 1989):

$$\mathrm{TFPS}_{i,t} = -\sum_j q_{i,j,t} \cdot (p_{i,j,t} - p_{i,j,0}) + \sum_j q_{j,i,t} \cdot (p_{j,i,t} - p_{j,i,0}) \qquad (5)$$

whereas eq. (4) measures the creation of TFPS using the index number approach, eq. (5) can be interpreted as a distributional rule of TFPS. As it is self-evident, such a distribution depends on the price variations of outputs (first element on the right hand-side) and inputs (second element on the right hand-side) and can be transposed into the traditional IO context if the entire accounting system in current and constant price is available. For a given period, t, the following definition of TFPS can be considered:

$$\mathbf{TFPS} = \left(\mathbf{S}'\boldsymbol{\iota} + \mathbf{s_k} + \mathbf{s_l} + \mathbf{s_m}\right) - \left(\mathbf{S}\boldsymbol{\iota} + \mathbf{s_f} + \mathbf{s_e}\right)$$

where $\boldsymbol{\iota}$ is a unit vector, $\mathbf{S}\left[s_{i,j}\right] = \mathbf{X} - \overline{\mathbf{X}}$, $\mathbf{s_k}\left[sk_i\right] = \mathbf{k} - \bar{\mathbf{k}}$, $\mathbf{s_l}\left[\mathrm{s}\,l_i\right] = \mathbf{l} - \bar{\mathbf{l}}$, $\mathbf{s_m}\left[\mathrm{s}\,m_i\right] = \mathbf{m} - \overline{\mathbf{m}}$, $\mathbf{s_f}\left[sf_i\right] = \mathbf{f} - \bar{\mathbf{f}}$ and $\mathbf{s_e}\left[se_i\right] = \mathbf{e} - \bar{\mathbf{e}}$.

By considering a given year *t*:

- $\mathrm{s}_{i,j} > 0$, it means that industry *j* is transferring surplus to the industry *i*,; and the reverse applies when $\mathrm{s}_{i,j} < 0$, that is to say, industry *j* is paying relatively less for the inputs provided by industry *i*. Particularly interesting is the net industry contribution: $\mathrm{s}_{n,i} = \sum_j \mathrm{s}_{j,i} - \sum_j \mathrm{s}_{i,j}$. When $\mathrm{s}_{n,i} > 0$, industry *i* is transferring surplus to the rest of the economy more than it is gaining from all other sectors.
- Industry *i* is transferring surplus to its primary inputs when, sl_i and sk_i are positive.
- When the price of some commodity falls, industries transfer additional surplus to consumers making $sf_i < 0$
- From the trade side, we have an inflow of productivity gains from the Rest of the World when $se_i > 0$ and $sm_i < 0$. And, the reverse applies when $se_i < 0$ and $sm_i > 0$. Then we can compute, as in Fontela et al. (2003), the net outflow $sm_i - se_i > 0$ or net inflow in the opposite situation, $sm_i - se_i < 0$.

The analysis of the TFPS is carried out for the period 1995-2002 for the Italian economy. The results are shown in Table 1. From the last column of this table, we see that the total amount of TFPS is negative, meaning that in the period 1995–2002, the Italian economy is not able to generate TFP gains as well as to create an available surplus to be transferred through a reduction in sales prices to the consumers and investors.

The figures also show that the rate of return of one factor of production paradoxically increases albeit inefficiency in production (negative innovation gains). Indeed, the rate of return to capital raises whilst the real wage rate falls, reflecting that production activities are transferring TFPS to capital and absorbing TFPS from labour. These results, I believe, are the consequences of the national labour market reform undertaken in 1993 (Income Policy Agreement) which has generated a high labour-capital conflict ending up giving advantage to the capital side and increased labour market flexibility[183] leading to the reduction of the bargaining power of workers and the purchasing power of wages.

As far as the net foreign flows are concerned, overall, during the period in analysis Italy experienced positive terms of trade effects. The net foreign inflow (14121) reflects the high capacity of the Italian economy to gain innovation spillovers from the Rest of the World (ROW). However, the capacity of the Italian economy to gain from terms of trade improvement is not able to offset the negative domestic productivity performance. This gives us a picture of an economic system where consumers (Government and Households) and investors have to give up part (or all) of their TFPS to pay a high price for consumption and capital goods, respectively.

From a sectoral investigation, we understand that Mining, Quarrying, and Manufacture of Transport Equipment are those sectors able

[183] The work of Devicienti et al. (2007) shows that, after the national labour market reform, wages became more flexible since they are now more responsive to local unemployment. Before the reform, wages were set within a centralized bargaining with automatic indexation of wages to the real inflation. Instead, the reform has introduced a new bargaining system. The centralized bargaining process still remains in order to set the industry wide national wage, but with indexation to the Government's target inflation (which is always lower than the real inflation). The additional wage distributed to the workers (or the top up component) is now set according to the firm and regional conditions.

to generate the highest TFP gains. However, these sectors act a different distribution process of the TFPS.

Mining and Quarrying is able to distribute just a minimum part of its TFP gains since in this sector the rate of return to capital and the real wages increase, and its position with the rest of the world is weak. Indeed, we see that about 77% of the TFPS is absorbed by the rest of the world through an increase in the cost of imports (144, is the price index). Furthermore, the overall position with respect to the ROW is negative. Substantially, under the period in analysis, this sector has suffered of negative terms of trade with the results of a net outflow of TFP surpluses (8084).

With regards to Manufacture of Transport Equipment, the total surplus available for distribution (10550) is greater than the innovation gains generated (10393). This is happening because Manufacture of Transport Equipment, is not only able to generate TFP surpluses but, at the same time, is also able to lower its costs through a reduction in the overall cost of primary inputs (22) and take advantage of positive spillovers from imports. On the other hand, the distribution process gives advantages to more investors (9415) and the ROW (1570) by a fall in the price of capital goods and exports, respectively.

The worst performance in term of innovation gains is coming from Construction, Financial, and Insurance Activities. In the former sector, not only the TFPS is negative (49380) but also there is a net transfer of purchasing power towards primary inputs which is going to advantage only capital. Albeit the net benefit from the ROW is positive, this is not able to cover the rise in the price of value added and the negative TFPS, meaning that Construction is a sector that has a strong rental position in the market, absorbing as a consequence TFP surpluses from the final demand with important drawbacks especially for investors. In the latter sector, instead, the negative TFPS (25502) is partially offset by a reduction in the cost of primary inputs and positive external spillover from imports. Nevertheless, the total surplus available for distribution still remains negative (19798) with the consequences that consumers and investors have to pay a high price for consumption and capital goods, respectively.

If we just consider the net outflow or inflow of TFP surpluses, the best performance is experienced by Agricultural, Forestry and Fishing,

for which we have a total net inflow of TFP gains (3090). Indeed, the related price index for imports is equal to 75.10 while the price index for export is 101.41 with an improvement of the terms of trade. On the contrary, the worst external performance is for Mining and Quarrying that experience a deterioration of the terms of trade (import price index is equal to 144.08 while the export price index is 88.92).

11.4 From TFPS to Garau's PPT

In eq. (5), the computation of the TFPS is obtained through market prices. We may decompose the market price $p_{i,j}$, as follows:

$$p_{i,j,0} = p^{*}_{i,j,0} + p^{**}_{i,j,0}$$

where $p^{*}_{i,j,0}$, is the price we would have if the agents present in the market were not able to gain from rental positions. It means a situation where the prices of all sectors adjust to their productivity and the rate of productivity growth is the same in all sectors. That is to say, a situation in which extra profits are zero and there is no modification of relative prices. $p^{**}_{i,j,0}$, is instead an index of market bias that identifies the presence of extra-profits and those agents that are in the position to gain from market imperfections. Substituting the definition of market price in eq. (5), we have that:

$$TFPS_{i,t} = -\sum_{j} q_{i,j,t}(p_{i,j,t} - p^{*}_{i,j,0} - p^{**}_{i,j,0}) + \sum_{j} q_{i,j,t}(p_{j,i,t} - p^{*}_{j,i,0} - p^{**}_{j,i,0})$$

(6)

Furthermore, with some simple adjustment, the eq. (6) can be rewritten ascribing to the TFPS and to the following decomposition the meaning of a measure of Purchasing Power Transfer (PPT):

$$\mathrm{PPT}_{i,t} = -\underbrace{\sum_{j} q_{i,j,t} \cdot (p_{i,j,t} - p^{**}_{i,j,0})}_{1} + \underbrace{\sum_{j} q_{i,j,t} \cdot p^{*}_{i,j,0}}_{2} +$$
$$+ \underbrace{\sum_{j} q_{j,i,t} (p_{j,i,t} - p^{**}_{j,i,0})}_{3} - \underbrace{\sum_{j} q_{j,i,t} \cdot p^{*}_{j,i,0}}_{4}$$

(7)

The market price indexes, $p_{i,j}$, allow us, through eq. (5), to compute the overall purchasing power transfers (PPT). With the decomposition process, in eq. (7), we can distinguish the technological performance of each sector (TFP), that is to say, the difference between the terms 4 and 2 on the right side of eq. (7), and a measure of the alteration of the natural market mechanisms, given by difference between terms 3 and 1 on the right side of eq. (7). With regards to the TFP component, the difference between real outputs and real inputs should be computed using ideal price indexes or prices consistent with the neoclassical framework (Wolf, 1985 and 1989). This measure reflects the welfare gains of innovations that allows sector *i*, to increase its outputs faster than its inputs between time *0* and *t*, if $\left[\sum_j q_{i,j,t} \cdot p^{*}_{i,j,0} - \sum_j q_{j,i,t} \cdot p^{*}_{j,i,0}\right] > 0$.

The market component of the PPT decomposition is given by (1) and (3):

$$\text{Market Surplus} = -\underbrace{\sum_{j} q_{i,j,t} (p_{i,j,t} - p^{**}_{i,j,0})}_{1} + \underbrace{\sum_{j} q_{j,i,t} (p_{j,i,t} - p^{**}_{j,i,0})}_{3}$$

The difference between these two terms can be interpreted as redistribution among the different economic agents of the market power generated through changes of the prices of inputs and outputs. If $p_{i,j,t} < p^{**}_{i,j,0}$ then the industry is losing bargaining power and it is transferring part of its purchasing power to its customers (intermediate producers or final users) by supplying its products at a lower relative price. Accordingly, the relative price of output of an industry decreases and the term (1) becomes positive. If $p_{j,i,t} > p^{**}_{j,i,0}$, the industry is transferring part of its purchasing power to its suppliers since is paying relatively more for its intermediate and primary inputs. This means that the

term (3) becomes negative. With regards to the computation of the measure of TFP in eq. (7), we adopt a discrete approximation of the Divisia index given by the Törnqvist chain index[184]:

$$p_j^* = \prod_{i=1}^{n+2} \left(\frac{r_{i,j}^1}{r_{i,j}^0} \right)^{\frac{1}{2}\left(w_{i,j}^0 + w_{i,j}^1\right)}$$

where r_i are the inputs prices, (*n* intermediate inputs and 2 primary inputs) and w_i^0 (w_i^1) are input shares, at constant prices, per unit of output for the two periods (the first, 1 and the last, 0). If current price values are deflated by their Törnqvist price index, the relative transfers reflect the effects of technical change. Indeed, in the neoclassical perfect competition context, it is recommended for consistency to use Tornqvist-Divisia indexes for the measurement of TFP (Wolff, 1989 and Fontela, 1994).

In order to compute the total measure of PPT, we should also calculate the Market Surplus (MS) through the distortionary price $p_{j,i,0}^{**}$. However, we do not have such price index. Then, in order to compute the MS component of eq. (7), we can use the definition of the market price seen above, $p_{i,j,0} - p_{i,j,0}^{*} = p_{i,j,0}^{**}$. This also means that MS can be easily obtained as residual.

According to eq. (7), if $PPT_{i,t} > 0$, the sector *i* is transferring purchasing power to the rest of the economy, through a reduction in the market power and an increase in TFP. While if $PPT_{i,t} < 0$ the sector *i* is absorbing resources from the rest of the economy. The results of the operations are presented in Table 2. The first column is the difference between terms (2) and (4) of eq. (7), whilst the second one is the difference between the terms (1) and (3) of the same equation. The last column is the total effect.

With regards to the manufacturing sectors, the best performance in terms of TFP are in the *Manufacture of Fabricated Metal Products*

[184] The use of Tornqvist's index for productivity measures has been strongly recommended by Wolf (1985 and 1989) and Fontela (1994). For the limitations of the Törnqvist Divisia index see Martini (1992).

and in the *Manufacture of Chemicals and Pharmaceutical*. *Manufacture of Fabricated Metal Products*, has positive productivity (TFP>0) and also positive market surplus (MS>0). This implies that this sector is giving up part of its purchasing power to the rest of the system. On the contrary, for *Manufacture of Chemicals and Pharmaceutical*, the capacity to generate productivity is partially offset by an increase of its market power.

What is interesting is the position of the *Manufacture of Machinery and Equipment*, and *Manufacture of Transport Equipment* that lose productivity but, at the same time, give up part of their market power allowing the system to regain PPT.

The manufacturing sectors that, more than other, experience an increase in its market power, is the *Manufacture of Coke and Refined Petroleum Products*. Its strong market position overwhelms the capacity to transfer purchasing power in terms of TFP.

From the side of services it is worth noting that some public services such as *Public Administration and Defense*, *Education* and *Human Health Services*, albeit the real outputs is greater than the real inputs, the distortionary market conditions prevent a redistribution through a favorable change in prices.

Also for *Electricity, Gas and Water supply*, we have the same kind of situation. By and large, it follows that an increase in TFP in a given sector of the economy is not necessarily leading to a decrease of its relative market prices, nor a decrease in its market power. Since our analysis takes in consideration the period 1995-2002, we are not able to capture the effect of the liberalization of the electricity supply that started in Italy at the beginning of 2004. Two years (2000-02) may not be enough to produce positive effect. From a liberalization policy we would expect not only an increase in TFP, but also a transfer of purchasing power to the rest of the system, given that a more competitive market in energy supply should lead to a decrease in its relative price change.

Construction and *Financial activities* not only have negative performance in terms of productivity but they also increase their purchasing power by increasing their relative price.

In conclusion, we can say that the capacity to generate productivity does not automatically produce downward pressure on relative prices. There is not a mechanical process according to which positive innovation gains correspond to an increase in the purchasing power of workers or capitalists, nor to a transfer of resources to consumers. Indeed, the total PPT available for distribution depends on the rule of distribution that in turn is the result of the structure of different markets. Prices in the market might be different from the ones we would expect in a perfect competitive market. Therefore, an industry may adjust its selling price increasing its purchasing power that is to say, enlarging the gap between the actual market price and the ideal price. The same might occur for instance in the market of labour or capital. Specifically, it is the combination of the degree of distortion in the market that determines the rule of distribution of the PPT.

11.5 Further Topics Under Inspection

Fontela closes his seminal paper (Fontela, 1989) describing an alternative model of growth where the long-term trend of increasing relatives prices in services changes in order to allow a process of TFPS transfers. Nowadays the role of the service sector belong to renewable energies, green chemistry or "internet of things" (Rifkin, 2014), as these are sector where a big concentration of research and innovation will probably produce TFP gains able to push the economy towards a new deal. In this paragraph, conceived as a road map for further inspection of area where TFPS analysis could be improved and become a useful tool for economic analysis and policy evaluation, we try to stress how the Fontela contribution today represents an inheritance rich of further suggestions.

11.5.1.Prices

Prices are fundamental, as seen in Sections two and three, in order to obtain coherent measures of TFPS and PPT. Moreover, in Garau (1997) and in Antille and Fontela (2003) a system of international prices is conceived to give an insight to the spatial distribution of productivity gains. The first uses import and export prices produced by the World Bank and his principal findings concern the possibility to design different mechanisms of effect transmission from the national to the inter-country dimension, depending on the national sectoral market power that is generally not strong enough to dominate the redistribution mechanism at the international level. This subject is really interesting in the European federal context, in order to assess regional growth, understanding how some regions contribute to other region's growth. Antille e Fontela (2003) conceive a more detailed system of TFPS transfers, distinguishing among domestic and imported input flows. Their evidence supports the Kaldor's idea (1976) that the evolution of the term of trade has to do with market structure and the example proposed, of Swiss industries with high level of innovation, able to appropriate their innovation gains by exporting at high prices in well differentiated markets, fits well with the Garau's development of Fontela idea.

11.5.2 Accounting systems

The recent book of T. Piketty (2014), that rediscovers and provides new arguments for the Kuznets Curve (1955), s brings back the focus of the economic discussion on the distribution of the surplus between capital and labour, providing also empirical evidence of the long term with regards to factors affecting it. Among convergence factors (i.e. reduction of inequalities), the most relevant is the innovation and knowledge diffusion resulting from human capital investments as it allows an increase in productivity and a positive effect on economic growth. Clearly, the first divergence factor is the absence of such investments but also the imbalance derived from wealth accumulation and concentration processes. When the annual ROE is greater than the growth rate, the assets inherited from the past grow faster than the production process; a minimum amount of capital income savings is needed to allow capital growth increase faster than the overall economic growth.

The labour-capital conflict, stressed in paragraph two, ending up giving advantage to the capital side imposes to understand upstream

mechanisms producing such results. Difference between PPT and TFPS could be interpreted as inertia in the adjustment mechanisms or, equivalently, as a distance from perfect competition and related automatic adjustment mechanisms. In this view I find that an interesting research topic could be the use of business registers of Job Centre (covering all dependent labour market movements, i.e. entry and exit in labour market) and Academic Institutions (graduates archives) to build labour market scenarios and to model how human capital policies (but also R&D policies) can determine sectoral growth and contribute to define productivity growth pattern.

Input-output accounting maintains its focus on production (where productivity gains are generated) and it is therefore inadequate to capture the complexity of the interrelations between production and consumption. Conversely, SAM accounting allows it. When the observed deviation from the optimal distributional result depends on the asymmetric speeds of adjustment of prices under the hypothesis that a rapid (low) adjustment of a specific price, means less (greater) dynamic rental positions for consumer, workers or enterprises emerge . Some possible and useful results of TFPS/PPT analysis conduct in this new accounting context concern the link among the generation of productivity gains in the production area with other areas, like saving and social security, where arrive a huge amount of resources produced by technical progress and/or augmented by market power.

In this same research line, implementation of accounting systems specifically integrated in the context of national accounts, is to be considered the analysis contained in Lo Cascio, Carbonaro, Guidi (1998), in which the authors use the satellite account of Transportation for structural analysis, in order to understand how this sector will affect the profitability of the economic system. The main results of the adoption of the TFPS transfer approach shows a strong absorption of TFPS from other branches, accounting for 7 % of GDP. Contributions come from the agricultural sector and the manufacturing and at the level of primary factors is essential the contribution of labour, resulting in a clear loss of welfare.

11.5.3 A modelling context

We need to have models useful for monitoring policies, able to estimate the possible long-term behaviour of some fundamental macroeconomic variables when structural policies are implemented. In that view we propose to go in depth in the modelling version constituted by CGE models. The analysis of productivity distribution and the modelling of regional technical change could be integrated in a CGE model in which the technology will be the most important variable in explaining relationship on the supply side. Such a model will be able to capture the short and long run effects (together with the transitional pathway) of an increase in productivity and then forecasting the productivity gains transfers among economic agents. Such model could be very helpful for the policy maker when the aim is both to push on the productivity and the final destination to the primary factors of the corresponding welfare gains. For example, if the regional government would invest in R&D, the analysis of TFP surplus can suggest us which sector would be able to generate the highest TFP and the surplus available for the distribution to the other agents.

The picture of inter-industry diffusion and distribution of the welfare gains of innovations provided by this model might be used to manage the process of prices adjustment when the industrial policy takes the form of selective subsidies. In fact, they can be oriented towards correction of imperfections in the market mechanism or in favour of sectors that exhibit high rate of innovation in order to transfer massive welfare gains to the rest of the economy.

The standard CGE modelling approach, based on neoclassical assumptions such as perfectly competitive markets and constant return to scale, leads to results on key macroeconomic variables consistent with price competition. Conversely, in our analysis we are interested in the study of the effects that arise in an economic system when in a specific sector there is evidence of imperfect competition. Usually, CGE models with imperfect competition[185] are based on the theory of product varieties that, in turn, is derived from the theory of industrial organisation

[185] See Harris (1984) and Harrison, Rutherford and Tarr (1997) for CGE models embedding market imperfection features such as price-setting and market power in some industries.

allowing the economies of scale instead of constant return to scale[186]. These models are used, between others applications, in order to assess the impact of the European unification in reducing inequalities, labour market imperfections and as a modelling tool, to endogenise innovation and technical progress that allows firms to determine their price mark-up endogenously and, in this way, to affect consumers utility.

The comparison between the long term simulation produced by the two models (standard and with imperfect competition) may be a good instrument to design public policies in order to support the process of diffusion of innovation, to choose which sectors need further liberalization and finally to design a tax system that allows the community to take control of at least part of the benefits of innovation, so that it can then support also in the future.

TABLE 11.1. The distribution of TFP surpluses in Italy, 1995-2002; values in millions of Euros

[186] See Dixit and Stiglitz (1977) for the notion of product varieties and the concept of industrial organisation.

	Agriculture, forestry and fishing	Mining and Quarrying	Manufacture of food products, beverages and tobacco	Manufacture of textiles and wearing apparel	Manufacture of leather and related products	Manufacture of wood and wood products	Manufacture of paper and paper products	Manufacture of printing and reproduction of recorded media	Manufacture of coke and refined petroleum products	Manufacture of chemicals and pharmaceutical	Manufacture of rubber and plastic products	Manufacture of other non-metallic mineral products	Manufacture of fabricated metal products, except machinery and equipment	Manufacture of machinery and equipment	Manufacture of elettrical equipment	Manufacture of transport equipment	Other manufacturing	Electricity, Gas and water supply	Construction	Wholesale and Retail trade; Repair of Motor vehicles and motorcycles	Accomodation and food service activities	Transportation and storage	Financial and Insurance activities	Real estate activity	Scientific research and development	Legal, accounting, management and other professional activities	Public administration and defence; Compulsory social security	Education	Human healt services	Other service activities	Total
Total TFPS[a]	-2618	10512	-1703	-696	-3070	983	3020	-374	-168	3310	3355	-295	6620	5780	5482	10393	-673	-6382	-49380	4317	-3195	9183	-25502	-7011	1554	-4407	-9178	-8950	-5406	1987	-62513
Lowering(-)/increasingr(+) the cost of primary inputs {b= [b1+b2+b3]}	-2908	479	271	-494	-69	-79	667	758	237	83	309	132	172	498	1197	-22	109	-1428	2018	14232	5658	4805	-4757	-5703	2276	-1921	-8457	-8290	-2342	1364	-1205
Labour [b1]	-388	108	-9	724	331	357	91	-88	78	628	325	51	720	1015	374	174	640	-1187	-127	6614	2830	-611	-2473	-693	2656	-329	-7649	-8994	-3041	458	-7414
Capital [b2]	-2523	371	282	-1223	-402	-437	574	844	148	-553	-18	74	-556	-524	818	-198	-533	-263	2134	7590	2825	5384	-2313	-5019	-383	-1609	-844	696	671	894	5910
Net Taxes [b3]	3	1	-2	5	1	1	2	1	10	8	2	7	9	6	4	3	2	22	12	28	4	32	29	9	3	16	36	7	29	11	299
		-0.77																													
Positive/Negative spillovers from Import [c]	*3031*	-8084	*3989*	*624*	*-23*	*783*	*3194*	*493*	*-1554*	9381	*1324*	*329*	8218	-364	*3801*	136	*266*	*820*	*80*	*1451*	*861*	*2489*	*947*	*1228*	*573*	*1815*	*0*	*22*	*0*	306	36138
Total available for distribution {a+[-b]+c}	3321	1949	2016	422	-3024	1846	5547	-639	-1959	12608	4369	-98	14665	4919	8086	10550	-517	-4134	-51319	-8464	-7992	6867	-19798	-79	-149	-671	-721	-637	-3063	929	-25171
Distribution Process																															
Lowering (+) or increasing (-) prices for intermediate inputs [d]	2547	1798	540	497	-383	1470	3769	-1025	-844	2899	1919	-910	9832	-3005	3258	-1324	-1542	-3024	-1682	-2817	-3118	4276	-11909	287	-606	-777	-53	142	-677	461	0
Lowering(+) or increasing(-) prices for consumers [e]	834	0	331	-700	-603	131	688	-12	117	1769	304	-29	180	186	1367	889	270	-1093	85	-1044	-4873	2344	-6945	-691	-51	-52	-668	-778	-2386	812	-9620
Lowering (+) or increasing (-) prices for investors [f]	-1	90	-124	142	-2	-68	-1	-16	18	-3	5	-78	-1262	6904	1037	9415	131	0	-49726	-4454	0	-291	0	346	518	215	0	0	0	-364	-37568
Lowering (+) or increasing(-) the price of export [g]	-59	59	1269	483	-2036	313	1091	414	-1250	7943	2141	919	5914	835	2424	1570	624	-17	5	-149	-1	539	-944	-21	-11	-57	0	0	0	19	22017
Total distribution {d+e+f+g}	3321	1949	2016	422	-3024	1846	5547	-639	-1959	12608	4369	-98	14665	4919	8086	10550	-517	-4134	-51319	-8464	-7992	6867	-19798	-79	-149	-671	-721	-637	-3063	929	-25171
Net outflow(-)/inflow(+) {c-g}	3090	-8144	2720	141	2013	470	2103	79	-304	1438	-817	-590	2303	-1199	1378	-1434	-358	837	75	1599	862	1951	1890	1250	584	1872	0	22	1	287	14121

Table 11.2. Total Factor Productivity and Market Surpluses in Italy, 1995-2002, in millions of Euros

	TFP	MS	PPT=TFPS
Agricolture, forestry and fishing	4182	-6800	-2618
Mining and Quarrying	-11495	22007	10512
Manufacture of food products, beverages and tabacco	547	-2249	-1703
Manufacture of textiles and wearing appareal	-153	-543	-696
Manufacture of leather and related products	-665	-2405	-3070
Manufacture of wood and wood products	717	266	983
Manufacture of paper and paper products	2239	781	3020
Manufacture of printing and reproduction of recorded media	-135	-239	-374
Manufacture of coke and refined petroelum products	2776	-2944	-168
Manufacture of chemicals and pharmaceutical	4727	-1417	3310
Manufacture of rubber and plastic products	432	2922	3355
Manufacture of other non-metallic mineral products	287	-582	-295
Manufacture of fabricated metal products, except machinery and equipment	5933	687	6620
Manufacture of machinery and equipment	-2468	8249	5780
Manufacture of eletrical equipment	-507	5989	5482
Manufacture of transport equipment	-3827	14220	10393
Other manufacturing	22	-695	-673
Electricity, Gas and water supply	3699	-10081	-6382
Construction	-2425	-46955	-49380
Wholesale and Retail trade; Repair of Motor vehicles and motorcycles	-16472	20789	4317
Accomodation and food sevice activities	-6010	2815	-3195
Transporation and storage	-4399	13581	9183
Financial and Insurance activities	-1034	-24467	-25502
Real estate activity	2808	-9819	-7011
Scientific research and development	-2402	3955	1554
Legal, accounting, managment and other professional activities	658	-5066	-4407
Public administration and defence; Compulsory social security	7172	-16350	-9178
Education	6858	-15808	-8950
Human healt services	905	-6311	-5406
Other service activities	-1747	3734	1987
Total	-9779	-52734	-62513

Chapter 12: The Comet: Emilio Fontela, Industrial and Techno-economic Analysis and Forecasting

Pàl KUKORELLY

12.1 Introduction

This Chapter, an homage written by a fellow economist from University of Geneva where I had first met Emilio Fontela, covers a variety of areas. The relation of the author with Fontela were constantly on two planes, professional and personal. Indeed, if our major link was the Battelle research universe, largely similar extra-professional activities allowed the easiest understanding in most fields. It is therefore legitimate that my recollection of past events in relation with Emilio be placed in this two-fold context. For me Emilio was Battelle, and Battelle was Fontela.

This text is based on reminiscences of Fontela as a colleague, friend and boss during our Battelle years and revives a few characteristic events and situations in which we travelled, worked, acted together. It implicitly reveals the work and life style of Emilio. The presence of eminent personalities here throws light on Fontela's circles of people who were privileged interlocutors. The exploration of the future was an important part of the researchers' general preoccupations, and the Explor macroeconomic system of analysis and forecasting was an important source of fertilisation in the whole spectrum of applied economics research.

12.2 The Presence of Emilio Fontela

Every section of this chapter is a homage to Emilio Fontela Montes, ´´ The Comet ´´.

Indeed, he enlightened all things: the ideas, the projects, our general research activities, and also the meetings we had with him, around him.

During the fifteen years I worked at Battelle, years which were, without doubt, the most interesting period of my professional life, none of my projects, none of my other activities and initiatives went without his advice, authoritative contribution and approval. He was the bridge between macroeconomics and the more closely applied discipline of micro, i.e., industrial economics (and also meso economics as discussed in the book). Although his area of close interest was socio-macroeconomics, econometrics and the application of mathematics and models, he moved with perfect ease in industrial economics and markets. The globalized world economy, trade, finance, and development questions had no secrets for him.

Always intellectually deeply curious, Fontela rode the high waves of culture and intelligence, sailing with lightness not only on both shores of the Atlantic, but also very far in the East, that is, Japan. He opened dialogues with the best in the Latin world and in the "West" – Great Britain and North America. Some of the brightest brains of a few Japanese enterprises sought his company. If the primary interest was in economics, his approaches covered the bulk of societal and political questions.

One day he proposed to initiate a research on a subject which in reality was very topical then, but at first it might have appeared rather esoteric: undertake exegetes of works – les Mémoires – of Charles de

Gaulle as one source the better understanding of which could help a more realistic view on post-WW II transatlantic politics.

12.3 Battelle: Fontela colleague and friend

For a number of years the Battelle Institute was the center of our lives. For me there were two outstanding leaders: Fontela and Hugo Thiemann, the Director of Battelle Geneva. When I joined Battelle Fontela was one of the youngest members of the Department of Applied Economics, and certainly the youngest research group leader. This was the Socioeconomics Group. Emilio had never been a "simple" economist. An open minded, cultured young man, he was interested in more than macroeconomics and mathematics, his grasp of abstract concepts was astonishing. Also the speed with which he saw through problems and situations. A fast thinker, his mind reacted instantaneously. One remembers Deleuze about Spinoza's “rapidity of thinking” – as quoted by Luc Bondy.

Battelle, particularly Battelle-Geneva, would not have been faithful to the Battelle Memorial Foundation’s declared fundamental goal defined in the will of its founder Gordon Battelle – “to work for the Benefit of Mankind” – without exploring the future, particularly the future of Homo Economicus in organized society. EXPLOR , and other projects in the same line and with similar methodology, served this purpose. The major findings of EXPLOR and its sister, INVEST, were apt to seriously enrich micro-area projects that were aiming at forecasting economic reality.

12.4 Emilio sailing the oceans

In addition to intelligence, the fundamental ingredient needed for a person interested in the future is curiosity and a wide cultural basis. Somebody who is equipped with all this will then also have good taste in most areas of life, not only in matters of gastronomy, arts and literature but will equally be attracted by people of style, knowledge and character. Men of this category can appreciate the relative importance of things and of events. They also fully live in their time and have centers of interest in which they can share ideas and experiences.

The culture of Emilio was basically Latin: Spain, Italy, France. His reading was of course much broader than this, especially from the Anglo-Saxon world, but he could very well "exchange" also with Germans (Battelle Institute Frankfurt!), Japanese or Russians, or Hungarians.

He was obviously best at home in Spain's history and present problems, but I personally knew little about his Spanish professional and cultural/political contacts. I travelled with him in every country in Western Europe, including the Benelux. I always felt that he must have had a deep-seated cultural and historical experience of all these countries. How could he have moved around with such simple elegance and have such easy, direct but discreet ways for intellectual exchange all over the continent without such experience? These personal qualities played no minor role in his acquaintance with (and indeed, his choice of) extraordinary, some flamboyant, personalities. Let me mention just three of them.

Louis Armand was a French *polytechnicien*, engineer and grand *administrateur*. He was a consultant to Battelle, particularly to Fontela and Thiemann and also to the Engineering Department. For an important study on the development of railway networks and relevant

technology in Europe, my team and I had to gather as much intelligence as possible. Thanks to Emilio's good relations with him, I had two long conversations with Louis Armand and later I could also discuss with him some of my findings.

This was important, because the future of railways constitutes not only important social/economic and technological problems, but also entails sensitive political questions. Louis Armand was a master. His spectrum of knowledge covered every sector of land transportation, the relevant technologies and their future potential, together with the social and political questions implied. Fontela was a privileged interlocutor.

Another personality and great thinker who appeared in one of the spheres around Fontela was Bertrand de Jouvenel. Indeed, one thinks that there were around him like concentric circles in which various personalities moved, according to time and place; not that they necessarily circled around our friend Emilio, but rather around the ideas they represented and handled, many of them with him. While Louis Armand was, however bright, knowledgeable and creative, a fairly straightforward person, Bertrand de Jouvenel had something of the "Enfant Terrible". He was non-conventional, very original and, as regards the ideas he picked, developed and published, indomitable. He was thus exactly the man who could supply themes, questions and “problematics” – this was part of the language – for the fertile soil that was Emilio Fontela's brainy head. In retrospect I think that de Jouvenel's colourful character was an additional attraction for Emilio.

It is possible that he hardly needed much inspiration from others, as he was constantly reading, thinking and looking around in the world. His unfailing curiosity and openness cannot be better illustrated than with the view of Emilio holding a (rather heavy) book in his hand at the tennis club, and, as time allowed it until the court would be free, reading it. This book could have been, by Bertrand de Jouvenel or, even by Richard Stone.

12.5 Exploring society and the future

Indeed, Richard Stone, of Cambridge fame, was one of the key advisers to Battelle's applied economics research. The myriad ideas that sprang in Fontela's imagination found no better way towards significant research projects than the exploration of the future. The way he went about it was as if he had read Chateaubriand who, in a beautiful poem, travels in the past, contemplates the present with contempt, and finally concludes -*"c'est à l'avenir qu'on se fie pour nous donner joie et trésor*".

There could be no greater joy for Emilo than what he experienced in the generation of ideas and the choice of the appropriate method to go ahead with. Confronting ideas with other ideas through discussion with interesting people coming from a variety of horizons was a favourite process of mutual learning and a source of enjoyment. Bertrand de Jouvenel and Richard Stone were among the enlightening interlocutors. If the first was a flamboyant personality, the second was a great professor who mixed serious research with a touch of distance and of irony.

We have seen already that Emilio was primarily interested in societal questions and what they may have in store for the future. Here comes Richard Stone in focus, as one world renowned expert, indeed a pioneer, of macroeconomic analysis, particularly as regards the development of modern national accounting. Stone was the key, if he was not the only recourse. Emilio knew the I/O systems that had been in process in Hungary, Soviet Russia and the United States. But he wanted a Battelle-Geneva system of analysis and forecasting. This was to become EXPLOR 80.

Battelle is not a government agency but a private research institute, therefore the development of EXPLOR depended on its utility

as an analytical tool helping a better understanding of the economy/industry of a country as a whole, as well as a good instrument to forecast at medium-long term. As it was so, the project could be funded only by corporate subscriptions. It was a multi-client project. The chartered activity of Battelle is contract research for industry and government. Although it emanates from a foundation, most researches must be funded by clients. This implies a specific quality: the results of the project must serve a purpose. The sponsor pays for it.

EXPLOR was a detailed Input/Output representation of the national economy. It was built for a number of countries of Western Europe. The essence is the determination of inter industry exchange. A series of complex tables for a given year which indicate the origin by main production sector of the intermediate consumption of its products by their main user sectors; the output of the production sector is, in the horizontal line the input(s) of the user sectors. A residue allows the establishment of the total output of the origin sector at the right-hand end of the line. Vertically appear the sectors shown in the horizontal lines. The bottom corner on the right shows the totality of the economy of the country. The preparation of such instrument is heavy work, but as a tool, it is an elegant instrument.

EXPLOR was a far- reaching analysis of the economy, indicating its development status and, much more importantly, through the 'technical coefficients' the structure by sector and out of this it made visible the social and industrial/technological network of the national economy. The picture as such was already a substantial advance in structural knowledge and understanding. EXPLOR tables made for several past and future dates of (for example) five year intervals, were eminent analytical and forecasting tools. Not simply analysis and forecasting in conventional terms, but also in terms of structure of economic activities, particularly of manufacturing industry. Change in technical coefficients shows change in technology.

As it is, it represent an extraordinary basis for technological forecasting. Let us see one easy example. The foundry industry supplies specific metals to various users, for example makers of transport equipment – road vehicles. Engine, gearing, body are heavy items that incorporate metal. Vehicle efficiency is better if weight can be reduced. The use of lighter materials is an economic objective and can be achieved by design changes and technological progress: witness the application of aluminium, complex alloys, ceramics, opto-electronics instead of copper wiring. This can be read through the user sector data in each horizontal line in EXPLOR.

EXPLOR was followed by two programs of the same importance: SOCIOMETRICA and INVEST. Both were based on the original methodology and the experience of their elder sister. I had the opportunity to present Invest to the top management of a few large industrial companies in Europe. The interest was keen, and some people, mainly in-house economists, were fascinated by both the methodology and the analytical and forecasting potential of the system. Indeed, very interesting cogent information could be derived from it. To achieve this, however, one needed the whole system, that is, the main report volume, at hand. One can only imagine what could at present be worked out of it in a renewed version using the information technology available today. Emilio should still be with us!

12.6 Techno-economics

Techno-economic study. What is it? How can it be made? What are the skills needed? The potential client himself, who has some idea of what he is interested to learn, may not know himself exactly the substance of the information that can respond to his preoccupation. A techno-economic study is not statistics, is not market quantification and

it is not even just economic forecast. It is beyond all these, even though in some respect it may be less.

A word of history is welcome here. After the end of WW II there were shortages all over Europe which lasted until the 1950's. The priority was on reconstruction, on efforts to increase production, and on productivity. Europe was suffering from a large productivity gap as compared to the United States. The OEEC, set up primarily to administer the Marshall Plan 1948/49 onwards took charge of the problem in cooperation with many Western European Countries and created the European Productivity Agency while there was also the Anglo-American Council on Productivity. Many 'productivity delegations' visited the United States under the aegis of the Organization between 1947/48 and 1949/55. But the productivity gap was reckoned to be still significant by 1975: it was estimated that American productivity was still substantially higher than Great Britain (39%), France's (22%), or Germany's (19%). Market research and other microeconomic studies were in the backyard then, if not altogether neglected, at least in Europe. The establishment of Battelle's Geneva research center was a timely operation. The concept of techno economics and technological forecasting was hardly known before the very end of the 1950's. Technoeconomics was invented and developed from the early 1960's onwards at the Battelle Institute and probably most advanced and best practiced in Battelle Geneva.

How can one claim this? Battelle worldwide, The Battelle Memorial Institute, sprung from Columbus, Ohio, in the United States and had made pioneering work as a private research institute specializing in contract research for industry; for decades nearly exclusively in the "hard sciences", -metallurgy, chemistry, physics. Battelle became big during and following WW II in the USA.

During the American war effort the US government was the privileged client of the Battelle Laboratories. Around 1950 it established two research centers in Europe, one in Germany at Frankfurt, the

other in Geneva, Switzerland. As the war shortages ceased in the United States, market research, product/process studies were in growing demand While Battelle's US and German centers had a large national market – and also benefitted from substantial government projects in their respective countries, Battelle Geneva was forced to face an international market, and, even more important, a private, competitive market for its research capabilities. Battelle-Geneva needed something more than the others: more diversity, more imagination, more originality and new methods. For us it was techno economics as this happened, it was thanks to Hugo Thiemann Battelle Geneva's visionary first director and ... to Emilio Fontela. He had a clear and accurate view of applied economics, including techno economics. In a speech to an audience of European, US and Japanese clients of our largest multi-client study ('Process Plant') he explained that techno economics is a language allowing economists and engineers and other technical people to have meaningful conversation.

During the first 3-4 years at Battelle I was primarily involved with industrial questions related to productivity, investment projects and their feasibility, infrastructure and transportation, as well as future product or service markets. These activities included international trade and development and also, as required by the projects undertaken on behalf of sponsors (this was the Battelle word used for clients) the study of export markets, together with the analysis of national development and foreign trade policies.

Techno-economics constituted vast areas of research. In some projects the economic and social consumption component was dominant, in others, more important; technical/technological factors guided large portions of the great variety of works undertaken. In techno-economics microand macroeconomics (statistics etc.) were combined with elements of a market research, technical parameters of products and of process technology and, as it was possible according to scope and content the project required and its budget allowed, technological forecasting. A large number of industrial sectors were covered by our techno-economic studies, from heavy industry to transportation. A few examples are described in the text.

Techno-economics was one of the research areas that lent themselves to efforts of originality: it was a new field, it required new methods of microeconomic/industrial research. And as it could respond to wide ranging information needs which would include new dimensions, it became a vast terrain of investigation, benefitting from the knowledge and experience of many areas of technological and economic intelligence. Techno-economics constituted a new language in which the engineer and the economist could understand each other and see through phenomena which otherwise would be only half understood. Techno-economic work at Battelle-Geneva had a broad spectrum: it comprised heavy industrial technology, consumer products from entertainment electronics to automobiles, petrochemicals to construction. For the researcher it was rewarding: work in a multidisciplinary environment is an extraordinarily enriching experience for all the team members. Battelle's Geneva research centre was the ideal place for such research environment: several hundred highly qualified engineers, chemists, physicists and economists, all inclined to cooperate in a great variety of projects.

Our professional interests broadened with our progress in work and responsibility. Emilio soon became head of the whole Department of Applied Economics and thus my immediate superior, as I was responsible for industrial and development studies. Emilio Fontela was not far from being the ideal colleague and superior – may I add here that he was indeed superior in many respects. An unforgettable example of collaboration comes to my memory.

The Institute (Battelle) was granted a large contract for a big study: the foreign trade in industrial equipment of a highly industrialized Western European Country. The research was to cover every important type of industrial machinery, from pumps to machine tools, from locomotives to turbines and generators and also heavy trucks and earth-moving equipment. The research themes implicit in the project were of course numerous and required a wide spectrum of methods of research.

The industrial area to be covered was huge and most of the products and processes incorporated much technology and one also had to consider the specific requirements as they were in the various user sectors and countries. The export potential depends on the economic growth, the development plans, policies and financial capabilities of the export target countries. A project of this size and complexity requires statistics, political gist, a vision of the future and some understanding of technology in a broad sense. The way this type of international trade is financed – institutions in the exporting country, the role of bank credit, the World Bank etc. –must also be considered.

A sizeable team worked on the project for over a year: economists, statisticians, engineers, physicists and other colleagues. And the one who demonstrated the best understanding and the clearest view of how the project should be conducted: it was Emilio Fontela. Not only did he give advice during the research, helped find intelligent shortcuts to advance progress; in the end, he came for the final presentation of the many specific reports and summary synthesis and made there a most impressive and convincing presentation of the general conclusions and recommendations of the Battelle team in front of about forty leaders of the industry and of the relevant ministries.

12.7 The techno-economic approach

Techno-economic approach, as perfected in our applied economics department headed by Fontela, was the method used in many studies. An economist would endeavour to have the eye of an engineer, the engineer to have two hats. Even the sociologist will be welcome in the team, together with, as the subject may require, with a chemist or physicist. I can recall working on a project concerning medical devices

together with a consulting physician. The variety of the research areas was quite extraordinary. In many instances we were expected to have an "original" approach, hence the utility of the multidisciplinary team. The ‘techno-economist’ must analyse all types of parameters. The key concept is user requirements. These may include consumer requirements as well as industrial technological constraints. User requirements must be understood and interpreted. In some studies itmultidisciplinarity can well mean the presence of sociologists or medical specialists. There is always the need to look into the future. Once the user requirements have been mapped and specified, they will have to be interpreted in terms of equipment (and process/technology) apt to respond to them. The facts could be: number and type of equipment (machine, apparatus), their mechanical and physical characteristics. A crucial (frequent) question: increased capacity, larger plant size and more scale economies are in focus: but the industrial risks of high temperature and/or of high pressure may increase more than proportionately with the increase in size because, for example, the materials (metals, alloys) behave differently. Size may be limited by the physics.

Let us see a few examples. Should this medium-size French company commit substantial investment in a new facility for a very specific product used in the surface treatment of special metallic components with a new technology? Three questions have to be answered: what are the requirements of the contemplated changes in the new facility, will the planned new technology allow an economically competitive procedure, will the new plant’s larger size and capacity and consequently increased emissions environmentally be tolerable? Accessorily the size of the future market and the relevant competition must be taken into consideration. The responsibility of the project team is all the greater that the investment will be decisive for hundreds of jobs. In another study, which became a "classic" at Battelle- Geneva, and in which Emilio Fontela’s ideas and supervision played an important role, the question was to imagine, outline and simulate the energetically best design for this highly energy-intensive plant somewhere in the middle of continental Europe where no substantial energy sources were locally available. By its very nature, the project required a multidisciplinary team: the economists were supplemented by engineers and physicists. At the end, fluid-bed technology was retained and a second contribution

by the Battelle team was the adaptation of the fluid bed to the specific process used in the production facility in question.

12.8 Examples of Sector areas

12.8.1 Multi-client studies

The ministry of industry which was also in charge of questions related to technology of a Western European country asked us to propose a study aimed at the future metallurgical/physical characteristics of pressure vessels used in the chemical and petrochemical industry in view of the ever-growing size, people thought, of the average production unit.

At the time the conventional wisdom regarding most process industries was: the larger the size and capacity of the plant, the higher the economies of scale. The ministry was interested in the present and future size of the domestic and export markets, together with technological trends in the major user sectors.

This project was a double success. The Ministry in question was satisfied. Perhaps even more important, this was for us the second reason for the success: the work allowed us to acquire substantial new knowledge of the industries involved and direct experience how best analyse and forecast the economy and technologies of the user industries of pressure vessels which constitute the major typical equipment

item for the chemical and oil refinery industry and also for the enterprises supplying the equipment. In my Division of Industrial Economics and Development there was a group working for the mechanical engineering industries. In cooperation with the Chemical Industry Division, and under the aegis of our patron and friend Emilio, we worked out a multi-client project, an extraordinarily ambitious study proposal we called “Process Plant” (PP). Unforgettable, enormous, but we made it.

PP involved a large team of economists, engineers, chemists and "*informaticiens*" – this was their etiquette. Five major process industry equipment items were studied: pressure vessels, pumps, heat exchangers, compressors and distillation columns. The petrochemical and other heavy chemical industry as user sectors. The objectives: size (by major country and continent) and future of oil, petrochemical/chemical industry output, perspective on global demand and trends by major chemical and refinery product category. The examination of the major process trends was to yield information on, for example, the likely future, economically and technically most efficient, size of oil refineries. The consequent changes in parameters such as pressure or heat and, most importantly the consequences on the items of equipment covered by the research.

About 50 companies from Europe, the United States and Japan subscribed the study. The progress meetings held in Geneva were attended by representatives of most of them, a miniature world-industry parliament. Emilio introduced the intellectual rationale of the study and about 20 months later he brilliantly helped us prepare the final presentations and outlined the main findings. These were laid out in reports in English, French and German. The Japanese made their own translation. The Process Plant project kept the core team busy for about fifteen months. It left us, no, not tired but enthusiastic for some new venture.

12.8.2 The Battelle cafeteria

The idea of the process plant study originated in the knowledge and experience acquired in the 'private' study on pressure vessels. But we were constantly looking for new ideas that could be developed into research projects for which there would be a market, i.e. sponsor The Battelle environment could not be more favourable: great freedom of the research staff, intellectual intercourse among economists, chemists, physicists, engineers … and an excellent cafeteria open all day long. This reminds me of what Max Perutz (the uncle of our colleague Peter Perutz) said when questioned about the successes of his team in Cambridge: "our secret is, that the University has an excellent cafeteria'' (interview in the Financial Times, 1970's).

One nice early spring day, mid-afternoon in the cafeteria, J.T., from the Engineering Department, told us about his work on injection machines and the changing technical requirements resulting from the new synthetic materials being developed by the chemical industry to respond to the even more exacting demands of the user sectors – building, packaging, other industrial applications, transport equipment, aircraft, etc. He insisted particularly on the technical limitations of certain types of machine design which should be examined critically (physics, math, design, materials), analysed and improved . Coincidence: the Battelle Institute offered a few researchers, including J.T. and myself, 4 "sabbaticals" weeks 'at the BSRC – Battelle Seattle Research Centre – a 'villégiature' for reading, dialoguing, acquiring some more general culture. J.T. and I came back from Seattle with a new proposal for a multi-client study, on engineering plastics with focus on the machines and their technical characteristics and necessary improvement of the latter. The project aimed at the main trends in the user sectors, their effects on the requirements for the synthetic materials that would be in demand and how the plastic-transforming (injection, etc.) could respond. Again, there would be questions of heat and pressure. The engineers' work included the mathematics and physics of heat, pressure and the chemical transformation occurring in, for example, the cylinder. The techno economists supplied data and forecasts about the user industries and the future market for machines. Our approach was broad and specific at the same time: markets (10-year forecasts) for the selected synthetic materials and plastic-working (transforming) ma-

chines, market specifics according to user sector and, of great importance, physical/mathematical limits in the guidance of the development of new, higher-capacity machines. It was, in retrospect, best techno economics and genuine technological forecasting.

The study sold well everywhere – Europe, North America, Japan.

In this section on multi-client projects we should mention the one on Platinum. It was a most timely initiative, launched by our colleagues in the Chemical Industry group. Indeed, the study was proposed to the relevant players in mining/refining of Platinum and in the industry segments researching and making, for example, catalysers for automobiles.

12.8.3 Transportation

"Ship Types of the Future" was the rather pompous title advanced by the client who requested the study. Such title may appear less surprising as one knows that it came from the shipbuilders association – of a West European country. The Battelle team had the potential client come down to earth and suggested a study that could be feasible. First, we proposed to take into consideration cargo ships only. It was accepted.

The actual study included the changing structures and volumes of selected types of cargo (commodity), the observable trend in ship and propulsion design and choice since the Second World War (including lessons from the Liberty ships) – primarily as regards shipbuilding materials and their behaviour on sea, as well as actual and foreseeable port capacities in relation to the main sea routes and corresponding growth of trade.

The project team comprised techno economists, one naval architect working in my division of Industrial Economics and Development. and other engineers of Battelle Geneva's engineering department. The project was a success, although no quantitative forecasts were made, neither technological forecast proper was undertaken.

The experience of "Ship Types of the Future" helped us in the conceptualization of a maritime forecasting study for one of the world's largest mining companies which was exporting, i.e. transporting metallic ores between at least three continents. How to optimise the ships journeys, how far can the size of these heavy cargo ships further grow – both as regards their economics of size and speed and the constraints stemming from the size, depth (dredging costs!) of ports; what role for combination carriers? In this study all the relevant sea routes were mapped, the traffic volume in major (relevant) commodities quantified and analysed, the loading/unloading ports characterized, ships categorized, with particular attention to the optima use of combination carriers. The techno economic team was supplemented by Battelle's group of applied mathematics. A ten-year forecast projected the relevant trade flows and the major technical parameters – ports and ships.

12.8.4 Heavy Industry

The pressure vessel study mentioned above, as well as the multiclient project Process Plant concerned heavy industries both as regards the chemical and oil refinery side and the equipment items included.

An "express train" project – as the client requesting called it - was undertaken on heavy machine tools for machining aerospace industry components for a company controlled by a state holding in a South-Western European country. "Express train" meant that the project should have been completed in three months. I had been called urgently to visit the company and had to outline a research proposal on the spot and sign a personal commitment that I would try to have the relevant research contract prepared overnight in Geneva. The contract was prepared for a study that would be completed in four months. This time we

also had to involve the Battelle research centres in Frankfurt in Germany and Columbus, Ohio, in the United States (where Battelle was headquartered).

For the study, a classic techno economic research, the principal challenge was the time allotted to complete the study. The project covered the major aircraft components with size, probable design and materials, and consideration of major competitors in Europe, North America and Japan. The Battelle team was a typical multidisciplinary group, headed by a colleague from the engineering department. For us the circumstances were more interesting (for once!) than the subject matter: the internal politics in the client's organization, a large government-controlled 'trust'.

Seamless steel tubes (pipes) in residential construction: the project was made for a German manufacturer of steels for various industries. We investigated the current use of water piping in various types of residential buildings. It was found that several materials were in use, and their cost/price range was wide. The price differences were not matched by the quality of the different materials. Sizeable differences were observed in this regard from one country to another. After a cross-examination of all available economic and technical factors and the necessary effort to look into future determinants, it was concluded that synthetic materials, as opposed to copper and steel, would have a dominant position in the market. This techno-economic conclusion was the outcome of the examination of a large number of buildings, in existence or being planned.

A Battelle-Geneva team of techno-economists participated in a huge study on Iron ores and ironmaking worldwide. In this project the knowledge and experience accumulated in Battelle's American and European research centres was determinant for its scope was so broad: it included ore reserves, access to them, their availability, the technology of enrichment, of transportation and the trends in blast furnace technology. A particular challenge was: work out estimates of the industry in the Soviet Union and China, at a time closed territories.

12.8.5 Regional Economics

A request came one day to Battelle-Geneva from the United Nations Economic Commission for Europe (based in Geneva). It asked us to prepare and submit a proposal for the study of a contemplated free trade area in the four Maghreb countries, i.e. Algeria, Libya, Morocco and Tunisia. Instantly, we started to call it the (potential) Arab Common Market.

The question was challenging. No precedent, no former experience of a politically dreamed agglomeration actively promoted by an international organization, the Organization of the United Nations; not less. We submitted a study proposal and the Commission approved, signed and financed it.

Carrying out the project was a real challenge. Our team, members of a private research institute, had to initiate the necessary contacts with the relevant/competent instances in the four countries. The area is difficult from many points of view: telecommunications, traveling, political and administrative approaches. Of course a lot of footwork and … patience were required in the different ministries and other official bodies. Nevertheless, we jumped into the project with our usual élan and enthusiasm, but also with scepticism.

Existing, but also traditional past trade among these North African country was meagre. Land communications and transport facilities East-West-East were poor – since the 19th century their trade was South-North-South as they had been French, or Italian colonies. There was no direct railroad between any of them. The goal of the study was to assess how mutual trade (and development) could emerge and grow as a result of the planned progressive mutual reduction of the obstacles to trade. We visited many enterprises and institutions. The major question was: what are and could be the complementarities between these

four national economies. We made no forecasts, but mapped the few important sectors to be taken into consideration. Let me recall here one recurring – and amusing – experience with this project. The four members of the team heard one word very frequently as they tried to be received by various officials: “Wait”.

12.9 Imagination rules the waves

As I have said earlier, Battelle, more particularly Battelle-Geneva, was to a large extent the pivot of our life. I am sure this was so with Fontela, though the spectrum of his interests was broader than most others'. I was tempted to have for subtitle here "Myriads of Ideas", but the truth is that, if many, many ideas were generated within our groups of colleagues impulses often originated "outside", that is, not on the Battelle campus.

It must be added here that, primarily thanks to Thiemann, the researchers had extraordinary freedom. (Thiemann had coined and used the term “chercheur-entrepreneur” based on the will of Gordon Battelle which constituted the legal and moral basis of our work.) Freedom was coupled with responsibility as much regarding general moral responsibility as commitment for research work and in face of the sponsor/clients. I remember one of my close colleagues (A.S.) saying that researchers at Battelle-Geneva were as Citizens in Rome. Nothing is more helpful for the generation of ideas in an intellectual environment than freedom, combined with a nice -"gemütlich" cafeteria open all day (see Max Perutz).

Ideas often arose from requests by clients or would-be clients. These led to actual projects, or were germs for new ideas.

The list of ideas generated would be endless. We would obviously find many among them hopelessly farfetched. The best ideas were of course those from which we could derive a project. One in this category Emilio was holding one morning in hand volume I of the Memories de Charles de Gaulle. Well, said Emilio, the truth is between the lines of the written text. He must have read Ferdinand de Saussure and Roland Barthes. Who would have known he was interested in semiotics? He proposed to undertake a computer analysis of de Gaulle's now classic work. Another day he thought of starting a similar exercise with the works of David Ricardo.

12.10 Emilio Fontela Montes, the Comet, “Homo Ludens”

As I pay tribute to Emilio, I wish to paint a true picture. We have already heard quite a lot about his intellectual qualities. But probably not enough. His imagination was legendary. His intelligence was coupled with strong internal discipline in work and, as far as I can say, in his life. He proposed original ideas and approaches. He had vast general reading end culture. Was he a "high flyer"? A fine man, he was better than the usual high flyer. All the more so, that he had his born elegance and discretion. Rather introvert. He may have been sometime a little insecure. He was never aggressive, though he rarely hid his opinion. Emilio was young and remained young. He never really lost his youth, his youthful appearance and manners. He moved in the world with ease. He had this "lightness of being" (Kundera). Going to a meeting with the top management of a very large company in Paris, all Emilio carried

with him was a sizeable box of Monte Cristo Number Four cigars. No notebook: everything in his memory, before and after the meeting.

In Battelle Geneva he was my superior – and I obeyed him. One afternoon he came to my office :*"Kuko, viens on va jouer au tennis*". As I showed feigned protest, he said it is an order. Intellectuals do not always wear a necktie. He knew I always had one in the drawer of my desk. Important visitors are promptly announced, he opens the door of my office :" *Kuko, notre (sic) cravate* !" Emilio Fontela was a colleague and a boss ; and a friend forever. He was a true man, a classical man. A "Homo Ludens".

Chapter 13: Consumer research at Battelle in the Age of Optimism

Alexander W. R. HAWTHORNE

13.1 Introduction

My experience at Battelle-Geneva began at the end of the period of expansion and growth of the Institute. Buoyed by the economic vitality of the 1960s and carried by a series of remarkable and inspiring personalities, the working environment – and the work itself – was stimulating and challenging. The reputation of Battelle-Geneva had already been made and the clients included the Gotha of European industry, both multi-national and large family businesses. In addition, many Government clients, both national and regional entities, used the Institute's services, sometimes in preference to national institutes because of the non-involvement of Battelle in political issues. The staff represented a vast range of nationalities, with strong Swiss, French and British contingents.

My account is of the factors which I perceived as giving a prestige to research and economic planning at that time, many of which have faded from public consciousness in the last 40 years, of the personal enthusiasm which we brought to our research, and the methods which were appropriate to the time and place. Success brought difficulties of its own, and the world, and our markets, changed after 1973. I describe the new kinds of projects and the new commercial environment in which they had to be marketed. The structure in which Battelle Geneva had to conduct its research, in the absence of the official subsidies and ongoing public projects which formed the core support of many research organizations and indeed of the Battelle organization in the United States, was always constraining and in more critical times, posed great challenges to the open multi-disciplinary research models which had been so successful. My career as an economist eventually took an-

other route, where the issues faced and methods applied were quite different. I nonetheless followed many of the principles underlying Battelle research and the capabilities, particularly those learned from project development, the process of enquiry and the management consulting projects which I had become involved with, were of critical importance.

13.2 Macro-Economic and sectorial forecasting

13.2.1 The Department and its context

I joined the Applied Economics department at Battelle-Geneva in May 1969. I was attached to a newly created section concentrating on forecasts of food products consumption. Several of the section's other members had worked in the macro-economic forecasting group and were strongly influenced by the logic and rigor of national accounting. Indeed the principal sections in what was called the Industrial Products group of Applied Economics, led by Alan Gordon, each concentrated in a major consumer expenditure area – construction and housing, tourism and leisure, and food and beverages. This close linkage with the national accounting structure provided a framework for forecasting activities. The macro-economic forecasts conducted in the department provided guidelines as to trends and ranges of future consumer expenditure for each category of products, country by country.

By the time I arrived at Battelle, the departmental leadership had however understood that forecasting economic development over several years demanded more than the projection of macro-economic variables. As André Gabus points out, Emilio Fontela was acutely aware of the physical and technological realities, which constitute economic

activity. The role of prices in steering demand within the real economy had been explicitly recognized and with this, the importance of technology. Technology and raw materials considerations define product costs, and of equal importance for consumption forecasting, technology can render possible the creation of new, transformed products, of superior quality, more easily conserved and distributed or in which services for the consumer, such as ease of preparation, are incorporated, advantages for which increasingly affluent consumers may be prepared to pay.

Our forecasts were also based on physical constraints; the close relations, encouraged by the departmental leadership, with the sections of the Institute's Chemistry and Engineering departments specializing in food technology made us aware of the physiological and nutritional requirements which set limits to total potential demand for food and beverage products.

13.2.2 The prestige of applied research and forecasting

The social and economic environment in which our researches were conducted was very different from that of 2015. Technical progress driven by research had made dramatic contributions to the outcome of the Second World War, greatly influencing Western nations aligning themselves on the political and economic model of the United States, which had proven successful and which enjoyed, thanks to exceptional American leadership in the pre- and immediate postwar period, a high level of moral and economic prestige. Applied research, as practiced in the United States in the decades preceding the war, was focused during the course of the conflict, on specific military projects, most notoriously in nuclear weapons but of equal military importance, in the two fields of electronics and aviation, both of which had immediate and major consequences for everyday life, and had transformed civilian life dramatically in the quarter-century following the war. A major reason for the success of these projects was the close cooperation between the military users of the technology and the scientists and engineers involved, cooperation without precedent, which contributed to popular confidence in applied science and optimism about the future.

Applied research had also led to extraordinary medical advances, of a significance only previously equaled in the decades preceding the First World War, and to progress in food production and conservation, textiles and construction.

The demands of reconstruction, and a socio-economic context which distributed income through offering well-remunerated employment and education to a greatly extended part of the population, ensured that the new technologies were rapidly disseminated. A striking example was aviation. The gas turbine engine and electronics not only rendered air travel faster and safer; they also transformed the economy of this mode of transportation. Aircraft which could make a return trip across the Atlantic in 24 hours with a high degree of reliability in all weathers rendered mass air travel between continents a reality. The electronic and telecommunication industries proved even more powerful than the cinema as instruments to disseminate the new knowledge, present new opportunities and objects of emulation, advertise the achievements of the new technologies as well as to market products to the expanding mass of solvent consumers, and as a particularly effective vehicle for political as well as commercial propaganda.

The prestige of the great wartime projects and their many benign consequences from which the population benefitted acted as a powerful motivating force for further research projects and for forecasting activities aiming to define future needs and design approaches to satisfy them. Once again, reconstruction facilitated and encouraged major public and private development plans and investment initiatives, to develop electric power production, transport infrastructure of all kinds, housing, education and medical care. The population as a whole supported these projects and programs. This was in particular the case since both the economic and the physical advantages of the technologies were widely shared. The electronic revolution created new industries and facilitated the operation of existing ones, requiring a new labour force with new training, but not excluding other workers. The example is frequently given of the high pay and good conditions enjoyed by relatively untrained staff in the new industries, or in existing ones, which shared in general economic growth, such as the automobile industry.

Economic planning, of which forecasting was an integral part, still enjoyed very considerable prestige and interest. The belligerents in both World Wars had imposed strict allocation of resources, in favor of military priorities. The imperfections of these systems should not make one overlook that they indeed fulfilled their purpose of directing resources to military ends. In the interwar period, the planned economy of the Soviet Union provided the industrial base which made the country a world industrial and military power and in the eyes of many the real victor of the Second World War.

The Soviet Union was not the only exponent of planned development between the wars. The Roosevelt administration in the United States followed and greatly expanded the initiatives of its conservative predecessors in response to and as a consequence of the Great Depression, and engaged unused resources in major public projects with the goal of regional development in disfavored regions and in support of the agricultural economy, depressed by drought and falling demand. The Tennessee Valley project together with the construction of many other major hydro-electric installations in other regions not only contributed to economic development; they also played a vital part in the American war effort, permitting aluminium production for the manufacture of aircraft on the largest scale, and providing the electrical energy for nuclear weapons production. The growth of what is now called the "Sunbelt" – the previously poor and rural South East of the United States – witnesses the success of these projects.

France was, of the Western European countries, the most open to a rationalist approach to its postwar reconstruction and economic revival. The ignominious defeat in 1940 convinced a younger generation of politicians and leaders that the country's industrial base needed active reconstruction on the largest scale, and to the highest technical standards. Even under the occupation, French administrators and technicians began to set national development priorities and initiate technical studies. With few fossil fuel resources, energy was a priority sector and the systematic exploitation of hydroelectric resources, on the American model, the initial response. Since the points of generation

were largely in rural frontier areas, far from the urban and industrial centers, France, like the Soviet Union, became a world leader in electric power transmission technology, the principles of which were also applied to the reconstruction of the heavily damaged railway system. In a series of post-war plans, infrastructure improvement and projects for new technology development were systematically pursued. Nuclear technology was also seen as a major further energy source as well as a response to the country's perceived military weakness. Each decade brought new technical projects; in the 1960s the independent nuclear deterrent as well as civil aviation, in the 1970s, high-speed rail transportation, telecommunications and nuclear energy.

The French plans were characterized by the importance accorded to social objectives such as reduction of regional differences, the development of social infrastructures and adapting to the impact of international competition. Their importance was political as much as economic since the process explicitly involved industry, labour, the public services and the Government in setting objectives and priorities. The social dimension was accorded much importance since the planners were well aware of the potential for conflict generated by the tensions of the war years and the collapse of the colonial empire.

The achievements of the country in the postwar decades, which took place within this context, were considerable and inspired a notable recrudescence of national pride and confidence. The research group which I joined was Francophone and the confidence, optimism and imagination of its members were infectious.

13.3 Example: forecasting for the food industry

The first major project I participated in was a forecast of consumption of 12 major beverage categories in the six countries of the EEC, as it then was, the seven EFTA countries and the United States. The food chemists provided us with the overriding guideline that fluid requirements per person per day are on average three liters, of which 1,5 liters are derived from foodstuff, so that demand for all other beverages (including tap water) could not durably exceed 1.5 liters. The question that interested the numerous enterprises, which sponsored this multi-client project, was how these 1.5 liters would be shared among different categories of beverages. Discussions with our scientific colleagues provided a variety of insights and understanding of the products, their origins and their role in nutrition and diets. Certain of these insights were of a counter-intuitive nature, such as to make us, as economists, think differently about future tastes, needs and trends. It became clear to us that certain common beverages resulting from traditional methods of preserving natural raw materials such as grains and fruit juices through fermentation and distillation had become in effect entirely new products such as wine and beer, with an appeal and a dietary contribution different from the raw materials. Others, such as milk products or fruit juices, natural products themselves, were still ideally consumed in their fresh or natural form and remained difficult to distribute on a large scale because of their perishability; for many years the only practicable conservation technologies would either produce a very different product or a product lacking many of the nutritional and organoleptic qualities of the fresh product. In these cases, an exciting challenge was presented to industrial producers and large-scale distributors by new technologies which offered the potential of large-scale commercialization of products much closer in taste and presentation to the highly perishable fresh products than were hitherto existing preserved products, and were both ready to consume and easily conserved. In markets characterized by rising income and openness to innovation, where the newest technologies offered food industry clients superior higher value-added products closer to the natural products, more and more consumers would pay for such added value. It was also very important for manufacturers to know which products or transformation processes would lose attractiveness as better products appeared and thus see their market share decline, even if their price were to be reduced. One of the classic cases revealed by the department's researchers, which we examined in detail in our next major project, was margarine, at the time a widely consumed butter substitute; its consumption was

stagnating with increasing income as consumers reverted to butter, a trend set to increase. Faced with this forecast, leading manufacturers modified its composition to improve its taste and its dietetic qualities, substituting vegetable for animal fats so they could claim it actually enjoyed health advantages over butter. In this way, margarine consumption was in fact encouraged and remained higher than butter consumption for many years; only very recently has butter, supported by trends to "natural" and "biological" foods, regained its place of primacy.

13.4 Macro-economic and technical guidelines

Such were the insights and potential provided by a vision of economic forecasting which explicitly incorporated technical and industrial considerations. The appeal of this approach, even in a conservative industry like the food sector, became evident, and the beverage project, initially aimed to attract the sponsorship of a handful of major industrial processors, appealed after its launching to numerous smaller companies and firms in related sectors such as packaging and manufacturing equipment, which joined the sponsoring group.

It soon became clear that this approach could be applied to the entire range of food products, not merely beverages, and with the support of key sponsors, a far broader project, encompassing all food products, was initiated. One of the impulses for this project was also to analyze whether the predictions of the macro-economic forecasts, which suggested that as manufactured goods became more plentiful, consumers would spend increasing amounts on services incorporated into the products, could in fact be documented in this particular market.

To take full advantage of the macro-economic and technical guidelines offered to our group required comprehensive data of great detail and precision on the totality of the sector, comparable from one national market to another. Great expenditures of time and energy were committed to the collection, analysis and understanding of basic production and consumption statistics. It was not enough to simply collect the numbers; the research process demanded that the significance and origin of each data set be examined and that among other factors, the real purpose for which the sets were initially collected be understood and that it be clearly known on what basis they were established. In this way data on the same subject for different countries could be compared and differences and disparities comprehended. The data collection process, so often taken for granted by economists and business analysts, thus became a key part of the research itself, often revealing much about the influence and interests of producers and distributors as well as of technological developments and regulatory and fiscal concerns within a sector.

These projects, and the availability of extensive data bases of high quality, as well as the acquaintance with the statistical offices and associations which provided this information, allowed the research group to propose and carry out many specific market and corporate strategy studies for individual companies and organizations. The possession of this data endowed the group with a degree of credibility for such projects and the confidence to propose and launch them. In no subsequent job as a business economist working on sector-related projects have I felt such confidence in the raw material I worked with; in none would collating such data resources have been possible.

These analyses were complemented by a form of research which many ex-colleagues recall as the most characteristic and most surprising experience at the Institute: enquiries with industry and distributors. Such in-depth interviews were indeed one of the backbones of Battelle research. It is retrospectively astonishing that so many companies were willing to receive visits from Battelle researchers and answer detailed questions about their products, manufacturing processes, raw materials

and even about costs of production. Even more surprising is that companies were willing to discuss these issues by telephone, not merely as follow up to a visit, with a researcher they had met, but even in response to an initial telephone contact. This openness is witness to the high prestige of applied research at the time, and to the idea that this openness could contribute to the common good as well as merely to the interests of their competitors, which may indeed sometimes have been the case. With some organizations it was doubtless encouraged by the reputation of Battelle itself but many of those contacted were not familiar with the Institute.

Forecasting demand for products within a macro-economic category required the application of subjective or intuitive criteria, gained partly from analysis but, to a very large part, to direct enquiry. The most useful method turned out to be the comparative approach.

In a forecasting exercise, there must be a vision of a future. This future must be desirable, and represent a goal towards which members of society will strive. The future must be plausible; one which there is a reasonable chance of attaining. The future must be credible, insofar as there are reasons to believe that the vision does not contradict scientific knowledge and facts. In our food projects such credibility was given by, among other factors, the physiological needs of the consumers referred to above. In most visions of the future, the simple paradigm "more is better" has proven to be the most satisfactory rule of thumb. Insofar as throughout most of history, economics has concerned the management of scarcity, and social organizations structured for this purpose, few principles have such satisfactory explanatory force.

A further critical assumption, initially grounded in post-war optimism and a liberal-democratic vision of the world was that national markets would follow trends already observed in the largest and most affluent markets. Thus there would be a convergence of consumption habits with increasing income and sophistication, and free exchange. In our major prospective studies the United States, by far the largest and

most affluent single market, was taken as the model toward which consumption patterns would trend. Since it existed, it fitted the criteria of a possible future. Analysis of our 10-year databases did not fail to confirm this initial working hypothesis, although national preferences continued to be evident.

13.5 "Researcher-entrepreneurs" – the bottom-up approach

It was an outstanding feature of Battelle-Geneva, reflecting, as later experiences would underline, the personalities of the senior management of the time, that the impulse for research projects was "bottom-up". Research staff was encouraged, not to say constrained, to conceive, formulate and market their own projects. An interesting example of such an initiative at research section level (4-5 staff members) occurred two years after my arrival; a section member met a delegate to an FAO congress on tropical fruit exports who was interested in marketing bananas. A conference of banana producers was to take place in the French Antilles a few weeks later. We became enthusiastic about a broad market study after learning from our technical colleagues about the multiple uses, nutritional qualities and remarkable fibers of the banana, and within a short space of time produced a proposal for a techno-economic study for producers and distributors, translated into several languages and supported by some existing clients. A member of the group managed to gain accreditation to the congress and spent several days meeting with national delegates and international organizations. Although the project was never adopted it made many organizations outside our corporate client base aware of our resources, particularly our database and our highly structured research philosophy. It also reflected the intense optimism, confidence and enthusiasm, which reigned

in our group, as well as the open-mindedness of the departmental leadership which supported the not inconsiderable costs of this initiative. But their confidence was not misplaced; within a year the section had acquired several major mandates from international organizations.

The researcher-entrepreneur carried the entire responsibility for ensuring that client expectations were met. He could, within his budget, call on colleagues with relevant experience but relied, in face of the unexpected, on his own flexibility – working overtime, but also rethinking the project during its course. A case which I had experienced when asked to conduct a classical market study for a family enterprise, led to we as researchers becoming involved with internal decision processes within the client corporation; during the course of the project, it became clear that the client was already in possession of ample factual information and employed competent managers familiar with the markets we were commissioned to study. However, this information and the competences were not flowing into the company's decision processes as they should. After consultation with an external board member, himself a senior manager in a leading consumer products company, we changed our market research project into a management consulting project, in which we and the sector managers spent a week presenting conclusions as to the trends and opportunities in each market area we had investigated and submitting proposals for action to the management board.

As it transpired, this project became a model for many later mandates where the client needed our experience to translate data into a business model or concept.

13.6 "Top-down" – the institutional system, source of contradictions

Notwithstanding the freedom granted to researchers to generate and sell projects, the Battelle environment was in fact very constraining.

The sophisticated management accounting system demanded that every hour be accounted for and be charged to a project, as was every business expense down to photocopies and telephone communications. A large bureaucracy oversaw issues of intellectual property, contracts, and the frequently contradictory interests of the various research centers worldwide. Within the departments, each section leader was responsible for assuring that the time of each researcher was "charged" to a project financed for the most part by an external client, and exceptionally from resources from the foundation or the particular research center. In consequence, each group leader had an overriding interest in assuring that the means at his disposal be used to finance himself and the members of his section and not dissipated towards other departments or to other sections. Project development funds were allotted to the departments and thence to group and section heads and were hoarded to assure each group's interests.

Under conservative managers, this management accounting system worked very much to the disadvantage of the kind of interdisciplinary research described. It was to the credit of Emilio Fontela as department head that cooperation with the technical departments and between sections within his department, was actively encouraged and could grow to become a preferred model for project development. Indeed it would have been foolish not to draw on the resources of the technical departments since few economic research institutes in Europe had substantial in-house technical departments the resources of which they could so readily draw on. Another factor promoting this interdisciplinarity was the initial vocation of the Battelle Institute, which was scientific and technical research; economics at Battelle-Geneva was initially an activity complementary to the technical departments. Nonetheless, pressure to keep project funds within one's own profit center was always felt.

It can be argued that this contradiction was one of the causes of the collapse of the food economics department at Battelle, victim of its own success. The creative energy of the first few years made great demands on the research team. The commercial success of the group generated high expectations on the part of management; the pressure to sell

projects, up to and beyond the capacity of the teams, was very great. Team members found themselves working simultaneously on two or even more projects, with consequent fatigue and inefficiencies in managing the projects. Controlling the costs of the large and complex projects engendered by success was a challenge for young researchers who were focusing on client satisfaction. At about the same time, the Institute's management team was weakened by the departure of the founder Hugo Thiemann and the subsequent withdrawal of Emilio Fontela as department head. The Battelle system did not foresee financial rewards for successful researchers or group heads; since overhead charged to projects on researchers' time was a large and direct multiple of salary, a salary increase obliged a researcher to complete a given project in less time to stay within his budget. This was one of the reasons why a group of researchers, inspired by the success of the consumer projects research units, made themselves independent at this time to exploit these successful areas in a context which allowed more personal reward and greater flexibility. Shortly thereafter, several members of the food economics research team also left the Institute, departures motivated largely by the long period of stress and high work load to which they had been exposed.

13.7 1973: a new environment for research

These changes coincided with the 1973 energy crisis, which brought the realization that the steady evolution of consumption habits towards those of the wealthiest countries, the constant on which our forecasts had hitherto been based, might not occur, or at best would be a far slower and more complex process. Growth would be slower and might not, in some countries, occur at all or in different forms and at differing rates. Our industrial clients became more price-conscious and

looked for more than massive data compilation. The projects which were successful after this time were either those which explored burgeoning markets with a very substantial degree of collaboration with the technical departments, to demonstrate both technical and economic feasibility of new approaches, or which included a greater part of motivational or multi-factoral analysis in determining demand and the qualities sought by consumers.

Under these circumstances, the contradictions of interdisciplinary research became yet more constraining. The conception and sale of projects was more demanding, and the volume of funded project work declined. The new management, whose mission was to maintain financial equilibrium with a minimum of risks, was disinclined to share project funds with other departments and profit centers, even though the demands of the market were for flexibility and multidisciplinarity. The encouragement and support for the multidisciplinary projects which I was involved in after this time came largely from the technical departments to which our group had reached out earlier, and the development and launching of projects of this kind required agreement that the economics department rely on budgetary support from the technical departments both for project conception, which was more difficult and lengthy than earlier, and in the event of an involvement in the project greater than initially foreseen. A multi-client project proposal had become a mini-research project in its own right, no longer a matter of intuition, inspiration and a few days of documentary research and initial discussions with possible or existing clients. Weeks of effort were devoted to familiarization with the technical literature, establishing basic statistics of current consumption and production patterns and determining the feasibility of the proposed research program.

A striking sign of the change in the business climate were cases where a major corporation requested a detailed proposal for a project, requiring substantial preparation. Some weeks after the document was dispatched, the Institute received a request for submissions for a study identical to that proposed by Battelle. More common than such plagiarism but also a contrast with previous sponsor behavior were aggressive price negotiation, an insistence that the project be conducted in phases

each subject to specific approval and attempts by subscribers to multi-client studies, where each subscribing company normally paid the full subscription, to create client groups where several large corporations would join together as a single subscriber, and divide the costs among them. A contributing factor to such trends was undoubtedly the fall in value of many major currencies against the Swiss franc, in which Battelle-Geneva had to bill its services.

13.8 New project approaches for the more uncertain environment

The last food industry studies in which I participated reflected these trends. The first of these was a multi-client study on the use of protein additives in the food sector, in which the Food Chemistry department had a major role, though this project was initially launched by the Food Economics unit. Another smaller multi-client study was initiated between the Chemical Engineering department and the Food Economics unit, on the evolution of the fish farming industry, an area in which the US laboratories of the Battelle Institute were already, and are still active, with recognized expertise; in Geneva this promising area for techno-economic research was perhaps not exploited as it could have been. It is probable that had the impetus and encouragement of the Fontela era still prevailed, this area could have become a perennial research focus, since know how was at hand.

The third of this generation of projects was a study on beer markets, which complemented statistical analysis of consumption trends with an enquiry into factors encouraging beer consumption to which techniques for multi-factor analysis and graphical presentation of the

results were added. This project involved complex price negotiations, the use of lower-cost external services for the consumer panels and an execution of the project in phases, a very demanding process for the project team.

In the face of these market conditions, I preferred to work on projects in the well-established macro-economic forecasting area within the department, where the tradition and influence of Fontela and the surviving members of his team provided intellectual stimulus and the focus on data exploitation and interpretation which had characterized the initial projects in the food sector. In addition my fortuitous introduction to management consulting led to participation in studies in this area. The first involved analyzing social trends for a publishing group. The second, for a state research entity, once again involved a large program of enquiries with food manufacturers and the use of multi-variate analysis to treat the responses to our complex questionnaire.

13.9 Transition to a new career

It was by this time clear to me that the world of research was changing, the generosity and enthusiasm of the initial years was dissipating and that forecasting as we had originally conceived it was losing its significance. The crisis of 1973 clearly presaged a world no longer ruled by trends which justified optimism but rather conditioned by the unpredictable and by chance. In response to the unpredictable it was clear that stability and continuity – with the long term investments among which research is one of the most important and the most vulnerable – saw their significance diminish and the very short term grow in importance. Two worlds seemed to call for increased attention on my

part: the world of the corporation, which the consulting projects had opened to me, and the world of major trends in demography, resources and application of technology: the key to which seemed to lie in a study of macro-economic techniques and procedures. In these two worlds there appeared to be clients, potentially interesting chances and opportunities. I thus left Battelle for post graduate studies in business and economics.

Curiously it was in my management courses that I appreciated the full sophistication of the Battelle system: no case I studied, no course I attended, demonstrated profit-center models or management accounting systems as sophisticated as those of Battelle. It was also clear that in its decentralization of product development initiatives, Battelle had anticipated the visions of good practice being taught.

During this period I conducted studies for public entities, financed by a foundation, on the theme of economic planning in European countries. These studies were based on published material, largely complemented by extensive enquiries with the responsible agencies. Here the experience of conducting such enquiries proved of great value; despite the hesitations of the sponsors who feared that I might be unable to obtain interviews with senior personalities. Most of the persons I spoke to were quite familiar with Battelle and with the macroeconomic forecasting programs and with Fontela, even if they had no personal acquaintance with him. Their names and the issues covered by the studies, seemed quite familiar although I had not directly dealt with these entities or studied their activities while in Battelle. Both projects were thus more experiences in recognition of themes and activities which had been part of daily experience in my stay at Battelle, than ventures into entirely unknown territory.

Following my postgraduate studies I worked at a management training center. I was engaged to conduct research into management and economic themes of potential interest to the sponsoring companies. Research was however not a core activity of the organization. Resources

were very limited and my principal activity soon became program development and organization. Curiously this activity brought me into frequent contact with the same circles and individuals I had met towards the end of my stay at Battelle and during my studies of economic planning organizations and their methods, who proved to be those most able to speak or lead seminars on the subjects of interest to us, the business climate, enterprise promotion, sectoral perspectives, trade and industrial relations.

My next move, into banking, took me out of the research area into that of project finance and corporate finance. Forecasting was a key part of this activity and one to which I devoted much of my efforts. Of all the experiences at Battelle, the management consulting exposure proved to be the most significant. I became a consumer of research into market developments; such forecasts underlay our estimations and simulations of the future profitability of the projects submitted to us or of proposed acquisition financings. In contrast to earlier forecasting experiences, risk management became a principal focus; a project would normally comprehend the calculation of hundreds of possible outcomes, on the basis of different cost and revenue assumptions to each of which a probability was assigned on the basis of estimates provided by specialized research units (macro-economics, commodities, etc.) within the bank.

13.10 Reflections: research and the researcher

The optimism of the 1960s has given way to a more nuanced, not to say disabused vision of the contribution of technology and economics to our well being. Digital technology was present in the late 1960s, not as an all-encompassing feature of daily life but in the background for military and certain commercial purposes. It was still very costly, slow to use and familiarity was limited to a world of specialists.

Despite the fact that the tools and instruments of the digital revolution are now everywhere to hand, it can be argued that this technology does not have the inclusive nature of earlier revolutions. Its economic benefits are very selective. The digital revolution has enormously enriched a handful of clever and ingenious individuals. Its products, however, tend to exclude human beings from the labour force rather than to draw many up into a new prosperity. The technology is used to create new monopolies, and hand yet more power to large corporations and government authorities. It thus contributes to the increasing social inequality which we now observe. Its exponents have done everything to avoid sharing the benefits with their fellow citizens; the products are largely manufactured in distant low-wage areas, a process which the technology itself facilitates, so that the populations whose savings and efforts created the nurseries for its growth do not share in the direct economic benefits, although use of the products is generalized. As customers, they are, however, doubly exploited in that having paid to use the products, they abandon their privacy to their suppliers who can track their activities for commercial and control purposes. It is not surprising that optimism about the future is at a low point.

The technologies which created the prosperity of the 1960s mostly owed little to the digital revolution. The gas turbine, the aircraft of the 1960s – the Boeing 707 and 747, Concorde – the space missions, the TGV-were still designed with slide rules, computers playing a growing but still limited role. The Apollo program, which captured the world's imagination, used in its 11 years of existence, a volume of computational capacity no greater than that used today in a single Google search: (http://thenextweb.com/google/2012/08/28/fun-fact-one-google-search-uses-computing-power-entire-apollo-space-mission/). The Apollo capsule's onboard computational facility offered 64 K of memory and ran at 40khz! Thanks to the extraordinary ingenuity and creativity of the program engineers this modest capacity sufficed for the series of complex tasks required.

Yet the resources which this technology offers to researchers to understand and shape the present and future are enormous and full of promise. Much so-called recent innovation has simply been exploiting

the facility offered by computational speed to creating trivial commercial applications. True research should have goals commensurate with the potential of the methods at hand. Economic planning allowed our societies to set goals, not just military ones but ones such as developing hydro-electric energy which genuinely contributed to well being and quality of life. Medical research is an area in which this ideal is still present if far from ubiquitous.

The Battelle experience should encourage researchers to address big problems in a spirit of generosity. While at Battelle, I had the good fortune to work in a number of areas offering a wide range of challenges. Most elements of the Battelle experience therefore remained relevant in later jobs, and sources of insights. The key importance of data, and a critical regard thereof, was central, as was the interdisciplinary techno-economic approach. Experience in conceiving and planning credible research programs, designed to address real problems, using limited information, sharing in the knowledge of others by interviews and visits and the willingness to seek understanding of new areas, trusting to one's intuition, are vital assets to researchers. Above all is the capacity to be excited by a problem and deeply committed to its solution, in intense collaboration with others. Battelle remains in my recollection for these reasons as a remarkable and unequalled human experience.

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