CULTURES, FINANCE AND GROWTH*

by

Michele Bagella, Leonardo Becchetti and Stefano Caiazza

Abstract

The literature on economic growth has recently emphasized the role of institutions but has not thoroughly explored the impact of different religious and cultural backgrounds on institution building. In this paper we argue that religious differences among countries are crucial determinants of the evolution of financial and non financial institutions. Moreover, we find that a positive link between finance and growth arises only in those countries whose cultural background allowed them to reach a sufficient degree of institutional development. This result is consistent with predictions of a nonlinear relationship between finance and growth from a recent vintage of theoretical models. The religious background-institutional development nexus is finally used in the paper to demonstrate that the effect of institutions on growth is for a significant part exogenous.

Michele Bagella
University of Rome Tor Vergata , Department of Economics, Via di Tor Vergata snc, 00133 Roma. E-Mail : bagella@economia.uniroma2.it

Leonardo Becchetti
University of Rome Tor Vergata, Department of Economics, Via di Tor Vergata snc, 00133 Roma. E-Mail : becchetti@economia.uniroma2.it

Stefano Caiazza
University of Rome Tor Vergata, Department of Economics, Via di Tor Vergata snc, 00133 Roma. E-Mail : caiazza@economia.uniroma2.it

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1. Introduction

The empirical literature on the determinants of economic development has progressively tested the significance of the impact on growth of several factors different from the traditional production inputs. Durlauf and Quah (1998) in a survey of the literature identify 87 different proxies of variables tested in empirical analyses. Among the most important of them, human capital (Mankiw-Romer-Weil, 1992), the government sector (Hall-Jones, 1997), social and political stability (Alesina-Perotti, 1994), corruption (Mauro, 1995), social capital (Knack-Keefer, 1997), income inequality (Persson-Tabellini, 1994; Perotti, 1996) and financial institutions (Pagano, 1993; King-Levine, 1997). [1]

While this literature often claims the importance of looking at institutions and at "deep fundamentals" in order to understand the roots of economic growth, the relationship between cultural heritage from religious beliefs, institution building and economic development has not been thoroughly explored.

Only a few empirical papers tackle the issue of the relationship between religion and economic growth. [2] The

[1] According to these authors financial institutions improve the screening and monitoring of investment projects, provide mobilisation and aggregation services to savings and enhance opportunities for risk management and liquidity.

[2] Most of them focus on a more specific issue in this literature, the Weberian hypothesis, which postulates a positive relationship between protestant ethics and growth (Iannaccone, 1998). The Weberian hypothesis has been criticised on theoretical grounds by historians (Tawney, 1926; Viner, 1978) and has not yet found adequate support in the empirical evidence.

traditional approach adopted is a test on the impact of religion as an additional regressor in exogenous or endogenous growth models (Sala-y-Martin, 1999). [3] Its main limit is that of testing the marginal contribution of religious affiliation on levels or growth of per capita income without investigating the more complex links between religious beliefs and the same factors affecting growth. This broader perspective has been recently taken by Stulz and Williamson (2001) investigating whether religious background significantly affect financial institutions net of the effect of language, trade openness and the origin of the country's legal system. The authors find that creditors' rights are significantly less protected in catholic than in protestant countries.

We believe that this is a fruitful direction in which the growth literature (and, in our particular case, the finance-growth literature) may be implemented. It is reasonable to assume that "deep fundamentals", such as cultural *ethos* or religious beliefs, have an impact on growth not only directly, but also by shaping and ordering the set of values which crucially influence institution building and individual behaviours and, through them, the "wealth of nations".

Our paper aims to broaden the scope of this more recent investigation. It analyses the effects of religious backgrounds on institutions on an enlarged set of countries with respect to Stulz-Williamson (2000) and evaluates the comparative impact of three religious environments (Catholicism, Protestantism and Islam) on institution building. Finally, it verifies whether the different development of financial and nonfinancial institutions affects the relationship between them and growth. In this respect a final advantage of our approach is that the previously identified

[3] Within such literature, Sala-y-Martin (1987) tests the marginal impact of religious affiliation together with a large set of potential regressors and finds a negative and significant impact of both catholicism and protestantism. Grier (1997) finds that former British colonies grew more than former Spanish colonies but he also shows that controlling for protestantism does not help to close the development gap between them. Blum and Dudley (2001) compare Catholic and protestant cities between the 16th and the 18th century and conclude that the difference in growth is partially attributable to a difference in religious beliefs.

relationship between religious background and institutional development allows us to tackle the endogeneity problem in the relationship between growth and institutions by instrumenting latter with religious background.

The paper is divided into five sections including introduction and conclusions. In the second and third section we outline our theoretical hypotheses and we discuss how religious beliefs are systems of value rankings which crucially affect rewards to talent (Murphy et al., 1991) and economic decisions of individuals. In the fourth section we analyse the effects of religious backgrounds on a set of institutional indicators net of the impact of several control variables and verify whether some convergence in institutional shaping across religious worlds has occurred in the last decades.

In the fifth section, we test whether the previously measured differences in financial institutions affect the relationship between finance and growth. Our empirical findings seem consistent with theoretical and empirical results (Saint Paul, 1992; Harrison et al, 1999) showing that finance and growth positively affect each other only if the development of financial institutions is above a given threshold.

2 Religious beliefs, financial and nonfinancial institutions: does a difference between protestant and catholic countries exists ?

The hypothesis that religious and cultural backgrounds significantly affect institutions and growth has been often supported by sociologists and historians but much less explored by economists.

Among the few of them, Landes (1998) finds that cultural factors contribute to explain differences in human capital accumulation and in rates of economic development. This conclusion does not contradict the Weberian hypothesis that the protestant Reformation divided Europe in two different areas with

different standards for productive effort, contractual dealings and accumulation of capital. This hypothesis (1930) postulates that Protestantism gives relatively higher social value to entrepreneurship and to the accumulation of "productive" human capital. For these reasons, gifted individuals in protestant societies invested more in human capital and directed it more toward productive activities.[4]

Delacroix (1992) resumes Weber's argument by saying that "the worldview propagated by Protestantism broke with traditional psychological orientations through its emphasis on personal diligence, frugality and thrift, on individual responsibility, and through the moral approval it granted to risk-taking and to financial self-improvement". In the same direction Blum and Dudley (2001) state that "a representative protestant would be more inclined to participate more actively in economic life and would be more likely to refrain from consuming fruits of its labour than would a representative Catholic".

The rationale for the Weberian hypothesis is rooted in the theological differences between catholic and protestant creed. In the protestant (calvinist) *ethos* in fact, wealth is often regarded as

[4] The existence of a link between capitalism and protestant Reformation is also implicitly advocated by the *Encyclopedia Britannica* which gives the following explanation to the voice *Capitalism*. "*CAPITALISM: also called free market economy, or free enterprise economy. Economic system, dominant in the Western world since the breakup of feudalism, in which most of the means of production are privately owned and production is guided and income distributed largely through the operation of markets. Although the continuous development of capitalism as a system dates only from the 16th century, antecedents of capitalist institutions existed in the ancient world, and flourishing pockets of capitalism were present during the later European Middle Ages. The development of capitalism was spearheaded by the growth of the English cloth industry during the 16th, 17th, and 18th centuries. The feature of this development that distinguished capitalism from previous systems was the use of the excess of production over consumption to enlarge productive capacity rather than to invest in economically unproductive enterprises, such as pyramids and cathedrals. This characteristic was encouraged by several historical events. In the ethic encouraged by the protestant Reformation of the 16th century, traditional disdain for acquisitive effort was diminished, while hard work and frugality were given a stronger religious sanction. Economic inequality was justified on the grounds that the wealthy were also the virtuous*."

a sign of "predestination" by God.[5] On the contrary, the catholic *ethos* remains much more related in the past to the idea that God's providence is what matters and that wealth accumulation is a sign of greed, and of wrong ranking of values.

One of the most insightful syntheses of the Weberian hypothesis is from Marshall (1982) who advocates that "protestant asceticism (according to Max Weber) restricted consumption of luxuries and prohibited spontaneous enjoyment of the world. On the other hand, it insisted upon relentless efforts in one's lawful vocation as the duty of all Christians. This unique combination, Weber felt, was almost certain, ceteris paribus, to lead to the accumulation and reinvestment of capital by those involved in business activities…. Thus, through the entirely unintended consequences of the double injunction to diligence in lawful callings and asceticism in the world, ascetic Protestantism created the modern capitalist mentality".[6]

In the light of the debate resumed above we argue that religious beliefs - and the cultural environment generated by them – are likely to affect not only individual behaviour, but also to shape the institutional framework in which decisions are taken. More specifically, we argument that (and want to test empirically whether): i) the protestant ethics laid the ground for a stronger defence of property rights; ii) the higher social value of entrepreneurial risk taking in protestant societies, emphasised by Weber, is at the root of the relatively higher development of financial markets in which people can share risk intertemporally or cross-sectionally; iii) the higher value of individual

[5] We argue that religious beliefs still breed local cultures even though actual catholic and protestant societies are largely "secularised". To quote an example, obituaries in protestant societies are focused on the professional qualities and life activities of the defunct, while catholic burial ceremonies emphasize much more the moral qualities of the dead.

[6] The above described cultural differences were likely to affect not only human capital investment but also the extent to which human capital was directed toward productive activities. A well known paper finds that "social" rewards to talent have a crucial influence on growth (Murphy et al., 1991). Religious or cultural beliefs may indeed place high social value on rent seeking activities such as army memberships. In these cases country talents will be oriented toward these acitivities and not toward entrepreneurship.

responsibility has led to a higher emphasis on economic freedom and to a limitation of the role of the state in financial and nonfinancial markets.

To illustrate the first point Blum and Dudley (2001) argue that higher respect of contractual obligations in protestant societies may be the result of the higher costs of defection from contractual relationships in protestant societies. For Catholics this cost is low because it is always possible to obtain pardon with the intermediation of a priest. For a Calvinist, or for believers of other ascetic protestant denominations influenced by Calvinism, there is not such intermediation and defection weakens the belief in one's own predestination.

On the second point, it is useful to summarize the differences between two established archetypes of financial markets (the market oriented and the bank oriented system) into four main points: i) the limited role of the state in the ownership of banks; ii) the quality of information; iii) the protection of minority shareholders and iv) the repression of insider trading (Allen-Gale, 1997). From a descriptive point of view cultural backgrounds induced by religious beliefs and geographical location (Europe or the US) are two partial but not mutually exclusive explanations for these differences.[7]

In conclusion, even though we may think that the protestant cultural background with its higher social support for entrepreneurial risk-taking and for private (more than government controlled) economic activity may have influenced the development of freedom on exchange and financial markets, the hypothesis needs to be tested accurately since counterexamples may be easily found.

[7] The Netherlands and the UK are in Europe but their financial markets are more similar to the market oriented archetype, so that their protestant cultural background may have influenced their institutional choice. On the other hand, financial markets in Scandinavian countries are not so similar to the bank oriented archetype and Germany (a country which is divided between Protestants and Catholics) is the most relevant example of the bank oriented archetype.

On the third point, it is plausible to conclude that the increased emphasis on individual responsibility against tradition and the role of Church authorities led to a general reduction of the pressure of both religious and civil authorities on individuals life and, therefore, fostered the creation of a society in which the role of the state was more limited than in Catholic countries.

3. Religious beliefs, nonfinancial and financial institutions: the Islamic financial system

The *shariah* is the set of rules and laws governing the Islamic financial system. It is based on the *Quran,* on its interpretation from the Prophet Muhammad (known as *Sunnah)* and on the Islamic jurisprudence. The *shariah* contains important prescriptions ruling economic behaviour of believers.

A crucial one is the "prohibition of the payment or receipt of any predetermined, guaranteed rate of return *(riba)*.[8] This closes the door to the concept of interest and precludes the use of debt-based instruments." (Iqbal, 2001) On the other hand, it must be observed that Islam places high value on risk-sharing and entrepreneurship, discourages speculative behavior, and emphasizes the sanctity of contracts.

The prohibition of interest charges hinges on arguments of equality and social justice. Islam considers them a cost that is determined ex ante without taking into account the outcome of business operations and with the risk of endangering their success. On the contrary, equity partnership and ex post participation to profits is seen as more equitable as it positively contributes to create wealth and to promote successful entrepreneurship.

Even though a modern reinterpretation of the *Quran* argues that the prohibition affects only usury interest, the prohibition is widely respected by Islamic banks or, even when it is not

[8] Riba (Sura II, 279) literally means prohibition of "excess" which is how fixed interest payments are considered.

respected, banks are reluctant to defend real interest rates in presence of high inflation as they may be perceived by fundamentalists (suffering of monetary illusion!) as usury interests.[9]

The underdevelopment of debt instruments in the Islamic finance, affected by orthodox Coranic prescriptions, eliminates a degree of freedom and a crucial source of external finance. Even though, it is known that debt may create conflicts of interests between creditors and shareholders, with the former being more risk averse than the latter, it is nonetheless a crucial instrument to prevent cash flow waist from managers (Jensen-Meckling, 1976; Jensen, 1986 and Grossman-Hart, 1982). Moreover, with the impossibility or the difficulty of signing debt contracts firms are unable to signal their strength to financiers in a framework of asymmetric information (Ross, 1977; Leland-Pyle 1977; Brennan-Kraus, 1987; Noe, 1988; Costantinides-Grundy, 1989; Stein, 1992; Bagella-Becchetti, 1998).

Finally, the *riba* has traditionally contributed to reduce specialized Islamic banks' ability to invest efficiently. The gap has been bridged by the services of Western banks that swiftly and efficiently deploy funds into Islamically acceptable channels. But this has often meant lower returns for Islamic investors owing to the second layer of intermediation. (Iqbal, 2001)

The above described consideration lead us to argue that the islamic cultural background has serious effects on the development of financial markets and, through it, on growth. This hypothesis will be tested in the empirical analysis which follows.

[9] In order to fullfil Sharia's principles Islamic markets provide a wide range of instruments. The most important are cost-plus financing (*mudaraba*), profit-sharing (*murabaha*), leasing (*ijara*), partnership (*musharaka*), and forward sale (*bay' salam*).

The *mudaraba* is a way of circumventing the prohibition of interest payments as it allows banks to get back the capital borrowed plus commission fees which roughly correspond to interest expenses.

4.1 Empirical analysis: some descriptive evidence on the link between religious heritage and institutions

In the past two sections we presented arguments on the potential effects of religious beliefs on the shaping of institutions. To verify the significance of them we analyse the relationship between religious beliefs and different indicators of civil, legal and economic freedom.[10] Religious affiliation is taken from two

[10] We use the index of economic freedom published in the *Economic Freedom of the World: 2000 Annual Report* which is a weighted average of the seven following composed indicators designed to identify the consistency of institutional arrangements and policies with economic freedom in seven major areas: EFW(I) Size of Government: Consumption, Transfers, and Subsidies, i) General Government Consumption Expenditures as a Percent of Total Consumption (50%), ii) Transfers and Subsidies as a Percent of GDP (50%). EFW(II) Structure of the Economy and Use of Markets *(Production and allocation via governmental and political mandates rather than private enterprises and markets*) i) Government Enterprises and Investment as a Share of the Economy (32.7%); ii) Price Controls: Extent to which Businesses Are Free to Set Their Own Prices (33.5%); iii) Top Marginal Tax Rate *(and income threshold at which it applies*) (25.0%); iv) The Use of Conscripts to Obtain Military Personnel (8.8%). EFW(III) Monetary Policy and Price Stability *(Protection of money as a store of value and medium of exchange*), i) Average Annual Growth Rate of the Money Supply during the Last Five Years (34.9%) minus the Growth Rate of Real GDP during the Last Ten Years; ii) Standard Deviation of the Annual Inflation Rate during the Last Five Years (32.6%); iii) Annual Inflation Rate during the Most Recent Year (32.5%). EFW(IV) Freedom to Use Alternative Currencies *(Freedom of access to alternative currencies*) i) Freedom of Citizens to Own Foreign Currency Bank Accounts Domestically and Abroad (50%); ii) Difference between the Official Exchange Rate and the Black Market Rate (50%). EFW(V): Legal Structure and Property Rights *(Security of property rights and viability of contracts*) i) Legal Security of Private Ownership Rights *(Risk of confiscation*) (34.5%); ii) Viability of Contracts *(Risk of contract repudiation by the government*) (33.9%); iii) Rule of Law: Legal Institutions Supportive of the Principles of Rule of Law (31.7%) and Access to a Nondiscriminatory Judiciary. EFW(VI) International Exchange: Freedom to Trade with Foreigners i) Taxes on International Trade, ia Revenue from Taxes on International Trade as a Percent of Exports plus Imports (23.3%), ib Mean Tariff Rate (24.6%), ic Standard Deviation of Tariff Rates (23.6%), ii) Non-tariff Regulatory Trade Barriers, iib Percent of International Trade Covered by Non-tariff Trade Restraints (19.4%), iic Actual Size of Trade Sector Compared to the Expected Size (9.1%). EFW(VII) Freedom of Exchange in Capital and Financial Markets, i) Ownership of Banks: Percent of Deposits Held in Privately Owned Banks (27.1%); ii) Extension of Credit: Percent of Credit Extended to Private Sector (21.2%); iii) Interest Rate Controls and Regulations that Lead to Negative Interest Rates (24.7%); iv) Restrictions on the Freedom of Citizens to Engage in Capital Transactions with Foreigners (27.1%).

sources: the *CIA Economic Factbook* and the *Italian De Agostini Atlas* which collects historical information from domestic Census data.

Scores for the seven indexes of civic, legal and economic freedom obtained for each country are weighted according to the following formula $Ij = \sum_i w_i X_i / \sum_i w_i$ where w_i is the share of the population affiliated to a given religion in country i and X_i is the score of country i for the indicator j. We define this as the *fuzzy approach* since each country may be fractionally attributed to different religious worlds. We may argue, though, that this weighting is too generous toward minority beliefs. We therefore choose to attribute alternatively to a given creed only those countries in which the chosen religion has at least the relative majority. Under this second approach (*dychotomic approach*) w_i is therefore equal to one if the relative majority of the population of a given country is affiliated to a certain religion and zero otherwise.[11]

With both approaches we find descriptive support for the Weberian hypothesis when we consider average 1970-1997 indicators (Table 1). Protestant countries are characterised by reduced state intervention (EFW1), higher security of property rights and viability of contracts (EFW5) and higher freedom to trade with foreigners (EFW6) with respect to Catholic countries. Furthermore, stock market capitalisation accounts on average for around 31 percent of GDP in protestant countries against around 19 percent in Catholic countries. The difference between protestant and catholic countries, on the one side, and muslim countries, on the other side, is even sharper. Values for security of property rights and viability of contracts (EFW5), freedom to exchange with foreigners (EFW6) and development of banking institutions (EFW7) are halved with respect to protestant

[11] The difference between the two approaches is particularly relevant for some countries. Consider for instance the case of Switzerland, the Netherlands and the United States which all have two almost equal shares of Catholics and Protestants. Results which follows have been shown to be not sensitive to observations from these three countries.

countries, while the decline in stock market capitalisation is slightly less pronounced (12 percent in Muslim countries).

T-stats on mean values averaged across the sample period (with the dychotomic approach) show that the difference in means between Christians and Muslims is significant on all indicators with the exception of monetary and price stability, while the difference between Catholics and protestants is significant only in the legal structure and property right and in the freedom to trade with foreigners indicator. The other important point is that alternative determinants of institutional heterogeneity such as civil law/common law and the English language variables are not significant for any of the seven institutional indicators (Table 1). Is the significance of differences in mean stable across time and classification approach? When we pass from the dychotomic to the fuzzy approach (i.e. Germany is considered half catholic half protestant) Muslim/Christian results are confirmed but all the differences between Catholics and protestants becomes significant.[12]

If we repeat the test on the beginning and the end of the observation period

we observe that (if we use the dychotomic approach) in three cases Catholics converge to protestants in the end of the observation period (structure of the economy and use of markets (EFW2); freedom to use alternative currencies (EFW4); freedom of exchange in capital and financial markets (EFW7)) (Table A.1a and A.b in the Appendix). On the contrary, countries which strictly abide by Islamic law diverge on freedom to use alternative currencies and to trade with foreigners and converge in legal structure and property rights.

These institutional differences are consistent with the divergences arising from the two different religious backgrounds in terms of the social value of entrepreneurial risk taking,

[12] The move from the dychotomic to the fuzzy approach generates an increase in the degrees of freedom with consequences on the significance of tests since variance does not change much. Reuslts are available from the authors upon request.

individual responsibility and respect of contractual obligations described in the previous sections and, above all, with our considerations on Islamic finance.
By summarising results on the dynamics of institutions in the three worlds we may conclude that Catholics converged to protestant institutional quality in the last two decades, while the divergence, with the Islamic world remains consistent. We may interpret the substantial convergence between the two Christian creeds in the light of the cultural revolution ignited by Concilio Vaticano II, [13] which promoted convergence in terms of organisation (supply) and participation (demand) of cultual activities (Iannacone, 1998) and, above all, in terms of earthly values with the rise of Catholic movements which emphasize the calling to professional activities and partially to entrepreneurship (*Opus Dei*, *Comunione e Liberazione*, *Focolarini*). These movements have increased the emphasis on horizontal coordination of believers in the society as opposed to the pressure from the vertical hierarchy which has been typically considered as a determinant of the differences between protestant and Catholic culture.

4.2 Econometric findings on the relationship between religious backgrounds and institutions

Descriptive statistics on institutional quality in countries with different religious traditions may obviously be affected by composition effects. The most likely candidates are per capita GDP, language and origin of the legal system. A clear distinction among the effects of each of these variables on institutional quality is problematic. Religious background may have started affecting institutional quality and, through it, per capita income far before our estimation period. The insignificance of religious

[13] The Concilio Vaticano II generated a revolution which reduced the gap between catholic and protestant creeds on different prespectives: i) ecumenism; ii) access to the Bible of individuals iii) responsibility of laics in curch life; iv) cult.

background once we introduce (beginning of period) per capita income as explanatory variable therefore does not necessarily implies that religion does not affect institutions.

We nonetheless estimate a model in which the three alternative variables are introduced as regressors while the dependent variable is alternatively represented by an unweighted average of EFW7, EFW4 and EFW1 or of EFW7, EFW5 and EFW1. We choose a combined variable of institutional quality because an individual indicator reflects only a limited part of the whole institutional system which is not enough per se to affect economic behaviour and growth. We already argued that the prohibition of *riba* may inhibit the development of debt instruments and of a traditional banking system, but the problem is usually circumvented by savers in Islamic countries through deposit accounts in foreign banks (500 billions of dollars in 2001). If a low evaluation on EFW7 is combined with a low evaluation in EFW4 (measuring also freedom of opening deposits in foreign banks)[14] the possibility to avoid the religious norm is limited and the effects on economic behaviour are more serious.

We also combine these indicators with EFW2 and EFW5 because we believe that free pricing and a sound legal structure for property rights are fundamental for the development of the industrial system on which the development of financial institutions is based.[15]

We consider for our estimates three different sample periods: i) 1985-1997 a time interval in which the digital divide is a new important factor of convergence/nonconvergence and in which

[14] EFW7 and EFW4 composite financial governance indicators measure two crucial variables which have been shown to affect growth such as government control of the banking system and role of foreign banking in domestic financial industry. Wachtel (2001) finds that foreign ownership of banks leads to rapid introduction of product and service innovation, attracts foreign direct investments and generates economies of scope and scale. La Porta et al. (2001) find that government owhership of banks does not lead to rapid growth of financial intermediation and has negative effects on growth.

[15] De Soto (2001) calculates that some developing countries have very high level of hidden capital (132 billion of dollars in the Philipines, 74,2 billion of dollars in Peru) which cannot be used as collateral for investment for the lack of property right registration.

Information and Communication Technology (ICT) indicators which will be used in level and growth equations; ii) 1975-1997 in which ICT indicators are not available but level and growth equations will be estimated; iii) 1960-1997 in which ICT indicators are not available and only the level equation will be estimated since we do not dispose of a reliable GDP in PPP for the beginning of this sample period.

Our empirical findings shows that a significant and positive effect of christian cultural background on the combined indicator of institutional development even after controlling for the effect of the beginning of period per capita GDP, language, OECD/non OECD country affiliation and origins of the legal systems (Table 2).[16] The result is robust and confirmed in all of the considered sample periods. On the other hand, a separate estimate reveals that the difference between catholics and protestants is not significant.[17] This result is consistent with the descriptive evidence on institutional convergence (between Catholics and Protestants) and nonconvergence (between Christians and Muslims) in the last two decades.

5. The financial institutions -growth nexus

Results of the relationship between religious backgrounds and financial institutions evidenced a significant difference among the three religious worlds consistently with the arguments developed in section 2. Once we recognise such difference, we wonder whether traditional cross-country analyses on the relationship between finance and growth should take it into account.

A recent vintage of finance-growth theoretical models definitely suggests that we should.

[16] Results from the 1985-97 sample are omitted for reasons of space and are available upon request.

[17] Estimates are omitted for reasons of space and are available from the authors upon request.

Saint Paul (1992) identifies a trade-off between technological diversification (which implies despecialisation and no choice of the more specialised technology) and financial diversification. The development of financial markets allows entrepreneurs to achieve diversification on financial markets and therefore to reduce technological diversification by choosing the riskier and more profitable technology. The model has multiple equilibria. If financial markets are insufficiently developed and it is too costly for entrepreneurs to access them, a low growth-low financial development equilibrium is achieved. If, on the contrary, the development of financial markets is such that entrepreneurs' costs of access are lower than a given threshold a high growth-high financial market equilibrium is achieved.[18]

This model provides a strong theoretical rationale for the hypothesis that the finance-growth relationship holds only if financial institutions are sufficiently developed. Since our three religious worlds are characterised by three different degrees of financial development we test whether each of them overcomes the threshold over which the positive relationship between finance and growth is achieved.[19]

To test the finance-growth relationship we adopt the traditional Mankiw-Romer-Weil (1992) approach including in the estimate measures of bottlenecks reducing ICT (when the regression is run on the 1985-97 sample in which these data are

[18] Note that the model assumes that costs of access to financial market are fixed while costs of technological diversification are proportional to the output. Therefore the relationship between growth and financial markets is biunivocal and, after a certain threshold, growth positively affects financial market development which, in turn, has positive feedback effects on growth.

[19] An almost observationally equivalent result of biunivocal finance-growth relationship after a given threshold is found by Harrison-Sussman and Zeira (1999) and Deidda (2001). The former find that economic growth increases banks' activity and promotes new entries. Entries reduce costs of financial intermediation and in turn boost investment and growth. The second argues that, in an economy with risk averse savers and learning by lending, transition from financial repression to full financial repression may initially lead to a recession, while, with the increasing level of expertise and institutional quality, it guarantees a growth inducing allocation of financial resources. Therefore, after a learning period, financial development leass to a high growth equilibrium.

available), economic freedom and religious affiliation.[20] The estimated level equation is therefore:

$$(1) \qquad \ln\left(\frac{Y_t}{L_t}\right) = c + l_1 \ln\left(A_{BR-ICT(0)}\right) + l_2 g_{BR-ICT} t + \frac{a}{1-a-b}\ln\left(s_k\right) +$$

$$+ \frac{b}{1-a-b}\ln\left(s_h\right) - \frac{a+b}{1-a-b}\ln\left(n+g+d\right) + gEFWREL_i$$

where i = Catholics, Protestants, Muslims. The estimated conditional convergence equation is:

(2)

$$\ln((Y/L)(t) - \ln((Y/L)(0)) = c' + g_{BR\ ICT} t + (1-e^{-?t})\frac{a}{1-a-ß}\ln\left(s_k\right) +$$

$$+ (1-e^{-?t})\frac{ß}{1-a-ß}\ln\left(s_h\right) + (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln\left(n+g+d\right) \quad (1-e^{-?t})\ln((Y/L)(0)) +$$

$$+ (1-e^{-?t})\ln(A_{BR\text{-}ICT(0)}) + (1-e^{-?t})gEFWREL_i$$

where i = Catholics, Protestants, Muslims and $c' = g_{KP} t + (1-e^{-lt})\ln(A_{KP(0)})$.

Variables for our empirical analysis are taken from the World Bank database. The dependent variable *Y/L* is the gross domestic product per working-age person[21] converted into

[20] The theoretical foundation of this specification augmented with BR-ICT variables is described in Adriani-Becchetti (2001).

[21] We perform the estimate with four different specifications which alternatively consider the ILO labor force and population in working age as labor inputs and observed income or trend income as a dependent variable. The ILO labor force includes the armed forces, the unemployed, and first-time job-seekers, but excludes homemakers and other unpaid caregivers and workers in the informal sector. We use trend income alternatively to observed income to avoid that our results be influenced by cyclical effects on output (Temple, 1999). Full estimates results are available upon request.

international dollars using purchasing power parity rates,[22] L is number of people in the working age cohort (population aged between 15 and 64). s_k is gross domestic investment over GDP, s_h is the (secondary education) ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown (generally the 14-18 age cohort).[23] To measure factors reducing ICT bottlenecks[24] we consider an unweighted average of the four different proxies: i) the number of main telephone lines per 1,000 inhabitants;[25] ii) internet hosts (per 10,000 people) or the number of computers with active Internet Protocol (IP) addresses connected to the Internet, per 10,000

[22] An international dollar has the same purchasing power over GDP as the U.S. dollar in the United States.

[23] It is also defined as gross enrollment ratio to compare it with the net enrollment ratio in which the denominator is the enrollment ratio only of the age cohort officially corresponding to the given level of education.

[24] The empirical literature on growth usually neglects the impact of technological progress on the differences between rich and poor countries by implicitly assuming that knowledge and its incorporation into productive technology is a public good, freely available to individuals in all countries (Temple, 1999).

This approach cannot be applied to one of the most important sources of innovation in the last decades (Information and Communication Technology) since ICT is a bundle of quasi-public knowledge products and non public goods, needed for the fruition of the *knowledge products* themselves. Knowledge products are in fact weightless, expansible and infinitely reproducible (software, databases). They may be considered almost as public goods since expansibility and infinite reproducibility make then nonrivalrous, and copyright protection make them much less excludable than other innovation such as new drugs which are protected by patents (Quah, 1999).

If ICT would consist only of knowledge products, it should be available everywhere almost immediately no matter the country in which it has been created. This does not occur though since the immediate diffusion and availability of knowledge products is prevented by some "bottlenecks". In our opinion these "*bottlenecks*" are: i) the capacity of the network to carry the largest amount of knowledge products in the shortest time, ii) the access of individuals to the network in which knowledge products are immaterially transported and iii) the power and availability of terminals which process, implement and exchange knowledge products which flow through the network. We therefore argue that bottleneck reducing factors such as the diffusion and power of personal computers, the diffusion of internet access and the capacity of the network have been crucial determinants of the wealth of nations in these last two decades and we want to establish how deep fundamentals have affected domestic diffusion of ICT technology.

[25] Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network. Data are presented per 1,000 people for the entire country.

people; iii) mobile phones (per 1,000 people); iv) personal computers (per 1,000 people). Finally, EFWREL is the combined indicator of governance and institution. It is composed by the dependent variable in estimates presented in the previous section (EFW742 or EFW752) when the country has a nonzero share of believers for a chosen religious background and is zero otherwise.[26]

When we inspect the distribution and correlation among variables used to estimate equations (1) and (2),[27] what really strikes is the difference in the distribution of physical and human capital investment in our sample. The reduced distance between the 10th and the 90th percentile values (respectively 13 and 29 percent) indicates that convergence in the investment to GDP ratio is almost achieved, while this is not the case when we look at human capital investment (where the 10th and the 90th percentile values are respectively 8 and 101 percent).[28]

Besides the already analysed relationship between religious background and institution building, the correlation matrix indicates that the share of Protestants has a more positive relationship than the share of Catholics and Muslims with the stock of factors easing access to ICT (0.34, against 0.19 and –0.38) and with human capital (0.13, against -0.31 and –0.09).[29]

Results from econometric estimates on all countries when the institutional variable is represented by an average of the EFW2, EFW4 and EFW7 indicators are reported in Tables 3 and 4 while Table 5 resumes results when: i) EFW5 replaces EFW4 in the institutional variables; ii) ICT factors are added in the 1985-1997 sample estimate and iii) when regressions are run on non OECD

[26] Results which follow are substantially unchanged if we raise the threshold to a ten percent share of believers.

[27] The relevant tables are omitted for reasons of space and available from the authors upon request.

[28] Remember that secondary school gross enrollment ratio may be more than 100 percent as the denominator is represented by the age class while the nominator may include students which are more than 18-years hold.

[29] The table is omitted for reasons of space and is available from the authors upon request.

countries only.[30] A first significant empirical finding is that the effect of financial institutions on growth is positive when we consider it in protestant and catholic countries (first, second, fourth and fifth estimate in Table 3) and insignificant when we consider its impact in Muslim countries only (third and sixth estimate in Table 3). This occurs both in level and growth estimates. Since the latter subgroup has been shown to have a significantly lower level of development of financial institutions the hypothesis that financial institutions start being beneficial only after a given threshold is not rejected by our empirical test. The result is confirmed in both level and growth estimates, with OLS and IV approaches and for all considered sample periods.[31] More in detail we observe that the first column in Table 3 meets all predictions of the MRW model. Coefficient of physical capital, human capital and of the $n+g+d$ variable are significant and correct. The restriction for the three coefficients is supported. Implied factor shares are in the range of those traditionally estimated.[32] The weak significance of human capital coefficient in growth equations is typical of these estimates (column 8) and it is interesting to see that the adoption of ICT variables (which are known to increase productivity of human capital[33]) as instruments reinforces the significance of this variable (column 10). Note also that in all estimates in which the contribution of the institutional

[30] Detailed results of these estimates are available upon request.

[31] The rationale for using IV estimators is that, even though the 12-year distance between institutional variables and the dependent variable should reduce the risk of endogeneity typical of the finance-growth relationship, the risk does not disappear completely if we consider that the dependent variable is highly serially correlated. Therefore we use our previously tested relationship between institutions and religious background instrumenting the former with the latter. Religious backgrounds vary just slightly across decades (even under the impact of economic growth) but can definitely be considered exogenous by construction here since country participation to a given religious world is invariant in the last half of the century and not affected by economic growth of the sample period (or by previous economic growth correlated with it).

[32] Mankiw- Romer and Weil (1992) expect a human capital share between ½ and 1/3, while their estimate of the physical capital factor share ranges from 0.4 to 0.14 when considering OECD countries only.

[33] See among others Oliner and Sichel (1994) and Lehr-Licthemberg (1999).

variable is considered only for Muslim countries estimates present various problems different from the insignificance of the institutional factor. Estimates on the 1975-97 sample confirm results from Table 3 with the only exception of a weaker coefficient for the $n+g+d$ variable.
Table 5 reports institutional coefficients for estimates which include ICT factors as regressors or for estimates on non OECD countries only. All these estimates support our previous results.

Conclusions

It is reasonable to imagine the wealth of nation as being determined by a complex pattern of relationships involving heritage from religious traditions, institutional shaping, capacity to spread innovation and investment in physical and human capital.
This paper provides a theoretical interpretation and an empirical test of these patterns.
A robust result of the paper suggests that three religious and cultural backgrounds have a strong impact on the way institutions are designed. The reduced role of the state, the higher emphasis on economic freedom and on the stronger defence of legal obligations are shown to be significantly related to the specific cultural background originated by the Reformation and recently assimilated also by Catholic countries. On the contrary, the prohibition of interest charges in Islamic finance, even though not always respected and often circumvented, generates weaker and less efficient banking and financial institutions. By testing the impact of institutions separately for the three religious backgrounds we find that a positive relationship between finance and growth occurs only in the subgroup (protestant and catholic countries) in which financial institutions are more developed.

We believe that these results provide a contribution to the empirics of growth on several respects and reconcile empirical

findings with most recent theories on finance and growth. In countries with religious and cultural backgrounds unfavourable to the development of financial institutions fixed costs of accessing debt and equity markets are high and sources of external finance are costly. These countries do not possess enough instruments to diversify risk and do not allow entrepreneurs to invest in risky activities. They are therefore trapped in a low growth equilibrium in which financial institutions are underdeveloped. In countries in which cultural and religious backgrounds did not prevent the development of financial institutions, intertemporal and cross-sectional risk sharing induce easier access to external finance and allows entrepreneurs to invest in risky activities. In these countries a virtuous positive relationship between financial development and growth exists.

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Table 1. Institutions, economic freedom and religious affiliation

(mean values 1970-1997)	*EFW (1)*	*EFW (2)*	*EFW (3)*	*EFW (4)*	*EFW (5)*	*EFW (6)*	*EFW (7)*
Catholics	7.548	4.647	6.915	6.925	6.159	6.075	6.016
Protestants	6.012	5.048	8.059	6.453	8.056	7.290	6.717
Muslims	8.192	2.373	7.165	4.202	4.544	4.411	3.512
Islamic law	7.704	1.988	7.802	3.6	4.229	4.556	3.393
Christian	7.449	4.150	7.110	6.159	6.010	6.065	5.526
Civil Law	7.564	3.788	7.181	6.109	5.723	5.768	5.252
Common Law	7.728	4.233	7.515	5.102	6.180	5.875	5.266
English Language	7.951	4.062	7.455	4.860	5.934	5.495	5.107
Non English Language	7.422	3.710	7.066	6.042	5.717	5.844	5.204
T-test on the significance of the difference in means (1.76 and 2.38 are respectively the 90% and the 99% significance threshold)							
Islamics vs christians	0.530	-3.881	1.069	-2.960	-2.282	-2.437	-2.832
Muslims vs christians	2.127	-4.356	0.112	-2.972	-3.665	-3.538	-3.615
Catholics vs. protestants	3.327	-0.928	-1.769	0.607	-2.767	-2.108	-1.112
Civil Law vs Common Law	-0.567	-1.164	-0.868	1.871	-0.946	-0.261	-0.028
English vs Non English Lang.	1.934	0.950	1.033	-2.209	0.463	-0.185	-0.185

The index of economic freedom published in the *Economic Freedom of the World: 2000 Annual Report* is a weighted average of the seven following composed indicators designed to identify the consistency of institutional arrangements and policies with economic freedom in seven major areas: EFW(I) Size of Government: Consumption, Transfers, and Subsidies, i) General Government Consumption Expendi tures as a Percent of Total Consumption (50%), ii) Transfers and Subsidies as a Percent of GDP. EFW(II) Structure of the Economy and Use of Markets *(Production and allocation via governmental and political mandates rather than private enterprises and markets)* i) Government Enterprises and Investment as a Share of the Economy (32.7%); ii) Price Controls: Extent to which Businesses Are Free to Set Their Own Prices (33.5%); iii) Top Marginal Tax Rate *(and income threshold at which it applies)* (25.0%); iv) The Use of Conscripts to Obtain Military Personnel (8.8%). EFW(III) Monetary Policy and Price Stability *(Protection of money as a store of value and medium of exchange)*, i) Average Annual Growth Rate of the Money Supply during the Last Five Years (34.9%) minus the Growth Rate of Real GDP during the Last Ten Years; ii) Standard Deviation of the Annual Inflation Rate during the Last Five Years (32.6%); iii) Annual Inflation Rate during the Most Recent Year (32.5%). EFW(IV) Freedom to Use Alternative Currencies *(Freedom of access to alternative currencies)* i) Freedom of Citizens to Own Foreign Currency Bank Accounts Domestically and Abroad (50%); ii) Difference between the Official Exchange Rate and the Black Market Rate (50%). EFW(V): Legal Structure and Property Rights *(Security of property rights and viability of contracts)* i) Legal Security of Private Ownership Rights *(Risk of confiscation)* (34.5%); ii) Viability of Contracts *(Risk of contract repudiation by the government)*; iii) Rule of Law: Legal Institutions Supportive of the Principles of Rule of Law (31.7%) and Access to a Nondiscriminatory Judiciary. EFW(VI) International Exchange: Freedom to Trade with Foreigners i) Taxes on International Trade, ia Revenue from Taxes on International Trade as a Percent of Exports plus Imports (23.3%), ib Mean Tariff Rate (24.6%), ic Standard Deviation of Tariff Rates (23.6%), ii) Non-tariff Regulatory Trade Barriers, iib Percent of International Trade Covered by Non-tariff Trade Restraints (19.4%), iic Actual Size of Trade Sector Compared to the Expected Size (9.1%). EFW(VII) Freedom of Exchange in Capital and Financial Markets, i) Ownership of Banks: Percent of Deposits Held in Privately Owned Banks (27.1%); ii) Extension of Credit: Percent of Credit Extended to Private Sector (21.2%); iii) Interest Rate Controls and Regulations that Lead to Negative Interest Rates (24.7%); iv) Restrictions on the Freedom of Citizens to Engage in Capital Transactions with Foreigners (27.1%). *Any of the considered indicators has a 0-10 value range. A higher value means a higher level in the item considered by*

the indicator . Countries are assigned to the religion followed by the majority of inhabitants according to national Census data. In the alternative fuzzy approach in which scores for the seven indexes of civic, legal and economic freedom obtained for each country are weighted according to the following formula $Ij = \sum_i w_i X_i / \sum_i w_i$ where w_i is the share of the population affiliated to a given religion in country i and X_i is the score of country i for the indicator j. Results are not substantially different and are available upon request.

Table 2 Institutions, economic freedom and religious affiliation

Sample	**EFW247**				**EFW257**			
1960-1997	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*
Muslims	0.001	0.3	- 0.001	-0.18	0.001	0.3	-0.001	-0.18
Christians	0.012	2.76	0.011	2.47	0.012	2.76	0.011	2.47
Gdp60	1.234	7.9			1.234	7.9		
Gdpl60			1.064	7.43			1.064	7.43
Engl	-0.061	-0.17	- 0.031	-0.09	-0.061	-0.17	-0.031	-0.09
Civlaw	0.180	0.32	0.136	0.24	0.180	0.32	0.136	0.24
Comlaw	-0.392	-0.69	- 0.396	-0.68	-0.392	-0.69	-0.396	-0.68
D_oecd	-0.501	-1.37	- 0.280	-0.78	-0.501	-1.37	-0.280	-0.78
Cons	-6.197	-4.39	- 4.946	-3.68	-6.197	-4.39	-4.946	-3.68
N. of obs.		97		96		97		96
	F(6,88)	17.93	**F(6,87)**	19.69	**F(6,90)**	17.93	**F(6,91)**	20.32
R-squared		0.58		0.55		0.58		0.54
1975-1997	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*	*Coeff.*	*T stat.*
Muslims	0.004	0.63	0.002	0.39	0.004	0.63	0.002	0.39
Christians	0.010	1.9	0.010	1.8	0.010	1.9	0.010	1.8
Gdp75	1.167	5.29			1.167	5.29		
Gdpl75			0.998	5.23			0.998	5.23
Engl	0.211	0.46	0.254	0.55	0.211	0.46	0.254	0.55
Civlaw	0.669	1.01	0.537	0.81	0.669	1.01	0.537	0.81
Comlaw	0.259	0.38	0.185	0.27	0.259	0.38	0.185	0.27
D_oecd	0.293	0.65	0.432	0.99	0.293	0.65	0.432	0.99
Cons	-5.336	-2.92	-4.223	-2.53	-5.336	-2.92	-4.223	-2.53
N. of obs.		95		94		95		94
	F(6,88)	13.28	**F(6,87)**	12.61	**F(6,88)**	11.37	**F(6,87)**	10.95
R-squared		0.43		0.43		0.43		0.43

Variable legend: *efw247*: unweighted average of 1997 values of EFW(2), EFW(4) and EFW(7); *efw257*: unweighted average of 1997 values of EFW(2), EFW(5) and EFW(7); *muslims*: dummy which takes value of one for countries in which muslims are the majority; *christians*: dummy which takes value of one for countries in which christians are the majority; *gdpl 60(75)*: GDP per ILO worker in 1960(75); *gdp 60(75)*: GDP per working age population in 1960(75) ; *civlaw*: dummy which takes value of one for countries in which civil law prevails, *comlaw*: dummy which takes value of one for countries in which common law prevails; *engl*: dummy which takes value of one for countries in which English is among the main spoken languages; *d_oecd*: dummy for OECD countries.

Table 3. Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW4 and EFW7 – sample period 1985-1997

	OLS LEVEL ESTIMATE		IV LEVEL ESTIMATE		OLS LEVEL ESTIMATE		OLS GROWTH ESTIMATE		IV GROWTH ESTIMATE		OLS GROWTH ESTIMATE	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.412	2.14	0.674	2.62	0.266	1.41	0.422	5.21	0.440	5.23	0.085	4.95
Ln(s_h)	0.857	9.58	0.749	6.46	0.920	9.82	0.093	1.59	0.130	1.92	0.061	1.34
Ln(n+g+d)	-1.205	-2.96	-0.856	-1.74	-1.236	-3.03	-0.242	-1.42	-0.166	-0.94	0.177	-1.8
Ln(gdp_{t0})							-0.165	-3.4	-0.228	-3.14	0.046	-1.43
Efw742mus					-0.16	-0.16					0.009	1.7
Efw742ch	0.043	2.23	0.136	2.5			0.049	4.15	0.082	2.95		
Constant	1.196	1.11	1.534	1.26	1.3	1.3	-0.575	-1.18	-0.204	-0.33	0.487	-2.82
Implied a	0.18		0.28		0.12							
Implied b	0.38		0.31		0.42							
Countries		96		96		92		88		74		89
H_0: $l_1 + l_2 = -l_3$	F(1,91)	0.02 (0.89)	F(1,91)	0.93 (0.33)	F(1,87)	0.01 (0.91)	F(1,82)	2.13 (0.14)	F(1,68)	4.00 (0.04)	F(1,83)	0.92 (0.34)
Joint significance of regressors	F(4,91)	82 (0.00)	F(4,91)	65.8(0.00)	F(4,87)	71.5(0.00)	F(5,82)	15.3(0.00)	F(5,70)	13.1(0.00)	F(5,83)	11.6(0.00)
R-squared		0.77		0.71		0.75		0.45		0.50		0.37
Instruments			*Ln(s_k), Ln(s_h), Ln(n+g+d), chris85*						*Ln(s_h), Ln(n+g+d), gdp85, $A_{BR\text{-}ICT(85)}$, $g_{BR\text{-}ICT}$, chris85*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t)) - \ln((Y/L)(0)) = c' + (1 - e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1 - e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1 - e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) + (1 - e^{-?t})\ln((Y/L)(0)) +$$

$$+ (1 - e^{-?t}) gEFWREL_i + u_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. *Ln(gdp_{t0})* is the beginning of period (1985) GDP. In IV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table 4. Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW4 and EFW7 - sample period 1975-1997

	OLS LEVEL ESTIMATE		IV LEVEL ESTIMATE		OLS LEVEL ESTIMATE		OLS GROWTH ESTIMATE		IV GROWTH ESTIMATE		OLS GROWTH ESTIMATE	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.745	3.54	1.082	3.92	0.332	1.29	0.819	6.05	0.749	5.93	0.801	5.07
Ln(s_h)	0.609	7.38	0.459	3.57	0.766	8.78	0.123	1.82	0.03	1.85	0.126	1.84
Ln(n+g+d)	-0.466	-0.98	-0.215	-0.38	-0.663	-1.31	-0.144	-0.29	-0.112	-0.43	-0.383	-0.71
Ln(gdp_{60})							-0.340	-5.33	-0.290	-4.86	-0.239	-3.33
Efw742mus					0.025	0.85					-0.022	-0.92
Efw742ch	0.106	5.15	0.306	4.6			0.067	3.7	0.032	1.5		
Constant	2.864	2.3	2.755	1.75	3.180	2.26	0.129	0.09	0.165	0.12	-0.938	-0.58
Implied a	0.32		0.43		0.16							
Implied b	0.26		0.18		0.37							
Countries		131		131		117		69		69		73
H_0: $l_1+l_2=-l_3$	F(1,126)=2.56 (0.112)		F(1,126)=4.4 (0.0379)		F(1,112)=0.57 (0.452)		F(1,63)=2.61 (0.1109)		F(1,63)=1.58 (0.1409)		F(1,63)=0.95 (0.3339)	
Joint significance of regressors	F(4,126)= 75.69		F(4,126)= 30.64		F(4,112)= 47.3		F(5,63)= 14.5		F(5,63)= 12.8		F(5,63)= 10.41	
R-squared		0.59		0.33		0.54		0.55		0.55		0.48
Instruments			*Ln(s_k), Ln(s_h), Ln(n+g+d), chris60*						*Ln(s_k), Ln(s_h), Ln(n+g+d), chris60*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t)) - \ln((Y/L)(0)) = c' + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) +$$

$$+ (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})gEFWREL_i + u_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. In IV estimates chris60: the share of Christians in 1960.

Table 5. Synthetic results on the institutional variables in ICT augmented estimates and in in non-ICT augmented estimates in the non–OECD sample*

	Institutional variable: unweighted average of EFW2. EFW5. EFW7											
	85-97 level estimate		85-97 growth estimate		75-97 level estimate		75-97 growth estimate		85-97 level IV estimate		85-97 growth IV estimate	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Efw752mus	-0.010	-0.45	0.010	1.14	0.016	0.49	0.020	1.3				
Efw752ch	0.041	2.03	0.052	3.87	0.101	4.73	0.75	3.40	0.150	2.46	0.094	3.12

	Non OECD countries only													
	85-97 level estimate		85-97 level IV estimate		85-97 growth estimate		85-97 growth IV estimate		75-97 level estimate		75-97 level IV estimate		75-97 growth estimate	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Efw742mus	-0.028	-0.83			0.024	2.17			0.025	0.85			0.021	1.47
Efw742ch	0.043	1.66	0.126	2.23	0.071	2.92	0.046	2.74	0.106	5.15	0.315	4.44	0.069	4.29
Efw752mus	-0.041	-1.13			-0.041	-0.73			0.016	0.49			0.020	1.3
Efw752ch	0.038	1.36	0.139	2.19	0.047	2.39	0.086	2.93	0.101	4.73	0.306	4.6	0.079	4.02

	All countries ICT augmented									
	85-97 level estimate		85-97 growth estimate		85-97 level IV estimate		85-97 level estimate (non OECD only)		85-97 growth estimate (non OECD only)	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Efw742mus	-0.010	-0.61					-0.058	-2.79		
Efw742ch	0.040	2.64	0.051	4.29	0.14	2.86	0.063	2.76	0.046	2.93
Efw752mus	-0.013	-0.76					-0.067	-2.85		
Efw752ch	0.037	2.29	0.056	3.94	0.15	2.66	0.062	2.41	0.049	2.51

Legend: efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise; efw752mus (efw742ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. Full estimate results are available upon request.

Appendix A

Table A.1.a Institutional arrangements, economic freedom and religious affiliation

Test t for difference in means

	EFW1	EFW2	EFW3	EFW4	EFW5	EFW6	EFW7
Civil Law '75 vs Civil Law '97	1.198	-1.077	2.303	-4.362	-4.175	-4.894	-3.531
Civil Law '75 vs Common Law '75	0.046	1.211	3.774	2.290	-1.791	-1.487	0.514
Common Law '75 vs Common Law '97	0.330	-3.686	-1.773	-4.897	-1.901	-1.258	-2.783
Civil Law '97 vs Common Law '97	-0.591	-1.880	-0.609	0.792	-0.589	1.070	0.417
Islamic law '75 vs Islamic law '97	-0.595	-0.774	-2.358	-0.397	-8.041	-1.409	-1.494
Islamic law '75 vs christians '75	-1.456	-2.102	-0.071	-0.758	-3.029	-1.226	-2.517
Christians '75 vs christians '97	0.987	-3.041	-1.493	0.615	-2.439	-3.834	-4.097
Islamic law '97 christians '97	0.789	-3.149	0.974	-3.627	0.140	-1.910	-3.001
Muslims '75 vs muslims '97	1.505	-0.795	-1.858	-0.875	-2.766	-1.763	-1.953
Muslims '75 vs christians '75	0.094	-1.981	-0.596	-0.974	-3.017	-2.579	-3.070
Muslims '97 vs christians '97	-0.008	-3.873	0.380	0.254	-2.109	-2.818	-4.206
Catholics '75 vs catholics '97	1.505	-2.957	-1.488	-4.044	-3.598	-4.043	-3.219
Catholics '75 vs protestant '75	3.541	1.565	-0.559	1.171	-2.454	-2.299	0.217
Protestant '75 vs protestant '97	1.063	-5.088	-3.404	-3.663	-4.132	-0.840	-3.858
Catholics '97 vs protestant '97	3.841	-0.735	-2.030	0.318	-2.635	-0.554	-0.894
English '75 vs English '97	0.103	-3.589	-2.273	-5.757	-1.757	-2.104	-2.836
English '75 vs Non English '75	1.031	-1.666	0.111	-2.835	1.360	-0.334	-1.085
Non English '75 vs Non English '97	1.094	-0.923	-1.405	-3.767	-3.494	-4.050	-2.262
English '97 vs Non English '97	1.957	1.309	0.838	-0.913	0.080	-1.363	-0.721

The table reports the value of t- Student for the significance of the difference across means

Table A.1.b Institutional arrangements, economic freedom and religious affiliation

Test t for difference in means

	EFW1	EFW2	EFW3	EFW4	EFW5	EFW6	EFW7
Muslims vs christians	-3.516	-5.854	-3.704	1.654	-5.435	-5.531	-5.841
Catholics vs protestants	5.224	4.775	4.691	4.784	3.398	3.717	4.577
Muslims '75 vs muslims '97	-3.414	-3.864	-0.535	-2.088	-3.909	-0.227	-2.752
Christians '75 vs christians '97	-0.008	-4.244	-0.983	-3.633	-5.697	-0.943	-4.508
Muslims '75 vs christians '75	-3.313	-5.029	-3.743	-4.375	-3.112	-4.828	-4.246
Muslims '97 vs christians '97	-3.513	-5.530	-3.839	-5.971	-4.841	-5.013	-6.073
Catholics '75 vs catholics '97	-0.005	-4.406	-0.655	-3.156	-6.313	-0.977	-4.943
Protestant '75 vs protestant '97	-0.150	-2.615	-0.789	-3.156	-2.604	-0.058	-2.345
Catholics '75 vs protestant '75	6.344	3.040	5.258	4.244	0.709	3.098	2.433
Catholics '97 vs protestant '97	6.488	4.657	4.661	4.776	3.719	3.566	4.650

* Scores for the seven indexes of civic, legal and economic freedom obtained for each religious creed are weighted according to the following formula $Ij = \sum_i w_i X_i / \sum_i w_i$ where ω_i is the share of the population affiliated to a given religion in country i and X_i is the score of country i for the indicator j.

Table A.2 Variance-covariance matrix of regressors included in the system

	Efw1	Efw2	efw3	efw4	efw5	efw6	efw7	Mus	Cath	Prot	A_{BR-ICT}	Engl	Civlaw	Comlaw	Isllaw	Sk	sh
efw1	1.000																
efw2	-0.107	1.000															
efw3	-0.278	0.119	1.000														
efw4	-0.302	0.654	0.256	1.000													
efw5	-0.705	0.463	0.420	0.633	1.000												
efw6	-0.515	0.509	0.324	0.676	0.741	1.000											
efw7	-0.293	0.772	0.446	0.799	0.597	0.665	1.000										
Mus	0.219	-0.422	0.081	-0.317	-0.320	-0.370	-0.368	1.000									
cat	-0.004	0.252	-0.256	0.265	-0.023	0.144	0.184	-0.446	1.000								
Prot	-0.436	0.243	0.163	0.231	0.391	0.280	0.318	-0.271	-0.263	1.000							
A_{BR-ICT}	-0.630	0.558	0.237	0.591	0.786	0.666	0.641	-0.387	0.198	0.346	1.000						
Engl	0.183	0.211	0.070	-0.171	-0.007	-0.100	0.013	-0.099	-0.312	0.013	-0.149	1.000					
Civlaw	-0.086	-0.176	-0.039	0.106	-0.059	0.050	-0.032	0.068	0.405	-0.075	0.045	-0.764	1.000				
Comlaw	0.037	0.214	0.075	-0.065	0.071	-0.010	0.081	-0.096	-0.324	0.134	0.026	0.762	-0.900	1.000			
Isllaw	0.057	-0.343	0.105	-0.364	-0.156	-0.310	-0.279	0.613	-0.289	-0.139	-0.144	-0.015	-0.031	0.015	1.000		
sk	-0.195	0.225	0.200	0.248	0.472	0.370	0.232	-0.104	-0.058	-0.071	0.438	0.027	-0.016	0.027	0.094	1.000	
sh	-0.593	0.480	0.226	0.528	0.762	0.662	0.555	-0.349	0.127	0.266	0.863	-0.113	0.033	-0.002	-0.065	0.516	1.000

Legend: mus: dummy which takes value of one for countries in which muslims are the majority; cat: prot: civlaw: dummy which takes value of one for countries in which civil law prevails, comlaw: dummy which takes value of one for countries in which common law prevails; engl: dummy which takes value of one for countries in which english among the main spoken languages; isllaw: dummy which takes value of one for countries in which Islamic law prevails s_h , secondary school gross enrolment ratio; s_k investment to GDP ratio. A_{BR-ICT} is the stock of BR-ICT factors. Efw(I) Size of Government:. Efw(II) Structure of the Economy and Use of Markets *(Production and allocation via governmental and political mandates rather than private enterprises and markets)*. Efw(III) Monetary Policy and Price Stability *(Protection of money as a store of value and medium of exchange)*. Efw(IV) Freedom to Use Alternative Currencies *(Freedom of access to alternative currencies)*. Efw(V): Legal Structure and Property Rights *(Security of property rights and viability of contracts)*. Efw(VI) International Exchange: Freedom to Trade with Foreigners. Efw(VII) Freedom of Exchange in Capital and Financial Markets. *Any of the economic freedom indicators has a 0-10 value range. A higher value means a higher level in the item considered by the indicator* .

Table A.3 Distribution of quantitative variables used in the estimates (1985-1997 averages)

Percen tiles	Investment in physical capital (% of GDP)	Investment in human capital (Gross enrolment ratio as a % of GDP)	Income in PPA per working age population (per capita 1985 US $)	Income in PPA per worker	Trend income in PPA per working age population	Trend income in PPA per worker	A(ict)	g(ict)
1	6.620	4.675	195.834	216.245	200.082	216.267	-23.173	-4.602
10	13.058	8.873	446.769	503.295	448.290	503.070	-4.047	-0.948
20	15.671	17.278	671.443	764.644	675.713	764.719	-3.402	-0.424
30	17.602	23.725	1047.948	1260.976	1040.689	1261.166	-2.564	-0.223
40	19.640	37.000	1688.625	2325.163	1685.002	2321.192	-1.876	-0.082
50	21.089	46.150	2704.084	3844.928	2698.030	3844.621	-1.021	0.080
60	22.126	55.864	4193.635	6432.814	4194.923	6433.710	-0.257	0.224
70	23.714	73.167	6661.203	9600.666	6706.979	9596.848	0.256	0.507
80	25.912	85.991	22572.370	33133.670	22577.790	33133.680	0.905	0.655
90	29.419	101.073	38623.740	47839.680	38701.350	47827.540	1.281	0.964
99	37.950	124.473	64473.260	82969.690	64325.350	83904.640	1.983	17.888
Percentiles	**EFW(1)**	**EFW(2)**	**EFW(3)**	**EFW(4)**	**EFW(5)**	**EFW(6)**	**EFW(7)**	
1	3.200	0.000	0.700	0.000	1.125	0.000	0.000	
10	4.998	1.868	3.225	3.000	3.480	2.435	2.435	
20	6.255	2.450	4.800	4.300	4.010	3.385	3.385	
30	6.943	2.885	6.675	4.600	4.763	4.053	4.053	
40	7.515	3.530	7.400	4.800	5.425	4.820	4.820	
50	7.950	4.163	7.975	5.600	5.925	5.425	5.425	
60	8.225	4.560	8.325	7.275	6.670	6.270	6.270	
70	8.505	5.115	8.675	8.550	7.270	7.283	7.283	
80	8.890	5.700	9.000	9.300	9.010	7.867	7.867	
90	9.105	6.548	9.400	10.000	9.605	8.858	8.858	
99	9.950	9.675	9.575	10.000	10.000	9.950	9.950	

Table A.4 Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW5 and EFW7 – sample period 1985-1997

	OLS level estimate		IV level estimate		OLS level estimate		OLS growth estimate		IV growth estimate		OLS growth estimate	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.396	2.05	0.680	2.55	0.268	1.41	0.425	5.11	0.445	5.1	0.433	4.93
Ln(s_h)	0.852	9.08	0.730	5.84	0.911	9.25	0.057	0.91	0.093	1.26	0.049	0.76
Ln(n+g+d)	-1.240	-2.91	-0.799	-1.48	-1.221	-2.89	-0.240	-1.31	-0.078	-0.37	-0.402	-2.16
Ln(gdp_{60})							-0.154	-3.05	-0.230	-3.06	-0.060	-1.26
Efw752mus					-0.010	-0.45					0.010	1.14
Efw752ch	0.041	2.03	0.150	2.46			0.052	3.87	0.094	3.12		
Constant	1.176	1.07	1.714	1.32	1.527	1.36	-0.540	-1.01	0.128	0.17	-1.540	-3.01
Implied a	0.18		0.28		0.12							
Implied b	0.38		0.30		0.42							
Countries		95		95		89		85		71		86
H_0: $l_1+l_2=-l_3$	F(1, 90) =0.001 (0.98)		F(1,90)=0.90 (0.34)		F(1,84) = 0.01 (0.93)		F(1,79)=2.43 (0.05)		F(1,65)=3.64 (0.06)		F(1.80)=0.80 (0.29)	
Joint significance of regressors	F(4, 90) = 77.83		F(4,90)= 59.37		F(4,4) = 68.98		F(5,79)=13.9		F(5,65)= 12.13		F(5.80)=10.41	
R-squared		0.77		0.70		0.75		0.47		0.52		0.36
Instruments			*Ln(s_k), Ln(s_h), Ln(n+g+d), chris85*						*Ln(s_h), Ln(n+g+d), gdp85, $A_{BR\text{-}ICT(85)}$, $g_{BR\text{-}ICT}$, chris85*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t) - \ln((Y/L)(0)) = c' + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) +$$

$$+ (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})gEFWREL_i + u_i$$

s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw752mus (efw742ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. InIV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table A.5 Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW5 and EFW7 - sample period 1975-1997

	OLS level estimate		IV level estimate		OLS level estimate		OLS growth estimate		IV growth estimate		OLS growth estimate	
Gdp97	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.715	3.39	1.027	3.66	0.318	1.22	0.752	6.07	0.632	5.64	0.712	5.07
Ln(s_h)	0.622	7.25	0.470	3.47	0.779	8.38	0.131	1.7	0.121	1.85	0.173	1.99
Ln(n+g+d)	-0.411	-0.85	-0.042	-0.07	-0.598	-1.17	-0.350	-1.14	-0.26	-1.01	-0.648	-1.96
Ln(gdp_{60})							-0.283	-4.8	-0.32	-3.56	-0.180	-2.54
Efw752mus					0.016	0.49					0.020	1.3
Efw752ch	0.101	4.73	0.315	4.44			0.75	3.40	0.43	3.23		
Constant	3.057	2.42	3.321	2.03	3.364	2.39	-0.676	-0.8	-0.32	-0.7	-1.993	-2.28
Implied a	0.31		0.41		0.15							
Implied b	0.27		0.19		0.37							
Num oss		130		130		115		87		87		89
H_0: $l_3+l_4=-l_5$	F(1,125)=2.7 (0.102)		F(1,25)=4.77 (0.0308)		F(1,110)=0.72 (0.396)		F(1,81)=2.98 (0.088)		F(1,81)=2.98 (0.088)		F(1,83)=0.49 (0.485)	
	F(4,125)= 66.75		F(4,25) = 7.81		F(4,110) = 42.45		F(5,81)= 16.03		F(5,81)= 16.03		F(5,83)= 12.04	
R-squared		0.57		0.28		0.53		0.55		0.55		0.46
			Ln(s_k), Ln(s_h), Ln(n+g+d), chris60						*Ln(s_k), Ln(s_h), Ln(n+g+d), chris60*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t) - \ln((Y/L)(0)) = c' + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) +$$

$$+ (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})gEFWREL_i + u_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw752mus (efw752ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. In IV estimates chris60: the share of Christians in 1960.

Table A.6 Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW4 and EFW7 – sample period 1985-1997 – non OECD countries

	OLS level estimate		IV level estimate		OLS level estimate		OLS growth estimate		IV growth estimate		OLS growth estimate	
	COEFF	TEST	COEFF	TEST	COEFF	TEST			COEFF	TEST	COEFF	TEST
$Ln(s_k)$	0.571	2.54	0.782	3.01	0.466	2.12	0.458	4.48	0.447	4.59	0.426	4.19
$Ln(s_h)$	0.744	9.55	0.674	5.91	0.773	10.24	0.100	1.3	0.073	1.21	0.058	1.01
Ln(n+g+d)	-0.287	-0.38	0.008	0.01	-0.343	-0.48	-0.211	-0.74	-0.246	-0.56	-0.406	-0.84
$Ln(gdp_{85})$							-0.193	-2.58	-0.159	-2.79	-0.047	-0.92
Efw742mus					-0.028	-0.83					0.024	2.17
Efw742ch	0.043	1.66	0.126	2.23			0.071	2.92	0.046	2.74		
Constant	3.428	1.67	3.678	2.12	3.648	1.78	-0.503	-0.55	-0.631	-0.5	-1.702	-1.36
Implied a	0.25		0.32		0.21							
Implied b	0.32		0.27		0.35							
Countries		72		72		68		50		64		65
$H_0: l_1+l_2=-l_3$	F(1,67) = 1.2 (0.182)		F(1,67)=3.72 (0.058)		F(1,63)=1.62(0.20)		F(1,44)=1.22 (0.27)		F(1,58)=0.37 (0.545)		F(1,59)=0.03 (0.87)	
Joint significance of regressors	F(4,67) = 35.2		F(4,67)= 28.93		F(4,63) = 40.18		F(5,44)= 9.95		F(5,58)= 9.45		F(5,59)= 9.69	
R-squared		0.66	0.59			0.65		0.51		0.48		0.43
Instruments			*$Ln(s_k)$, $Ln(s_h)$, Ln(n+g+d), chris85*				*$Ln(s_h)$, Ln(n+g+d), gdp85, $A_{BR\text{-}ICT(85)}$, $g_{BR\text{-}ICT}$, chris85*					

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t) - \ln((Y/L)(0)) = c' + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) +$$

$$+ (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})gEFWREL_i + u_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. *$Ln(gdp_{85})$* is the beginning of period (1985) GDP. In IV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table A.7 Level and growth equations – Institutional variable: unweigthed average of EFW2, EFW5 and EFW7 – sample period 1985-1997 – non OECD countries

	OLS level estimate		IV level estimate		OLS level estimate		OLS growth estimate		IV growth estimate		OLS growth estimate	
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.550	2.43	0.783	2.93	0.501	2.25	0.448	4.37	0.458	4.23	0.444	4.28
Ln(s_h)	0.748	8.99	0.669	5.54	0.762	8.95	0.033	0.5	0.061	0.69	0.018	0.31
Ln(n+g+d)	-0.319	-0.39	0.045	0.06	-0.363	-0.47	-0.336	-0.65	-0.185	-0.54	-0.574	-1.08
Ln(gdp_0)							-0.139	-2.32	-0.195	-2.33	0.016	1.38
Efw752mus					-0.041	-1.13					-0.041	-0.73
Efw752ch	0.038	1.36	0.139	2.19			0.047	2.39	0.086	2.93		
Constant	3.405	1.54	3.777	2.05	3.575	1.66	-0.870	-0.59	-0.323	-0.29	-2.080	-1.5
Implied a	0.24		0.32		0.22							
Implied b	0.33		0.27		0.34							
Countries		71		71		65		61		47		62
H_0: $l_1+l_2=-l_3$	F(1, 66) = 1.3 (0.257)		F(1,66)=3.28 (0.074)		F(1,60)=1.34 (0.252)		F(1,55)=0.08 (0.78)		F(1,41)=0.78 (0.38)		F(1,56)=0.05 (0.83)	
Joint significance of regressors	F(4, 66) = 32.17		F(7,66)= 26.24		F(4,60) = 37.4		F(7,55) =9.12		F(4,41)=9.23		F(7,56)= 6.56	
R-squared		0.64	0.56			0.66		0.47	0.49			0.42
Instruments			*Ln(s_k), Ln(s_h), Ln(n+g+d), chris85*						*Ln(s_h), Ln(n+g+d), gdp85, $A_{BR\text{-}ICT(85)}$, $g_{BR\text{-}ICT}$, chris85*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

and growth equation

$$\ln((Y/L)(t)) - \ln((Y/L)(0)) = c' + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) - (1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) +$$

$$+ (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})gEFWREL_i + u_i$$

s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw752mus (efw742ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. *Ln(gdp_0)* is the beginning of period (1985) GDP. In IV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table A.8 Level equations (1975-1997) (non OECD only)

	OLS level estimate		IV level estimate		OLS level estimate		OLS growth estimate		IV growth estimate		OLS growth estimate	
Gdp97	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.715	3.39	1.027	3.66	0.318	1.22	0.745	3.54	1.082	3.92	0.332	1.29
Ln(s_h)	0.622	7.25	0.470	3.47	0.779	8.38	0.609	7.38	0.459	3.57	0.766	8.78
Ln(n+g+d)	-0.411	-0.85	-0.042	-0.07	-0.598	-1.17	-0.466	-0.98	-0.215	-0.38	-0.663	-1.31
Efw752mus					0.016	0.49						
Efw752ch	0.101	4.73	0.315	4.44								
Efw742mus											0.025	0.85
Efw742ch							0.106	5.15	0.306	4.6		
Constant	3.057	2.42	3.321	2.03	3.364	2.39	2.864	2.3	2.755	1.75	3.180	2.26
Implied a	0.31		0.41		0.15							
Implied b	0.27		0.19		0.37							
Countries		130		130		115		131		131		117
H_0: $l_1+l_2=-l_3$	F(1,125)=2.7 (0.102)		F(1,25)=4.77 (0.0308)		F(1,110)=0.72 (0.396)		F(1,126)=2.56 (0.112)		F(1,126)=4.4 (0.0379)		F(1,112)=0.57 (0.452)	
Joint significance of regressors	F(4,125)= 66.75		F(4,25)= 27.81		F(4,110)= 42.45		F(4,126)= 75.69		F(4,126)= 30.64		F(4,112)= 47.3	
R-squared		0.57		0.28		0.53		0.59		0.33		0.54
Instruments			*Ln(s_k), Ln(s_h), Ln(n+g+d), chris60*						*Ln(s_k), Ln(s_h), Ln(n+g+d), chris60*			

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = l_0 c + l_1 \ln(s_k) + l_2 \ln(s_h) + l_3 \ln(n+g+d) + l_4 EFW_i + e_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise; efw752mus (efw752ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. In IV estimates chris60: the share of Christians in 1960.

Table A.9 Growth equations (1975-1997) (non OECD only)

Dgdp97	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.752	6.07	0.712	5.07	0.793	6.33	0.804	5	0.723	5.13
Ln(s_h)	0.131	1.7	0.173	1.99	0.132	1.87	0.134	1.72	0.160	1.94
Ln(n+g+d)	-0.350	-1.14	-0.648	-1.96	-0.515	-1.81	-0.655	-2.21	-0.683	-2.1
Ln(gdp_{θ})	-0.283	-4.8	-0.180	-2.54	-0.289	-5.01	-0.187	-2.77	-0.178	-2.52
Defw752mus			0.020	1.3						
Defw742mus									0.021	1.47
Defw752ch	0.079	4.02								
Defw742ch					0.069	4.29				
Constant	-0.676	-0.8	-1.993	-2.28	-1.146	-1.47	-2.062	-2.59	-2.088	-2.42
Countries		87		89		91		95		91
$H_0: l_1+l_2=-l_3$	F(1,81)=2.98 (0.08)		F(1,83)=0.49 (0.485)		F(1,85)=2.01 (0.160)		F(1,89)=0.76 (0.384)		F(1,85)=0.37 (0.542)	
Joint significance of regressors	F(5,81)=16.03		F(5,83)=12.04		F(5,85)=16.79		F(5,89)=12.44		F(5,85)=13.23	
R-squared		0.55		0.46		0.55		0.46		0.47

Note: the Table reports results from the following growth equation

$$\ln((Y/L)(t)) - \ln((Y/L)(0)) = c' + (1 - e^{-?t})\frac{a}{1 - a - ß}\ln(s_k) + (1 - e^{-?t})\frac{ß}{1 - a - ß}\ln(s_h) - (1 - e^{-?t})\frac{a + ß}{1 - a - ß}\ln(n + g + d) +$$

$$+ (1 - e^{-?t})\ln((Y/L)(0)) + (1 - e^{-?t})gEFWREL_i + u_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. efw752mus (efw752ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. . *Ln(gdp_{θ})* is the beginning of period (1985) GDP. In IV estimates chris60: the share of Christians in 1960.

Table A.10 Level equations (ICT augmented) (1985-1997)) Institutional variable: unweigthed average of EFW2, EFW5 and EFW7

	ALL COUNTRIES				Non OECD countries			
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
$Ln(s_k)$	0.422	2.57	0.317	2.05	0.481	1.87	0.434	1.72
$Ln(s_h)$	0.778	8.25	0.787	8.84	0.742	11	0.730	12.19
$Ln(n+g+d)$	0.132	0.34	-0.043	-0.12	0.187	0.33	-0.238	-0.46
Efw752ch	0.037	2.29			0.062	2.41		
Efw752mus			-0.013	-0.76			-0.067	-2.85
$Ln(A_{BR\text{-}ICT(0)})$	0.816	5.19	0.790	5.41	1.010	6.19	0.999	7.25
$G_{BR\text{-}ICT}t$	0.779	7.27	0.764	7.41	1.041	9.4	1.001	8.44
Constant	4.544	4.29	4.515	4.35	4.530	2.91	3.913	2.56
Implied a	0.19		0.15		0.22		0.20	
Implied b	0.35		0.37		0.33		0.34	
Countries		77		75		53		51
$H_0: l_3+l_4=-l_5$	F(1,70) = 9.91 (0.0024)		F(1,68)= 6.82 (0.0111)		F(1,46)=4.58 (0.037)		F(1,44)=2.6 (0.037)	
Joint significance of regressors	F(6,70) = 84.55		F(6,68) = 78.13		F(6,46)= 70.47		F(6,44)= 68.19	
R-squared		0.88		0.87		0.81		0.82
Instruments								

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = c + l_1 \ln\left(A_{BR-ICT(0)}\right) + l_2 g_{BR-ICT} t + l_3 \ln\left(s_k\right) + l_4 \ln\left(s_h\right) + l_5 \ln\left(n+g+d\right) + gEFWREL_i + e_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw752mus (efw752ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. $Ln(gdp_0)$ is the beginning of period (1985) GDP. In IV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table A.11 Level equations (ICT augmented) (1985-1997)) Institutional variable: unweigthed average of EFW2, EFW4 and EFW7

	ALL COUNTRIES				Non OECD countries			
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
$Ln(s_k)$	0.440	2.7	0.315	2.04	0.499	1.94	0.398	1.62
Ln(s_h)	0.750	8.43	0.774	9.07	0.711	10.86	0.721	13.42
Ln(n+g+d)	0.057	0.16	-0.149	-0.41	0.049	0.1	-0.377	-0.73
Efw742ch	0.040	2.64			0.063	2.76		
Efw742mus			-0.010	-0.61			-0.058	-2.79
Ln($A_{BR\text{-}ICT(0)}$)	0.798	5.21	0.815	5.56	0.990	6.18	1.042	7.45
$G_{BR\text{-}ICT}t$	0.775	7.36	0.769	7.37	1.031	9.94	1.018	8.79
Constant	4.403	4.26	4.261	4.09	4.235	2.86	3.637	2.3
Implied a	0.20		0.15		0.23		0.19	
Implied b	0.34		0.37		0.32		0.34	
Countries		78		78		54		54
H_0: $l_3+l_4=-l_5$	F(1,71)=11.14 (0.001)		F(1,71)=7.23 (0.008)		F(1,47)=4.62 (0.0368)		F(1,47)=1.85 (0.01803)	
Joint significance of regressors	F(6,71)=90.79		F(6,71)=81.9		F(6,47)= 85.74		F(6,47)= 85.15	
R-squared		0.87		0.86		0.82		0.82

Note: the Table reports results from the following level equation

$$\ln\left(\frac{Y_t}{L_t}\right) = c + l_1 \ln\left(A_{BR-ICT(0)}\right) + l_2 g_{BR-ICT} t + l_3 \ln\left(s_k\right) + l_4 \ln\left(s_h\right) +$$
$$+ l_5 \ln\left(n + g + d\right) + gEFWREL_i + e_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. *Ln(gdp_{85})* is the beginning of period (1985) GDP. In IV estimates the following additional variables are used as instruments: chris85: the share of Christians in 1985; $A_{BR\text{-}ICT}$ (1985) is the stock of BR-ICT factors at the beginning of sample period (1985), $g_{BR\text{-}ICT}$ is the growth rate of the BR-ICT index. The BR-ICT index is an unweighted average of ICT1: main telephone lines per 1.000 people. ICT2 is the number of computers with active Internet Protocol (IP) addresses connected to the internet) per 10,000 people. ICT3: Mobile phones (per 1,000 people). ICT4: Personal computers (per 1,000 people).

Table A.12 Growth equations (ICT augmented) (1985-1997)

	ALL COUNTRIES				Non OECD countries			
	COEFF	TEST	COEFF	TEST	COEFF	TEST	COEFF	TEST
Ln(s_k)	0.454	5.61	0.445	5.69	0.454	3.62	0.440	3.77
Ln(s_h)	0.035	0.46	0.094	1.38	0.019	0.21	0.085	1.07
Ln(n+g+d)	-0.014	-0.07	-0.012	-0.07	-0.190	-0.37	-0.137	-0.33
$G_{BR\text{-}ICT}t$	0.149	2.24	0.175	2.77	0.235	2.87	0.270	3.39
Ln($A_{BR\text{-}ICT(0)}$)	-0.012	-0.13	0.046	0.51	0.058	0.47	0.126	1.09
Dgp85	-0.206	-3.35	-0.231	-4.03	-0.189	-2.37	-0.221	-3.17
Dfw752chr	0.056	3.94			0.049	2.51		
Dfw742chr			0.051	4.29			0.046	2.93
Constant	0.465	0.76	0.464	0.82	-0.067	-0.067	0.091	0.07
Countries		71		74		47		50
H_0: $l_1+l_2=-l_3$	F(1, 63)= 4.40 (0.43)		F(1,66)= 6.83 (0.11)		F(1,39)= 0.29 (0.59)		F(1,42)=0.84 (0.363)	
F test	F(7,63)=13.24		F(7,66)=14.75		F(7,39) = 15.6		F(7,42)= 14.17	

Note: the Table reports results from the following growth equation

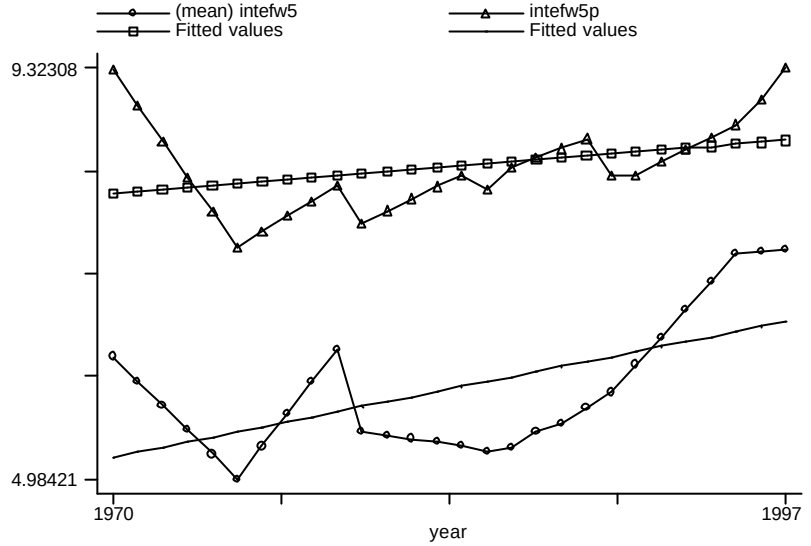
$$\ln((Y/L)(t)) - \ln((Y/L)(0)) = c' + g_{BR\_ICT}t + (1-e^{-?t})\frac{a}{1-a-ß}\ln(s_k) + (1-e^{-?t})\frac{ß}{1-a-ß}\ln(s_h) +$$

$$(1-e^{-?t})\frac{a+ß}{1-a-ß}\ln(n+g+d) - (1-e^{-?t})\ln((Y/L)(0)) + (1-e^{-?t})\ln(A_{BR\text{-}ICT(0)}) + (1-e^{-?t})gEFWREL_i + v_i$$

where s_h , s_k and n (gross enrolment ratio, investment to GDP ratio and rate of growth of population) are calculated as estimation period averages, while the dependent variable (gross domestic product per working age population in purchasing power parity) is measured at the end of period. EFWREL is efw742mus (efw742ch): unweighted average of 1997 values of EFW2, EFW4 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise; efw752mus (efw752ch): unweighted average of 1997 values of EFW2, EFW5 and EFW7 if the share of muslims (christians) is higher than zero, zero otherwise. *Ln(gdp_{t0})* is the beginning of period (1985) GDP.

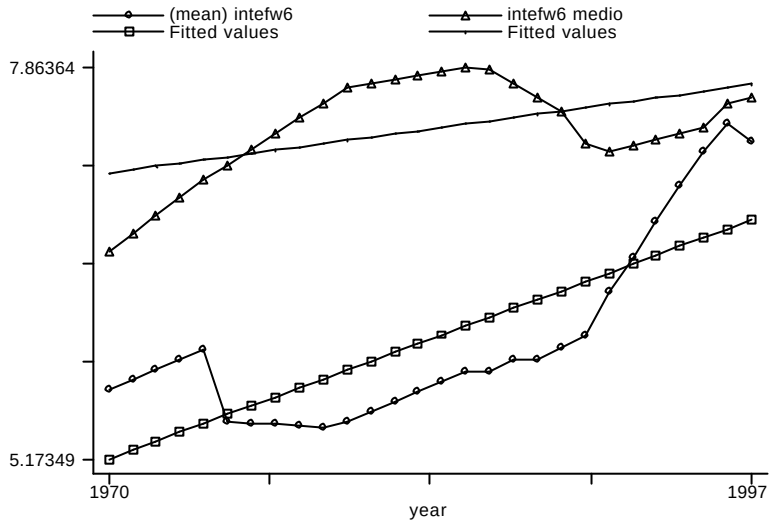
APPENDIX B

Fig.1a Convergence of catholic an protestant countries in terms of security of property rights and viability of contracts



EFW(V): Legal Structure and Property Rights *(Security of property rights and viability of contracts*) [16.6%] i) Legal Security of Private Ownership Rights *(Risk of confiscatio*n) (34.5%); ii) Viability of Contracts *(Risk of contract repudiation by the government*) (33.9%); iii) Rule of Law: Legal Institutions Supportive of the Principles of Rule of Law (31.7%) and Access to a Nondiscriminatory Judiciary.

Fig.1b Convergence of catholic an protestant countries in terms of Freedom to Trade with Foreigners



EFW(VI) International Exchange: Freedom to Trade with Foreigners [17.1%] i) Taxes on International Trade, ia Revenue from Taxes on International Trade as a Percent of Exports plus Imports (23.3%), ib Mean Tariff Rate (24.6%), ic Standard Deviation of Tariff Rates (23.6%), ii) Non-tariff Regulatory Trade Barriers, iib Percent of International Trade Covered by Non-tariff Trade Restraints (19.4%), iic Actual Size of Trade Sector Compared to the Expected Size (9.1%).

Fig.1c Convergence of catholic an protestant countries in terms of investment in human capital

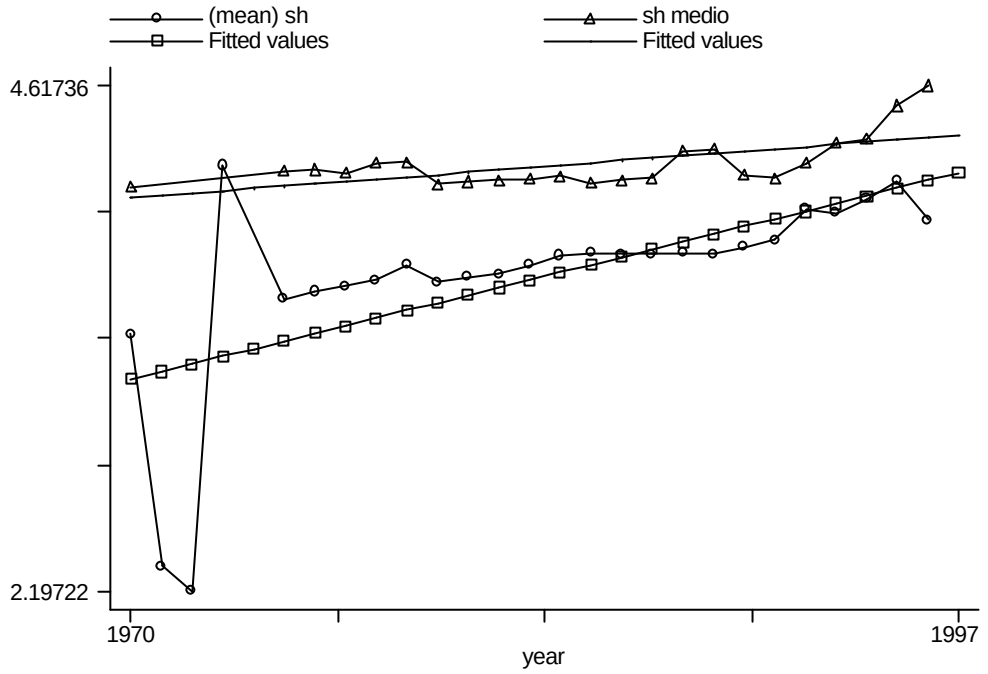
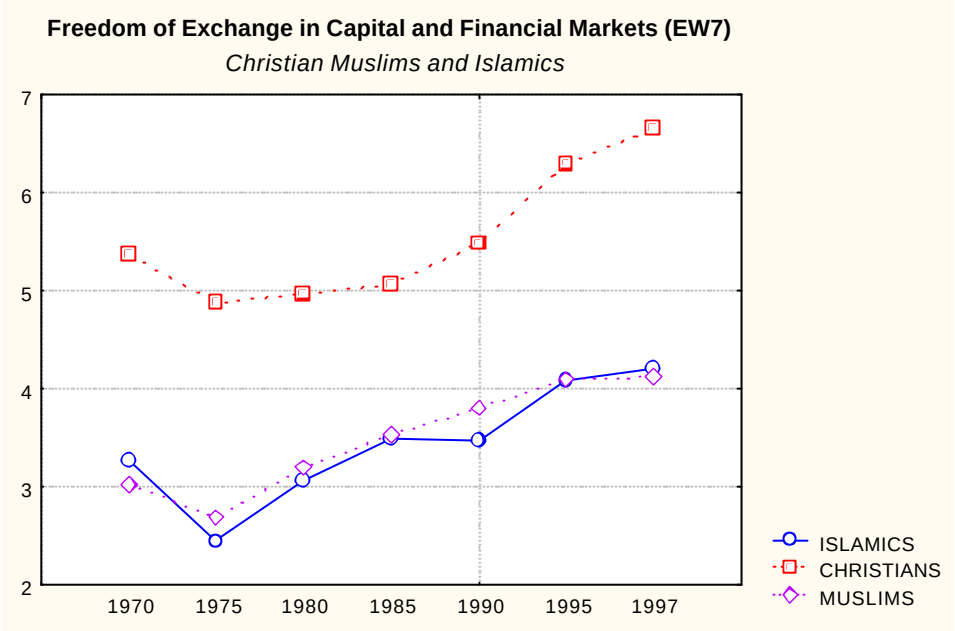
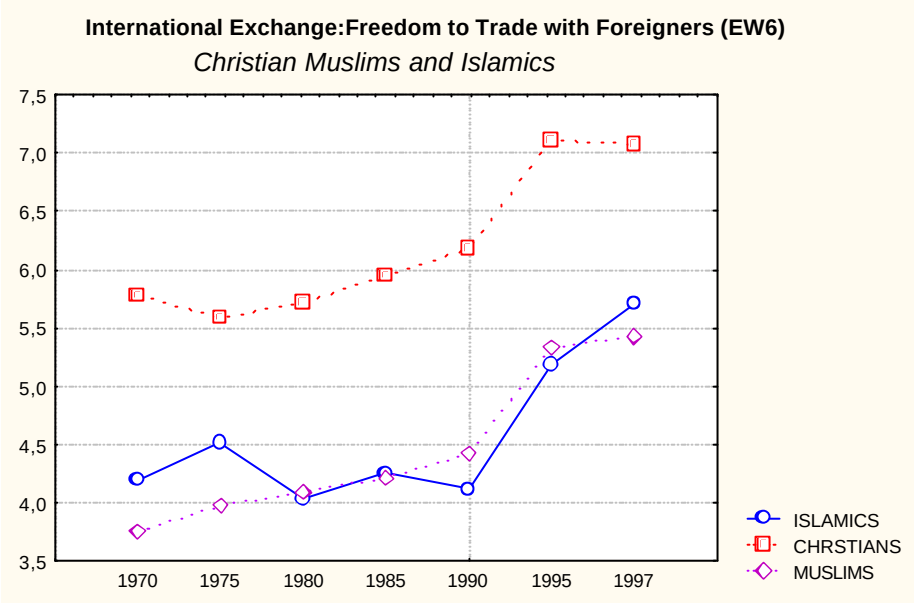


Figure 2.a



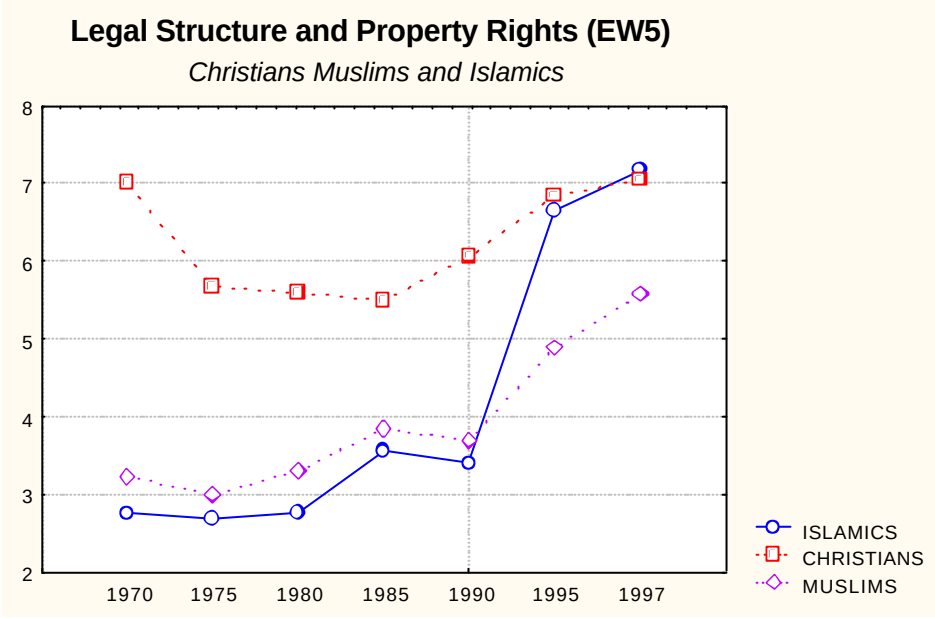
Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majority and the Islamic law plays a dominant role

Figure 2.b



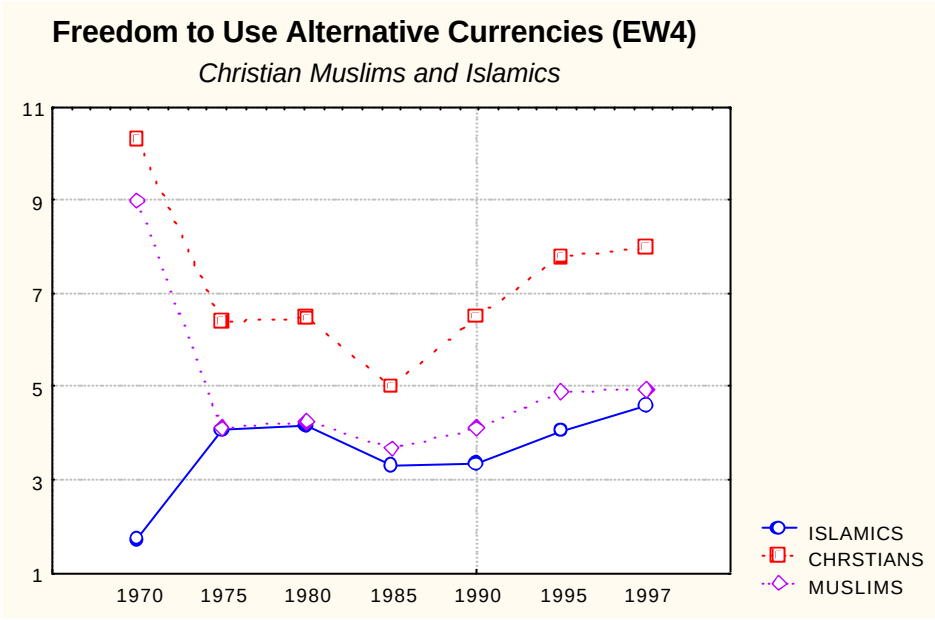
Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majo rity and the Islamic law plays a dominant role

Figure 2.c



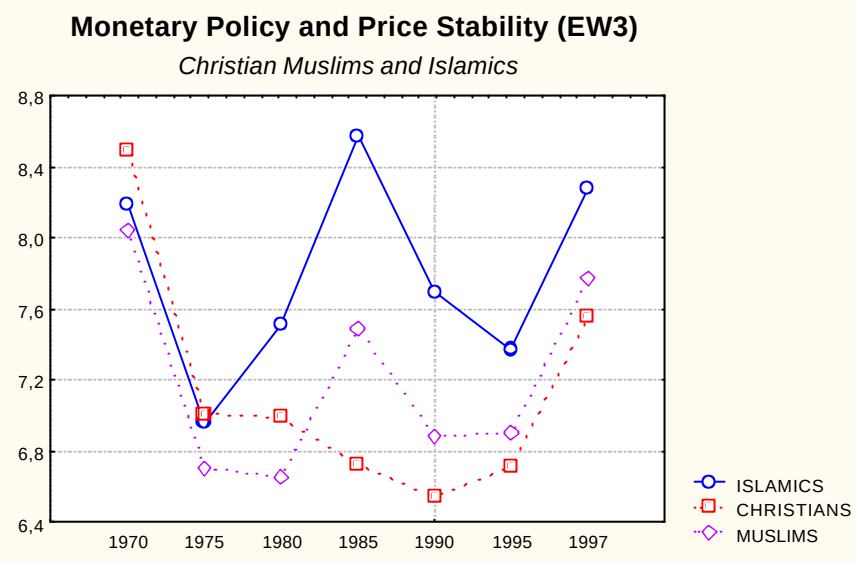
Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majority and the Islamic law plays a dominant role

Figure 2.d



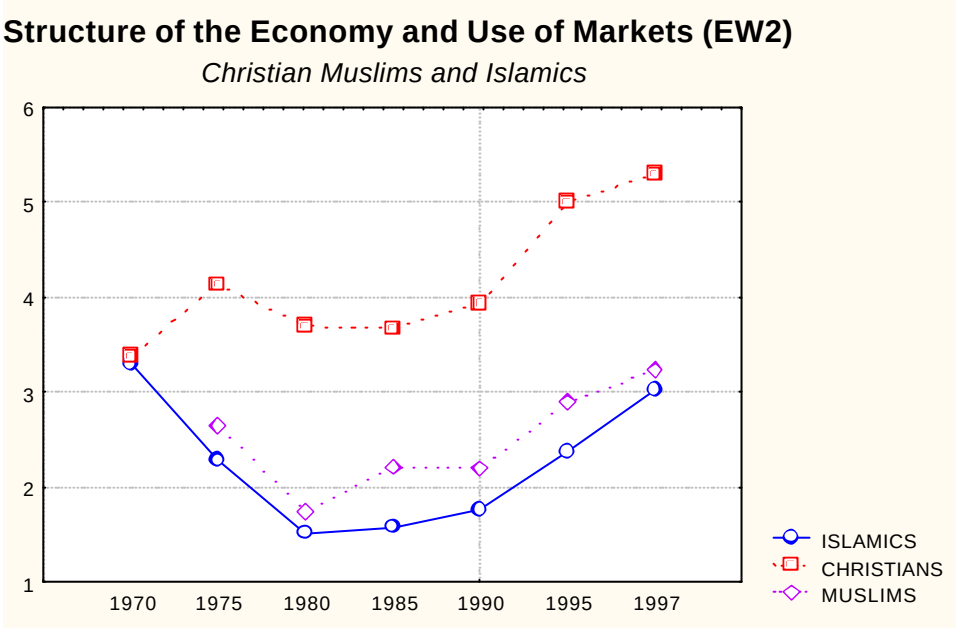
Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majority and the Islamic law plays a dominant role

Figure 2.e

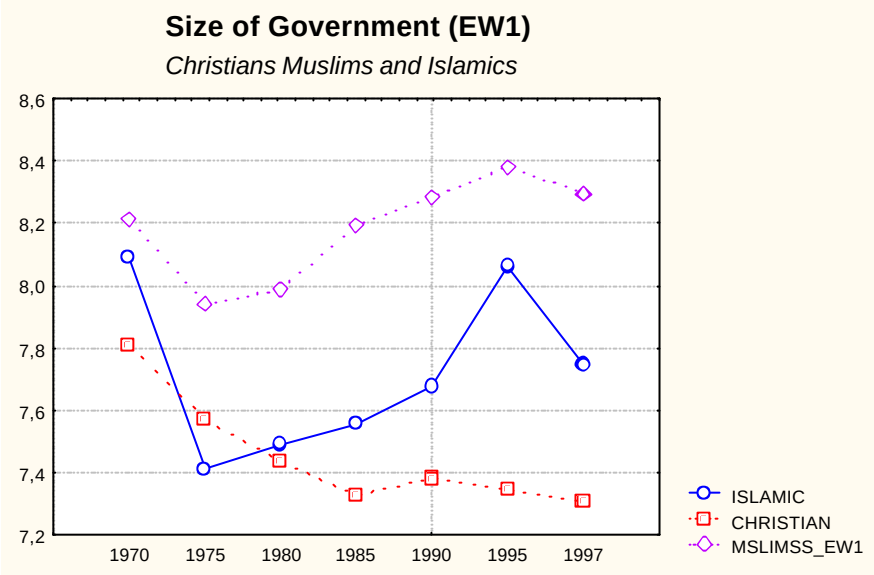


Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majority and the Islamic law plays a dominant role

Figure 2.f



Legend: christians: countries in which christians are the majority, muslims: countries in which muslims are the majority; Islamics: countries in which muslims are the majority and the Islamic law plays a dominant role


Size of Government (EW1)
Christians Muslims and Islamics
8,6
8,4
8,2
8,0
7,8
7,6
7,4
7,2
1970
1975
1980
1985
1990
1995
1997
ISLAMIC
CHRISTIAN
MSLIMSS_EW1