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ESSAYS ON THE INDIAN ECONOMY

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A mia sorella Francesca

"Tupkary started by defining biofuturology for me: it is a science
that gives you an intellectual master-key to understanding
the development of the human race.
He said the human brain is dived into two halves:
the right side is equipped to deal with diversity
and the left side with uniformity.
The typical Indian has a 'right-side brain'
and the typical European a 'left-side brain',
although he conceded there were plenty of exceptions to this rule.
Cultures which have a strong right-side brain
are good at dealing with complex thoughts
and tend towards a democratic and decentralised society.
Their minds are original but disorganised.
People who have a strong left-side brain are more disciplined
but tend to develop autocratic and centralised societies.
They are better at organisation but lack imagination.
Hindus are right-side, Muslims are left-side.
Polytheistic Indians are right-side, monotheistic Europeans are left-side;
the software of human development comes from India.
The hardware comes from the west.
'Are you following?' asked Tupkary. I was indeed."

Edward Luce (2007), *In Spite of the Gods*, Abacus, London, p.145

Abstract

Three decades of extraordinary growth have drastically modified the economy of India, and its centralized, closed and agriculture-based structure definitely belongs to the past. In the early 1980s, India was one of the most closed countries in the world, every step of production was under the license system governed by the central state, half of the national income derived from agriculture and the "Hindu rate of growth" seemed to condemn the economy to a persisting level of backwardness. By contrast, India in 2009 is a country where more than half of GDP comes from service activities, it is the world major exporter of IT products and highly-skilled human capital, it represents one of the most attractive destinations for global companies' investments and, despite the global financial crisis, the pace of growth of the economy does not display any alarming signal of decline. Nevertheless, despite these successful results, India is the country where the majority of world's poor lives, accounting for more than one third of the worldwide malnourished children. Moreover, the largest part of Indian working population finds employment in rural areas and more than half of the national income comes from unregistered activities. The question about whether India will be able to transform its economic growth pattern into an economic development process is therefore still open.

This thesis consists of four separate essays and is a contribution to the debate concerning the mechanisms and the consequences of the Indian growth experience. It investigates and evaluates the changing Indian economy in the last two and a half decades under four main aspects: the process of reforms, the distribution of income, the creation of new jobs and the specialization of trade. It is found that India implemented a context-specific growth strategy, especially if compared to other economies like China or Russia. This strategy was characterised by a gradual approach to economic and policy reforms that enhanced the performance of the country and stimulated the rapid shift from agriculture to services. However, the tertiarization of India occurred at the expenses of the process of industrialization. The weakness of the manufacturing sector, as shown by its limited contribution to GDP formation, appears to explain a number of structural problems of the economy. In fact, it is associated with a widening of the income gap between landlocked and coastal states of the Union; it is responsible for the jobless growth dilemma; and it constrains the degree of Indian trade specialization to the less dynamic sectors of world trade.

The contents and the main findings of each chapter can be summarized as follows:

– *Chapter 1* studies the different patterns of growth of China, India and Russia by exploring and comparing the processes of reforms that have generated and accompanied their high and sustained rates of growth. Focusing on the sector transformations involved into the three economies, I show that the growth strategies implemented present specific characteristics in terms of gradualism and policy choices. I explore the effects of economic growth on regional income disparities and the extent to which the recent increase in prosperity has been homogeneously distributed within each of the three giants. The analysis makes use of Theil's *T* statistics and transition probability matrices to reveal that income disparities within the Indian states and Chinese provinces have increased. In particular, landlocked and rural areas are in general still far from reducing the income gap from coastal and richest regions. In the case of Russia, the great divide is fuelled by the presence of hydrocarbons resources, which tend to be concentrated in West Siberia.

– *Chapter 2* investigates the process of convergence/divergence across Indian states. After surveying the main economic reforms implemented during the last decades in the Indian Union, I conduct an econometric study of the determinants of economic growth in the neoclassical frame of the Solow model. One of the main novel aspects of the convergence analysis is the attention paid to the spatial pattern of growth across Indian states. Making use

of spatial econometric tools, I control for two different kinds of spatial interaction: distance and neighbourhood. The results suggest that the gap between poor and rich states has constantly increased during the 1980s and the 1990s. Specifically, winners were those states that benefited the most from the recent process of reform and liberalization, thanks also to their geographical advantage and to the presence of a developed service sector. Losers were instead the landlocked and highly populated states with a predominant agricultural sector and a low level of innovation.

– *Chapter 3* investigates the jobless growth scenario affecting Indian manufacturing. Despite the incredible economic performance in the last twenty-five years, India maintains a high discrepancy between the rate of growth of the economy and the rate of growth of employment. Labour elasticity to output has decreased over time and the capability of the Indian economy to generate employment seems to be limited. As a result, more than 60% of Indian workers are still employed in agriculture and 94% of total labour force can be found in the unregistered segment of the economy. This paper analyzes the jobless growth problem in India in terms of a Kaldorian framework where the linkages between agriculture and industry enter labour demand through the changes in the terms of trade between the two sectors. Moreover, I investigate the role of the unorganized sector in influencing the growth of the registered employment. Using a dynamic panel dataset on registered manufacturing from the 15 major Indian states over the period 1980-2004, System-GMM estimates show that states with a higher growth of demand for industrial goods originating from agriculture also exhibit a higher growth of employment. In addition, in those states where the weight of the unregistered manufacturing has risen over time, the jobless growth problem has worsened.

– Finally, *Chapter 4* examines the pattern of international trade specialization in Indian manufacturing since the mid-1980s by using data on trade flows. Low-technology sectors still dominate the categories for which India exhibits the largest degree of trade specialization. By contrast, high-technology sectors are prevalent among the categories for which India is import-dependent. Significantly, India has experienced an improvement in the degree of specialization in some of the most dynamic sectors of world trade.

Table of Contents:

Chapter 1: China, India and Russia: Economic Reforms, Structural Change and Regional Disparities[a] 8

Chapter 2: Whither the Indian Union? Regional Disparities and Economic Reforms[b].....38

Chapter 3: Jobless Growth in Indian Manufacturing: A Kaldorian Approach[c] 70

Chapter 4: The Changing Pattern of Foreign Trade Specialization in Indian Manufacturing[d] 101

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Chapter 1

China, India and Russia:

Economic Reforms, Structural Change and Regional Disparities

1.1 Introduction

The process of globalization has established China and India as the new economic powers in the world scene. Their incredible rhythm of growth in the last decades has completely changed the relations and equilibrium among the economies taking part to the international integration process. Furthermore, the successful experience of these two countries has induced a rapid increase in the demand for commodities and raw materials. Russia, a leading hydrocarbons producer, has been one of the most beneficiary of such request[1]. In particular, starting since 1999, the country has taken on a sustained and stable pattern of growth close to that of China and India. The Russian recovery has taken place after some years of turmoil following the Soviet Union collapse and culminated with the August 1998 financial crisis.

The choice of the three economies is motivated not only by the striking results in terms of their economic performances, but also by their historical, political and economic characteristics. To different extents, they have all experienced central-planning systems where the role of communist parties or left-orientated governments has been dominant and controlling all the decisions about economic policy. Even if the communist political apparatus is still present in China, major market-orientated and pro-liberalization reforms have been implemented to adapt the socialist ideology to the global capitalism. Furthermore, Russia, China and India present similar features in geographical terms; they are among the biggest countries all over the world in terms of land extension. In the case of China and India the huge territorial extension is also associated with the first and the second highest population respectively and together the two countries account for more than one third of the whole world population.

The positive performance of these economies has attracted mounting attention among researchers and economists. The debate has focused not only on their impact on the global

[1] Together with Russia the other country that seems to have adapted at best to the increased Chinese and Indian demand for raw materials is Brazil. The four countries have been labelled as the BRIC and are expected in less than forty years to acquire a share in the world economy larger than G6 group (Wilson and Purushothaman, 2003). In this paper we have been focusing only on the three Asian emerging economies.

economy but also on the reasons behind the jump in their rates of growth. The literature has developed many explanations to describe the economic growth process in the three countries. Large-scale capital investment, financed by large domestic savings and foreign investment, seems to have played a key role in China. The reforms, through the creation of the Township and Village Enterprises (TVE's) and the Special Economic Zones (SEZs), led to a further expansion in the household savings (Morrison, 2006). In turn, this has induced an acceleration in the rate of growth of the economy. In India, the process of growth has been mainly caused by an improvement in labour productivity. This followed the rapid surge in TFP that can be explained through the positive effect of the registered manufacturing enterprises privatization coupled with high barriers to foreign trade (Rodrik and Subramaninan, 2004). The post-recession Russian recovery has been driven by the general increase in international oil prices accompanied by more appropriate exchange rate levels that have made exports profitable. Furthermore, Berkowitz and De Jong (2003) argue that the sharp increase in the rate of growth also derived from price liberalization policies, which brought a further improvement in the terms of trade.

The different sources of economic growth have not prevented the rise of huge regional disparities within each of the three giants. The gap between faster growing and poor regions has been increasing constantly over time constituting a common characteristic associating the recent acceleration in growth patterns of China, India and Russia. The aim of this research is to provide an in depth description of the regional inequalities, highlighting similarities and differences of winners and losers regions in the three countries. Our study is based on regional data provided by the three national statistics institutions of the three emerging economies. We provide two different perspectives to look at the persistent divergence across regions. First, we present a static analysis making use of the Theil's T statistic, which allows assessing the contribution of each region to the overall amount of *between*-regions-inequality within the three countries. Second, we examine the dynamics of the divergence process making use of transition probabilities matrices. Our empirical investigation seems to suggest that China and India exhibit some similarities. In both countries more prosperous areas tend to be located along the coasts and highly urbanized, as opposed to backward regions, which tend to be landlocked and prevalently rural. In the case of Russia the most important factor generating inequality is represented by hydrocarbons, which tend to be very concentrated in few regions mainly located in West Siberia.

One more common factor underlining the economic boost of the three countries is the important role played by reforms. China, India and Russia represent striking examples of how

policies can be contingent on the economic scenario. This suggests that best strategies to spur the growth rate cannot be predetermined, but rather specific to the context of their application. In addition, the quality of institutions has been found crucial for the duration and sustainability of growth accelerations (Rodrik, 2004 and 2005, Hausmann, Pritchett and Rodrik, 2005 and Jong-A-Pin and De Haan, 2007).

Before moving to the regional dimension, our analysis focuses on the main characteristics of the growth patterns in Russia, China and India, with particular attention to the impact of the reform strategies. We compare the different approaches to liberalization and openness and the timing with which they have been realized. We also look at sectoral changes into the three economies and how they have been affected by the liberalization patterns. Our analysis suggests that China has gone first through a pro-market liberalization and only in a second moment through a pro-business approach to reforms, while India did the opposite, first going through a process of privatization and then opening to the international trade. Russia has instead faced a period of so called big bang reforms, simultaneously privatizing and opening its economy. To this has corresponded a different sector structure evolution of the three emerging economies in that China exhibits a prevalence of manufacture share, India a prevalence of service share and Russia a cumbersome share of the industrial sector as inherited by the Soviet period coupled with a mounting share of services.

The structure of the paper is as follows. Section 2 describes the process of reforms implemented in China, India and Russia since late 1970s and its effect on the rate of growth and the transformations in the structure of the economies. Section 3, after the description of the datasets, illustrates the regional disparities within the three states making use of Theil's T statistics. Section 4 focuses on the income dynamics through the analysis of transition probabilities matrices. Finally, section 5 draws the conclusions.

1.2 Economic reforms, growth and structural change

1.2.1 The process of reforms

The first way to compare Russia, India and China is to analyze the main features of the process of reforms that has determined and accompanied the patterns of growth. Reforms have been implemented with differences in terms of gradualism, steps and kind of policy choices. The first to begin was China (Table 1a), starting with the election of Deng Xiaoping in 1978, after three decades in which Chinese leaders adopted a Soviet-style heavy-oriented development strategy (Lin, Cai and Li, 1996). The basic state policy, commented as

"reforming the system" (Naughton, 1995), has focused on the formulation and implementation of overall reform by creating a pricing system, decreasing the role of the state in resource allocations and opening to the outside world. The first part of Chinese economic reform involved implementing the Household Responsibility System (HRS) in agriculture, by which farmers were able to retain surplus over individual plots of land rather than farming for the collective. By the end of 1984, approximately 98 percent of all farm households were under the HRS and agriculture output and household income started to increase. This policy was followed by incentives to rural industrialization through the establishment of the Township and Village Enterprises (TVE's), which were industries owned by townships and villages. Due to the remarkable boom in investment and entrepreneurship generated by such enterprises, the TVE's have been considered as the growth engine of the country until the mid-1990s (Qian, 2003a).

The second phase of Chinese reform during the '80s was aimed at creating market institutions and converting the economy from an administratively driven command economy to a price driven market economy. From 1984, the task of price reform was achieved using the dual-track pricing system in which rural enterprises were allowed to sell over-quota product at market price and such approach was eventually employed also in some industrial goods and in the labour market. The goods allocated at market prices were increased and by the early-1990s they included almost all products. Moreover, further effort was made in order to give enterprises sufficient autonomy and sufficiently powerful incentives to allow them to respond to market forces.

The main last part of the economic policy during the 1980s regards the role of foreign trade. Under Deng Xiaoping foreign trade was regarded as an important source of investment funds and modern technology: restrictions on commercial flows were relaxed and foreign investment was legalized allowing and encouraging joint ventures with foreign firms. The symbol of trade reforms in China was the creation of Special Economic Zones (SEZs) that stimulated productive exchanges between foreign firms with advanced technology and major Chinese economic networks (Lai, 2006). Since 1980, the government established SEZs in Shenzhen, Zhuai and Shanou in Guangdong province, in Xiamen in Fujan province and in the entire province of Hainan. In 1984 further 14 coastal cities were opened to overseas investment and over time a multilevel diversified pattern of opening and integrating coastal areas with river, border, and inland areas was developed.

1a. Political events and main economic reforms, China

YEAR	POLITICAL EVENTS	MAIN ECONOMIC REFORMS
1976		1966-1976 Cultural Revolution
1978	Election of Deng Xiaoping	
1979		Creation of HRS (Household Responsibility System), peasants allowed to retain over-quota output
1980		Creation of Special Economic Zones
1981		Beginning of 1980s: creation of TVEs (Township and Village Enterprises)
1983		The People's Bank of China was nominally designated a central bank
		1982-1983 elimination of price controls on more 500 small consumer items
		1980-1983 fiscal contracting system, local governments allowed to retain over-quota revenues
1984		Dual-track system, enterprises were allowed to sell over-quota product at market prices
1989	Tiananmen Square Event	
1990		Two stock exchanges were set up
1991		
1992	Socialist Market Economy declaration	"Commercialization" of SOEs (State Owned Enterprises)
		Regulations on Transforming the Management Mechanism of State-Run Industrial Enterprises
		Full price marketization
		Abolishment of the “iron rice bowl” (the permanent employment system)
1993		New accounting system
		Tax reform
1994		Abolishment of dual-track exchange rate
		Separating tax reform, a brand new unified tax system including VAT, and recentralization of tax collection to central government
		Adoption of four major state banks of the international accounting standard
1995		Privatization of small SOEs
		Budget Law
		Central Bank Law, central bank has the mandate for monetary policy independent from the central government
1999		Private ownership and the rule of law incorporated into the Constitution
2000		
2001	Ascension to WTO	
2004		Constitution amended to guarantee private property rights

However, the transition of China towards a market system was far from complete and in early ‘90s its economy was a mixed system, or, following the definition by the XIV Congress of the Chinese Communist Party in 1992, a “socialist market economy”: the state owned and controlled the largest non-agricultural enterprises and the major industries were still primarily guided by the central plan. From 1994, the reform policy, “replacing the system”, had been guided with more clear targets and, although state ownership was still regarded as a "principal component of the economy", private ownership was considered for the first time a

"supplementary component of the economy". The Fifteenth Party Congress held in September 1997 made a major breakthrough on ownership issues by elevating private ownership to an "important component of the economy" (Qian, 2003)[2]. Privatization of State Owner Enterprises (SOEs) and layoffs of state workers began to emerge on a large scale in 1995 (Cao, Qian, and Weingast, 1999), started initially by local governments as experiments in a few provinces, such as Shandong, Guangdong, and Sichuan and increased during the following decade. By the first years of the new millennium, more than two third of China's GDP is in the private sector. Furthermore, the restructuring of ownership was accompanied by the abolition of the dual-track approach, reforms of fiscal, financial and banking system, and downsizing of the government bureaucracy (see, for example, Qian and Roland 1998 and Dong 1999).

The brief picture of reforms implemented by China has revealed that its growth strategy has been firstly signed by the implementation of "pro-market" policy and then by the adoption of a "pro-business" orientation. Rodrik and Subramanian (2004) originally used such distinction describing the Indian process of reforms during the 1980s and 1990s, even if India preferred to adopt the "pro-business" policy in the first decade (see also Kohli, 2006a and 2006b). Although the process of reforms took place with the Green Revolution in the 1970s (Table 1b), it is the Rajiv Gandhi's government in the second half of the 1980s that started to modify the role of central planning system and relax the complex mechanism of the Licence Raj system applied to enterprises for investment and product diversification. Among the main initiatives, it is worth to underline the Monopolies and Restrictive Trade Practices Act (MRTP), which reduced many restrictions on monopolies; the expansion of the Open General Licensing (OGL), that includes the list of commodities for which no formal licence was required for foreign trade; the reduction of the number of items included in the so-called "canalized" imports list, commodities for which the government had monopoly rights for imports. However, high barriers to trade have accompanied all these acts in order to favour incumbent producers and businesses, by protecting them from foreign competition and by promoting the modernisation of existing domestic establishments and the creation of new ones. Therefore, the overall level of trade protection increased during the decade and India was one of the closest economies among developing countries of that period (Das, 2003).

The Indian reform process switched towards the "pro-market" orientation after the financial and political crisis in 1991. The government guided by prime minister Narasimha Rao and his finance minister Manmohan Singh started to pursue economic liberalization with

[2] Private ownership and the rule of law were incorporated into the Chinese Constitution in March 1999.

the aim of removing impediments to markets. Even if the previous initiatives towards privatization and the removal of the system of licences were intensified, high priority was put to the lowering of foreign trade barriers and to the enhancement of international integration.

1b. Political events and main economic reforms, India

YEAR	POLITICAL EVENTS	MAIN ECONOMIC REFORMS
1975		During the '70s the Green Revolution was implemented
1976		Re-introduction of OGL (Open General Licensing, list of goods with no license for import) list with 79 capital items
1978		By the end of '70s, increasing pressures for liberalization policy from industrial lobbies
1980	Re-election of I. Gandhi	
1981		Removal of licensing requirements in 20 industries and some relaxation of import controls
1984	Murder of I. Gandhi	
	Election of R. Gandhi	
1985		Introduction of replenishment licenses to exporters as incentives
		50% of business profits from exports made income tax deductible
		The interest rate on export credit was reduced from 12% to 9%
		47 product groups free from the industrial licensing system
		Price and distribution controls on cement and aluminum abolished
1986		Canalization declined from 67% in 1980 to 27% of total imports
		Duty-free imports of capital goods allowed in selected "thrust" export industries
		28 industry groups broad banded, no license for product differentiation
		Capacity utilization allowed to expand in firms reaching 80% capacity utilization
		Between 1985/1986 relaxation of MRTP (Monopolies and Restrictive Trade Policies)
1987		OGL reaches 1007 capital goods and 620 intermediate goods
1988		100% of business profits from exports made income tax deductible
		OGL reaches 1170 capital goods and 949 intermediate goods
1990		Between 1985/1990 the real exchange rate was depreciated by 30% (nominally 45%)
		OGL reaches 1329 capital goods
		Introduction of MODVAT (Modified Value Added Tax) covering all manufacturing sub sectors (excl. Petroleum, textiles and tobacco)
1991	Murder of R. Gandhi	Statement of Industrial Policy
	Election of N. Rao	Public monopoly limited to 8 sectors, all the others opened to private investments
	Finance Minister M. Singh	Relaxation of controls on FDI
		Creation of Special Economic Zones where 100% of FDI allowed in manufacturing sectors
		Devaluation of the rupee by 22% against dollar
1992		Introduction of a dual exchange rate: exporters allowed to sell 60% of their exchange in the free market, and 40% to the government at a lower official price
1993		Foreign companies own up to 51% equity in 34 high priority industries
1994		The highest tariff rate on import fell to 85% (it was 355% in 1990)
		National Telecommunications Policy for private and FDI in cellular and telephone services
1996	Win of BJP, first no-left party	The highest tariff rate on import fell to 50%
1997	Instability BJP/Congress	
1998	Election of A.B.Vajpayee (BJP)	

1999		The Insurance Regulatory and Development Authority permits private and FDI to operate in the insurance market
		Liberalization of banking
		NTP defined FDI in internet services
		Infrastructure sectors opened to private and FDI (excl. Railways)
2003		Electricity Bill privatized generation, transmission and distribution of electricity
2004	Election of M.Singh (Congress)	The highest tariff rate on import fell to 25%

Tariff and non-tariff barriers were reduced over time for most intermediate and capital goods and numerous initiatives were also put in place to attract foreign capital, especially in services. In 2004 the highest tariff rate on import as percentage of value added fell to 25%, from 355% reached at the end of the 1980s (Williamson and Zagha, 2002 and Panagariya, 2004). Furthermore, by the end of the decade banking, insurance, telecommunications and infrastructure, where the Indian state sector was operating under condition of monopoly, were open to the private sector and to Foreign Direct Investment (FDI). Following the experience of China, special units, in particular in Information Technology (IT) activities[3], were established allowing the share of foreign investment to reach 100%.

The case of Russia is different from both India and China (Table 1c). Even if the Perestroika proposed by Mikhail Gorbachev at the 27th Communist Party congress of 1986 tried to introduce some attempt of change[4] (Gooding, 1992 and Tompson 1993), Russia faced all the reform processes in just few years. In 1992 it liberalized both trade and production system. The first government of Boris Yeltsin after the Soviet Union collapse abolished the state orders, eliminated most of restriction on foreign trade, privatized more than 85% of small enterprises and 1/3 of the state enterprises. In two years 70% of medium and large enterprises and 90% of small enterprises were into private hands. However, the rapid implementation of this process of reforms has not produced the expected results in terms of economic performance (Aghion and Blanchard, 1998, Dabrowski et al., 2005 and Sprenger, 2006) mainly due to the distortions in the distribution mechanism of vouchers to 144 million citizens for purchase shares in medium and large enterprises. It is only after the financial crisis in 1998 that Russia started a new pattern of growth. On the one hand, the election of Vladimir Putin in 1999 coincided with a further acceleration in the reforms process with the

[3] These units can be under a number of possible schemes, including Export Oriented Units (EOUs), Export Processing Zones (EPZs), Special Economic Zones (SEZs), Software Technology Parks (STPs), and Electronics Hardware Technology Parks (EHTPs) (Panagariya, 2004).

[4] The Law on the State Enterprise (Association) introduced autonomy without fiscal responsibility in SOEs. The Law on Cooperatives gave more freedom in creating new firms in the legal form of co-operatives. Finally, the Law on Leasing created collective leasing.

improvement of Russian Federalism, the simplification of tax system, the reconstruction of legal, pension and health systems, the regulation of natural monopolies and the tradability of land resources.

1c. Political events and main economic reforms, Russia

YEAR	POLITICAL EVENTS	MAIN ECONOMIC REFORMS
1977	Leonid Brezhnev becomes Chairman of the presidium of the USSR Supreme Soviet or head of state. Chairman of the presidium of the USSR Supreme Soviet or head of state.	
1983	The first successor of Brezhnev became Andropov	
1984	Death of Andropov and election of Chernenko	
1985	Death of Cernenko and election of Gorbachev	
1986	27th party congress of 1986. Perestroyka begins.	
1987		the Law on the State Enterprise (Association): autonomy without fiscal responsibility in SOEs
1988		the Law on Cooperatives: more freedom in creating new firms in the legal form of co-operatives
		the Law on Leasing: creation of collective leasing
1990		the '500 Days Program, but never implemented
1991	Yeltsin elected Russian president	Land reforms
	Golpe failure	
1992		Liberalization and abolition of state orders
		Liberalization of foreign trade through elimination of most foreign exchange restrictions
		Privatization of small enterprises through employee buyouts and public auctions
		Distribution of vouchers (one voucher equal to 10000 rubles) to 144 million citizens for purchase shares in medium and large enterprises
1993		More than 85% of small enterprises and 1/3 of the state enterprises privatized
1994		70% of medium and large enterprises and 90% of small enterprises into private hands
		Further elimination of export restrictions
1995		Fiscal tightening
1996	Re-election of Yeltsin	
1997		Failure of the reforms program of the "young reformers" due to the "war of the oligarchs"
1998		Financial crisis
1999	Election of Putin	
2000		Improvement of the Russian Federalism
		Simplification of the tax system
		Reconstruction of the legal system
		Changes in the pension and health systems
		Regulation of natural monopolies
		Making land resources tradable
2004	Re-election of Putin	

On the other hand, Putin's policies have tended to attribute to the state bureaucratic apparatus a central role in some key sector of the economic activity, as it is for example the case of hydrocarbons trade. The recovery started in 1999 has been mostly the result of the sharp increase in international hydrocarbons prices. Massive exports of oil and gas have restarted the engine of the Russian economy ensuring a sustained annual average rate of growth over 6% during the period 1999-2004 and even higher in the following years. This hydrocarbons led growth has resulted in huge regional disparities (Buccellato and Mickiewicz, 2007) and a steady increase in the dispersion of GDP per capita across regions with the West Siberian area outperforming the rest of the federation (exception made for Moscow).

The comparison among the processes of reforms has revealed two main characteristics concerning the choices in terms of growth strategies adopted by Russia, China and India. The first regards the orientation and the objects of the strategies: China and India opted for separating the trade liberalization policy from the privatization reforms. The SEZs were created in early 1980s in China, where the "commercialization" of the SOEs started in the 1990s, while India reduced the role of its central state in the first decade with high protection to foreign competition and lowered trade tariffs only ten years later. Furthermore, they introduced context-specific measures in their strategies, as in the case of TVEs in China, a precise example of socialist market system, or IT units in India, created to sustain and take advantage of the local human capital. Russia, on the other hand, turned to trade liberalization and privatization reforms at the same time, dismantling its past centralized economic and political system in just few years. This also demonstrates that differences in growth strategies regard not only the aims of the reforms but also the type and the quality of the institutions, which followed different patterns of evolution from the old political systems (Goldstein, 1995, Lewis, 1995, McFaul, 2001 and Singh, 2003). The second difference among the three growth strategies is the duration of reforms. India and China can be viewed as appropriate examples of policy gradualism. India achieved only in the last years a degree of openness similar to that of the countries defined as open after more than a decade of trade liberalization policy, while the role of Chinese central state is still heavy on the economy despite the several measures introduced to improve the participation of the private sector. Russia, instead, reached high level of openness and privatization as soon as it started its process of reforms, despite the effects of this strategy produced a negative rate of growth in the first years, a situation never faced by China and India during their growth patterns.

1.2.2 Growth and structural change

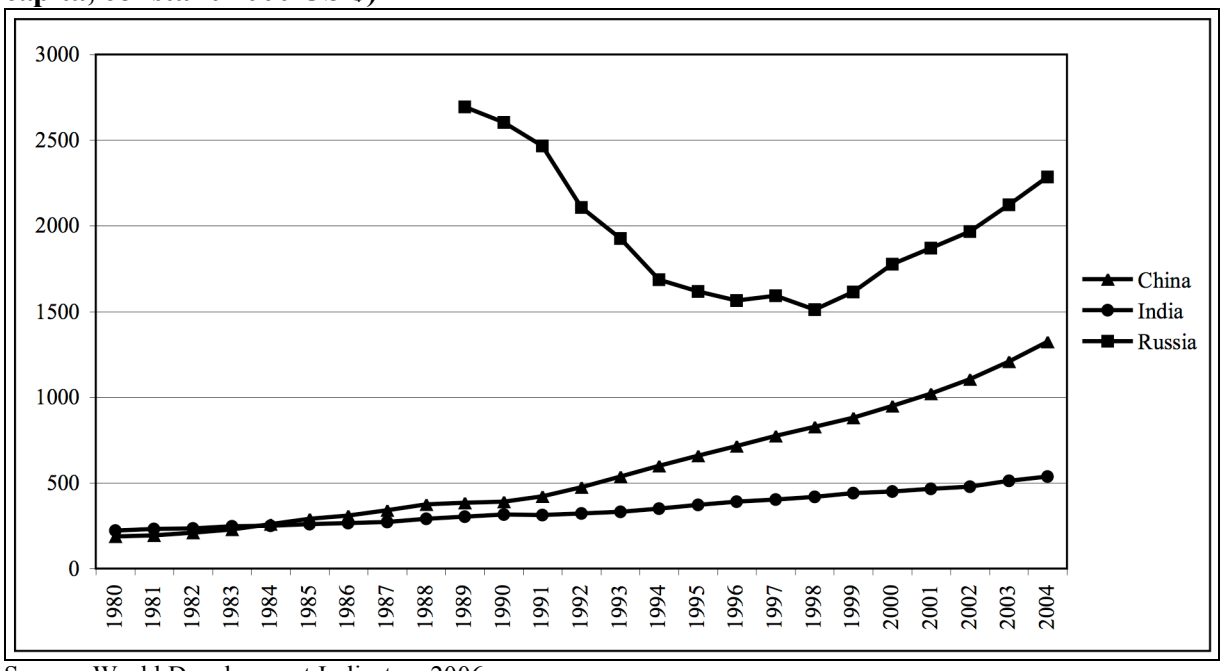
India and China have been able to double their rhythm of growth since the early 1980s, when the average rate of growth of the per-capita income increased to 3.6% and 7.8% respectively (see Figure 1 and Table 2). Such pattern is recorded also in the next decade with a further increase in the Chinese rate, while the beginning of the new millennium has seen acceleration in the per-capita income of both countries with China maintaining its incredible rhythm of 8.5% per year. In practice, with the exception of the financial crisis of Indian economy in 1991, both countries have never faced a deceleration in their rate of growth in the last 25 years: as a result, in 2004 Chinese and Indian per-capita income amounted to 7 and 2.4 times of that in 1980. The experience of Russia, instead, can be divided into two phases. From the Soviet Union collapse to 1998, the country faced a drastic economic crisis with a negative growth rate of per-capita income nearly to -3.5% per year. From 1999 to 2004, its economy has taken on a new growth pattern, with an average rhythm of growth around 6%.

Table 2. GDP per capita average growth rate, 1980-2004, (constant 2000 US $)

	1980-1990	1990-2000	2000-2004
China	7.77	8.64	8.46
India	3.59	3.64	4.11
Russia	-	-3.46	7.23

Source: World Bank Indicators 2006 and authors' calculations

Figure 1. Economic performance, China, India and Russia, 1980-2004 (GDP per capita, constant 2000 US $)



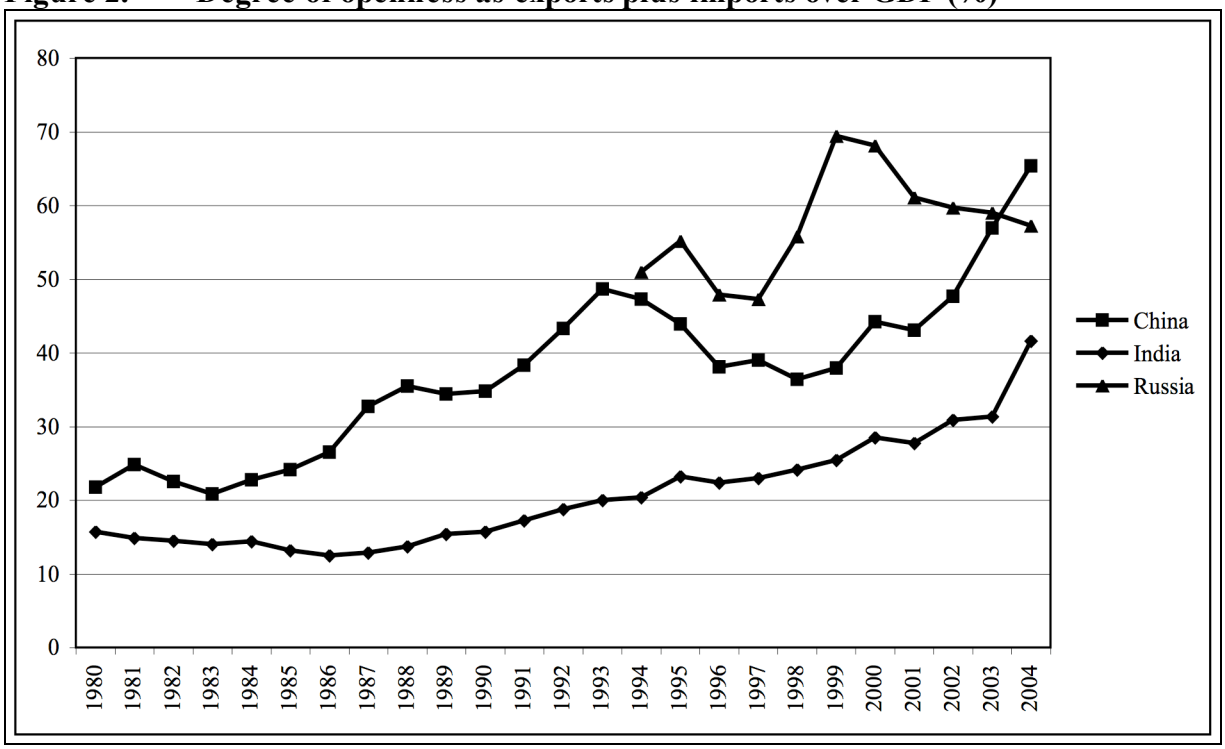
Source: World Development Indicators 2006

The negative experience of Russian economy in the first half of the 1990s suggests that the implementation of the reforms in a few years has not generated the expected results, differently from what happened in China and India, where the reforms spread over more than two decades have never arisen periods of long economic crisis. However, China, India and Russia are, at present, among the fastest growth economies in the world. Although all the three countries have been able to grow at a high and sustained rhythm, such result has been accompanied by two main differences in the transformation process from the central-planning system to a market-oriented economy. First, elements of diversity in the approach to the international trade emerge from Figure 2. The degree of openness, measured as the sum of exports and imports over GDP, started to increase in India only in early 1990s and doubled to 30% at the end of the decade. During the 1980s the economy was strongly closed and the "pro-business" policy of Rajiv Gandhi was accompanied by a further raising in foreign trade barriers. The evolution of openness in China displays a different pattern: it started to increase in 1983, when it represented the 21% of GDP and the government created the SEZs, and then it accelerated in early 1990s, jumping to nearly 50% in 1993. The Chinese degree of openness then experienced a notable reduction in middle-1990s mainly due to the diminishment of imports from 25% in 1993 to 16% in 1998. However, it accelerated again at the end of the decade and jumped rapidly to more than 65% of GDP in 2004. Russia, instead, which showed the highest degree of openness among the three countries in middle-1990s, increased its trade in the second half of the decade reaching the value of 70% in 1999 but it suffered a remarkable reduction in the last years reaching 57% in 2004.

The second characteristic that differentiates the three experiences of growth is the process of transformation in the sectoral structure of the economies (Figures 3a-3c). Each country seems to have followed a specific pattern of changing over time, countersigned by industry in China, services in India and by both sectors in Russia. In the last three decades, Chinese sectoral structure has been constantly characterized by a predominant presence of the manufacturing sector (Figure 3a). In fact, with the only exception of part of the 1960s when agriculture activities increase production, China clearly displays a predominance of industrial sector over agriculture and services. However, during the last three decades the pattern of manufacturing sector has experienced different directions: after a steady increase during the 1970s mainly at expenses of agriculture, it faced a slight decrease during the 1980s replaced by an increasing share of services, to start again experiencing a positive trend during the following decade, when reforms move towards privatization policy. In the 1990s, the pattern of services shows a fall in the first half and a rise in the second half of the decade, while

agriculture continues experiencing its prolonged fall reaching a share of approximately 15%. At the end of the period under study, industry accounts for more than 50% of China's GDP.

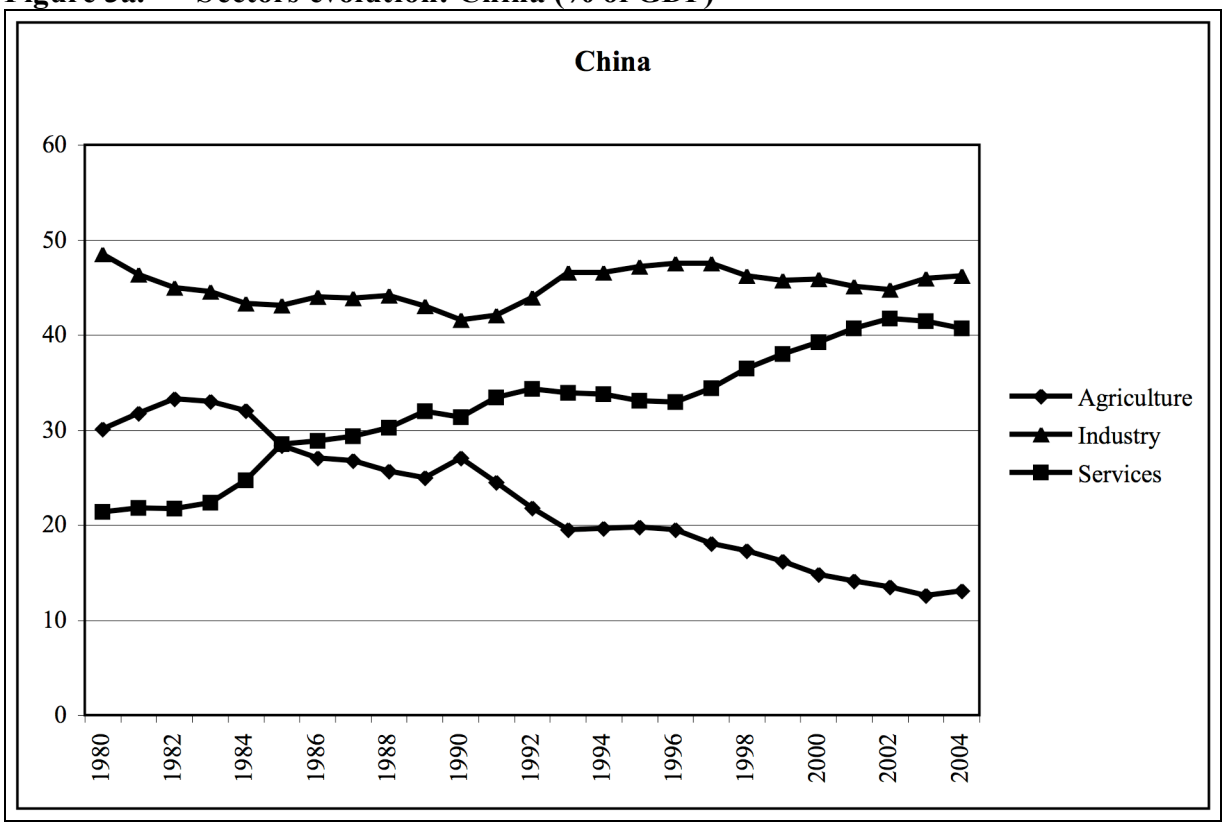
Figure 2. Degree of openness as exports plus imports over GDP (%)



Source: see Figure 1

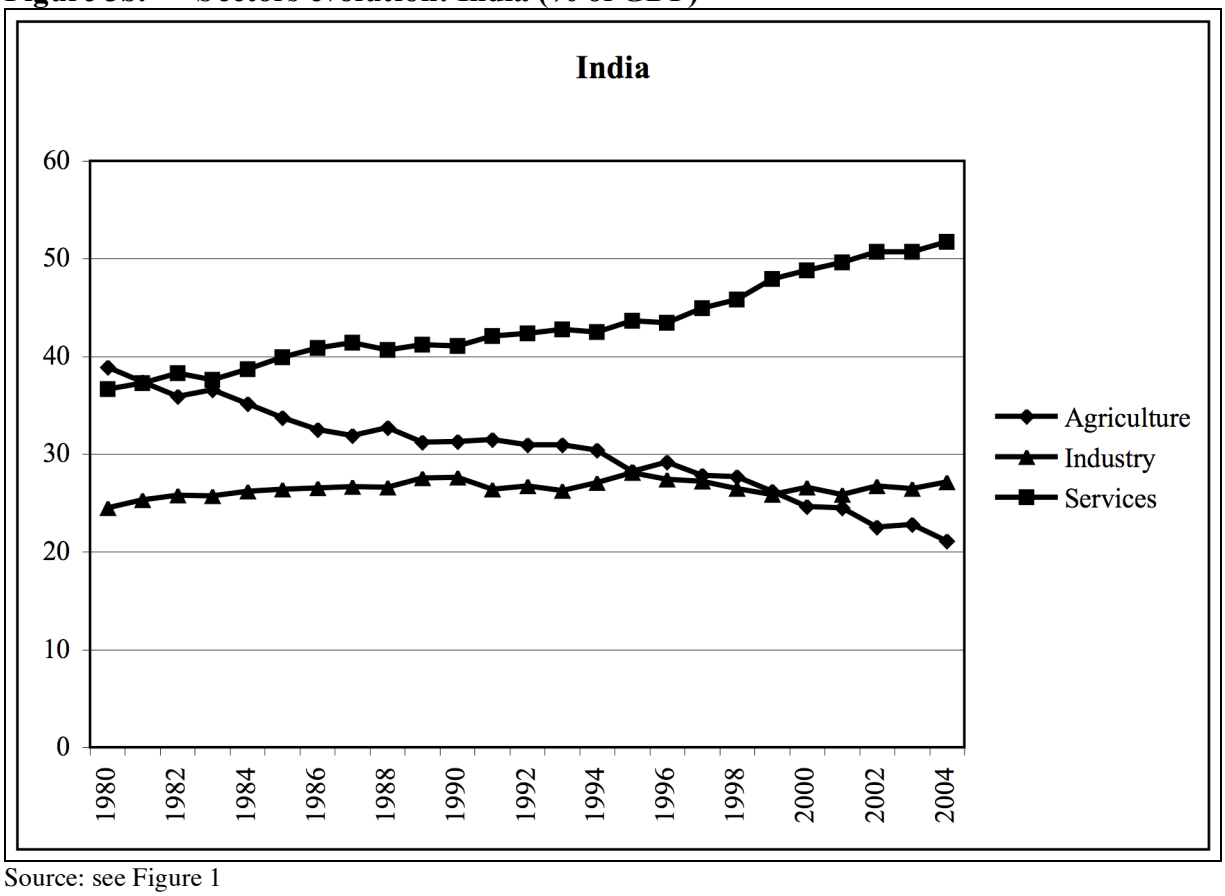
In India the picture is completely different, with a net predominance of services activities (Figure 3b). If indeed the agriculture as in China has continuously decreased in weight, even if it still accounts for more than 20% of GDP, the industry has only slightly increased in the last twenty-five years, with a more emphasized positive trend during the 1980s. At the beginning of the new millennium, industrial share in India is less than half of that in China. Services start to growth since early 1980s, but its path increases especially during the second half of the 1990s when Indian government accelerated the process of liberalization reforms. The last years see service activities accounting for more than 50% of total production, while manufacturing maintain constant its weight on GDP. The wide gap in industry share between Chinese and Indian economies is the most revealing difference in the growth strategy adopted by the two countries (Bosworth and Collins, 2007).

Figure 3a. Sectors evolution: China (% of GDP)



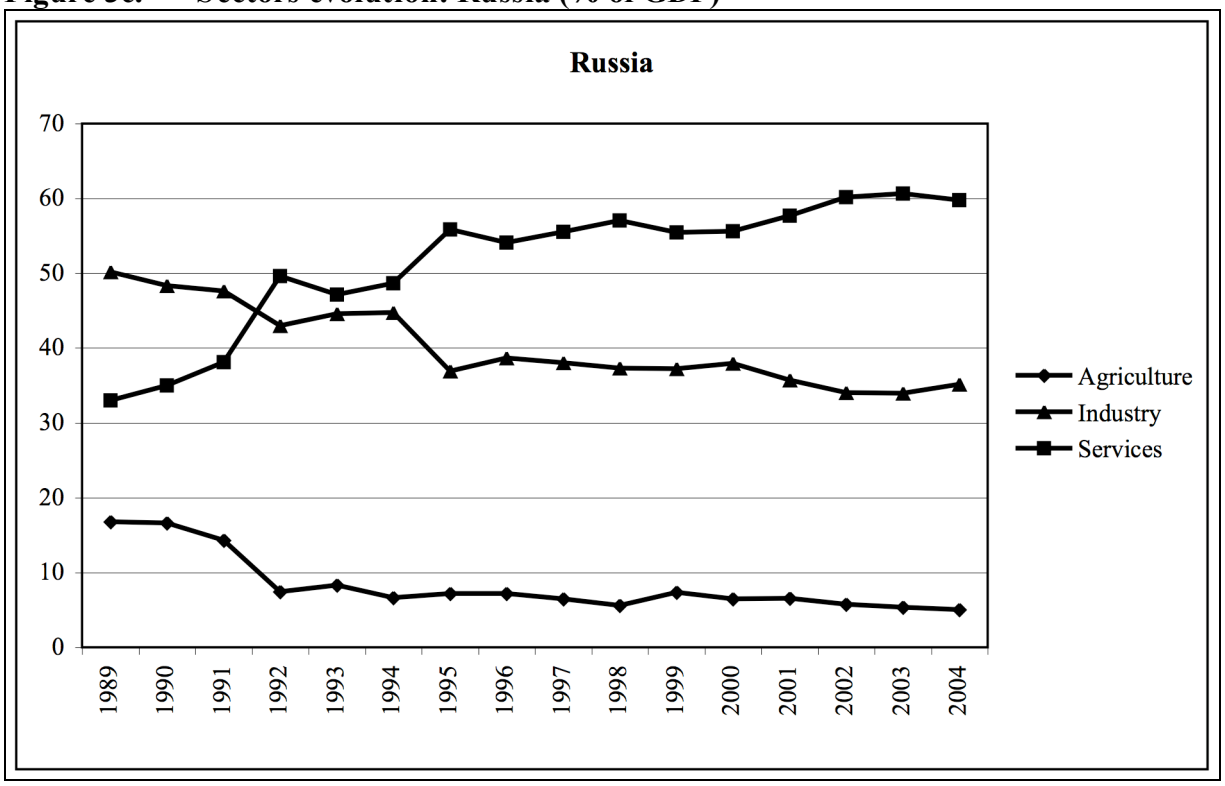
Source: see Figure 1

Figure 3b. Sectors evolution: India (% of GDP)



Source: see Figure 1

Figure 3c. Sectors evolution: Russia (% of GDP)



Source: see Figure 1

In the case of Russia, we can only study in detail what happened during the 1990s (Figure 3c). Russia entered the transition period with a very heavy production structure inherited from the Soviet period and this is reflected by the high share of manufacturing in total production representing approximately one half of total production (Gregory and Lazarev, 2003). The subsequent fall in its weight mainly during the first half of the 1990s can be easily explained in light of the rapid deterioration of obsolete capital and a consequent fall in productivity. The corresponding increase in weight of the services sector is induced more by the general fall in output (more pronounced for industry) rather than a consistent growth in his absolute value. The trend starts to reflect a real increase in volume only after 1999, when the rate of growth of Russian economy becomes again positive and on average over 6%. The most striking figure highlighted in Figure 3 concerning Russian economy in 2004 is the low share of agriculture, the weight of industry around 35% and the jump of services to more than 60% of GDP[5].

The evolution in the sectoral structure in the three countries can be read and analyzed by considering the choices in terms of economic reforms. China, India and Russia seem to have

[5] The World Bank (2004) states that a consistent part of gas and oil revenues are misattributed to wholesale trade in order to escape taxation and this could bring to an overstatement of the share of service at expenses of the manufacture sector.

implemented different strategies in order to try to achieve a fast and sustained rate of growth, and the timing of the reforms has played a determinant role also for the transformation of the structure of the economies. These policy choices and the transformations they generated suggest that services sector can be viewed as the engine of growth in India and Russia in the present growth patterns, while in China the key role is played by industry. The dependence on service activities is more evident in the case of India, whereas Russian economy can still lean on its high degree of industrialization. Moreover, the comparison between Indian and Chinese experiences indicates that high rates of growth can be achieved and maintained in the long-run also without the process of industrialization and different strategies can be implemented to transform a low-income country into a fast-growing economy.

More interesting, if we put in relation the timing of reforms with the pictures presented in Figures 3a-3c, we can easily stress a simple relation between economic reforms and sectoral specialization. The agriculture sector has declined in all the countries and this is the fact in common. But the paces of the other two sectors seem to diverge in the sample. In the case of China, during the 1980s, services activities increased their contribute to GDP, in particular in the first half of the decade when SEZ were created. Furthermore, industry, which faced a decrease in the same decade, started to grow in the 1990s, when more freedom was given to the private sectors, and reached the 50% of GDP at the end of the decade. India, which did the opposite in terms of choices, faced a similar pattern: when it privatized, in the 1980s, manufacturing activities beneficiated form the reforms, while the services sector showed a deeper jump in the second half of 1990s when the pro-market policy was implemented. The case of Russia is more difficult to understand due to the short time series, but it seems that services beneficiated the most from the liberalization and trade reforms, with a jump to nearly 60% of GDP at the end of the period: but the fact that Russia, which is the most opened among the three countries, presents also the higher share of services over GDP, strengthen the relation between trade liberalization and service increase.

Previous sections have shown the differences of the three growth patterns in terms of policy choices, growth rate performances and sectoral structure transformations. Next section will investigate whether the effects of these processes have generated convergence among the regional incomes in China, India and Russia, to test if the sustained growth rates have benefited the most the poorest regions.

1.3 One common factor: the within country regional disparities

Our regional empirical analysis for China, India and Russia is based on data collected by the national statistics offices, which are the National Statistical Bureau, the Central Statistical Organization and the Federal Statistic Service respectively. The datasets present some specific characteristics of which one has to be aware of in order to implement any kind of analysis. Data for the regional GDP and population for 31 Chinese provinces are available over the period 1980-2005. The data are provided in national currency at 1980 prices. The GDP per capita is simply obtained dividing the GDP by the population. Some changes have occurred in the administration of Chinese provinces, in that, for example the current province of Hainan was separated from Guandong in 1985, while the province of Chongqing was annexed by the Sichuan since 1996. For simplicity, we threat all the regions individually for the whole period. Data for the auto-administrative district of Hong Kong are excluded from the study.

For the Indian Federation we consider 22 States including also Goa, Manipur and the Union Territory of Dehli. Many studies on convergence across the Indian States tend to exclude these three regions due to the small dimension. Mizoram and Sikkim are excluded from the sample due the lack of data. Jharkhand, Chattisgarh and Uttaranchal, created out of Bihar, Madhya Pradesh and Uttar Pradesh respectively, are still considered parts of the original states for the years following and the acquisition of administrative independence in the year 2000. However, our quantitative analysis will be mainly descriptive and, hence, not vulnerable to possible biases due to the extension of the territories. As said above, the main source of the data is the CSO, which provides data over the period 1980-2004. Net State Domestic Product (NSDP) is at factor cost and is based on 1980 constant prices.

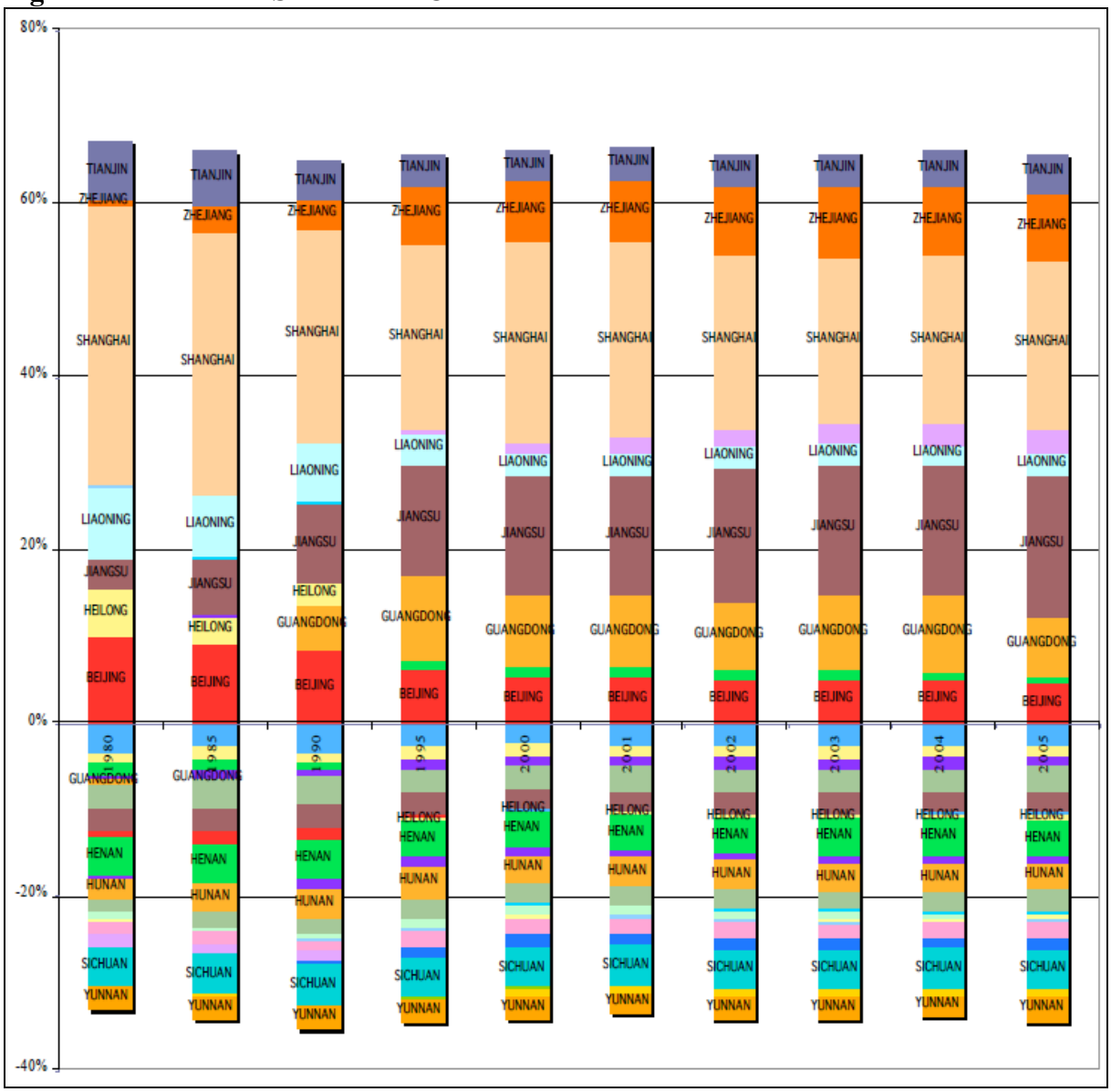
More attention deserves the data for the Russian federation. The Federal Statistic Service provides data since 1992, but due to changes in the federal structure and strong imbalances during the first period of transition from the central planned to the market economy, we decide to consider the period following the August 1998 financial crisis. Hence we end up by including 88 Russian regions for the period 1999-2004. The data also includes the two cities of Moscow and Saint Petersburg and eight autonomous regions. Data for some regions are adjusted when reported to include also the figure of the autonomous regions as part of them. An important example in this sense is represented by the Tyumenskaja Oblast, which includes the two autonomous regions of Jamalo-Neneckij and Chanty-Mansijskij. In order to avoid overestimating the figure for the regional GDP of the Tyumenskaja oblast we

subtracted to it the figures for the two administrative autonomous units. We repeat the same procedure whenever the problem is present.

The process of growth in the three giants has been accompanied by a steady process of divergence in level of GDP per capita and standards of living within the three countries. The process of reform and the entrance within the global economy have marked a clear division between winner and loser regions. This has led to the paradox of fastest growing economies with persistent level of poverty among the highest registered all over the world (for example the Indian Federation remains the country with the highest absolute number of people living below the poverty threshold all over the world). The pattern of divergence among the regions between the three countries has also been found to exhibit a spatial component (see Alessandrini et al. 2008, Buccellato 2007, Aroca et al. 2006). More in particular, Indian states and Chinese provinces are often found to be successful in their patterns of growth when situated in coastal areas as opposed to land-locked rural regions which in some cases appear completely trapped to poverty.

In order to conduct a comparative analysis of the regional disparities characterizing the three countries, we make use of the Theil's statistic. The Theil's T statistic is simply computed multiplying three factors: the regional population share (region's population/country's population), the quotient of the regional average income and the national average income, and the natural logarithm of the quotient of the regional average income and the national average income. This last factor of the product is crucial in determining the sign of the statistic, which will be positive in the case that the region has an average income over the national average and negative when below the national average. This procedure is repeated for each year where data are available allowing also for a comparative evolution over time within each of the countries. The main advantage of the Theil's T index is to allow a graphical representation of the contribution that each region provides to the national distribution of income. However, this procedure does not allow to make direct comparison among the three countries in terms of which of them exhibit the higher level of inequality, but only to make statements about the within countries *between*-regions disparities and their evolution over time. It is also worthwhile to remark that ceteris paribus regions with larger population will have larger Theil elements associated as opposite to regions with small population and/or average income close to the national average which will have small Theil element (as a reference for the Theil's t see Conceisao Galbraith 1998).

Figure 4. Theil's Statistic for China 1980-2005

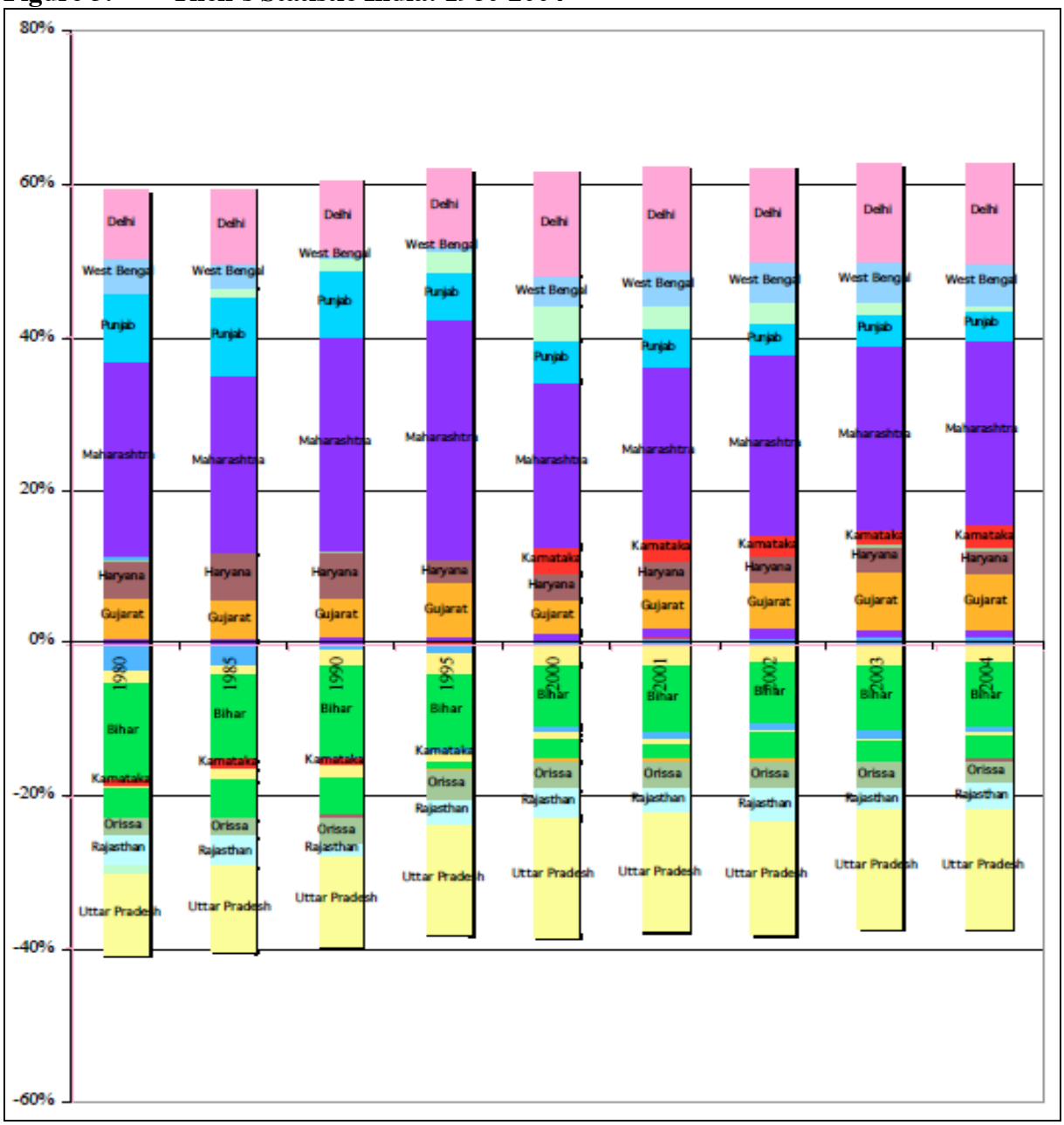


Source: Compiled by the authors based on data from NBS

The Theil graph referring to China is displayed in Figure 4. Over the period considered six provinces, the three municipalities of Beijing, Tianjin and Shangai and the three provinces of Zhejjiang, Jangsu and Liaoning remain constantly over the national average exhibiting an important contribution to the overall amount of disparities across Chinese Provinces. After the record growth rate registered in the second half of the 80s, also the province of Guandong enters the group of regions located constantly above the national average in level of average GDP per capita. In general our results seems to confirm the ones obtained by Galbraith et al. (2004), who found that more export orientated regions located along the East cost of the country were able to attract more foreign currency and tended to outperform the landlocked provinces. With the gradual increase in the level of openness of Chinese economy, the coastal

and richer regions have also proved to be more attractive to foreign investors, and, hence, been able to widen the gap separating them from the backward rural part of the country.

Figure 5. Theil's Statistic India: 1980-2004



Source: Compiled by the authors based on data from CSO

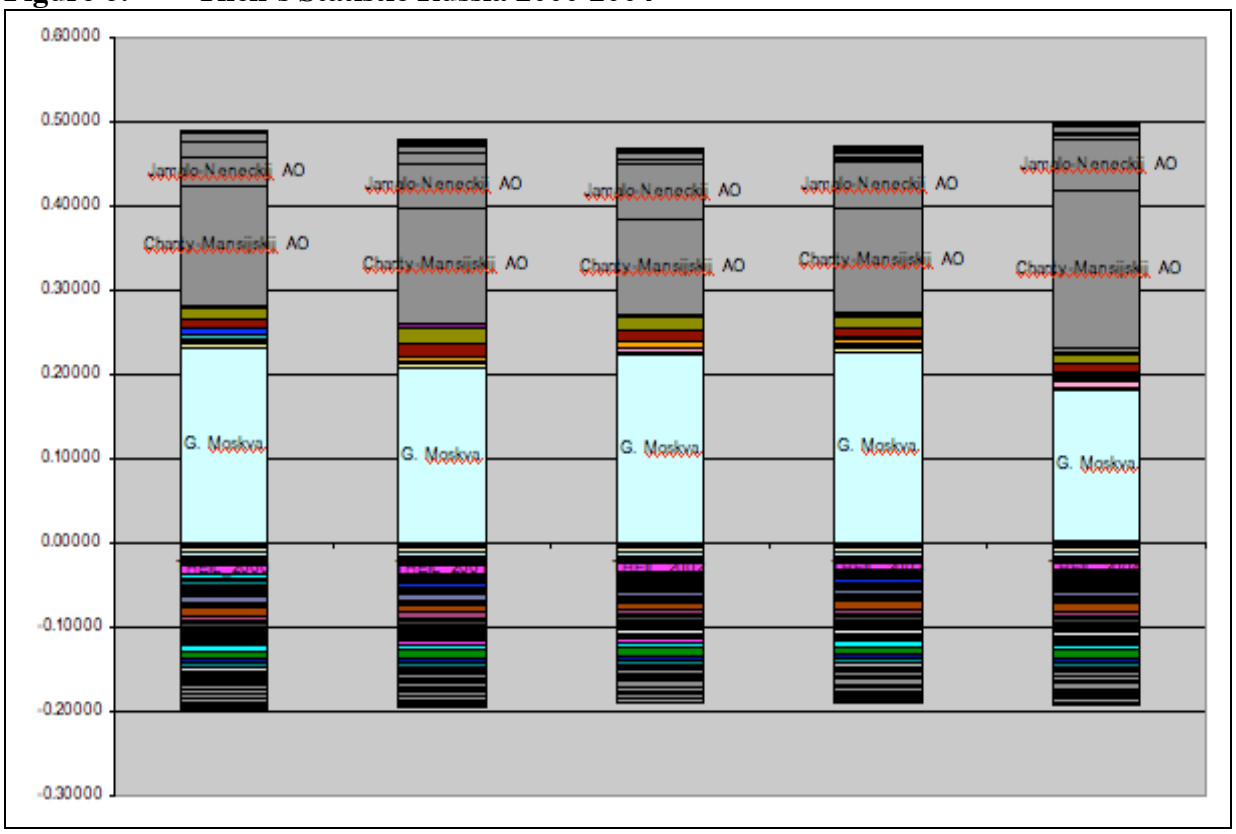
The case of India exhibits some striking similarities with the one of China. Figure 5 shows indeed how also in the case of the Indian Federation states contributing more markedly to income inequality are those with a higher level of urbanization (see the case of the Union Territory of Dehli and Haryana state) and the regions located on the coast (West Bengal, Gujarat and Maharashtra). The geographic location in India tends also to coincide with a

prevalence of specific sector shares in that approximately half of the total agricultural value added in India is produced in the northern and central states, whereas 40 percent of industrial and service sector output is produced in the coastal states of Maharashtra, Gujarat and Tamil Nadu (Purifield 2006). The state of Punjab, being landlocked and a prevalently rural economy, represents an outlier in this sense. Punjab has been one of the most successful states in the Indian Federation in enjoying the process of innovation realized with the green revolution, which has taken place in the late 70s. The productivity in the rural sector has been enhanced through the irrigation of last portion of territories coupled with an increase of the arable land, making Punjab one of the faster growing States. Located below the average, we can find the two states of Bihar and Uttar Pradesh with prominent shares in the contribution of disparities among Indian states. This highlights an important fact characterizing the Indian regional distribution of income, where the poorer states tend to be also among the most populated. This is also confirmed by the stylized fact of the Indian paradox for which one of the fastest growing countries in the world is also the one with the highest absolute number of poor people living with less than $2 per day.

The case of Russian federation has some specific characteristics due to the cumbersome share of the hydrocarbons extraction and trade in determining the GDP pattern of growth. The patterns of *between* regions inequality are indeed mainly led by the West Siberian Area. Figure 6 shows how the two autonomous regions of Chanty-Mansijskij and Jamalo Nenetskij, which are both part of the Tyumenskaya oblast, where it concentrates approximately one half of the total amount of hydrocarbons produced in Russia, are constantly over the national average with prominent shares in the overall inequality among Russian regions. More in particular, the Chanty-Mansijskij Autounomous Okrug represents the main centre of the Russian oil industry, while Jamalo Nenetskij Autonomous Okrug is the area where the highest share of gas production takes place. The remaining portion of the territory is the 'proper' Tyumenskaya Oblast, mainly consisting of the town Tyumen (the capital) and playing the complementary role of onward hydrocarbons transmission and strategic basis of oil and gas administration offices (Glatter 2003 as cited in Buccellato and Mickievicz 2008). Galbraith et al. (2004) argues that the prominent contribution of the Tyumen region to Russia between inequality reflects the advantage of export oriented areas with respect to other regions in attracting strong currency revenues and of urban entities with developed systems of services (like Moscow, which also is found to play a prominent role in enhancing inequality among Russian regions). We instead argue that if for China this mechanism seems at work, in Russia the main engine of divergence is represented by oil and gas. One of the poorest areas in the

Russian Federation is represented by the Caucasus area. In particular regions like the Republic of Inguscetia and Dagestan, located in the neighbourhoods of Chechnya seems to remain trapped to poverty probably due to the instability brought by the military conflict in the area. However, Dagestan has been enjoying a relatively high pace of growth in the last few years thanks again to the hydrocarbons exports.

Figure 6. Theil's Statistic Russia 2000-2004



Source: Compiled by the authors based on data from *Goskomstat*

1.4 Income dynamics

In a series of papers Quah (1993, 1996 and 1997) has criticized standard regression approaches to studying convergence processes for being unable to focus on mobility, stratification and polarization in the income distribution. In order to analyze the world income distribution, he proposed the "distribution dynamics" that describe the evolution of the distribution of income and the probabilities that a country can become more or less rich with respect to its initial income conditions. The law of motion that describes this process is the following:

$$F_{t+1} = M * F_t$$

where F_t and F_{t+1} denote the distribution of incomes across countries at time t and $t+1$ respectively, and M encodes information on whether the economies transit subsequently to widely different income levels. Each row of M is a probability mass function describing the distribution over states of the system after one transition given that the system is currently in the state corresponding to that row. The iteration of the process for s years can be easily described by:

$$F_{t+s} = M^s * F_t$$

We make use of transition probabilities to study the dynamics of income distribution of China, India and Russia, in order to understand whether there are signals of income polarization and which country has shown the best performance in terms of income mobility. In each country, we group regions into quartiles on the basis of their initial income distribution in ascending order starting from the I quartile. In the transition matrix, rows represent the distribution at time t, while columns describes the distribution at the end of the process ($t + s$). Each cell (i, j) describes the probabilities that a region belonging to income group i moves to group j at time $t + s$. For instance, the first row measures the probabilities that a region starting from the poorest quartile remains in the same position or transits into the II, III or IV quartile.

Tables 3, 4 and 5 collects the income transition probabilities for China, India and Russia respectively. Tables 3 and 4 reports the results for the entire period and for the 1980s and 1990s in order to understand if the distribution path has changed in the two decades, while for Russia, due to the lack of regional data, we show the distribution matrix for the last four years as reported in Table 5.

Table 3. Transition probabilities, China 1980-2004

	1980-2004				**1980-1990**				**1991-2000**			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
I	91.1	8.9	0.0	0.0	91.3	8.8	0.0	0.0	93.1	6.9	0.0	0.0
II	8.9	83.9	7.3	0.0	8.8	80.0	11.3	0.0	6.9	91.7	1.4	0.0
III	0.0	7.3	91.1	1.6	0.0	11.3	85.0	3.8	0.0	1.4	98.6	0.0
IV	0.0	0.0	1.8	98.2	0.0	0.0	4.3	95.7	0.0	0.0	0.0	100.0

Source: authors' calculations based on NBS

Table 4. Transition probabilities, India 1980-2004

	1980-2004				1980-1990				1991-2000			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
I	88.2	11.8	0.0	0.0	83.3	16.7	0.0	0.0	87.0	13.0	0.0	0.0
II	12.0	78.1	9.9	0.0	16.7	71.6	11.7	0.0	13.0	77.9	9.3	0.0
III	0.0	10.4	84.0	5.6	0.0	11.7	83.3	5.0	0.0	9.3	81.4	9.3
IV	0.0	0.0	6.3	93.7	0.0	0.0	5.0	95.0	0.0	0.0	9.3	90.7

Source: authors' calculations based on CSO

Table 5. Transition probabilities, Russia, China and India 2000-2004

	RUSSIA				CHINA				INDIA			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
I	88.8	11.2	0	0	87.5	12.5	0.0	0.0	100.0	0.0	0.0	0.0
II	11.8	81.6	6.6	0	12.5	81.3	6.2	0.0	0.0	90.9	9.1	0.0
III	0	6.6	88.2	5.2	0.0	6.2	93.8	0.0	0.0	12.5	87.5	0.0
IV	0	0	5.3	94.7	0.0	0.0	0.0	100.0	0.0	0.0	4.3	95.7

Source: authors' calculations based on NSB (China), CSO (India) and *Goskomstat* (Russia).

The first of the three tables reveals that China has a high degree of persistence, in particular in the IV richest quartile, where more than 98% of the highest income regions maintain the position between 1980 and 2004. Furthermore, small signals of movements can be noted between I and II quartile and between II and III quartile where 9% and 7% of the regions respectively change the position with respect to 1980. However, the persistence is more evident if we consider the second decade, where nearly the totality of the medium-high and high income regions are stable: between 1980 and 1990 more changes happen in the middle part of the distribution with 11.3% of the samples changing the position (this off-diagonal element records 15.6% in the second half of the decade). Table 4 shows the transition matrix of India. The diagonal elements are smaller than those of China, indicating less persistence in keeping the position, in particular in the III and IV quartile. Moreover, the first decade shows more mobility with respect to the second one in the lowest quartile and in the middle part of the matrix. Anyway, the 1990s reveal more changes in the upper part of the distribution with 9.3% of the sample shifting from III to IV quartile and vice versa. It is interesting to add that in the first years of the millennium all the regions belonging to the lowest quartile keep the position (as reported in Table 5). The last table describe the transition probabilities of Russia for the years 2000-2004. We report also the matrices for

China and India for the same span time in order to have a comparison among the three countries. Differently from China and India, Russia does not present any quartile with 100% of persistence. Moreover, it shows changes between I and II and between II and III quartile similar to those of China and it has the lowest value in the high-income group of regions.

Table 6. Indicators of income mobility

		1980-2004	1980-1990	1991-2000	1980-1985	1986-1990	1991-1995	1996-2000	2000-2004
CHINA	M^1	0.12	0.16	0.06	0.15	0.17	0.04	0.08	0.13
	M^2	0.33	0.43	0.16	0.40	0.45	0.13	0.24	0.35
INDIA	M^1	0.19	0.22	0.21	0.22	0.25	0.22	0.19	0.09
	M^2	0.48	0.56	0.52	0.59	0.60	0.55	0.52	0.25
RUSSIA	M^1	-	-	-	-	-	-	-	0.16
	M^2	-	-	-	-	-	-	-	0.41

Source: authors' calculations based on NSB (China), CSO (India) and *Goskomstat* (Russia).

Note:
M^1 = (K - trace (transition matrix)/(K-1)
M^2 = 1 - det (transition matrix)

A more precise measure of mobility is provided by the indicators M^1 and M^2 (see Shorrocks, 1978) whose higher values imply a larger degree of mobility across income quartiles. The indicator M^1 captures the relative magnitude of the diagonal and off-diagonal elements by using the trace of the transition matrix whereas M^2 is based on its determinant. These indices allow us to compare the income mobility across the three economies for the period 2000-2004 and, in the case of China and India, to analyze its evolution through the years (Table 6). First of all, India displays a higher degree of mobility than China for the whole period, implying that its income distribution across regions has experienced more changes since 1980 with respect to that of China. Second, both countries show higher values of the indicators during the 1980s, when they started their processes of reforms. In the case of China, the reduction from the 1980s to the 1990s is stronger, indicating that the economic growth process during the 1980s has induced more transformations in the Chinese income distribution than that during the following decade. However, the last ten years see the two indicators growing again implying a rise in the degree of Chinese income mobility. Third, even if India shows higher indices in the all sub-periods between 1980 and 2000, the values of both decrease starting from early '90s and fall in the years 2000-2004 when M^1 and M^2 reach 0.9 and 0.25 respectively from 0.22 and 0.59 recorded at the beginning of the '80s. This last conclusion implies that Indian regions have gained persistence especially in the last years,

when, for the first time, the two indices are below the respective Chinese values. Finally, in 2000-2004 Russia shows the highest degree of income mobility, even if M^1 and M^2 are far from the values recorded by India during the '80s. Russian Federation shows therefore a certain degree of dynamism in its income distribution that is higher than those of China and India for the same period.

1.5 Conclusions

In the last decade China, India and Russia have manifested the intension and the ability to be protagonist in the global economy. Despite the fact of having all shared, even if to different extents, the experience of central planning system, the three giants seem to have adapted at best to the new challenges posed by the accelerated international integration process. All the three economies display impressive rates of growth, even if China and India started the new pattern of rapid and sustained growth two decades before Russia.

Among the three countries the impact of China has been far more incisive (Wolf 2008). For the year 2006 China was the world's largest exporter of merchandized products, behind Germany and the US and 8th in the export of commercial services reaching a share of the 8% in total world exports of goods and 3.3% of world export in commercial services. Smaller but still very impressive is the performance realized by India, whose shares were 1% and 2.7% percent respectively. Moreover, India became the world leader in IT exports at the beginning of the new millennium (Chauvin and Françoise, 2003), confirming the high level of dynamism of its emerging economy. Russia has enjoyed increasing trend of international hydrocarbons prices and to some extent this reduces the impressiveness of its economic performance. The Russian economy exhibits indeed still a very low degree of diversification and, hence, it is still not clear whither this giant is going.

However, China, India and Russia suffer all enormous disparities among their provinces, states and regions respectively and a high level of persistence in the income distribution, especially in the case of the Chinese and Indian economies. Within all the three countries there is a huge gap between some areas having reached high living standards comparable with the western ones, while some other areas, mainly the rural ones, appear completely trapped to poverty. The persistence in the disparities raises the doubt that the impressive performances of the three giants represent at the moment more a quantitative rather than a qualitative economic development. Furthermore the gap between rich and poor

areas can also represent a risk for political stability, in that poorer regions demand more independence from the central state.

References

Aghion, P. and O. J. Blanchard (1998), "On Privatization Methods in Eastern Europe and Their Implications, *Economics of Transition* Vol. 6, No. 1, pp. 87-99.

Alessandrini, M., T. Buccellato and P. Scaramozzino (2008), **"**Whither the Indian Union? Regional Disparities and Economic Reforms", *Rivista Italiana degli Economisti,* Vol. 13, No. 3, pp. 69-101.

Aroca, P., D. Guo, G. J. D. Hewings (2006), "Spatial Convergence in China: 1952-1999", UNU-WIDER, Research Paper No. 2006/89, August.

Berkowitz, D. and D. DeJong (2003), "Policy Reform and Growth in Post-Soviet Russia", *European Economic Review,* Vol. 47, No.2, pp. 337-352.

Bosworth, B. and S. M. Collins (2007), "Accounting for Growth: Comparing China and India", NBER Working Paper No. W12943.

Buccellato, T. (2007), "Convergence across Russian Regions: A Spatial Econometrics Approach," CEFIMS Discussion Papers, No 70.

Buccellato, T. and T. Mickiewicz (2007), "Oil and Within Region Inequality in Russia", Centre for the Study of Economic and Social Change in Europe, UCL School of Slavonic and East European Studies, Economics Working Paper No. 80.

Cao, Y., Qian, Y. and B. R. Weingast (1999), "From Federalism, Chinese Style to Privatization, Chinese Style", *Economics of Transition,* Vol. 7, Issue 1, March.

Chauvin, S., and L. Françoise (2003) "India Bets on Technology Niches", Centre d'Etudes Prospectives et d'Informations Internationales, Working Paper No. 221, March.

Das, D. K. (2003), "Quantifying Trade barriers: has Protection Declined Substantially in Indian Manufacturing?", ICRIER Working Paper No 105, Indian Council for Research on International Economic Relations.

Dabrowski, M., Mau, V., Yanovskiy, K., Sinicina, I., Antczak, R., Zhavoronkov, S. and A. Shapovalov (2005), "Russia: Political and Institutional Determinants of Economic Reofrms", Center for Social and Economic Research, Institute For The Economy in Transition, Moskow-Warsaw.

Dong, J. P. (1999), "China's Economic Reform and Open Policy and Korea Enterprises' Investment Strategies", in D. W. Lee and J. Z. Yi (ed.) *Comparison of Economic Developments of Korea and China*, Yonsei University Press.

Durlauf, N. S., P. A Johnson and J. R. W. Temple (2004), "Growth Econometrics", Vassar College Department of Economics, Working Paper Series, No.61.

Gooding, J. (1992), "Perestroika as Revolution from Within: An Interpretation", *Russian Review,* Vol. 51, No. 1, pp. 36-57.

Goldstein, S. M. (1995), "The Political Foundations of Incremental Reform", *The China Quarterly,* No. 144, Special Issue: China's Transitional Economy, pp. 1105-1131.

Greogry, P. R. and Lazarev, L. (2004), "Structural Change in Russian Transition", Center Discussion Paper No. 896, Economic Growth Center, Yale University.

Hausmann, R., Pritchett, L. and D. Rodrik (2005), "Growth Accelerations", KSG Working Paper, No. RWP04-030, Harvard University.

Jong-A-Pin, R. and J.De Haan (2007), "Political Regime Change, Economic Reform and Growth Accelerations", CESIFO Working Paper, No. 1905.

Kohli A. (2006*a*), 'Politics of Economic Growth in India, 1980–2005. Part I: The 1980s', *Economic and Political Weekly*, Vol. 41, No. 13, pp. 1251–1259.

Kohli A. (2006*b*), 'Politics of Economic Growth in India, 1980–2005. Part II: The 1990s and

Beyond', *Economic and Political Weekly*, Vol. 41, No.14, pp. 1361–1370.
Lai, H. H. (2006), "SEZs and Foreign Investment in China: Experience and Lessons for North Korean Development", *Asian Perspective*, Vol. 30, No. 3, pp. 69-97.
Lewis, J. P. (1995), *India's Political Economy: Governance and Reform*, Oxford University Press.
Lin, Justin Yifu, Fang Cai and Zhou Li (1996) *The China Miracle: Development Strategy and Economic Reform*, The Chinese University Press, Hong Kong.
McFaul, M. A. (2001), "*Russia's Unfinished Revolution: Political Change from Gorbachev to Putin*", Cornell University Press, Ithaca, NY.
Morrison, W. M. (2006), "China's Economic Conditions", Congressional Research Service, CRS Issue Brief for Congress
Naughton, B. (1995) *Growing Out of the Plan: Chinese Economic Reform, 1978-1993*, Cambridge University Press, New York and Melbourne.
Panagariya, A. (2004), "India in the 1980s and 1990s: a Triumph of Reforms", International Monetary Fund, Working Paper No. 04/03, March.
Quah, D. (1993), "Empirical Cross-Section Dynamics in Economic Growth", *European Economic Review*, Vol.. 37, No. 2-3, pp. 426-434.
Quah, D. (1996), "Twin Peaks: Growth and Convergence in Models of Distribution Dynamics", *Economic Journal*, Vol. 106, No. 437, 1045-1055.
Quah, D. (1997), "Empirics For Growth and Distribution: Stratification, Polarization and Convergence Clubs", *Journal of Economic Growth*, Vol. 2, No. 1, pp. 27-59.
Qian, Y. (2003a), "The Institutional Foundation of China's Market Transition", in Boris Pleskovic and Joseph Stiglitz, (ed.), *Annual World Bank Conference on Development Economics 1999*, 289-310, Washington DC, World Bank.
Qian, Y. (2003b), "How Reform Worked in China", in D.Rodrik, (ed.), *In Search of Prosperity: Analytic Narrative of Economic Growth*, Princeton, NJ, Princeton University Press.
Qian, Y. and G. Roland (1998), "Federalism and Soft Budget Constraint", *American Economic Review*, Vol. 88, No. 5, pp. 1143-1162.
Rada, C. and L. Taylor (2006), "Developing and Transition Economies in the Late 20th Century: Diverging Growth Rates, Economic Structures, and Sources of Demand", SCEPA Working Papers 2006-1, Schwartz Center for Economic Policy Analysis, New School University.
Rodriguez, F. (2007), "Openness and Growth: What Have We Learned?", Working Paper, No. 51, United Nations, Department of Economics and Social Affairs.
Rodrik, D. (2003), "Introduction: What Do We Learn From Country Narratives?", in D. Rodrik (ed.), *In Search of Prosperity: Analytic Narrative of Economic Growth*, Princeton, NJ, Princeton University Press.
Rodrik, D. (2005), "Growth Strategies", in P. Aghion and S. Durlauf (ed.), *Handbook of Economic Growth,* Ed. 1, Vol. 1, Chapter 14, 967-1014, Elsevier
Rodrik, D., and A. Subramanian (2004), "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition", NBER Working Paper No. 10376, March.
Shafaeddin, S. M. (2005), "Trade Liberalization and Economic Reform in Developing Countries: Structural Change or De-Industrialization?", United Nations Conference on Trade and Development, Discussion Paper No. 179.
Shorrocks, A.F. (1978), "The Measurement of Mobility", *Econometrica,* Vol. 46, No. 5, pp. 1013-1024.
Singh, N. (2003), "Some Economic Consequences of India's Institutions of Governance: A Conceptual Framework", UC Santa Cruz Economics Working Paper No. 556.

Sprenger, C. (2006), "The Determinants of Ownership After Privatisation-The Case of Russia", International College of Economics and Finance, Higher School of Economics Moscow, EFA 2005 Moscow Meeting.
Theil, H. (1967), *Economics and Information Theory*, North Holland, Amsterdam.
Tompson, W. J. (1993), "Khrushchev and Gorbachev as Reformers: A Comparison", *Britich Journal of Political Science*, Vol. 23, No. 1, pp. 77-105.
Williamson, J. and R. Zagha (2002), "From the Hindu Rate of Growth to the Hindu rate of Reform", Center for Research on Economic Development and Policy Reform, Working Paper No. 144, Stanford University.
Wilson, D and Roopa Purushothaman (2003), "Dreaming With BRICs: The Path to 2050", Goldman Sachs, Global Economics Paper No.99.
Wolf M. (2008), "A waking giant tugging hard at its chains", *Financial Times*, Friday January 25th 2008.
World Bank (2004), *Country Economic Memorandum for Russia,* World Bank, Washingto

Chapter 2

Whither the Indian Union?

Regional Disparities and Economic Reforms

2.1 Introduction

The issue of whether states and regions at different levels of development tend to converge to a common growth pattern has attracted considerable attention since the pioneering work by Barro and Sala-i-Martin in the early 1990s (see Barro and Sala-i-Martin, 2003). This original line of enquiry was mainly aimed at testing the prediction of (conditional) convergence to a common equilibrium growth path implied by the exogenous growth model by Solow (1956), as contrasted to the prediction of no convergence that was implied by most growth models of the endogenous growth variety.

Several studies carried out on India tend to lend support to the view that the recent pattern of growth in the Indian Federation has been characterised by an increasing *divergence* across states in terms of GDP per capita. A number of possible explanations have been put forward to account for this inequality in economic performance. The ability of individual states to attract foreign investors appears to have been greater for richer states, and this could have contributed to widen the gap with the poorer states (Bhattacharya and Sakthivel, 2004, and Purfield, 2006). A further element of divergence could be traced to the heavy backwardness of rural areas, which combined with an excessive rate of population growth could have trapped them into a vicious circle of poverty (Datt and Ravaillon, 2002). Under this respect, Besley and Burgess (1998) argue that poverty has decreased more markedly in States where land reform on tenancy and the abolition of intermediaries have been pursued more rigorously. Finally, divergence could have resulted from differences in the quality of infrastructures. Nagaraj, Varoudakis and Véganzonès (2000) carry out a multidimensional analysis of the long-run sources of growth across Indian States to show that infrastructures are the single most important determinant of success or failure in economic performance. This could also explain why some states like Haryana and Punjab have performed relatively well when compared to other areas of the country with a similar share of agriculture.

Particular attention has been paid to the role of the economic reforms implemented since the economic recession in 1991. If at the aggregate level the reforms have unambiguously stimulated growth, at the regional level their effect has been much more controversial. Kochhar *et al*. (2006) argue that consequences of reforms and of increased decentralisation have been twofold. At the level of the overall economy, liberalisation measures have improved India's economic performance. At the state level, however, they have generated disparities in the levels of income through the differential impact of liberalisation across regions (see also Ahluwalia, 2000). Fast growing peninsular states appear to have reached production standards not too far from Western ones, while states of the hinterland continue to be relatively poor.

However, the economic literature appears to be far from conclusive in assessing whether the economic growth pattern in India, especially before the 1990s, has been univocally characterized by convergence or divergence in terms of per capita income. For example, Cashin and Sahay (1996), controlling for internal migration, support the idea of a slow convergence pace characterizing the pre-reform period (1961-1991), while Das (2002) shows that regional wage rate per capita converged across Indian states between 1956-57 and 1992-93. Bandyopadhyay (2003) establishes the existence of two income convergence clubs over the period 1965 to 1998 and finds that income disparities across states had declined during the 1960s but have increased over the following three decades. Finally, Adabar (2003), making use of data from 1976-77 to 2000-01, provides evidence of a conditional convergence rate in the order of 12% across the 14 major states of the Union.

The purpose of this paper is to explore the main determinants of long-run growth across Indian states both before and after the reforms launched in the early 1990s. One of the main novel aspects of our convergence analysis is the attention paid to the spatial pattern of growth across Indian states. The spatial effects are introduced in a twofold setting. We indeed consider both distances (measured in highway kilometres between the capitals of the states) and neighbourhood (common borders among states) as possible factors affecting the rate of growth of individual states. It will be found that the location of states is an important factor affecting their performance, and that neglecting spatial effects can contribute to the overestimation of the convergence rate. The evaluation of the role of sectoral shares dynamics and their specific role on state growth performance constitute another innovative feature of this paper.

Our results seem to go in favour of the hypothesis that Indian states experienced divergence in the 1980s and 1990s, but at a more pronounced pace since the trade

liberalization reforms. We argue that the pattern of divergence has acquired a very significant spatial connotation. Coastal states have benefited the most from the increased level of openness. By contrast, landlocked rural areas have fared worse and have generally lagged behind. However, states like Haryana and Punjab have been able to attain high levels of performance despite their mainly rural production structure and their landlocked status, due to the successful implementation of rural reforms together with improved irrigation systems and high availability of arable land.

The structure of this paper is as follows. Section 2 looks at the main characteristics of Indian states, with particular regard to the process of reforms that has accompanied the acceleration in growth of the Indian economy. Section 3 analyses the pattern of convergence or divergence across Indian states both for the whole period since 1980 and separately for the pre- and post-reform periods. Section 4 explores the geographical dimension of the dynamics of divergence by introducing spatial econometric models. We can thus carry out a three-dimensional analysis of divergence patterns by considering differences over time, sectors and space. Section 5 draws the main conclusions.

2.2 Facts and data about Indian states

2.2.1 The Indian states: an overview

The Indian Union is constituted by twenty-eight states and seven federally governed Union Territories, populated by more than one billion people. Due to the sheer size and complexity of its territory, together with its highly heterogeneous socio-economic and cultural background, India appears to have the characteristics of a continent rather than a single country. The Indian Union includes more than one third of the poor people in the world. Despite this, India is the main exporter of highly-skilled software engineers, financial service analysts and pharmaceutical researchers. India is a nation with 35 towns exceeding 1 million people, but, at the same time, a country where 70% of the population live in rural areas and are still extremely dependent on the luck of the rainfall every year. Furthermore, India is the nation with the highest number of official languages in the world. Nonetheless, thanks to the young and educated generations who are fluent in English, the Indian economy is an attractive destination for global companies, which are increasingly outsourcing their customer services and technical support and have channelling foreign direct investment into the Union.

The heterogeneity that characterizes India emerges also at a regional level. For example, one difference across the states concerns their size and their population density. The

population of India amounted to 1.1 billion people in 2004, but around 450 million of them were concentrated in just 4 states: Uttar Pradesh, Maharashtra, Bihar and West Bengal. Uttar Pradesh, one of the poorest states of the Union, is the most populated state of India, with 179 million inhabitants. Other states, as Goa, Manipur or Meghalaya accounted for few millions of people. The average population of the 24 states in the sample was 46 million, comparable to larger European countries. As noted by Bhattacharya and Sakthivel (2004), the size of population can impact negatively on economic growth, in particular in rural areas where the demographic growth rate is still high relative to the national average. Numerous other differences stem from institutional, political and cultural factors. First, the nature of India's federal system assigns different taxation powers to the Central Government and to the States, depending on whether the source of income is agriculture or non-agriculture (Rao and Singh, 2006). For example, states are allowed to levy taxes on the sale and purchase of goods but not on services, and therefore this could have a different impact on economic performance depending on the regional specialization. Secondly, there are wide differences in the political composition of the state governments. Two extreme cases are represented by Kerala, where communist parties have been in power since the 1950s, and Maharashtra, where the BJP, the principal opponent to the Congress Party, has guided the state during the liberalization process in the 1990s. The nature and the quality of institutions can induce profound differences in policy choices, especially during the years of liberalisation of trade and factor markets, with significant effects on the growth process (Rodrik and Subramanian, 2004, and Purfield, 2006). Moreover, a further element of heterogeneity across states is the continued presence of caste and ethnicity systems (Gang, Sen and Yun, 2002) that still appear to play a strong role mainly in rural states, contributing to trapping them in a persistent condition of backwardness (see also Mehta and Shah, 2003). Finally, differences can emerge from the presence of large metropolitan areas that operate as industrial districts (*e.g.* Ahmedabad, Gujarat), poles of attraction for FDI (Mumbai, Maharashtra) and sites for IT companies (Bangalore, Karnataka). The positive impact of the degree of urbanization becomes even stronger when coupled with a strategic geographic position. For example, access to the sea seems to play a key role. This was especially evident during the liberalization process in the 1990s that opened India's market to the rest of the world. In general, the presence of these centres "can serve both the internal market and the international market, and can more make logistical links with foreign suppliers and customers[6]" than interior areas.

[6] Sachs, Bajpai and Ramiah (2002).

A more detailed picture of the Indian Union can be obtained by looking at the evolution of the set of economic policies implemented in the last three decades. After the Green Revolution that virtually eliminated famine in India, the next big push took place under the governments of Indira and Rajiv Gandhi during the 1980s and especially since the early 1990s with the process of trade liberalisation. These reforms not only influenced the pace of economic growth of the country, but also produced deep transformations into the structure of the Indian economy, and the changes in the specialisation of states have played a significant role in explaining their economic performance in the more recent period.

The 1970s

The process of reforms in India can be traced back to the agricultural policies under the Green Revolution period. Between 1967 and 1978 important efforts were made to reduce the gap between population growth and food production, through the introduction of high-yielding seed varieties and through the implementation of tenancy and ceiling-redistributive reforms and of land consolidation. The process of modernization of agriculture has ensured that Indians have more food on average, and the impact of land reforms on poverty has been positive leading to a rise in agricultural wages (Besley and Burgess, 2000). However, it would appear that the Green Revolution has not produced even results across all rural areas (Ghatak and Roy, 2007), and that greater efficiency in redistribution policy is still needed (Land Research Action Network, 2003). The highest increment in agricultural production was registered in Punjab, where it grew at an annual rate of 4.5% on average between 1970 and 1994. Successful reforms have also been implemented in Haryana, but other states, like Bihar, that were poorer and still largely dependent on rural sectors, recorded a rate of growth of just 1.5% (see Table 2 in Mearns, 1999).

The 1980s

The second wave of reforms is identified with the "pro-business" policies initiated by Indira[7] and accentuated by Rajiv Gandhi during the 1980s (see De Long, 2003, Panagariya, 2004,

[7] It is interesting to underline that, after returning to power in 1980, Indira Gandhi made a break with the democratic socialist content of Nehru's statist model of development, abandoning the redistributive thrust of her rhetoric and policies and prioritising economic growth as the state's main goal. As noted by Kohli (2006*a*, pp. 1255-1256): "What eventually triggered the upward shift in the growth rate of the Indian economy around 1980 was a slow but sure adoption of a new model of development. Instead of the statist and the nationalist model of development of the Nehru era, that was then accentuated in a populist direction by Indira Gandhi during the 1970s, Indira Gandhi herself shifted India's political economy around 1980 in the direction of a state and business alliance for economic growth. This change was not heralded loudly and has often been missed by scholars, especially because Indira Gandhi remains deeply associated with the politics of 'garibi hatao'. Nevertheless […] evidence shows that the post-Emergency Indira Gandhi was a different Indira Gandhi: she

Rodrik and Subramanian, 2004 and Kohli, 2006*a*). These policies were mainly directed at increasing the productivity of firms through the simplification of the licence system and the relaxation of industrial controls, thereby allowing new investments and product diversification and letting private companies enter those sectors that used to be monopolies of the Centre. This strategy was accompanied by high trade barriers in order to promote the creation and consolidation of firms and shield them from foreign competition. Chari (2007) estimates that relative Total Factor Productivity (TFP) improvement in the deregulated industries was about 32% over a period of ten years following the licence reform. The industrial sector experienced a sustained growth in states like Gujarat, Punjab and Maharashtra (Bhide, Chadha and Sakthivel, 2005). States specialising in manufacturing activities appear to have played a key positive role in driving and sustaining Indian growth in the 1980s, while in the previous decades their impact on growth had been opposite in sign. In addition, it has been noted that the manufacturing industry exerted a positive impact on the convergence process if the registered or large scale sector is considered, while unregistered or small scale manufacturing, which constitute the majority of the secondary sector, showed no clear sign towards convergence or divergence in the Indira and Rajiv Gandhi's period (Nair, 2004).

The 1990s

This policy stance changed with the "pro-market" attitude of the new governments in the aftermath of the financial and political crisis in 1991[8] (Kohli, 2006*b*). The pro-liberalization reforms opened the Indian market to foreign competition. Even if trade barriers were lowered very gradually (Ahluwalia, 2002*a*,*b*), these new policies stimulated an increase in Indian trade and a jump in FDI inflows. In particular, some states like Karnataka, Andhra Pradesh and Tamil Nadu, thanks to the foreign investment[9] experienced a sustained growth of the IT activities, especially in towns like Bangalore, Hyderabad and Chennai where a highly mobile

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downplayed redistributive concerns and prioritized economic growth; sought an alliance with big business; adopted an anti-labour stance; put brakes on the growth of public sector industries; and demoted the significance of economic planning and of the Planning Commission. […] Starting in the early 1980s then, Indira Gandhi's government initiated a series of pro-business policy reforms."

[8] In this year India recorded a negative growth of about 1% in terms of per capita income mainly due to the unsustainable external borrowings and public expenditure of the previous decade. Furthermore, the crisis was emphasized by the assassination of Rajiv Gandhi, by the collapse of Soviet Union that was one of the main India's trade partners and by the oil price shock connected with the Gulf war. Basu and Maertens (2007) provide a useful account of the events that led up to the crisis.

[9] One hundred percent foreign investment was permitted in information technology units set up exclusively for exports. These units can be set up under several schemes, including Export Oriented Units, Export Processing Zones, Special Economic Zones, Software Technology Parks, and Electronics Hardware Technology Parks (Panagariya, 2004).

skilled and low-wage labour force was present. The activities in these areas have permitted India to become the major exporter of IT products in the world at the beginning of the new millennium (Chauvin and Lemoine, 2003). Even though this new wave of reforms also affected the deregulation of industry, most of the emphasis was placed on the liberalization of trade in services. This was achieved by opening up the insurance, banking, telecommunications and infrastructure sectors to the private sector, including foreign investors. The expansion of services during the 1990s seems to replace manufacturing as the engine of Indian growth, although an effective introduction of the new technologies into the rest of the economy must still be implemented (D'Costa, 2003, and Dasgupta and Singh, 2005).

The Green Revolution, the "pro-business" and the "pro-market" policies have drastically changed the pattern of growth of India, transforming what still is a rural country into one of the fastest growing economies in the world. The impact of these changes on the performance and on the economic structure of the states is the topic of next section.

2.2.2 State-level growth performance and sector specialization

India's new accelerated pattern of growth can be traced back to the beginning of the 1980s under the Indira Gandhi's government. The economy started to grow at about 6% per year, leaving behind the "Hindu rate" of growth of the previous decades, which stagnated at around 3.5% between 1950 and 1980. As a consequence of the expansion of the economy, the average Net State Domestic Product (NSDP) per capita of the 24 states of our sample increased from 1,756 rupees in 1980 to 3,967 rupees in 2004 (Table 1). The most striking aspect of the left part of the table is that the six richest states at the beginning of the period – Delhi, Goa, Punjab, Maharashtra, Haryana and Gujarat – maintained the top positions in 2004. Similarly, the group of the six poorest states also remained very stable, with Bihar, Uttar Pradesh, Madhya Pradesh, Orissa and Assam locked in the bottom positions. In the most recent period, after a long phase of slow growth because of the continued tensions between India and Pakistan for the control of the territory, Jammu and Kashmir joined the group of the six poorest states, while some middle-income states like Tamil Nadu and Karnataka gained positions. Furthermore, the north-eastern state of Arunachal Pradesh appears in the top group in the first half of 1990s replacing Gujarat, while between 1985 and 1990 Tripura, Meghalaya and Rajasthan leave the bottom group and maintain middle and middle-low positions in the next years.

Table 1. The Indian states: economic performance

	Per Capita NSDP at constant (1980) Indian Rupees						Per Capita NSDP average annual growth (in percentage)						
	1980	**1985**	**1990**	**1995**	**2000**	**2004**	**1980-1985**	**1985-1990**	**1990-1995**	**1995-2000**	**2000-2004**	**1980-1990**	**1990-2000**
Andhra Pradesh	1380	1573	2060	2429	3068	3718	2.8	5.8	3.5	4.9	4.9	4,3	4.2
Arunachal Pradesh	1571	2119	**2709**	**3607**	3530	3991	6.2	5.2	**6.1**	**-0.3**	3.1	5,7	**2.9**
Assam	*1284*	1510	*1544*	*1595*	*1646*	*1862*	*3.4*	0.5	*0.7*	*0.6*	*3.1*	*1,9*	*0.7*
Bihar	*917*	*1074*	*1197*	*915*	*1285*	*1266*	*3.3*	*2.4*	*-4.8*	*7.5*	*0.4*	*2,8*	*1.4*
Delhi	**4030**	**4665**	**5447**	**6580**	**9108**	**10764**	**3.2**	**3.2**	**4.0**	**6.8**	**4.3**	**3,2**	**5.4**
Goa	**3145**	**3091**	**4883**	**5952**	**8535**	**8232**	**-0.1**	**9.8**	**4.1**	**7.9**	**0.4**	**4,8**	**6.0**
Gujarat	**1940**	**2186**	2641	3501	**3753**	**5072**	**2.7**	**5.1**	6.8	1.6	**7.9**	**3,9**	4.2
Haryana	**2370**	**2893**	**3509**	**3645**	**4372**	**5327**	**4.2**	**4.3**	**0.8**	**3.8**	**5.1**	**4,3**	**2.3**
Himachal Pradesh	1704	1781	2241	2589	3261	3963	1.1	4.8	3.0	4.8	5.0	3,0	3.9
Jammu and Kashmir	1776	1832	1784	1915	*2100*	*2297*	0.6	-0.2	1.4	1.9	*2.3*	0,2	1.7
Karnataka	1520	1644	2039	2573	3645	4249	1.7	4.4	4.8	7.3	4.0	3,1	6.0
Kerala	1508	1507	1815	2336	2822	3509	0.1	3.9	5.2	3.9	5.6	2,0	4.5
Madhya Pradesh	1358	*1409*	*1696*	*1809*	*1917*	*2195*	0.8	*4.0*	*1.5*	*1.4*	*3.8*	2,4	*1.5*
Maharashtra	**2435**	**2705**	**3483**	**4533**	**4880**	**6125**	**2.2**	**5.3**	**5.6**	**1.6**	**5.9**	**3,7**	**3.6**
Manipur	1419	1598	1739	*1807*	2204	2579	2.4	1.7	0.8	*4.2*	4.1	2,1	2.5
Meghalaya	1361	*1412*	1733	1838	2311	2750	0.7	*4.3*	1.3	4.7	4.4	2,5	3.0
Nagaland	1361	1653	1976	2293	2727	2922[a]	4.2	3.7	3.1	4.5	3.8[c]	3,9	3.8
Orissa	*1314*	1442	*1383*	*1640*	*1749*	*2262*	*2.3*	-0.1	*3.6*	*1.5*	*6.8*	*1,1*	*2.6*
Punjab	**2674**	**3249**	**3730**	**4120**	**4774**	**5308**	**4.0**	**2.8**	**2.0**	**3.0**	**2.7**	**3,4**	**2.5**
Rajasthan	*1222*	*1338*	1942	2073	2349	2831	*2.3*	*8.9*	1.9	2.7	5.6	*5,6*	2.3
Tamil Nadu	1498	1798	2237	2883	3691	3977	3.9	4.5	5.3	5.1	2.0	4,2	5.2
Tripura	*1307*	*1240*	*1642*	1865	3070	3638[b]	*-0.9*	*5.8*	*2.7*	10.5	5.8[d]	*2,4*	*6.6*
Uttar Pradesh	*1278*	*1375*	*1652*	*1687*	*1789*	*1970*	*1.5*	*3.8*	*0.4*	*1.3*	*2.4*	*2,6*	*0.9*
West Bengal	1773	1929	2145	2683	3507	4394	1.8	2.1	4.6	5.5	5.8	2,0	5.0
Average 24 states	1756	1959	2384	2786	3421	3697	2.3	4.0	2.8	4.0	4.1	3,1	3,4

Source: authors' calculations based on CSO data.

Note: richest states are in bold, while the poorest ones in italics. [a] 2002, [b] 2003, [c] 2000-2002, [d] 2000-200

A clearer picture of the economic performance of the states is obtained by looking at the evolution of the growth rates of the NSDP per-capita. The right part of Table 1 emphasises in bold and in italics the performance of the six richest states and of the six poorest states respectively at the beginning of the five-years period. For instance Maharashtra, which was the fourth richest state in 1980, grew at 2.2% per year between 1980 and 1985. Overall, the table reveals some mixed results. During the 1980s, all the six richest states in 1980 show a rate of growth above the rate of 3.1% per year, which was the average growth rate among the 24 states, whereas five of the six poorest states experienced a growth path under the average. This may have contributed to exacerbating the income inequalities across states. Rajasthan, that had the 23rd income level in 1980, is the only exception with 5.6% average growth per year. It is interesting to underline that the only rich state that grows at a higher rate in the first half of the 1980s relative to the second half is Punjab. This may be due to the lasting effects of the Green Revolution. All the other five richest states increase or maintain their rate of growth: for example, Goa jumps from a negative rate to 9.8% in the second half of the 1980s. Among the poorest states, Assam, Bihar and Orissa face a decline between 1985 and 1990, but Meghalaya, Madhya Pradesh, Uttar Pradesh and, in particular, Rajasthan and Tripura show an increase in their rate of growth.

The following decade sees the poorest states continuing to grow below the national average, with the exception of Tripura, which experienced a remarkable performance between 1995 and 2000. Some of the richest states however face a decline in their growth. By contrast, the middle-income and coastal states of Kerala, Karnataka, West Bengal and Tamil Nadu exhibited an increasing rate of growth, possibly due to the liberalization process of the Indian economy and to the amount of new FDI inflows. It is also important to underline the performance of Bihar in the second half of the 1990s, when its economy grew at 7.5% per year after negative growth in the first half. The last four years see Gujarat and Maharashtra growing at a fast rate together with the poor state of Orissa, while West Bengal, Kerala and Tripura managed to maintain the pattern of growth of the previous years. Goa and Tamil Nadu have displayed a fall in the rate, while Bihar interrupts the positive trend of the late 1990s.

These data yield some interesting conclusions that are summarized in Table 2. First of all, the six richest states have displayed, on average, a higher rate of growth than the six poorest ones in all the sub-periods analyzed. Furthermore, the second half of the 1980s is the best period in terms of growth for both groups, which displayed a very similar growth pattern. Finally, the ratio between the average per capita NSDP of the richest and of the poorest states

increased sharply during the second decade, especially in early 1990s when poorest states probably suffered the most from the crisis in 1991.

Table 2. Comparison between the six richest and the six poorest states

	1980	1985	1990	1995	2000	2004
Average per-capita NSDP						
Richest	2766	3132	3960	4740	5904	6805
Poorest	1220	1308	1519	1576	1748	1975
Ratio	*2.27*	*2.39*	*2.61*	*3.01*	*3.38*	*3.45*
Richest states exc. Delhi	2513	2825	3663	4371	5263	6013
Poorest states exc. Bihar	1281	1355	1583	1708	1840	2117
Ratio	*1.96*	*2.09*	*2.31*	*2.56*	*2.86*	*2.84*
Per-capita NSDP standard deviation (log-scale)	0.34	0.35	0.39	0.45	0.48	0.49
5-years average growth (%)						
Richest		2.7	5.1	3.8	3.8	4.4
Poorest		2.0	4.9	0.7	2.8	3.1
Population ('000)						
Richest	132541	148082	125856	141157	206245	221003
Poorest	258816	301276	345355	332966	379155	410369
Richest states exc. Delhi	126450	140536	116592	129874	192661	205610
Poorest states exc. Bihar	189575	224050	259698	261174	297282	321682
Share agriculture						
Richest	0.34	0.30	0.30	0.27	0.20	0.18
Richest without Delhi	0.40	0.35	0.36	0.32	0.23	0.22
Poorest	0.53	0.49	0.45	0.41	0.37	0.35
Share manufacturing						
Richest	0.26	0.28	0.28	0.28	0.30	0.29
Poorest	0.14	0.15	0.16	0.17	0.18	0.18
Share services						
Richest	0.40	0.42	0.42	0.45	0.50	0.53
Richest without Delhi	0.34	0.37	0.37	0.39	0.45	0.47
Poorest	0.33	0.36	0.39	0.42	0.45	0.47

Source: see Table 1

Even if the fast and sustained growth of the Indian economy in the last twenty-five years has produced different results in terms of state-level performance, changes in its sectoral structure seem to have affected all the states, with a general shift form agriculture activities to the service sector. Economic growth has been accompanied by a sharp reduction of the share of primary sectors on NSDP, from 43% of 1980 to 26% in 2004. This decrease has been absorbed by the growth of the manufacturing sector, especially in the second half of the 1980s – its share, stable at around 20% till 1985, jumps to 23% at the end of the decade and reaches 24% in 1995 – and by a rapid expansion of service activities. The tertiary sector, that experienced a stable growth pattern during the 1980s, has risen rapidly in the last ten years, and its share reached 51% in 2004. These changes are confirmed by looking at the

growth of the six states with the highest share in the three sectors. The growth process has been principally driven by the states specialising in industry in the late 1980s, when also agricultural states registered a rate of growth of 4.4% per year, and in the early 1990s. During the second half of the 1990s states specialising in service have grown at a rate of 6% per year, and are still experiencing the fastest rate of growth in the more recent years.

Other remarkable aspects emerge by looking at the evolution of the economy of some states. The share of agriculture is still high in the poor states of Orissa, Assam, Uttar Pradesh, and the production of primary items continues to have a strong impact on growth performance. This was the case for Bihar, which experienced a decrease in agricultural share from 47% to 41% and a negative growth between 1990 and 1995. However, agriculture seems to play a key role also in the rich state of Punjab, where its share is still about 40%. Among the most industrialized states, Gujarat is the only one that has experienced an increase of manufacturing share on NSDP. In Maharashtra and Tamil Nadu the manufacturing sector declined to the benefit of services in the last ten years. Furthermore, the share of manufacturing is also high in small states like Nagaland, Goa and Himachal Pradesh. It is interesting to underline that none of the poorest states appears in the top positions of the manufacturing shares rank, excluding Madhya Pradesh in 2000. However, this state experienced, as the previous case of Bihar, a fall in agricultural production, and consequently a slow rate of growth, between 1995 and 2000, and therefore a rise of non-agriculture share.

The poor states seem to suffer from an insufficient industrialization process, with 18% of the NSDP coming from secondary sector against 29% for the rich states. However, the expansion of the service sector appears to have affected both groups (see the lower part of Table 2): its share in the poor states jumped from 33% in 1980 to 47% in 2004, mirroring the increase in the rich states. Furthermore, while small states, like Goa and the western states Meghalaya, Manipur and Tripura, were overrepresented among the most specialized in services during the 1980s, the service expansion of the 1990s is mostly concentrated in bigger states like Tamil Nadu and Maharashtra. In the latter one, the share of the tertiary sector reached 60% of NSDP in 2004.

These aspects need further investigation, especially concerning the type of service activities in which the states specialize. In poorer states, the incidence of public administration and expenditures in health, education and poverty alleviation programmes are high and have displayed an increase in states like Orissa and Assam. Similar situations can be found in the small and middle-low income states of Western India. In the case of Goa or Tripura, over 25% of service activities are represented by tourism activities. By contrast, the

growth of services in middle-high and high income states, notably in Maharashtra or Gujarat, has mainly been driven by banking, insurance and other financial activities, or by business services, including IT, such as in Tamil Nadu or Karnataka.

The description of the states' economic structure suggests some tentative conclusions. First, the economy of the poorer states still appears to be heavily dependent on agricultural activities. The low share of the secondary sector seems to be a reasonable cause of their persisting backwardness. These states probably have not taken advantage of the reforms, in particular in agriculture, where they failed to follow the successful example of Punjab or Haryana. Second, service expansion has been uneven across the states in terms of sub-sectors: the richest and most industrialized states appear to benefit the most from the support of growth-driven activities. Finally, business services and IT industry are mainly concentred in the south of India, where coastal and middle-income states are located.

To sum up, all the aspects emerged from this discussion underline how the growth process in India and the changes in the structure of its economy have been highly uneven among the states. There are strong signals of divergence during the period 1980-2004. Table 2 shows the ratio between rich and poor states in terms of per-capita NSDP. Even when we exclude Bihar and Delhi, respectively the poorest and the richest state in all sub-periods, this ratio increases from 1.96 in 1980 to 2.84 in 2004. This means that 410 million of people in the poorest states have, on average, only around one third of the income of the 221 million of inhabitants in the richest states. Furthermore, the divergence between economic regions has been steadily increasing since the early 1990s. The standard deviation of per-capita NSDP in a log-scale increases from 0.34 in 1980 to 0.39 in 1990, but then reaches 0.49 in 2004. It is important to note that the rise in the standard deviation during the 1980s mostly happened in the second half of the decade, suggesting that not only the "pro-market" but also the "pro-business" reforms have produced larger benefits for the rich states than for the poor ones.

These results are confirmed by transition matrices[10] (Table 3) that display the estimated probabilities that states can become relatively richer or poorer conditional on their initial level of per-capita NSDP. States are grouped into four quartiles, from the poorest ones to the richest ones, depending on their initial level of income. The states present a very high degree of persistence over the whole period. However, low and middle-low NSDP states display more dynamism in the 1980s, when, for instance, the probability for the poorest states to increment their position was around 15%. During the 1990s, middle-high and high income

[10] See Quah (1993, 1996 and 1997).

states face a small increase in the probabilities of changing quartile, while the first two quartiles show a greater degree of persistence relative to the previous decade.

Table 3. Transition matrix estimates

1981-2004					
	I Quartile	**II Quartile**	**III Quartile**	**IV Quartile**	**Total**
I Quartile	88.19	11.81	0.00	0.00	100.00
II Quartile	11.97	78.17	9.86	0.00	100.00
III Quartile	0.00	10.42	84.03	5.56	100.00
IV Quartile	0.00	0.00	6.29	93.71	100.00
1981-1990					
	I Quartile	**II Quartile**	**III Quartile**	**IV Quartile**	**Total**
I Quartile	84.85	15.15	0.00	0.00	100.00
II Quartile	15.15	74.24	10.61	0.00	100.00
III Quartile	0.00	10.61	84.85	4.55	100.00
IV Quartile	0.00	0.00	4.55	95.45	100.00
1991-2004					
	I Quartile	**II Quartile**	**III Quartile**	**IV Quartile**	**Total**
I Quartile	91.03	8.97	0.00	0.00	100.00
II Quartile	9.21	81.58	9.21	0.00	100.00
III Quartile	0.00	10.26	83.33	6.41	100.00
IV Quartile	0.00	0.00	7.79	92.21	100.00

Source: see Table 1

The following sections will seek to explore the main determinants of the stylised facts presented in this section. Our main emphasis will be on the spatial pattern of growth across Indian states, and on the importance of neighbouring states in influencing the performance of individual states.

2.3 Convergence and divergence across Indian States

We make use of a number of empirical methodologies to analyse the pattern of growth of the Indian states and to explore the determinants of their different performance. The literature on convergence or divergence across states or regions evolved considerably since Baumol (1986) and Barro *et al*. (1991). The two concepts of absolute and conditional β-convergence, directly derived from the dynamic implications of the Solow model (1956), seek to establish whether rates of growth in a cross-section of countries or regions are negatively related to initial levels of GDP per capita. It is well known that cross-sectional regressions could present problems of both omitted variables bias and endogeneity. The conditional convergence approach could itself be considered as one possible way to address the omitted variable bias,

but the introduction of additional explanatory variables could raise a further problem of endogeneity, since the rate of growth could in turn influence some of the conditioning variables. In order to alleviate this potential difficulty, control variables are usually introduced in a predetermined form.

An effective strategy to deal with the issue of omitted variables bias in cross-sectional regressions is to reformulate the neoclassical convergence equation in a panel data format (Knight Loayza and Villanueva, 1993, and Islam, 1995). The dynamic specification makes it possible to relax the identical technology assumption and to control for unobservable country- or state-specific effects. Persistent disparities in technology development and in the quality of institutions have been found to play an important role in explaining cross-country economic performance.

This panel data approach is however not sufficient to deal with time-varying country-specific effects nor with endogeneity. Caselli, Esquivel and Lefort (1996) suggest using the Arellano-Bond (1991) GMM efficient estimator for dynamic panel data. However, this First-Differenced GMM approach has been found to suffer from serious bias when the time series are persistent and the number of time series observations is small. These issues could be potentially serious in the empirical analysis of growth and even more when it comes to studies of convergence, which is known to be a long run phenomenon. By exploiting an additional assumption that imposes a stationarity restriction on the initial conditions for GDP per capita, Blundell and Bond (1998) are able to obtain moment conditions that remain informative even for persistent series. This System GMM uses the lagged first-differences as instruments not only for the standard set of equations in first differences (as in the Arellano-Bond procedure), but also for a supplementary set of equations in levels (see also Bond, Hoeffler and Temple, 2001).

We use data for a subset of 24 Indian states for the period 1980-2004, made available by the Indian Central Statistical Organization (CSO). The Data Appendix describes the data set. The baseline model we will refer to for our estimates is a log-linear version of the Solow model:

$$(1) \qquad \ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = -(1-e^{-\beta\tau})\ln(Y_{i,t-\tau}) + (1-e^{-\beta\tau})\frac{\alpha}{1-\alpha}\left[\ln(s) - \ln(n+g+d)\right] + \eta_i + \varepsilon_{i,t}$$

where $Y_{i,t}$ denotes the level of GDP per capita of state i at time t, s the saving rate, n the population growth rate, g the rate of labour-augmenting technological progress, d the

depreciation of physical capital, α the share of capital in total output and β the convergence rate measuring the speed at which a given economy converges to its steady state output level. In empirical applications of the Solow model the investment rate or the capital expenditure are used as alternative proxies of the saving rate *s*. We standardize the capital expenditure by the NSDP following Caselli, Esquivel and Lefort (1996). The sum of the common exogenous rate of technical change and the common depreciation rate is assumed to be 0.05. We consider annual rates of GDP growth and, hence, the value of the time interval τ equals one. Based on equation (1) we can now build a common economic growth regression equation, through which we can indirectly estimate the coefficients α and β besides all the coefficients relating to the other control variables. Our regression equation takes the following form:

$$(2) \qquad \ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \gamma_1 + \gamma_2 \ln(Y_{i,t-\tau}) + \gamma_3 \ln(s_{i,t-\tau}) + \gamma_4 \ln(n_{i,t} + 0.05) + \varepsilon_{i,t}$$

Table 4 reports estimates for the textbook Solow model in both its unrestricted and restricted versions. The latter is obtained by imposing that saving and population growth enter in a difference format, to test whether in steady state they exhibit the same rate of growth. The results on convergence appear to be different depending on the estimation method. Both the OLS and the System GMM findings are in favour of divergence among the states, whereas the within-group (Fixed-Effect) and the Differenced GMM estimators imply a relatively high rate of convergence. The differences among the estimators are in line with the results of empirical analysis over cross-sections of countries. OLS have been shown to yield estimated convergence coefficients that are lower than those obtained after controlling for regional specific effects. Differenced GMM tends to provide even higher estimates of the convergence rate. However, Bond, Hoeffler and Temple (2001) use System GMM estimators and obtain results strikingly similar to the simple OLS regressions.

In our estimates, we obtain positive values for the β coefficients (implying convergence) when we use the Fixed-Effect and the Difference GMM estimators. According to the analysis in Bond, Hoeffler and Temple (2001), however, these estimates could be affected by a positive bias. When using a regional dataset, there could be an additional source of positive bias in the estimation of the convergence coefficient due to spatial interactions across the observations, which can be attributed to the presence of knowledge spillovers, trade, and migration among neighbouring regions. The issue of possible spatial interactions across the observations deserves particular attention and we will discuss it in detail in the next section. At this stage, it would appear that the most plausible estimates of the regional growth

Table 4. Unrestricted and restricted Solow model for 24 Indian states (1980-2004)

	Unrestricted Solow Model				Restricted Solow Model			
	OLS	Fixed Effect	Differenced-GMM	System-GMM	OLS	Fixed Effect	Differenced-GMM	System-GMM
Lag Annual Growth	-	-	-0.348	-0.399			-0.332	-0.445
			(0.066)***	(0.063)***			(0.078)***	(0.066)***
ln(Y)	0.011	-0.022	-0.349	0.018	0.008	-0.033	-0.343	0.026
	(0.006)*	(0.015)	(0.084)***	(0.007)***	(0.006)	(0.014)**	(0.097)***	(0.011)**
ln(s)	0.009	0.01	0.004	0.01				
	(0.005)**	(0.01)	(0.016)	(0.006)*				
n+ 0.05	-0.07	-0.127	-0.021	-0.082				
	(0.024)***	(0.036)***	(0.056)	(0.036)**				
ln(s)—(n + 0.05)					-0.003	-0.02	-0.021	0.005
					(0.005)	(0.009)**	(0.018)	(0.006)
Constant	-0.215	-0.108		-0.27	-0.029	0.283		-0.149
	(0.075)***	(0.113)		(0.097)***	(0.049)	(0.105)***		(0.083)*
Implied β	**-0.011**	**0.022**	**0.299**	**-0.013**	**-0.008**	**0.033**[11]	**0.297**	**-0.017**
Prob > chi2	(0.000)***	(0.0721)*	(0.000)***	(0.000)***	(0.0131)**	(0.000)***	(0.000)***	(0.000)***
Implied α	**-**	**-**	**-**	**-**	**0.789**	**0.373**[12]	**0.313**	**0.17**
Prob > chi2					(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Number of ID	24	24	24	24	24	24	24	24
Observations	546	546	499	525	527	527	480	506
R-squared	0.0215	0.11	-	-	0.0044	0.01	-	-
Number of instruments		-	252	328		-	180	184
	-	11.81	-	-		11.71	-	
Hausman Test		(0.0081)				(0.0029)		
Arellano-Bond test for AR(1) in first differences:	-	-	-3.64	-3.80		-	-3.75	-3.89
			(0.000)	(0.000)			(0.000)	(0.000)
Arellano-Bond test for AR(2) in first differences:	-	-	-0.68	1.30		-	-0.29	-0.37
			(0.498)	(0.193)			(0.773)	(0.710)
	-	-	0.000	0.000		-	0.000	0.000
Hansen test of overid. restrictions			(1.000)	(1.000)			(1.000)	(1.000)

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

[11] Computation method: (-(1-exp(-b))+0.165)

[12] Computation method: ((1-exp(-.180))*(a/(1-a))-0.051)

pattern are obtained with the System GMM specification. It should indeed be noted that all the variables have the expected signs, positive and significant for the investment ratio (which turns out to be insignificant both according to the Fixed-Effect and the Differenced GMM) and negative and significant for the population growth rate corrected by 0.05 (completely insignificant in the case of the Differenced GMM).

For what concerns the estimates of the restricted Solow model (right part of Table 4), the more reliable results appear again to be those obtained through the System GMM. The OLS predicts a share of capital in the order of 79%, which is too far from the value of around 10% computed as a simple average of the ratio between capital expenditure and the NSDP on our data. The Fixed-Effect rejects the hypothesis that the saving rate in the steady state completely offsets the sum of the population growth rate, the rate of technical change and the common depreciation rate. The Differenced GMM provides an incredibly high annual rate of convergence in the order of 30%. Finally, from a purely econometric viewpoint the lagged dependent variable is highly significant indicating a strong persistence of the annual growth rate of the NSDP per capita and, hence, limiting the choice between the two GMM specifications.

Summarizing, the comparison of alternative econometric methods lead us to consider the System GMM[13] as the most appropriate estimator. This yields a divergence rate of 1.3% for the unrestricted version of the Solow model and 1.7% for the restricted version. These results are consistent with other existing empirical findings, which also find evidence of increasing gaps between Indian regions (see Bandyopadhyay, 2006, for an accurate analysis of the issues).

2.4 The spatial pattern of growth

In a regional dataset the spatial interactions across observations can seriously affect the estimates of convergence patterns, whose magnitude could be overestimated. In our case this would imply an underestimation of the divergence rate. We therefore relax the assumption that observations are represented by states with arbitrarily drawn boundaries and implement a model, which allows for a degree of dependence across locations sharing a common border. Specifically, we make use of the so-called Spatial Lag System GMM Model, which introduces a spatial lag of the dependent variable among the explanatory variables and jointly

[13] For a detailed and technical discussion on why the system GMM could result superior with respect to the Differenced GMM see the paper by Bond, Hoeffler and Temple (2001).

controls for both time and spatial interaction across observations (Anselin, 1988 and Arbia, 2006). In order to explore the robustness of these effects, rather than considering interaction only across contiguous states sharing common borders (neighbourhood effect), we also take into account a more general specification in which the strength of the spatial interactions is inversely related to the distance among regions. In our application, we consider the distances in highway kilometres separating the main urban centres of each state.

The spatial dimension has been only marginally considered in recent studies concerning convergence across Indian states. However, a simple visual analysis of the patterns of growth relating to the Indian Union map would suggest that the group of best performers countries concentrates in the South, while the poorer countries concentrate in the north-eastern landlocked part of the Union. For a panel dataset with a time series dimension the most common way to address this issue is through the use of the Spatial Lag Model. In this paper we make use of a mixed regressive spatial autoregressive model, which consists of the regressive part based on the core variables of the Solow model and a spatial lag of the dependent variable to account for the possible spatial interactions in our regional dataset. Adding the spatial lag to the economic growth equation as depicted in (2) we obtain the following specification:

$$(3) \quad \ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \gamma_1 + \gamma_2 \ln(Y_{i,t-\tau}) + \gamma_3 \ln(s_{i,t-\tau}) + \gamma_4 \ln(n_{i,t} + 0.05) + \rho W [\ln(Y_{j,t}) - \ln(Y_{j,t-\tau})] + \varepsilon_{i,t}$$

,

$$\varepsilon_{i,t} \sim \text{i.i.d.}(0, \sigma^2 I_n)$$

where W is a binary contiguity matrix expressing neighbouring regions by 0-1 values. The value 1 is assigned when two regions have a common border of non-zero length, *i.e.* they are considered first-order contiguous. We also consider a second spatial specification in which the elements of the matrix W are the inverse of the distances among capital cities of each of the 24 states measured in highways kilometres. In equation (3), ρ denotes the coefficient associated to the spatial lag of the dependent variable and ε is a vector of independently and identically distributed error terms.

In order to estimate equation (3) one has to take into due account the source of endogeneity induced by the spatial lag of the dependent variable. To overcome the problem,

we only present estimates of model (3) obtained through the System GMM estimator, which allows us to treat the spatial lag as endogenous and, hence, estimate consistent coefficients[14].

Table 5 reports estimates obtained through System GMM, considering both the whole sample period 1980-2002 and the two sub-periods 1980-1990 and 1991-2002. In the left half of the table we display results obtained considering distances in highway kilometres across capitals of the 24 states for both the unrestricted and the restricted versions of the Solow model. The spatial coefficient appears to be significant for the series considered as a whole and over the period 1980-1990, for both versions of the Solow model. Our results are reinforced when considering a spatial model with neighbourhood effect. The spatial lag turns out to be always significant in the unrestricted version of the Solow model, and significant for the whole series and for the second sub-period 1991-2002 when estimating the restricted version of the model. In line with the literature concerning regional studies, we provide evidence that the inclusion of the spatial lag induces an increase of the divergence rate, which goes up from 1.3% in the traditional absolute convergence analysis without spatial lag to 1.8% when considering distance and to 1.6% with neighbourhood effects. Our results provide also evidence of an acceleration of the pace of divergence in the 1990s with respect to the 1980s[15].

Hence, taking into account spatial interactions across observations does not contradict our previous finding of a significant rate of divergence across Indian States in terms of NSDP per capita. However, such a result could reflect large geographical disparities in the sector distribution of economic activity. As argued by Purfield (2006), approximately half of the total agricultural value added in India is produced in the northern and central states, whereas 40 percent of industrial and service sector output is produced in the coastal states of Maharashtra, Gujarat and Tamil Nadu. Table 6 and Table 7 report results for the two different spatial specifications considering respectively distance and neighbourhood effects[16]. The spatial effects are substantially reduced when considering distances (they remain significant only when considering service sector as a control variable during the whole period and in the

[14] For a comprehensive survey on the panel data techniques that can be implemented allowing for the presence of spatial autocorrelation see Mutl (2006).

[15] During the 1980s we lose the observation of Delhi due to a lack of data for the capital expenditure. However, we decided to use all the data when possible. In order to check the robustness and comparability of the results relating to the 1980s and 1990s we also omitted Delhi from the 1990s. The main findings discussed in the paper are not affected.

[16] In order to check the robustness of our results to the possible interference of sector effects we also test three conditional convergence specifications using the share of production sectors to NSDP as additional explanatory variables. Among sectors agriculture appears to have constantly acted as a restraint to growth, mirroring the stylized fact discussed in the literature about the backwardness of rural areas. During the 1990s, it also emerges the positive impact of the service sector.

Table 5. Convergence across 24 Indian states (1980-2002): Spatial System GMM estimates with robust standard errors.

	Spatial analysis considering km distance (highways)						**Spatial analysis considering neighbourhood effects (common borders)**					
	Unrestricted Solow Model			**Restricted Solow Model**			**Unrestricted Solow Model**			**Restricted Solow Model**		
	1980-2004	**1980-1990**	**1991-2002**	**1980-2004**	**1980-1990**	**1991-2002**	**1980-2004**	**1980-1990**	**1991-2002**	**1980-2004**	**1980-1990**	**1991-2002**
Lag Annual Growth	-0.407	-0.399	-0.413	-0.403	-0.394	-0.41	-0.403	-0.383	-0.417	-0.392	-0.361	-0.415
	(0.062)***	(0.076)***	(0.072)***	(0.063)***	(0.071)***	(0.073)***	(0.062)***	(0.069)***	(0.075)***	(0.060)***	(0.068)***	(0.071)***
Spatial Lag Annual Growth	0.373	0.539	0.135	0.51	0.621	0.32	0.284	0.272	0.257	0.248	0.168	0.273
	(0.200)*	(0.279)*	(0.272)	(0.227)**	(0.329)*	(0.27)	(0.117)**	(0.148)*	(0.133)*	(0.129)*	(0.158)	(0.132)**
ln(Y)	0.025	0.023	0.028	0.026	0.024	0.027	0.022	0.014	0.025	0.018	-0.005	0.026
	(0.008)***	(0.016)	(0.007)***	(0.008)***	(0.016)	(0.008)***	(0.008)***	(0.016)	(0.008)***	(0.009)**	(0.023)	(0.008)***
ln(s)	0.01	0.013	0.009				0.011	0.013	0.01			
	(0.005)**	(0.009)	(0.005)*				(0.005)**	(0.009)	(0.006)			
n+ 0.05	-0.071	-0.09	-0.058				-0.065	-0.102	-0.053			
	(0.025)***	(0.038)**	(0.028)**				(0.021)***	(0.040)**	(0.026)**			
ln(s)—(n + 0.05)				0.004	0.001	0.005				0.004	0.002	0.006
				(0.004)	(0.006)	(0.005)				(0.005)	(0.009)	(0.005)
Constant	-0.327	-0.346	-0.314	-0.181	-0.16	-0.185	-0.287	-0.304	-0.278	-0.111	0.08	-0.171
	(0.091)***	(0.164)**	(0.093)***	(0.067)***	(0.124)	(0.067)***	(0.078)***	(0.171)*	(0.089)***	(0.072)	(0.176)	(0.066)***
Implied β	**-0.018**	**-0.016**	**-0.02**	**-0.018**	**-0.017**	**-0.019**	**-0.016**	**-0.010**	**-0.018**	**-0.013**	**0.004**	**-0.018**
Prob > chi2	(0.000)***	(0.018)**	(0.000)***	(0.000)***	(0.008)***	(0.000)***	(0.000)***	(0.001)**	(0.000)***	(0.000)***	(0.704)	(0.000)***
Implied α				**0.133**	**0.04**	**0.156**				**0.059**	**0.096**	**0.063**
Prob > chi2				(0.000)***	(0.000)***	(0.000)***				(0.000)***	(0.000)***	(0.000)***
Observations	480	197	283	480	197	284	480	197	283	480	197	283
Number of ID	24	23	24	24	23	24	24	23	24	24	23	24
Number of instruments	373	z141	235	296	112	187	373	141	235	296	112	187
Arellano-Bond test for AR(1) in first differences:												
z =	-4.03	-3.58	-3.64	-4.06	-3.61	-3.71	-4.08	-3.70	-3.68	-4.08	-3.77	-3.72
Pr > z =	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2) in first differences:												
z =	0.34	-0.18	0.54	0.36	-0.10	0.61	0.38	-0.15	0.67	0.46	-0.08	0.73
Pr > z =	(0.731)	(0.859)	(0.589)	(0.720)	(0.917)	(0.544)	(0.707)	(0.880)	(0.503)	(0.649)	(0.934)	(0.468)
Hansen test of overid. restrictions:												
	0.00	10.23	4.46	0.00	8.76	5.01	0.00	7.75	5.41	0.00	8.85	7.78
	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)

Robust standard errors in parentheses significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Convergence across 24 Indian states over the period 1980-2002 1980-1990, 1991-2002. Spatial System GMM estimates controlling for sector shares in total production. Spatial analysis considering km distance (highways).

	1980-2002			1980-1990			1991-2002		
Lag Annual Growth	-0.399	-0.406	-0.402	-0.395	-0.396	-0.4	-0.41	-0.411	-0.41
	(0.059)***	(0.060)***	(0.061)***	(0.067)***	(0.069)***	(0.074)***	(0.072)***	(0.072)***	(0.073)***
Spatial Lag Annual Growth	0.298	0.228	0.385	0.447	0.397	0.613	0.157	0.067	0.142
	(0.219)	(0.211)	(0.225)*	(0.302)	(0.296)	(0.298)**	(0.29)	(0.264)	(0.286)
ln(Y)	0.011	0.021	0.019	0.019	0.017	0.02	0.016	0.025	0.022
	(0.007)	(0.008)**	(0.008)**	(0.016)	(0.018)	(0.018)	(0.007)**	(0.008)***	(0.007)***
ln(s)	0.01	0.013	0.006	0.007	0.015	-0.001	0.012	0.013	0.008
	(0.004)**	(0.005)***	(0.004)	(0.008)	(0.008)*	(0.008)	(0.005)**	(0.006)**	(0.005)*
n + 0.05	-0.056	-0.078	-0.059	-0.046	-0.059	-0.068	-0.066	-0.076	-0.05
	(0.020)***	(0.020)***	(0.023)**	(0.05)	(0.047)	(0.043)	(0.026)**	(0.027)***	(0.029)*
lag_AGR	-0.109			-0.11			-0.079		
	(0.024)***			(0.036)***			(0.034)**		
lag_MAN		0.058			0.125			0.023	
		(0.039)			(0.054)**			(0.04)	
lag_SERV			0.071			0.071			0.072
			(0.028)**			(0.062)			(0.031)**
Constant	-0.147	-0.314	-0.303	-0.172	-0.237	-0.336	-0.209	-0.331	-0.283
	(0.059)**	(0.069)***	(0.095)***	(0.134)	(0.167)	(0.219)	(0.070)***	(0.083)***	(0.093)***
Implied β	**-0.008**	**-0.015**	**-0.014**	**-0.013**	**-0.012**	**-0.014**	**-0.011**	**-0.018**	**-0.015**
Prob > chi2	(0.009)**	(0.000)***	(0.000)***	(0.049)**	(0.118)	(0.061)*	(0.002)***	(0.000)***	(0.000)***
Observations	480	480	480	197	197	197	283	283	283
Number of ID	24	24	24	23	23	23	24	24	24
Number of instruments	361	361	361	141	141	141	223	223	223
Arellano-Bond test for AR(1) in first differences:									
z =	-4.02	-4.02	-4.01	-3.52	-3.53	-3.49	-3.53	-3.64	-3.60
Pr > z =	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2) in first differences:									
z =	0.08	0.19	0.33	-0.32	-0.32	-0.14	0.44	0.54	0.52
Pr > z =	(0.939)	(0.850)	(0.740)	(0.749)	(0.747)	(0.849)	(0.659)	(0.589)	(0.605)
Hansen test of overid. restrictions:									
chi2=	0.000	0.000	0.000	5.48	5.52	7.85	7.60	7.52	2.3
Prob > chi2	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)

Robust standard errors in parentheses *significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Convergence across 24 Indian states over the period 1980-2002 1980-1990, 1991-2002. Spatial System GMM estimates controlling for sector shares in total production. Spatial analysis considering neighbourhood effects (common borders).

	1980-2002				1980-1990			1991-2002	
Lag Annual Growth	-0.395	-0.405	-0.402	-0.376	-0.387	-0.387	-0.416	-0.42	-0.427
	(0.059)***	(0.061)***	(0.062)***	(0.064)***	(0.068)***	(0.068)***	(0.072)***	(0.074)***	(0.076)***
Spatial Lag Annual Growth	0.279	0.272	0.301	0.262	0.242	0.279	0.257	0.258	0.285
	(0.130)**	(0.131)**	(0.132)**	(0.146)*	(0.143)*	(0.145)*	(0.150)*	(0.146)*	(0.151)*
ln(Y)	0.009	0.022	0.02	0.006	0.014	0.016	0.012	0.027	0.027
	(0.006)	(0.009)**	(0.008)**	(0.014)	(0.019)	(0.018)	(0.008)	(0.009)***	(0.009)***
ln(s)	0.011	0.012	0.006	0.008	0.013	0.001	0.014	0.013	0.009
	(0.005)**	(0.005)**	(0.005)	(0.009)	(0.009)	(0.01)	(0.005)***	(0.007)*	(0.006)*
n + 0.05	-0.059	-0.066	-0.057	-0.082	-0.088	-0.08	-0.059	-0.057	-0.035
	(0.021)***	(0.019)***	(0.024)**	(0.042)*	(0.042)**	(0.044)*	(0.026)**	(0.026)**	(0.028)
lag_AGR	-0.105			-0.108			-0.097		
	(0.020)***			(0.035)***			(0.035)***		
lag_MAN		0.042			0.097			-0.008	
		(0.041)			(0.058)*			(0.044)	
lag_SERV			0.067			0.082			0.072
			(0.030)**			(0.064)			(0.038)*
Constant	-0.131	-0.29	-0.296	-0.163	-0.281	-0.325	-0.154	-0.296	-0.288
	(0.053)**	(0.070)***	(0.096)***	(0.127)	(0.174)	(0.221)	(0.075)**	(0.085)***	(0.090)***
Implied β	**-0.006**	**-0.016**	**-0.014**	**-0.004**	**-0.01**	**-0.011**	**-0.008**	**-0.019**	**-0.019**
Prob > chi2	(0.023)**	(0.000)***	(0.000)***	(0.470)	(0.878)	(0.144)	(0.008)***	(0.000)***	(0.000)***
Observations	480	480	480	197	197	197	283	283	283
Number of ID	24	24	24	23	23	23	24	24	24
Number of instruments	361	361	361	141	141	141	223	223	223
Arellano-Bond test for AR(1) in first differences:									
z =	-4.07	-4.07	-4.05	-3.67	-3.7	-3.65	-3.56	-3.68	-3.59
Pr > z =	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2) in first differences:									
z =	0.18	0.22	0.30	-0.23	-0.180	-0.17	0.48	0.65	0.50
Pr > z =	(0.880)	(0.828)	(0.762)	(0.816)	(0.857)	(0.867)	(0.631)	(0.517)	(0.619)
Hansen test of overid. restrictions:									
chi2=	0.000	0.000	0.000	4.84	10.550	6.62	8.92	8.67	2.15
Prob > chi2	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)

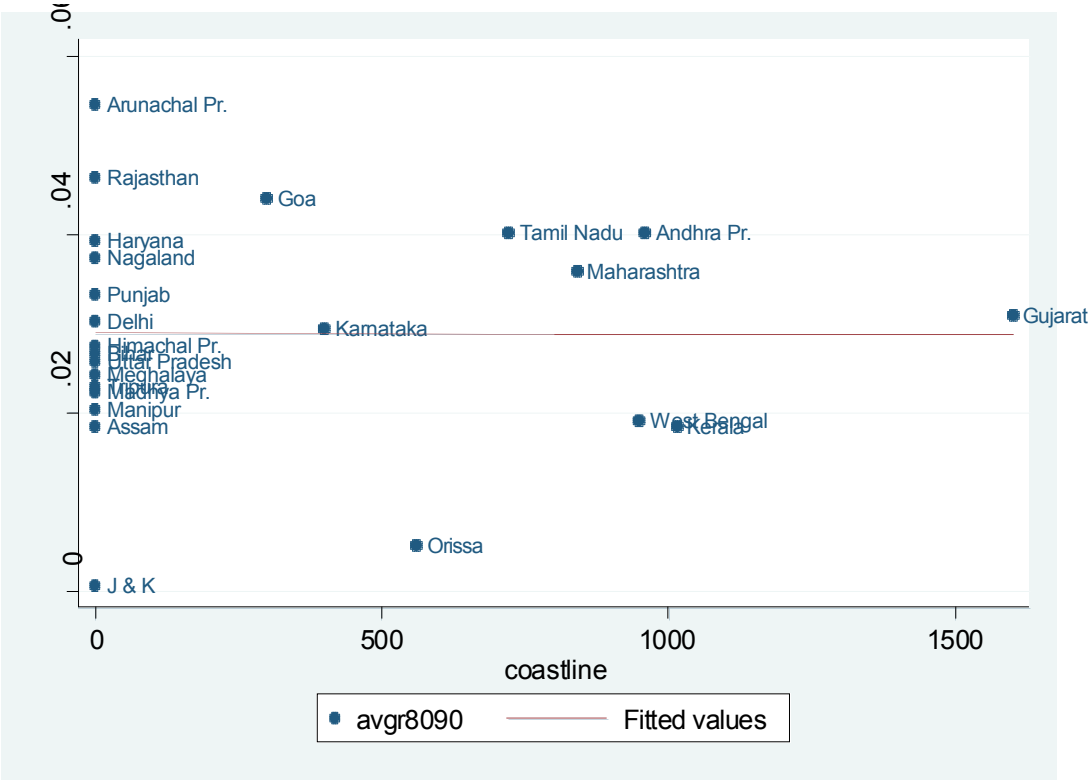
Robust standard errors in parentheses *significant at 10%; ** significant at 5%; *** significant at 1%

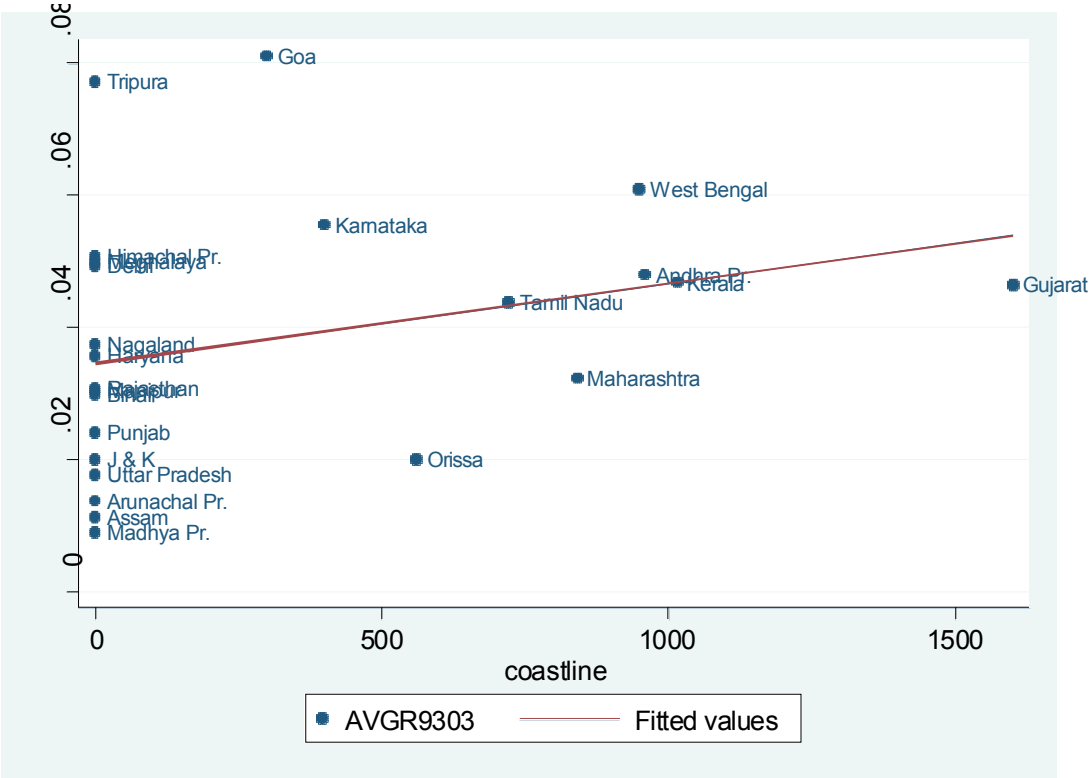
1980s), whereas they are still present and highly significant when measured in terms of the neighbourhood effects. These results tend to suggest that spatial interactions are stronger across very close states, and tend to disappear rapidly for longer distances. Furthermore, under both spatial specifications it appear that the fastest growing regions in the 1980s were those more specialized in manufacturing, whereas during the 1990s the fastest growing economies were those specialized in service activities.

When considering spatial effects for the Indian Union one has to take into account the possibility of a bias due to the presence of coastal states. Many of the largest urban centres tend to be located on the coast. In general, landlocked states have usually experienced slower paces of growth because of the difficulties in accessing the advantages of international trade (Sachs and Warner, 1997). For instance, given the high cost of domestic transport, it is often relatively easier and cheaper for coastal states to satisfy their food demand through imports rather than from purchases from the hinterland (Pingali and Khwaja, 2004). After the process of liberalization and openness to international markets started with the 1990s reforms, the gap between coastal and landlocked states could have further widened. Our spatial estimates would then capture this effect. This hypothesis is confirmed in Figure 1, which suggests an association between coastline length and economic growth during the post-reform period. Table 8 includes as a control variable the length of the coast of each state in order to check the robustness of the spatial effects. The spatial lag appears to be still present but rescaled in significance (the neighbourhood effect becomes completely insignificant during the 1990s). In accordance with what illustrated in Figure 1, our results suggest that the larger exposition to the sea has become a key factor enhancing regional growth after the reforms implemented in the 1990s.

These findings indicate that the last two decades have witnessed a constant increase in the level of divergence of income per capita among the states of the Indian Union. Moreover, the dimension of the gap separating poorer and richer areas has increased especially during the 1990s. The acceleration in the divergence rate could be attributed to the heterogeneous response of states, in terms of growth performance, to the reforms implemented since the early 1990s. In general, the strategy that was followed in the aftermath of the crisis in 1991 was aimed at achieving a broad liberalization of the economy and an increasing degree of openness to international markets through a gradual but steady cut in tariffs. Our econometric analysis indicates that the advantage acquired by those states with a larger exposure to the sea becomes crucial under this set of policies.

Figure 1. Length of the coastline and growth in the pre- and post-reform period.





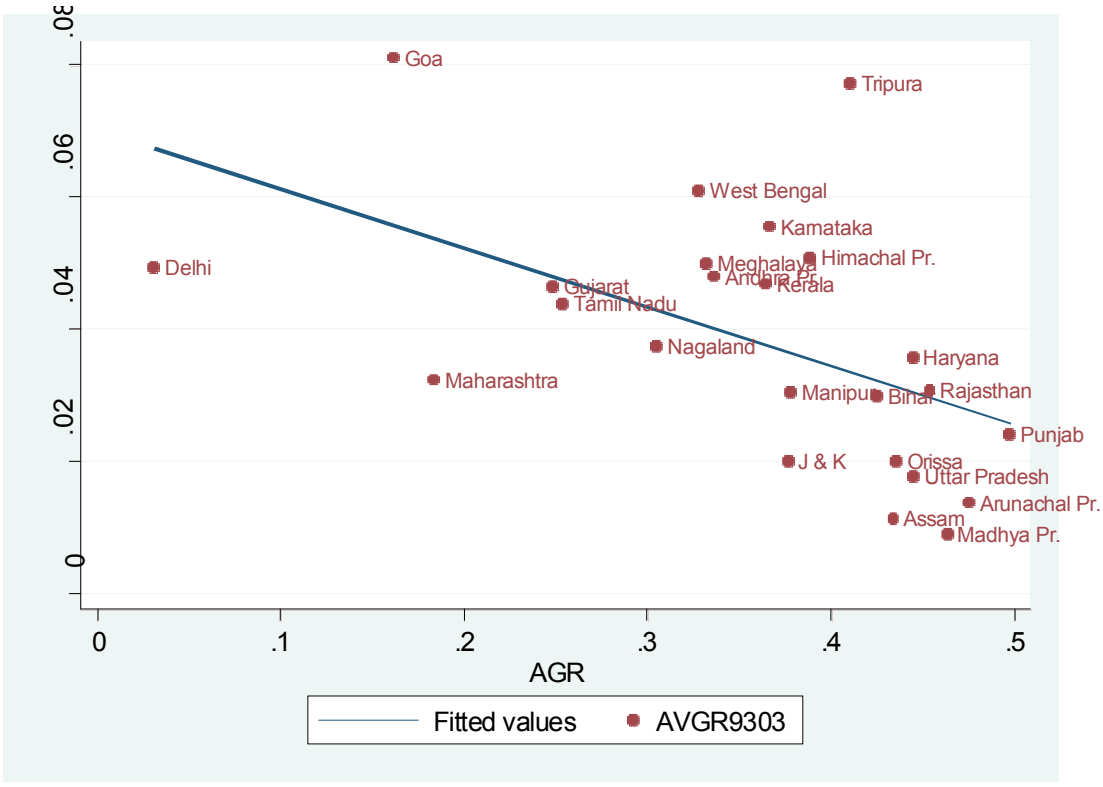
Source: CSO and *Indiastat*.

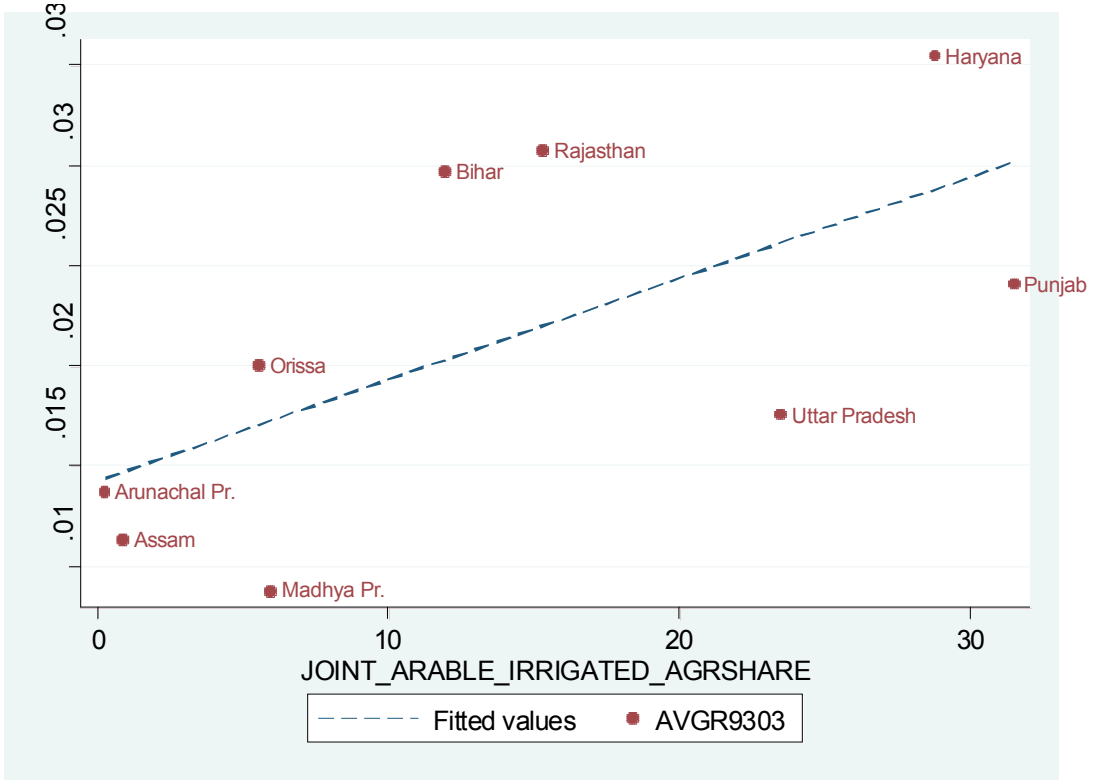
Table 8. Testing the robustness of the spatial lag making use of the regional coastline length as a control variable

	Spatial analysis considering distance (highways kilometres)			Spatial analysis considering neighbourhood (common borders)		
	1980-2004	**1980-1990**	**1991-2002**	**1980-2004**	**1980-1990**	**1991-2002**
Lag Annual Growth	-0.405	-0.381	-0.422	-0.41	-0.395	-0.419
	(0.060)***	(0.067)***	(0.074)***	(0.060)***	(0.074)***	(0.071)***
Spatial Lag Annual Growth	0.274	0.275	0.233	0.353	0.533	0.083
	(0.120)**	(0.147)*	(0.136)*	(0.200)*	(0.284)*	(0.269)
lag_log_NSDP	0.017	0.012	0.019	0.021	0.018	0.022
	(0.008)**	(0.015)	(0.009)**	(0.008)***	(0.016)	(0.008)***
ln(s)	0.016	0.015	0.015	0.015	0.016	0.014
	(0.005)***	(0.009)	(0.006)***	(0.005)***	(0.010)*	(0.005)***
n + 0.05	-0.045	-0.097	-0.029	-0.05	-0.085	-0.034
	(0.023)*	(0.040)**	(0.032)	(0.027)*	(0.038)**	(0.032)
log(coastline_length)	0.002	0.001	0.003	0.002	0.001	0.003
	(0.001)***	(0.001)	(0.001)**	(0.001)***	(0.001)	(0.001)**
Constant	-0.184	-0.271	-0.159	-0.229	-0.291	-0.193
	(0.078)**	(0.162)*	(0.114)	(0.093)**	(0.157)*	(0.112)*
Observations	480	197	283	480	197	283
Number of ID	24	23	24	24	23	24
Number of instruments	374	142	236	374	142	236
Arellano-Bond test for AR(1) in first differences:						
z =	-4.00	-3.67	-3.56	-3.95	-3.55	-3.52
Pr > z =	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2) in first differences:						
z =	0.25	-0.15	0.46	0.18	-0.17	0.34
Pr > z =	(0.805)	(0.882)	(0.645)	(0.857)	(0.867)	(0.731)
Hansen test of overid. restrictions:						
chi2=	0.000	0.000	3.21	0.18	5.53	4.36
Prob > chi2	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)

Robust standard errors in parentheses *significant at 10%; ** significant at 5%; *** significant at 1%

Figure 2. Agriculture and growth across 24 Indian States in the 1990s. The role of irrigation and arable land.





Legend: the upper graph represents the fit computed over the whole sample of 24 Indian states. The lower graph represents the sub-sample of the top nine states ranked by agriculture share. In the lower part of the graph we correct the share of the agriculture sector by the share of arable land and the share of irrigated land in order to capture the effect of reform and innovation in the sector. Source : CSO and *Indiastat*.

Particular attention deserves to be paid to the agricultural sector, which is found to play a significantly negative role over all the time spans considered. Rural areas have constantly lagged behind in terms of performance with respect to the rest of the Indian states during both decades considered in the analysis. However, within the group of rural states remarkable differences in terms of economic performance are present. In particular, those states with a large share of agriculture, together with a high percentage of arable land and an efficient system of irrigation, have generally outperformed other rural areas. Figure 2 illustrates empirically how the relationship between agricultural share and growth changes when the whole sample or, alternatively, the sub-sample including only states with a share of agriculture sector over the average is considered. States like Haryana and Punjab performed relatively well, despite their prevalent rural component in NSDP. This stylized fact is in line with the general finding that rural areas tend to be a reservoir of inefficient labour with low marginal productivity: such a context tends to be alleviated when labour can be reallocated in a newly established industrial sector or when productivity is enhanced through innovation and increased arable land. Furthermore, rural states starting with better infrastructure and human resources saw also significantly higher long-term rates of poverty reduction (Datt and Ravaillon, 1997). Punjab and Haryana have been among the most successful ones to implement innovative rural reforms through a continued expansion of farming and irrigated areas, double cropping existing farmland and use of seeds with improved genetics. The case of Uttar Pradesh is striking in this sense. This state, together with Haryana and Punjab, leads in terms of arable and irrigated land. Nonetheless, it has experienced poor performance in terms of economic growth. This could be partially explained through the fact that Uttar Pradesh, one of the states with the highest rate of poverty, also has the highest population density. The relative improvement in rural techniques may have been insufficient to offset a Malthusian dynamics, with population growing faster than food resources.

2.5 Conclusions

During the last two decades the states of the Indian Union experienced a continuous divergence in terms of their NSDP per capita. The main novel aspects of the analysis in this paper are the attention to the spatial aspects of the performance of Indian states and the attempt to capture the role played by the economic performance of the neighbouring states.

Based on a rigorous econometric and economic analysis we showed that the System GMM is the most appropriate estimator to conduct a study on the determinants of

convergence/divergence across Indian states. The System GMM is also suitable for the inclusion of a spatial lag. Our findings are in line with the statistical evidence for an overestimation of the convergence rate when omitting the spatial lag. We have then moved to the close examination of the presence of the positive and significant spatial connotation in the growth pattern of Indian states. We have shown that sectoral specialization is partly responsible for the spatial effects, which are indeed rescaled in magnitude and significance. The divergence has mainly been driven by the economic backwardness of rural areas, with the exception of those states which have performed relatively better due to more in-depth innovation during the Green Revolution and to the wider availability of arable land.

When controlling both for spatial effects and sector shares, we show how the pace of divergence has on average experienced an acceleration during the 1990s, after the process of reform started with the 1991 economic recession. The process of liberalization and increased openness to international markets has imparted a further geographical connotation to the process of convergence/divergence across Indian states. Clear disparities emerge between landlocked states and states having access to the sea, possibly due to a comparative advantage of the latter in increasing their volume of trade in the post-reform period. This hypothesis has been directly tested and confirmed econometrically by including the state length of the coast.

The last two decades have seen winners and losers among the states of the Union. Winners were those states that benefited the most from the recent process of reform and liberalization, thanks also to their geographical advantage and to the presence of a developed service sector. Losers were instead the landlocked and highly populated states with a predominant agricultural sector and a low level of innovation. In some of these rural states where these problems assume a heavier dimension (like Uttar Pradesh), the pressure on resources culminates in high rates of poverty. Historically, the growth pattern in India has been very uneven. In the more recent period, the imbalances in the growth process have become more severe. It would appear that there has been no trickle-down of economic growth from the fastest growing states to the poorer states. At a time when India is poised to become a leading economic superpower, it is crucial that these imbalances are corrected, so that there are no losers from India's success story.

Data Appendix

This paper considers 24 states of the Indian Union: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and the Union Territory of Delhi. The inclusion in the analysis of small and north-eastern states like Goa or Manipur and the Union Territory of Delhi, generally not considered in convergence studies, is mainly justified by the use of the Spatial Model. Mizoram and Sikkim are excluded from the sample due the lack of data, while Jharkhand, Chhattisgarh and Uttaranchal, created out respectively of Bihar, Madhya Pradesh and Uttar Pradesh, are considered parts of the original states for the years after the separation in 2000. Data on Nagaland and Tripura are available till 2002 and 2003 respectively.

The source of the data is the Central Statistical Organisation (CSO) for income and sectors while the Reserve Bank of India (RBI) provides data on capital expenditure. Net State Domestic Product (NSDP) series is at factor cost and is based on 1980 constant prices. According to CSO, NSDP is divided into: Agriculture, which includes Forestry and logging, Fishing and Mining and quarrying; Manufacturing, subdivided into Registered, Unregistered, Construction and Electricity, gas and water supply; Services, ramified into Transport, storage and communication, Trade, hotels and restaurants, Banking and insurance, Real estate, ownership of dwelling and business services, Public administration and Other services. Capital expenditure is weighted by the NSDP and deflated by the state's inflation rate.

References

Adabar, K. (2003), "Economic Growth and Convergence in India", ISEC, Institute for Social and Economic Change, Bangalore.

Ahluwalia, M. (2000), "Economic Performance of States in Post-Reforms Period", *Economic and Political Weekly,* Vol. 29, No. 10, pp. 1637-1648.

Ahluwalia, M. (2002*a*), "Economic Reforms in India Since 1991: Has Gradualism Worked?", *Journal of Economic Perspectives,* Vol. 16, No. 3, pp. 67-88.

Ahluwalia, M. (2002*b*), "State-Level Performance Under Economic Reforms", in Anne O. Krueger (ed.), *Economic Policy Reforms and the Indian Economy*, University of Chicago Press.

Alessandrini, M., B. Fattouh and P. Scaramozzino (2007), "The Changing Pattern of Foreign Trade Specialization in Indian Manufacturing", *Oxford Review of Economic Policy*, Vol. 23, No. 2, pp. 270-291.

Anselin, L. (1988), *Spatial Econometrics: Methods and Models*, Kluwer Academic Publishers, Dordrecht.

Arbia, G. (2006), *Spatial Econometrics. Statistical Foundations and Applications to Convergence*, Springer.

Arbia, G., R. Basile, and G. Piras (2005),"Using Spatial Panel Data in Modelling Regional Growth and Convergence", Working Paper No. 55, ISAE.

Arellano, M., and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, Vol. 58, No. 2, pp. 277-297.

Bandyopadhyay, S. (2003), "Convergence Club Empirics: Some Dynamics and Explanations of Unequal Growth Across Indian States", LSE STICERD Research Paper No. 69, London School of Economics and Political Science.

Bandyopadhyay, S. (2006), "Rich States, Poor States: Convergence and Polarisation in India", Department of Economics, University of Oxford, Discussion Paper No. 266.

Barro, R. J., (1984), *Macroeconomics*, 1st edition, Wiley, NewYork.

Barro, R. J., X. Sala-I-Martin, O. J. Blanchard and R. E. Hall (1991), "Convergence Across States and Regions", *Brookings Papers on Economic Activity*, Vol. 22, No. 1. pp. 107-182.

Barro, R. J., and X. Sala-i-Martin (2003), *Economic Growth*, 2nd ed., MIT Press, Cambridge (Mass.).

Basu, K., and A. Maertens (2007), "The Pattern and Causes of Economic Growth in India", *Oxford Review of Economic Policy*, Vol. 23, No. 2, pp. 143-167.

Baumol, W. J. (1986), "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show", *American Economic Review*, Vol. 76, No. 5, pp. 1072-1085.

Besley T., and R. Burgess (2000), "Land Reform, Poverty Reduction and Growth: Evidence from India", *The Quarterly Journal of Economics*, Vol. 115, No.2, pp 389-340.

Bhattacharya B.B., and S. Sakthivel (2004), "Regional Growth and Disparity in India: Comparison of Pre- and Post Reform Decades", *Economic and Political Weekly*, Vol. 39, No. 10, pp. 1071–1077.

Bhide, S., R.Chadha, and K.Kalirajan (2005), "Growth Interdependence Among Indian States: an Exploration", *Asia-Pacific Development Journal*, Vol.12, No.2, pp. 59-80.

Blundell, R.W., and S.R. Bond (1998), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, 87, 115-143.

Blundell, R.W., and S.R. Bond (2000), "GMM Estimation with Persistent Panel Data: An Application to Production Functions", *Econometric Reviews*, Vol. 19, No. 3, pp. 321–340.

Bond S., A. Hoeffler, and J. Temple (2001), "GMM Estimation of Empirical Growth Models", Economic Papers 2001-W21, Economics Group, Nuffield College, University of Oxford.

Buccellato, T. (2007), "Convergence across Russian Regions: A Spatial Econometrics Approach", Centre for Financial and Management Studies, SOAS, University of London, CeFiMS Discussion Paper No. 70.

Caselli F., G. Esquivel, and F. Lefort (1996), "Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics", *Journal of Economic Growth*, Vol. 1, No. 3, pp. 363-389.

Cashin P., and R. Sahay (1996), "Regional Economic Growth and Convergence in India", *Finance and Development*, Vol. 33, No 1, pp. 49-52.

Chari, A.V. (2007), "License Reform in India: Theory and Evidence", Yale University, mimeographed.

Chauvin, S., and F. Lemoine (2003) "India Bets on Technology Niches", Centre d'Etudes Prospectives et d'Informations Internationales, Working Paper No. 221.

D'Costa, A.P. (2003), "Uneven and Combined Development: Understanding India's Software Exports", *World Development*, Volume 31, No. 1, pp. 211-226.

Das, T. K. (2002), "Convergence across Indian States: Cross-Sectional and Panel Estimations", *South Asia Economic Journal*, Vol.3, No.2, pp.227-239.

Dasgupta, S, and A. Singh (2005), "Will Services Be the New Engine of Economic Growth in India?", Center for Business Research, Working Paper No.310, University of Cambridge.

Datt, G., and M. Ravallion (1997), "Why Have Some Indian States Performed Better Than Others at Reducing Rural Poverty?", International Food Policy Research Institute, FCND Discussion Paper No. 26, Washington.

Datt, G., and M. Ravallion (2002), "Is India's Economic Growth Leaving the Poor Behind?", *The Journal of Economic Perspectives*, Vol. 16, No. 3., pp. 89-108.

De Long, B. J. (2003), "India since Independence: An Analytic Growth Narrative", in D. Rodrik (ed.), *In Search of Prosperity: Analytic Narratives on Economic Growth*, Princeton, NJ, Princeton University Press.

Edmonds, V., N. Pavcnik and P. Topalova (2007), "Trade Adjustment and Human Capital Investments: Evidence from Indian Reform", IMF Working Paper, WP/07/94.

Gang, I.N., K. Sen, and M. Yun (2002), "Caste, Ethnicity and Poverty in Rural India", Departemental Working Papers 200225, Rutgers University, Department of Economics.

Ghatak, M. and S. Roy (2007), "Land Reform and Agricultural productivity in India: a Review of the Evidence", *Oxford Review of Economic Policy*, Vol. 23, Issue 2, pp. 251-269.

Islam, N. (1995), "Growth Empirics: A Panel Data Approach", *The Quarterly Journal of Economics*, Vol. 110, No. 4, pp. 1127-1170.

Knight, M., N.Loayza and D. Villanueva (1993), "Testing the Neoclassical Growth Model", *IMF Staff Papers*, Vol. 40, No. 3, pp. 512-541.

Kochhar, K., U. Kumar, R. Rajan, A. Subramanian and I. Tokatlidis (2006), "India's Pattern of Development: What Happened, What Follows?", IMF Working Paper, WP/06/22.

Kohli, A. (2006*a*), 'Politics of Economic Growth in India, 1980–2005. Part I: The 1980s', *Economic and Political Weekly*, Vol. 41, No. 13, pp. 1251–1259.

Kohli, A. (2006*b*), 'Politics of Economic Growth in India, 1980–2005. Part II: The 1990s and Beyond', *Economic and Political Weekly*, Vol. 41, No.14, pp. 1361–1370.

Land Research Action Network (2003), "Land Reform in India – Issues and Challenges, Part I and II", LRAN, January.

Le Gallo, J., C. Ertur, and C. Baoumont (2003), "A Spatial Econometric Analysis of Convergence across European Regions, 1980-1995", in Fingleton, B (ed.), *European Regional Growth*, Springer-Verlag (Advances in Spatial Sciences), Berlin.

Le Sage, J. P. (1998); "Spatial Econometrics", Department of Economics University of Toledo, mimeographed.

Mearns, R. (1999), "Access to Land in Rural India", World Bank Policy Research Working Paper No. 2123.

Mehta, A.K., and A. Shah (2003), "Chronic Poverty in India: Incidence, Causes and Policies", *World Development*, Vol. 31, No. 3, pp. 491-511.

Mutl, J. (2006), "Dynamic Panel Data Models With Spatially Correlated Disturbances", Dissertation submitted to the Faculty of the Graduate School of the University of Maryland, College Park in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

Nagaraj, R., A. Varoudakis and M.A. Véganzonès (2000), "Long-Run Growth Trends and Convergence Across Indian States", *Journal of International Development,* Vol. 12, No. 1, pp. 45-70.

Nair, K.R.G. (2004), "Economic Reforms and Regional Disparities in Economic and Social Development in India", Centre for Policy Research, Report of a Research Project funded by the SER Division of the Planning Commission of the Government of India.

Panagariya, A. (2004), "India in the 1980s and 1990s: A Triumph of Reforms", IMF Working Paper, WP/04/43.

Pingali, P., and Y. Khwaja (2004), "Globalisation of Indian Diets and the Transformation of Food Supply Systems", FAO, ESA Working Paper No. 04-05.

Purfield, C. (2006), "Mind the Gap—Is Economic Growth in India Leaving Some States Behind?", IMF Working Paper, WP/06/103.

Quah, D. (1993), "Empirical Cross-Section Dynamics in Economic Growth", *European Economic Review*, Vol. 37, No. 2-3, pp. 426-434.

Quah, D. (1996), "Twin Peaks: Growth and Convergence in Models of Distribution Dynamics", *Economic Journal*, Vol. 106, No. 437, pp. 1045-1055.

Quah, D. (1997), "Empirics for Growth and Distribution: Stratification, Polarization and Convergence Clubs", *Journal of Economic Growth*, Vol. 2, No. 1, pp. 27-59.

Rao, M.G., and N.Singh (2006), "The Political Economy of India's Federal System and its Reform", *Publius The Journal of Federalism*, Oxford Journals, Vol.37, No. 1, pp. 26-44.

Rodrik, D., and A. Subramanian (2004), "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition", NBER Working Paper No. 10376, March.

Sachs, D.J., and A.M. Warner (1997), "Fundamental Sources of Long Run Growth", *American Economic Review*, Vol. 87, No. 2, pp. 184-188.

Sachs, J. D., N. Bajpai, and A. Ramiah (2002), "Understanding Regional Economic Growth in India", *Asian Economic Papers*, Vol. 1, No. 3, pp. 32-62.

Solow, R. (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, Vol. 70, No. 1, pp. 65-94.

Swan, T. (1956), "Economic Growth and Capital Accumulation", *Economic Record*, Vol. 32, pp. 334-361.

Topalova, P. (2004), "Trade Liberalization and Firm Productivity: The Case of India", IMF Working Paper, WP/04/28.

Chapter 3

Jobless Growth in Indian Manufacturing: A Kaldorian Approach

3. 1 Introduction

The centrality of the role of employment in transferring the benefits of growth to the poor relies on the fact that labour is about the only resource in which the poor are relatively abundant (Khan 2007). The magnitude of the benefits of growth to the poor, therefore, largely depends on the nature and extent of employment that growth itself generates. However, the relationship between economic growth and employment is not automatic and predetermined and not all growth is equally employment intensive. The recent experience of some of the fastest growing Asian countries testifies that the employment intensity of growth, i.e. the rate at which employment grows when output increases, can not only be low but also decline over time despite a positive growth rate of the economy. In the case of India, the incredible growth performance in the last two and a half decades has rapidly modified the economic structure of the country, but without the expected transformations in terms of occupation. Although the strategy of "gradualism" (Ahluwalia 2002; Williamson and Zagha 2002), in less than twenty-five years, has transformed a closed, rural and centralized country into a market-oriented economy with more than half of GDP coming from services, the majority of Indians live in rural areas and/or are employed in informal activities.

The causes of inadequate employment growth and transformation in India are several. First, the nature of the transition form an inward-looking, regulation-based, import substitution economy to one based on competition and international integration could have entailed restructuring and job losses in inefficient enterprises and sectors and the reallocation of workers to new export-oriented industries (ILO 2005 and 2009). A second source is a sharp sudden shift away from labour intensive economic activities towards capital intensive ones. Even if India, for instance, has attained a strong comparative advantage in the highly skill-intensive information technology industry (IT) through its past policy of promoting higher technical education, the IT sector employs only 1.5 out of 500 million workers. Furthermore India lacks an effective diffusion of IT in all areas of the economy as well as incentives for education in order to upgrade manufacturing and agriculture where the bulk of the labour force is located (Dasgupta and Singh 2005). Third, inappropriate labour market

regulations affect labour costs and the adequate labour transfers. Indian labour laws are numerous, complex and even ambiguous and this could have promoted litigation rather than resolution of problems related to industrial relations (Sharma 2006). Finally, the wage elasticity has negatively affected the registered sector labour market, although the consideration of worked hours growth could reduce the effect of the rise in real wages (see the debate between World Bank 1989 and Bhalotra 1998).

This paper explores the evolution of the labour demand in Indian organized manufacturing by introducing the Kaldorian idea of the intersectoral linkages between agriculture and manufacturing among the possible economic explanations of jobless growth. On the one hand, we concentrate our attention on organized industry in order to investigate whether the sustained path of growth of Indian economy has positively affected the demand of those workers who receive higher wages, formal contracts and benefits in a sector, manufacturing, considered by Kaldor as the engine of growth. On the other hand, we want to study the role of effective demand coming from agriculture, the sector where most of Indians live and work, in influencing and sustaining industrial production and therefore labour demand. In the Kaldorian theory, in fact, manufacturing growth, and thus industrial employment, depend on the purchasing power of agriculture not only at the early stages of industrialization, but also in the long-run, through demand linkages for simple consumer goods and manufactured inputs. Since a strong productivity growth could generate job losses when aggregate demand is insufficient, a decline in rural purchasing power could contribute substantially to weaken industrial expansion and reduce employment.

Even if the Green Revolution virtually eliminated famine in India in the late 1970s, there are strong signals that economic conditions in rural areas have not improved at the same pace as the rest of the economy and that the transfer of labour from low- to high-productivity sectors has been incomplete. First, despite the official poverty rate having steadily decreased over time from 51.3 percent in 1978 to 27.5 percent in 2005[17] (NSSO 2007*a*), 75 percent of the poor are in rural areas, with most of them being daily wagers, self-employed householders and landless labourers. Furthermore, statistics on food (NSSO 2007*b*) indicate a reduction in per-capita food availability: the consumption of food grains, for example, felt from 473 grams per day in 1990 to 422 grams in 2005. Consequently, per capita output of cereals (wheat and rice) at present is more or less at the level that prevailed in the 1970s. Second, numerous researches demonstrated that the growth pattern of India has widened the gap between rich

[17] However, a 2007 report by the National Commission for Enterprises in the Unorganized Sector found that 77 percent of Indians, or 836 million people, lived on less than 20 rupees per day (0.5 $), with most working in "informal labour sector with no job or social security, living in abject poverty" (NCEUS 2007).

and poor states in terms of per capita income (Ahulalia 2000; Bhattacharya and Sakthivel 2004; Purfield 2006; Kochhar *et al.* 2006) and that economic backwardness persists in landlocked states with a predominant agricultural sector (Alessandrini, Buccellato and Scaramozzino 2008). Third, the evidence that the number of people living in slums in India has more than doubled in the past two decades[18] suggests that only a minority of the millions of farmers that have migrated from the countryside succeeded in earning the relatively high wages of manual labourers in India's cities (Mitra 2006; Mitra and Murayama 2008).

We make use of the intersectoral terms of trade as a measure of the linkages between agriculture and manufacturing. Due to the lack of data especially at regional level, this represents the clearest way to evaluate the purchasing power of agriculture relatively to manufacturing, or the effective demand for industrial goods coming form agriculture. The analysis of the effects of the intersectoral terms of trade on the Indian economy has been the object of a long debate (see Deb 2002 for an accurate review) and their effect on industrial growth, or industrial consumption goods, has been found negative (Rangarajan 1982; Ahluwalia and Rangarajan 1989; Mathur, 1990). However, most of these studies are based on years before the early 1980s and do not take into account the long period of sustained growth of the economy. Furthermore the Kaldorian models proposed by Thirlwall (1986) and Rada (2007) and the considerations by Grabowski and Yoon (1984) on monsoon economies indicate that the relation between the intersectoral terms of trade and industrial production, and thus industrial employment, is still not well established (see also Rattso and Torvik 2003).

We therefore test this hypothesis by including the ratio between agricultural prices and manufacturing prices among the explanatory variables of a dynamic labour demand equation. We then construct a panel dataset comprising the fifteen largest Indian states covering the period from 1980 to 2004. Applying a System-GMM procedure, our estimates confirm the positive economic relation between rising purchasing power in agriculture and labour demand growth in organized manufacturing: that is, states where the gap between agriculture prices and manufacturing prices has widened have significantly experienced a rise in manufacturing employment. Furthermore, the expansion of unregistered manufacturing exacerbates the jobless growth problem and reduces the response of formal employment to output growth.

The paper has the following structure. Section 2 describes the theoretical framework by considering the key features of the Kaldorian theory and introducing a simple model in

[18] India's slum-dwelling population had risen from 27.9 million in 1981 to 61.8 million in 2001 (NSSO 2003). The expansion is partly due to the rise in India's total population, which increased from 683 million in 1981 to 1.03 billion in 2001.

line with the hypothesis of a positive relation between effective demand and employment. Section 3 looks at the characteristics of the Indian labour market, with particular regard to the evolution of informal employment. Section 4 explores the analytical framework, the data and the System-GMM method. Section 5 draws the main considerations on results. Section 6 concludes.

3.2 The Kaldorian framework

The theory

In 1967, in a series of lectures about the strategic factors in economic development, Nicholas Kaldor wrote that "economic growth which involves the use of modern technology and which eventuates in high real income per capita, is inconceivable without industrialization" (Kaldor, 1967, p.54). This causal relationship is considered by the author as the unique road to economic development. Even if the debate on how economic growth can be translated into a development process is still open (Bolton 1997; Iscan 2004; Sala-i-Martin 2006; Basu and Mallick 2008), there is evidence that industrialization is a fundamental condition in order to achieve and sustain high rates of growth of the economy in the long run (Echevarria 1997).

Kaldor elaborated his concept in the three famous "laws" (Targetti 2005). The first law, called "the engine of growth hypothesis", asserts that the faster the rate of growth of manufacturing output, the faster the rate of growth of GDP. It follows that a greater excess of growth of industrial sector relative to GDP, that is when the share of secondary sector over GDP rises, will induce a faster growth of the economy as a whole. The transmission channels of this mechanism are formalized in the next laws. The second one, in fact, known as "Kaldor-Verdoorn law", suggests the existence of increasing returns to scale in manufacturing (Pieper 2003). The original relationship between output growth and labour productivity growth in manufacturing, as stated by Verdoorn (1949), is reversed in the Kaldorian theory: the growth rate of labour productivity is linear in output growth in the industrial sector. The Verdoorn's coefficient is determined by the effect of dynamic increasing returns, technical progress embodied in capital accumulation and the extent of the investment response to the growth of output, all of which are related positively to the degree of increasing returns to scale. This circular process becomes significant in sustaining economic growth in the long run. Finally, the third law states that the growth of productivity of an economy as a whole is positively related with the growth of output in the manufacturing sector through the labour reallocation to the manufacturing sector from the other sectors. This last law is based on the

argument that the non-industrial sectors have diminishing returns to scale: as labourers move out of the other sectors, characterized by "disguised unemployment" as in the case of agriculture, the average productivity of the remainder of the labour force will increase. The productivity of manufacturing, instead, will increase as it absorbs more labour to produce more of goods according to the Kaldor-Verdoorn law.

However, the fundamental question is to understand the determinants of the growth of industrial output. Kaldor identified the answer in the interactions between manufacturing and agriculture, which play a key role especially during the early stages of the development process of an economy. In particular, the growth of the secondary sector is dependent on the growth of the agricultural surplus that is the excess of food production over food consumption of the agricultural labourers. The agricultural surplus over self-consumption, considered by Kaldor as "the best available indicator of the development potential of an economy" (1967, p. 56), acts in a twofold way. First, if the demand for agricultural products increases after a raise in urban-industrial production and the agricultural supply is held constant, sooner or later, there will be inflation. Second, the growth of the agricultural surplus represents an essential condition for providing the growth of the purchasing power necessary for sustaining industrial expansion. In an economy at the early stages of its economic development, the largest part of the demand for manufacturing products comes from agriculture: the growth of industrial production is therefore primarily governed by the growth of effective demand. In agriculture, instead, the response to outside demand fluctuations plays a much smaller role. Agricultural production and productivity in the Kaldorian theory are mainly dependent on land-saving innovations, which include not only technical progress, but also the "social framework" of the sector incorporating the whole network of institutions through land reforms and the degree of education of rural population.

Under this set of economic relations, the initial impulse to industrialization has two main causes. First, it derives from the exports of agriculture and mining products that can be channelled to import the means – capital and technologies - for developing local industries. Second, it finds support on the adoption of protectionist policies: trade tariffs are effective for creating an internal demand for local industrial products, which substitute for manufacturing imports. However, the import-substitution policy through high barriers to international trade works till the local production satisfies the inner demand. From this point onwards, in order to prevent inflation and deficit in the trade balance, the growth of manufacturing should emerge from the exports of manufactured products, indicated as the fourth law or Thirlwall's law (see Targetti 2005) and/or from the development of the purchasing power of agriculture. To some

extent, the growth of domestic industry is governed by agricultural surplus also in the long run.

The model

Following the Kaldorian argument, Thirlwall (1986) developed a general two-sectors model of growth and development in which the economic equilibrium is founded on the balanced complementarity between industry and agriculture. Extending the basic model discussed informally by Kaldor (1975 and 1979) also considering the case of an economy opened to trade, Thirlwall stresses the role of agriculture growth as the driving force in the early stages of development in an individual country, which starts as a closed economy and then opens to trade. The total amount of industrial goods produced by the agricultural sector is exchanged for the agricultural surplus deflated by the industrial terms of trade (as the price of steel in terms of corn). Agricultural surplus may be used to purchase either investment or consumption goods from industry, while agricultural output is a function of the product of the investment ratio and the productivity of investment in agriculture. As a result, increases in agricultural output are also responsible for the growth of purchasing power, or demand, over industrial goods. Furthermore, while a rise in the industrial terms of trade reduces agricultural production growth (the industrial demand), the non-linear relation between the industrial terms of trade and the growth of industrial production (the industrial supply) is positive. Industrial production depends on the productivity of the investment in the sector and is indifferent to the workers' consumption preferences between food and industrial goods. In equilibrium, the growth rate of the economy is faster, the higher is the productivity of investment in both sectors, the higher is the agricultural savings ratio and the lower are industrial wage costs per unit of output. However, the stability of the model out of the equilibrium mainly relies on the coefficient of adjustment of the terms of trade to divergences between industrial demand growth and industrial supply growth. The behaviour of food dealers and merchants becomes therefore crucial: stability is guaranteed if they behave in such a way that the terms of trade adjust smoothly to the new equilibrium level. Low (relative) prices for agricultural goods constrain growth if the implied terms of trade reflect an excess supply of industrial goods due to the low purchasing power of agricultural sector to buy them. As a counterpart, a low price of steel positively affects the demand growth for industrial goods and is necessary for a higher rate of industrial growth.

The importance of intersectoral dynamics for growth as well as the interactions between sectors and the overall economy emerge also from the two-sector economy model

developed by Rada (2007). The modern sector, which produces tradable goods, is governed by the Kaldor-Verdoorn law and labour productivity is therefore endogenous, that is, determined from a demand-side perspective. Higher investment leads to an increase in the growth rate of output and, consequently, labour productivity. If output grows faster than labour productivity in the modern sector, there will be an expansion in employment. A transfer of labour from low-productivity subsistence sector to high-productivity modern sector has a positive impact on growth through a more productive use of labourers and via the effective demand. The speed at which the modern sector could continue to expand depends on the adjustment variable, indicated in the price of non-tradable goods. A higher price for the non-tradable goods raises the wage in the subsistence sector contributing to a higher demand for the tradable goods coming from the subsistence sector, but it weakens the demand coming from the modern sector itself. The contribution of a rise in the price of non-tradable goods on the growth of the modern sector, hence, is determined by the strength of the Engel effects (Clements and Selvanathan 1994; Foellmi and Zweimuller 2008). In a developing country still characterized by large disguised and underutilized labour force, the Engel effects are weak, and a lower demand from the modern sector is larger than the contribution to demand by the subsistence sector. Furthermore, if the decrease of industrial wages in terms of food price is significant, industrial labourers can be forced to return to agricultural work, causing a decline of labour supply to industry.

However, the classical hypothesis that a decrease in the industrial real wage in terms of agricultural goods is associated with a fall in industry labour supply does not seem to work in a monsoon agriculture context (see Grabowski and Yoon 1984). Many Asian countries are characterized by high variability in agriculture production due to the seasonality of the rainfalls. As noted by Oshima (1981), labour in monsoon agriculture is surplus only in a seasonal sense. If agricultural labour demand is highly seasonal, therefore, the deterioration of the terms of trade after a rise in food prices will not lead to a reallocation of workers from industry to agriculture whenever there are no additional jobs in the latter sector during the slack season. As a consequence, if the income level of industrial workers is close to subsistence, the rise in agricultural prices will force them to increase their (short-run) labour supply in order to maintain their standard of living[19]. Thus, unless the deterioration of the terms of trade reaches some critical level such that the ability of labourers to continue to work worsens, the supply of labour to industry will not decline.

[19] The increase in labour supply may occur through individual workers working longer hours or secondary workers in their families deciding to join the labour force.

Finally, it has to be noted that s strong tendency towards jobless growth can be accompanied by a high and increasing informal-sector employment. Individuals coming from agriculture who fail to find employment in the manufacturing formal sector can only find jobs in the informal activities. Even if the informal sector could offers rural migrants a better source of livelihood compared to rural conditions (Mitra 2006), the economy is constrained to a less efficient "dual" equilibrium (see Proto 2007). Tenurial contracts affect wealth accumulation (surplus) in the agrarian sector, which, in turn, determines the level of human capital investment of individuals migrating to the urban sector. The opportunity to migrate and find job in the formal activities depends on land rental price, which influences the competition of poor individuals for scarce land. If the income from such contracts is sufficiently high so that individuals can invest in education and find work in the formal manufacturing sector, the economy will tend to a modern equilibrium, characterized by the presence of a large manufacturing sector.

Summarizing, the theoretical implications discussed above can be formalized in the following simple Thrilwall-Kaldorian model. We start with the Kaldor-Verdoorn, which describes the positive relation between output growth (q) and labour productivity growth (pr) in the manufacturing sector (m):

(1) $$pr_m = \alpha_0 + \alpha_1 q_m$$

As productivity growth can be interpreted as the difference between manufacturing output growth and manufacturing employment growth, equation (1) can be rewritten in terms of employment:

(2) $$e_m = \beta_0 + \beta_1 q_m \text{, with } \beta_0 = -\alpha_0 \text{ and } \beta_1 = 1 - \alpha_1$$

The surplus in agriculture - the food left over after demand from peasants has been satisfied - can be used for the purchase of manufacturing goods. The total amount of manufacturing goods obtained by agriculture can be defined as:

(3) $$\frac{S_a}{P} = I_{ma}$$

where P represents the manufacturing terms of trade as the ratio between manufacturing prices and agricultural prices ($P=Pm/Pa$); S_a is the level of surplus in agriculture; I_{ma} is the amount of manufacturing goods, both investment and consumption goods, obtained by agriculture in exchange for its surplus. In manufacturing, instead, nominal wages can be used for the purchase of manufacturing goods (C_{mm}) or agricultural goods (C_{am}):

(4) $$WE_m = P_m C_{mm} + P_a C_{am}$$

By multiplying WE_m for $\frac{Q_m}{Q_m}$ and dividing both terms of equation (4) by P_m, we obtain:

(5) $$\kappa Q_m = C_{mm} + \frac{C_{am}}{P}$$

where $\kappa = \overline{W} l$ represents the wage bill per unit of manufacturing output, $\overline{W}$ the real wage, l the labour input per unit of manufacturing output and P the manufacturing terms of trade. If the agricultural surplus exchanged for industrial goods satisfies the demand for food coming from manufacturing ($S_a = C_{am}$), by assuming C_{mm} equal to 0 for simplicity, it follows that:

6) $$\kappa Q_m = \frac{S_a}{P}$$

or

(7) $$Q_m = \frac{S_a / P}{\kappa}$$

Equation (7) says that manufacturing output can be expressed as the product of the propensity to export manufacturing goods to agriculture $1/\kappa$ (the Harrod trade multiplier) and the agricultural surplus deflated by the manufacturing terms of trade (see Thrilwall 1982 and 1986). It follows that manufacturing output growth is positively related to increases in agricultural surplus and to improvements in the propensity to export to agriculture but is negatively related to the growth of the manufacturing terms of trade that reduces the demand for manufacturing goods coming from agriculture. By assuming $1/\kappa$ constant, in terms of growth, equation (7) becomes:

(8) $$q_m = s_a - p$$

By putting equation (8) into (2) we obtain an inverse relation between the employment growth in manufacturing and the growth of manufacturing prices with respect to agricultural prices:

(9) $$e_m = \gamma_o + \gamma_1(s_a - p)$$

where $\gamma_0 = \beta_0$ and $\gamma_1 = \beta_1$.

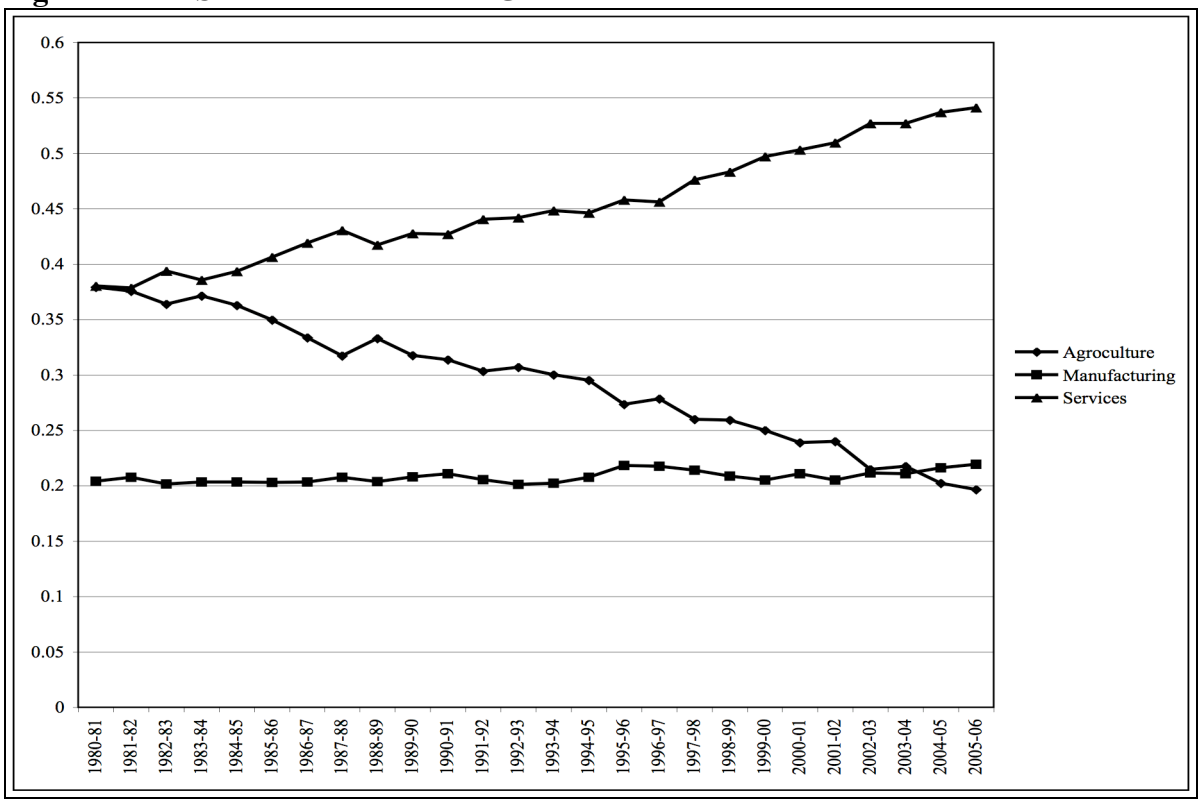
If the terms of trade are a valid measure of the intersectoral economic linkages, the dynamics between manufacturing prices and agricultural prices represent the movements in agriculture surplus, and therefore, in the purchasing power or agricultural demand over industrial production. In a jobless growth scenario, employment in manufacturing depends indirectly on the effective demand over industrial production and so on agriculture surplus. Furthermore, a higher purchasing power in agriculture raises the probability of agricultural labourers to migrate and find jobs in the (formal) manufacturing sector and leaves the industrial labour supply constant.

3. 3 Labour market in India

The Indian pattern of economic growth can be traced back to the first half of the 1980s, when the government of Indira Gandhi started to look at economic growth as the state's main goal (Kohli 2006*a*). The new strategy was implemented through a series of reforms aimed at increasing firms' productivity, by reducing the role of the central state on economy and by protecting them from foreign competition. Under this set of economic policy, the manufacturing sector recorded a growth rate of 5.7 percent per year during the decade and played the role of engine of economic growth till the financial crisis in 1991 (Rodrk and Subramanian 2004). The following decade, when India opened its economy to international competition through a liberalization process that definitely transformed the country into a market-oriented economy (Kohli 2006*b*), manufacturing maintained the pace of growth of the previous decade and jumped to an average of 7.8 percent at the beginning of the new millennium.

However, despite such performance, the weight of industry on Indian GDP has experienced very few changes (Figure 1). In 1980 the share of manufacturing was 20.4 percent, it increased to 21.1 percent in 1990 but then remained fairly stable till 2000.

Figure 1. Sector evolution over GDP



Source: CSO

The decrease registered by agriculture associated with the growth process has been absorbed by the incredible growth of services, risen from 42.7 percent of GDP in 1990 – it was 38 percent ten years before - to more than 50 percent in 2000, with an annual growth rate of 7.3 percent during the 1990s. With a share of services activities of 55 percent but with only one fifth of GDP coming from industry in 2005, the Indian economy seems to have skipped the phase of industrialization, jumping directly from agriculture to services in less than two decades (Dasgupta and Singh 2006). The anomaly of the Indian growth process, therefore, consists not only in the specific approach to growth demonstrated by the Indian policymakers, often labelled as "gradualism" (Ahluwalia 2002), but also in the particular consequences of growth on the structure of the economy. India has undoubtedly accelerated the linear stages of economic development which have generally implied the transformation of a country into a modern economy, and has implemented a rapid phase of "tertiarisation" of the structure of production. The Indian growth process, in fact, contrasts not only with the historical growth pattern performed by high-income economies (Chang 2002), but also with the experiences of similar countries as China (Alessandrini and Buccellato 2008)[20].

[20] Chinese sectoral structure has been constantly characterized by a predominant presence of the manufacturing sector, with more than 50 percent of GDP originating from industry in 2005.

Table 1. Indian labour force, millions

	1981	1991	2001	2005
Labour Force	305.73	369.14	451.38	476.13
Unorganised Sector	282.83	342.41	423.59	449.67
Organised Sector	22.90	26.73	27.79	26.46
as percentage of labour force	*7.49*	*7.24*	*6.16*	*5.56*
Private Organised Sector	7.40	7.68	8.65	8.45
as percentage of labour force	*2.42*	*2.08*	*1.92*	*1.78*

Source: *Economic Survey*, different issues, and World Development Indicators (2006).

Table 2. Sector distribution of employment in the organised sector (in percentage)

	1981	1991	2001	2005
Public				
Agriculture	8.3	8.2	7.2	8.4
Industry	21.1	20.5	18.0	16.1
Services	70.6	71.3	74.8	75.5
Private				
Agriculture	13.4	12.9	11.7	12.6
Industry	62.9	59.8	59.2	54.3
Services	23.7	27.3	29.1	33.2
Total				
Agriculture	9.9	9.5	8.6	9.7
Industry	34.6	31.8	30.8	28.3
Services	55.4	58.7	60.6	62.0

Source: *Economic Survey*, different issues.

The low degree of industrialization in India characterizes also the labour market. The primary sector, which employed 70 percent of workers at the beginning of the 1980s, still employs more than 60 percent of total workforce (Dutt 2003; Joshi 2004). The occupation in industry has shown an increase from 13.8 percent to 16.8 percent while in services, despite their fast increasing share in the economy, has gradually moved to 22.7 percent from the value of 17.2 percent. However, even though the official unemployment rate has decreased to 7 percent, this value does not take into account that the majority of the labour force is employed in the informal economy. In fact, as shown by Table 1, the organised sector occupied less then 5.6 percent out of the 476 millions labourers in 2005, recording a continuous decline during the decades, especially in the 1990s. In terms of workers employed in the private organised sector, the share over total labour force falls to less then 1.8 percent. Therefore, the Indian growth performance has been accompanied by a constant increase of the

weight of the informal employment[21] in the economy, with particular emphasis in the private segment. In terms of sector distribution, the organised sector has moved from industry to services, with the latter employing the 62 percent of the formal workers in 2005 (Table 2). Furthermore, the decline in the weight of the formal industrial sector has principally affected the private activities, with a decrease from 59.8 percent to 54.3 percent between 1991 and 2005.

Table 3. Unorganized sector distribution of employment, millions (estimates)

	1983	1993	1999
Agriculture	206.7	242.6	237.4
Industry	33.7	46.9	58.2
Services	39.4	60.7	73.5

Source: author's calculations based on *Economic Survey*, different issues, and Dutta (2002).

Table 3 provides an estimation of the numbers of informal labourers in agriculture, industry and services, calculated, for each sector, as the difference between total workers and formal workers. The Table reveals that most of the informal jobs are located in agriculture, where about 240 million people were employed at the end of the 1990s, while industry and services account for 58.2 and 73.5 million workers respectively. However, the labour force in the unorganised segment has been steadily increasing in industry and services during the two decades, while it remains quite stable in agriculture. A clearer picture of the unorganised sector in India is depicted by Table 4, which illustrates the share of informal segment in Net State Domestic Product (NSDP) by economic activity. The contribution to economy of informal sector has progressively decreased over time, from 70 percent of NSDP in 1980 to 58 percent in 2005, mainly driven by the decline recorded in services, as financing and trade, and in manufacturing. Construction and transport activities, instead, show a steady increase over time, mostly due the rising incidence of casual workers[22] over sectoral labour force (see Dutta 2002). Finally, agriculture, excluding mining, is over-represented by informal economy, with around 95 percent of agricultural production generated by unregistered sector.

[21] According to NCEUS (2007, p. 3), unorganized or informal workers are "those working in the unorganised enterprises or households, excluding regular workers with social security benefits, and the workers in the formal sector without any employment/social security benefits provided by the employers". The unorganised sector consists "of all unincorporated private enterprises owned by individuals or households engaged in the sale and production of goods and services operated on a proprietary or partnership basis and with less ten total workers".

[22] Causal labourers are those who are "casually engaged in others' farm or non-farm enterprises (both household and non-household) and, in return, received wages according to the terms of the daily or periodic work contract" (NSSO 2008, p. 14).

Table 4. Share of unorganised segment in Net State Domestic Product by economic activities at current prices (in percentage)

	1980	1991	2001	2005
Agriculture, forestry and fishing	95.2	96.2	96.4	94.4
Mining and quarrying	9.6	7.7	9.0	7.9
Manufacturing	46.3	39.1	36.5	32.8
Electricity, gas and water supply	6.0	3.6	2.8	4.7
Construction	48.0	55.5	57.2	62.4
Trade, hotels and restaurants	89.6	91.9	83.7	80.6
Transport, store and communication	45.2	52.3	57.2	63.7
Financing, insurance, real estate and business services	65.0	40.6	49.2	44.5
Community, social and personal services	25.9	19.4	23.7	27.1
Net State Domestic Product	*70.0*	*63.8*	*60.4*	*58.0*

Source: *National Account Statistics*, Government of India, different issues

Table 5. Sectoral employment output elasticities, registered sector

	1981/91	1991/01	2001/05
Agriculture, forestry and fishing	0.31	-0.03	0.39
Mining and quarrying	0.21	-0.37	0.63
Agriculture	**0.36**	**-0.20**	**0.81**
Manufacturing	0.08	0.03	-0.48
Electricity, gas and water supply	0.36	0.07	-0.40
Construction	0.14	-0.14	-0.39
Industry	**0.13**	**0.01**	**-0.43**
Trade, hotels and restaurants	0.25	0.14	0.32
Transport, store and communication	0.20	0.02	-0.17
Financing, insurance, real estate and business services	0.52	0.17	0.51
Community, social and personal services	0.40	0.12	-0.19
Services	**0.35**	**0.09**	**-0.08**
All	*0.33*	*0.07*	*-0.18*

Source: author's calculations based on *Economic Survey*, different issues

The above analysis leads to the conclusion that the capability of the Indian growth process to generate new job opportunities in the organized segment of the economy is dramatically limited and, despite the expansion of formal sector in total production, informal employment continues to rise. This result is supported by the evidence in Table 5, which presents the sectoral employment elasticities for the organised workers, obtained, for each sector, as the ratio between the average growth of formal workers and the average growth of

NSDP at constant prices (1999-2000) over different periods. The Table indicates that there has been a considerable reduction in employment elasticity to aggregate output, from 0.33 in the 1980s to the value of 0.07 recorded in the 1990s. At the beginning of the new millennium, the elasticity becomes negative, that is, the growth of the economy between 2001 and 2005 has led to the situation of job-destruction in the organized segment. This tendency has regarded most of the sectors, with particular emphasis in manufacturing, where the response of organised employment growth to the expansion of sectoral output has declined till -0.43. Only agriculture and trade and financing services increased their employment elasticities in recent years.

The divergence between the growth rate of the economy and the growth rate of employment in India has been the object of several different interpretations. First of all, since the take off in the early 1980s, output growth has been mainly driven by improvements in labour productivity rather than by additional occupation. The growth of output per worker rose from the average of 1.3 percent between 1960 and 1980 to the value of 3.8 percent between 1980 and 2004 (Bosworth *et al*. 2007; Basu and Maertens 2007). The increasing contribution of labour productivity to the growth of the economy was principally determined by the increase in Total Factor Productivity (Unel 2003; Bhaumik *et al*. 2006), which denotes the changes in efficiency and/or in production technology. TFP growth jumped to the average of 2 percent during the period 1980-2004 from the value of 0.2 percent in the previous two decades. As noted by Rodrik and Subramanian (2004), TFP growth reflects the positive response of the economy to the reform process, from the attitudinal shift towards "pro-business" policies in early 1980s till the trade liberalization in the 1990s. The political trigger could have elicited a large response in TFP because India was below its production possibility frontier and could have affected the performance of individual sectors rather than a re-allocation of resources from low-productivity activities to higher productivity sectors (Panagariya 2004; Virmani 2004). This could also explain the discrepancy in labour productivity performance between formal and informal sector, given that the weight of organised segment has declined over time in terms of employment, but augmented as share over total production. The labour transfer towards higher productivity formal activities has been therefore limited over time.

Second, the Indian labour market is relatively inflexible and laws are highly protective of labour. Labour market rigidities have restricted labour mobility, have led to capital-intensive methods and adversely affected the long-run demand for labour (Dutta Roy 2004; Bhattacharjea 2006; Mitra and Ural 2007). Furthermore, state-level analysis show that states

with pro-workers laws display lower rate of growth and poverty reduction (Besley and Burgess 2004). However, since labour restrictions apply only to the organised sector, the problem could lie in the lack of job security in the informal activities (Bhalotra 2003), which makes the modern informal sector more competitive (Sakthivel and Joddar 2006; Sharma 2006; Majumder and Mukherjee 2007). Lower wages together with the absence of unionization of workers in the informal economy would have pushed firms to compete on labour cost reduction rather than on innovation and technological investment (Bhattacharya and Ray 2003; Erumban 2009).

Third, even if the expansion of services has undoubtedly favoured the growth of the overall economy, it has not ensured an adequate absorption of labour. The IT sector, for example, viewed as the symbol of the Indian miracle, employs less than 1.5 million people and its potential for creating jobs is limited by the fact that it is able to occupy directly only educated people. Since the 5 percent of India's relevant age group receives college education (Joshi, 2004), the wide majority of workforce is unlikely to be met by IT industries as well as by financing or insurance services (Dasgupta and Singh, 2005). Furthermore, the fact that India is the main world exporter of highly skilled software engineers and financial service analysts (Chauvin and Lemoine, 2003) could hide a situation in which educated workers are forced to migrate to find job (Aneesh 2000; Manas *et al*. 2008). It follows that a greater extension of the IT advantages to the rest of the economy together with the reinforcement of the economic linkages between services and manufacturing industries would amplify the capability of the economy to employ the over two millions of scientists, engineers and technicians enrolled every year (Rao 2005).

3. 4 The analytical framework

The analysis of the main features of the labour market shows that India displays most of the relevant characteristics of the Kaldorian theory. The Indian economy, in fact, with the largest size of labour force located in agriculture and in unregistered activities, has widespread disguised unemployment, which represents the potential hidden labour force for manufacturing sectors. Moreover, informal, casual and daily labourers constitute the majority of Indian workers in rural areas, where most of the poverty is concentrated. It follows that agricultural surplus over self-consumption is low and the demand for industrial products coming from agriculture could be insufficient to ensure a further growth of manufacturing production accompanied by the efficient allocation of disguised labourers in organized

industrial activities. This leads to the expansion of the informal economy, which absorbs the mass of rural workers migrating to the urban centres and which could derail India away from its trajectory from a dualistic to a modern economy. Finally, historically, the pattern of Indian economic development has followed the phases of industrialization indicated by the Kaldorian theory. Economic policy has protected manufacturing firms from foreign competition in the 1980s and then has opened the industrial production to international integration with the liberalization process in the 1990s. As a result, the impulse to industrialization has been transferred from the domestic market to the world demand for Indian manufacturing products[23].

The Kaldorian framework, therefore, is appropriate for the analysis of the Indian jobless growth scenario. In order to include the linkages between agriculture and manufacturing, we use the intersectoral terms of trade as a possible explanatory variable of the labour demand. The terms of trade measure the exchange relationship between agricultural output and industrial output and reflect the balance between the two sectors. In an agrarian labour-surplus economy like India, if the terms of trade move in favour of agriculture, we expect that the effective demand of industrial goods rises and causes the demand of workers to increase whenever industrial production adapts to the growing purchasing power of agriculture. It follows that if agricultural prices are relatively too low, agriculture's growth of demand for industrial goods is limited and industrial production (and labour demand) could be demand constrained to a lower level of growth.

To test the effect of the intersectoral terms of trade on Indian employment in the organized manufacturing, we consider a log-linear labour demand equation of the following form (Layard and Nickell 1986; Bhalotra 1998):

$$(10) \qquad n_{st} = \Sigma_i \beta_i n_{st-i} + \Sigma_j \xi_j x_{st-j} + \upsilon_{st}$$

where the level of employment, n, in state s and year t is a function of its past values and of a distributed lag vector of explanatory variables, including capital (k), wage (w), output (y) and the intersectoral terms of trade (*itot*) between agriculture and industry expressed as the ratio of agricultural prices over manufacturing prices; *itot* and y can be viewed as a measure of the expected demand for manufacturing products. The vector υ_{st} contains the permanent but unobservable state specific effect and the remainder of the error term. The employment

[23] Indian merchandise trade as a percentage of GDP remained stable around 13% during the 1980s and experienced remarkable growth in the 1990s, reaching 32% in 2006 (World Development Indicators 2008).

equation depicted in (10) captures the impact of adjustment in derived labour demand through the presence of a lagged dependent variable among the regressors. This is in line with the assumption that there exist costs associated with employment, implying that labour demand depends not only on current factors but also on the initial level of employment. It follows that the employment decision rule should be considered as a dynamic problem. An additional lag structure may be necessary to allow for the effects of labour heterogeneity adjustment when the sequence of bargain or expectation about future wage and output level is considered or to control for serially correlated technology shocks (Nickell and Wadhwani 1991; Hamermesh 1993). In a dynamic setting, a differenced employment equation is adopted, so that the state specific effects can be transformed out. Thus, the model in first difference becomes:

$$(11) \qquad \Delta n_{st} = \alpha_t + \sum_i \beta_i \Delta n_{st-i} + \sum_j \gamma_j \Delta k_{st-j} + \sum_j \delta_j \Delta w_{st-j} + \sum_j \theta_j \Delta y_{st-j} + \sum_j \lambda_j \Delta itot_{st-j} + \varepsilon_{st}$$

In equation (11) all variables are in logarithms and *i* runs from 1 to 3 while *j* runs from 0 to 2. The dependent variable is represented by the growth of workers, which is function of its lagged values and of current and past values of capital, wage, output and intersectoral terms of trade. Capital (gross fixed stock), and output are deflated by state annual inflation, obtained as difference between current and constant state income growth, while wage (annual per capita earnings) is deflated by registered manufacturing inflation. The growth of the intersectoral terms of trade enters the labour demand equation as difference between agricultural and manufacturing prices growth. Using data provided by ASI (Annual Survey of Industries 2005-06, Ministry of Statistics and Programme Implementation, Government of India) and CSO (Central Statistical Organization), we construct a panel dataset for the fifteen largest Indian states[24] covering the years from 1980 to 2004.

A dynamic first-differenced equation of the form represented in (11) is characterised by the presence of autocorrelation, due to the inclusion of the lagged dependent variables among the regressors, which may be correlated with the error term. It follows that the ordinary least squares (OLS) estimator can induce a downward bias while the generalised least squares (GLS) estimator can induce an upward bias about the coefficients of the lagged dependent variables (Hsiao 2003). Moreover, the instrumental variable (IV) estimation does not make use of all the available moment conditions and does not take into account the

[24] The sample includes Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. These states accounted for 95.5% of Indian population in 2004.

differenced structure of the residual disturbances (Ahn and Schmidt 1995). In order to overcome the autocorrelation problem, Arellano and Bond (1991) proposed a generalised method of moments (System-GMM) by using additional instruments obtained by utilising the orthogonality conditions that exist between lagged values of the dependent variable and the disturbances (see also Arellano and Bover 1995; Blundell and Bond 1998). The System-GMM uses the lagged first-differences as instruments not only for the standard set of equations in first differences, but also for a supplementary set of equations in levels (see also Bond, Hoeffler and Temple 2001). The predetermined and endogenous variables are instrumented with suitable lag(s) of their own difference in the level equation. The System-GMM estimator is therefore more efficient as it exploits information both in the level and first-differenced equations.

We therefore apply the System-GMM procedure to equation (11) to check the role of output and intersectoral terms of trade in influencing labour demand growth. We use three different specifications of output growth for each state observation – registered manufacturing, manufacturing including unregistered activities and aggregate output – in order to analyze whether labour demand growth may be affected by scale dynamics. Furthermore, we want to investigate if the expansion of unregistered manufacturing has negatively influenced the employability in organized manufacturing; we test this hypothesis by replacing output growth with the growth of the share of informal manufacturing over total manufacturing. Next section provides the results.

3.5 Results

Between 1980 and 2004, the fifteen largest Indian states recorded an average growth of about 5 percent in terms of Net State Domestic Product (Table 6). Total manufacturing and, in particular, registered manufacturing output grew at a higher rate of 5.26 percent and 5.78 percent respectively, leading to a sensible reduction of the unregistered segment on total manufacturing of -0.83 percent per year. Despite this positive performance, the effect of growth on registered employment appears quite modest, with an average annual improvement of less than 0.5 percent across states. As a consequence, the increase in industrial output has been mainly sustained by labour productivity, as a result of the combined effect of the growth of the capital/labour ratio with the rise in TFP. The divergence between agricultural and manufacturing prices, instead, displays a rate of growth of less than 0.3 percent. The

purchasing power of agriculture on manufacturing products has remained practically unchanged during the period under study.

Table 6. Labour demand of registered manufacturing workers: variables average annual growth (in percentage), 1980-2004

Workers	0.46	Registered Manufacturing	5.78
Wage	1.05	Manufacturing	5.26
Capital	3.59	State Output (NSDP)	4.98
Intersectoral terms of trade	0.27	Unregistered Share	-0.83

Source: author's calculations based on *Economic Survey*, different issues

The consequences on labour demand of the movements of these variables are described by Table 7, which shows the results of the estimation of equation (11) using the System-GMM technique. Columns from (a) to (e) report the five specifications using different variables for output growth; in particular, column (d) and (e) capture the effect on registered employment of an increase in the weight of unregistered manufacturing activities. It is expected that employment growth is positively effected by increases in capital, output and demand of manufacturing products coming from agriculture and negatively associated with wage and the share of informal activities over manufacturing output. In our System-GMM procedure, intersectoral terms of trade and the unregistered share in column (d) are treated as strictly exogenous to labour demand.

Two standard tests of instruments validity are depicted in the Tables. First, the Arellano-Bond test for autocorrelation (Arellano and Bond, 1991) checks whether the presence of autocorrelation in the idiosyncratic disturbance term would render some lags invalid as instruments. In all the columns presented in the Table, the hypothesis of the presence of autocorrelation of order one is accepted while autocorrelation of order two is found to be absent. This confirms that the chosen lags are valid instruments for our specifications[25]. The second statistic is the Sargan test, which checks for joint validity of the instruments, that is, whether the instruments appear exogenous; it must be insignificant in order for the instrumental variables to be well identified. In five out of the six specifications the test confirms the exogeneity of the instruments, while in column (d) suggests that the unregistered share cannot be regarded as strictly exogenous with respect to labour demand.

[25] In order to reinforce our assumption, we estimate a static version of equation (11) verifying the existence of significant first-order as well as second-order autocorrelation. Therefore, the inclusion of the lags among the explanatory variables controls for autocorrelation of second-order and indicates that the dynamic version of the employment model should be estimated when the problem of omission of dynamic effects arising out of adjustments costs is considered.

Table 7. System-GMM estimations of labour demand growth across 15 Indian states, 1980-2004

VARIABLES	(a)	(b)	(c)	(d)	(e)+
L.workers	-0.376***	-0.379***	-0.382***	-0.379***	-0.362***
	(0.074)	(0.079)	(0.082)	(0.073)	(0.074)
L2.worker	0.024	0.016	-0.017	-0.014	0.005
	(0.054)	(0.056)	(0.046)	(0.044)	(0.040)
L3.workers	0.105**	0.093*	0.068	0.066	0.074
	(0.049)	(0.048)	(0.046)	(0.048)	(0.045)
wage	-0.089***	-0.090***	-0.093**	-0.087**	-0.098***
	(0.032)	(0.034)	(0.037)	(0.038)	(0.037)
L.wage	-0.057**	-0.059**	-0.054***	-0.042*	-0.046**
	(0.026)	(0.025)	(0.020)	(0.022)	(0.020)
L2.wage	-0.027	-0.029	-0.010	-0.002	-0.007
	(0.025)	(0.025)	(0.020)	(0.017)	(0.018)
capital	0.092***	0.091***	0.090***	0.100***	0.099***
	(0.029)	(0.029)	(0.026)	(0.030)	(0.028)
L.capital	0.030*	0.029*	0.028*	0.040**	0.030*
	(0.017)	(0.017)	(0.016)	(0.017)	(0.018)
L.capital	-0.023	-0.025	-0.032	-0.017	-0.027
	(0.016)	(0.017)	(0.020)	(0.018)	(0.017)
terms_of_trade	0.064**	0.065**	0.078**	0.072**	0.075**
	(0.027)	(0.027)	(0.036)	(0.030)	(0.031)
L.terms_of_trade	0.014	0.014	0.018	0.015	0.012
	(0.032)	(0.033)	(0.035)	(0.032)	(0.031)
L2.terms_of_trade	0.047	0.048	0.042	0.028	0.031
	(0.036)	(0.036)	(0.037)	(0.033)	(0.033)
registered_manuf	0.030*				
	(0.016)				
L.registered_manuf	0.042**				
	(0.019)				
L2.registered_manuf	0.037**				
	(0.015)				
manufacturing		0.048**			
		(0.022)			
L.manufacturing		0.049*			
		(0.028)			
L2.manufacturing		0.062*			
		(0.033)			
state_output			0.126***		
			(0.041)		
L.state_output			0.105		
			(0.076)		
L2.state_output			0.101		
			(0.081)		
unregistered_manuf_share				-0.034*	-0.023
				(0.019)	(0.020)
L.unregistered_manuf_share				-0.029	-0.005
				(0.039)	(0.039)
L2.unregistered_manuf_share				-0.058*	-0.034
				(0.033)	(0.032)
Constant	-0.175***	-0.175***	-0.098***	-0.077***	-0.077***
	(0.039)	(0.039)	(0.025)	(0.023)	(0.024)
Observations	308	308	312	312	312
Number of states	15	15	15	15	15

Arellano-Bond test for AR(1) in first differences:					
z=	-3.31	-3.33	-3.33	-3.27	-3.29
Pr > z =	0.001	0.001	0.001	0.001	0.001
Arellano-Bond test for AR(2) in first differences:					
z=	0.22	0.38	0.32	0.78	0.61
Pr > z =	0.827	0.702	0.75	0.435	0.54
Sargan test of overid. restrictions:					
chi2 =	320.76	321.83	325.04	297.37	325.72
Pr > chi2 =	0.384	0.386	0.322	0.003	0.313

Note: figures in parentheses are robust standard errors. *Significant at 10%; ** significant at 5%; *** significant at 1%. [+] Unregistered share treated as endogenous.

In the regressions summarized in Table 7, all the current rates of growth of the explanatory variables display the expected sign and are highly significant, with the exception of the unregistered share coefficient in column (d), which is insignificant. Furthermore, the coefficients are not affected by the different specifications on output growth. Current real wage has a significant and negative impact on labour demand and its coefficient is steadily around -0.09, while capital is significantly positive, with a coefficient between 0.091 and 0.100. These two findings are perfectly in line with the theory, which predicts a negative response of labour demand for an increase in wage and a positive shift for capital improvements. The role of the intersectoral terms of trade is significant and positive in all the columns and, although the purchasing power of agriculture has remained practically unchanged during the period, this result is supporting of Kaldorian framework. Therefore, states where agricultural prices have grown at a faster rate relative to manufacturing prices have also experienced a more rapid increase registered employment. The effective demand of industrial goods coming from agriculture has a positive key role on determining labour demand fluctuations. A greater purchasing power for rural people sustains industrial production and generates positive spillovers for employment. The effect of a rise of the intersectoral terms of trade lies between 0.064 and 0.078, with the highest values recorded when state output growth and the unregistered share enter the labour demand.

Other revealing results emerge from the analysis of the role of output growth on labour dynamics. The effect of an increase in production, as described in columns from (a) to (c), is positive and significant, but the effect and the significance rise with the scale of output. In particular, it appears that the impact of production growth is lower with registered manufacturing and higher with state output growth, implying that labour demand is more responsive to the economic performance of the state than to improvement in sectoral production. The influence of output dynamics on labour demand is therefore characterized by

the presence of scale effects. Moreover, we explore the impact of the unregistered segment on registered workers. As demonstrated by the higher influence of total manufacturing with respect to registered manufacturing alone (columns (a) and (b)), the impact of unregistered growth itself should be positive and reinforce the idea on the intersectoral relations between registered manufacturing and other sectors of the economy, both formal and informal. In fact, if we disaggregate manufacturing into its two components, the coefficient for the unregistered sector is found to be positive, but highly insignificant, while the registered segment coefficient loses its significance. However, as described in section 3, there is a large discrepancy in labour productivity between the two sub-sectors, and the weight of the unregistered segment varies widely across states. In order to further investigate this aspect, we consider the growth of the share of the unregistered sector over total manufacturing (columns (d) and (e)); this allow us to control for the changes of the effective weight of informal activities considering the expansion of the informal segment at the expense of the registered one. The effect turns now to be negative, that is, states where unregistered output has grown faster than registered output have experienced a deceleration in formal labour demand growth. Hence, registered manufacturing growth affects employment if the excess of growth with respect to the informal sector is positive. However, the level of significance of the unregistered share depends on whether it is included among strictly exogenous regressors. In column (e), in fact, where the unregistered share is treated as endogenous, the Sargan test turns to be insignificant as well as the coefficient of the regressor.

Table 8. Long-run elasticities of employment growth with respect to different variables

	(a)	(b)	(c)	(d)	(e)
Wages	-0.138	-0.139	-0.105	-0.102	-0.122
Capital	0.080	0.075	0.075	0.091	0.079
Intersectoral terms of trade	0.102	0.101	0.095	0.088	0.092
Registered manufacturing	0.086	-	-	-	-
Total manufacturing	-	0.123	-	-	-
Output	-	-	0.228	-	-
Unregistered share	-	-	-	-0.087	-
Unregistered share (end.)	-	-	-	-	-0.048

Table 9. Contribution of variables to the average growth rate of employment based on long-run elasticities

	(a)	(b)	(c)	(d)	(e)
Wages	-0.15	-0.15	-0.11	-0.11	-0.13
Capital	0.29	0.27	0.27	0.33	0.28
Intersectoral terms of trade	0.03	0.03	0.03	0.02	0.03
Registered manufacturing	0.50	-	-	-	-
Total manufacturing	-	0.65	-	-	-
Output	-	-	1.14	-	-
Unregistered share	-	-	-	0.07	-
Unregistered share (end.)	-	-	-	-	0.04
Explained growth rate	*0.67*	*0.80*	*1.32*	*0.32*	*0.22*
Actual growth rate	0.46	0.46	0.46	0.46	0.46

Finally, by making use of the long-run elasticities depicted in Table 8, Table 9 evaluates the contribution of the different explanatory variables to the average growth rate of employment during the period 1980-2004. *Ceteris paribus,* given trend wage growth of 1.05 percent p.a., a long-run elasticity between -0.10 and -0.14 implies a decline in employment between 0.11 and 0.15 percent p.a.. The corresponding figure for capital is a positive increase between 0.27 and 0.33 percent. The long-run elasticities of different measures of output growth confirm the scale effect response of employment to output dynamics, with 1.14 percent p.a. of growth when state output is considered (column (c)). Employment growth due to the unregistered sector reduction of 0.83 percent p.a. lies between 0.04 and 0.07 percent. The contribution of intersectoral terms of trade is instead practically null, with a value steadily around 0.03 percent; in fact, despite a high long-run elasticity of employment between 0.90 and 0.10, the slow growth of only 0.27 percent p.a. has significantly reduced the impact of the intersectoral terms of trade on employment expansion. Together, the variables predict growth of registered manufacturing employment between 0.22 and 1.32 percent p.a. between 1980 and 2004, which, in five out of the six specifications used, closely matches the actual rate of growth of 0.46 percent.

3. 6 Conclusions

The 2008 Global Hunger Index of developing and transitional countries (Von Grebmer *et al*. 2008) ranks India at 66th position out of 88 countries. The survey says that not one of the 17

states of the Union under study is in the low or moderate hunger category and concludes that the entire sample is in the alarming or extremely alarming group. Furthermore, despite the notable economic performance of Indian industry in the last two and a half decades with an annual growth of 5.3 percent, organized manufacturing employment growth was less than 0.5 percent. Rural poverty and jobless growth in manufacturing may be strictly related if analyzed through a Kaldorian framework. The development of the purchasing power of agriculture, in fact, is essential to stimulate the effective demand for industrial goods and to sustain industrial production in the long run. Since a strong productivity growth could generate job loss when aggregate demand is insufficient, rising rural incomes unleash a multiplier effect, increasing demand for farm and non-farm products and services, thereby stimulating rapid growth of employment opportunities in other sectors.

Taking into consideration this causal relation, the paper has investigated the role of agricultural surplus in influencing labour demand in Indian organized manufacturing. Using a panel dataset on the 15 largest states of the Union for the period 1980 to 2004, our System-GMM estimates confirm the positive linkage between a rise in agricultural purchasing power and the growth in manufacturing employment. We find that where the increase in agricultural prices relative to manufacturing prices has been wider, the employment in organised manufacturing has been higher. Furthermore, labour demand growth seems to be more elastic to aggregate output growth rather than to increments in registered manufacturing production. Given that the recent pattern of growth of Indian economy has been accompanied by increasing inequality across states as testified by numerous researches, such result could be a further element of growing divergence between rich and poor states of the Union. In addiction, since more than two-thirds of the Indian industrial workers are employed in informal manufacturing, we explore the effect of an increase of the weight of unorganized activities on determining formal employment. Our results show that in those states where the share of the unregistered manufacturing has risen over time, the jobless growth problem has worsened.

However, the change in the agricultural purchasing power has been modest in the last two decades and the majority of Indian labourers still lack a steady income flow and fall outside the social safety net system guaranteed by a formal occupation. As a consequence, India's potential manufacturing renaissance, especially in terms of employment, is still in its early stages. This appears quite surprising for a country whose supply of arable land is second only to the United States and which has successfully developed a process of tertiarisation of its economy. But modernization cannot only rely upon a strong IT sector and

labour productivity growth could be not sufficient to solve problems of acute poverty or underemployment. India should look to establish and reinforce forward and backward linkages between agriculture and manufacturing if it wants to transform a jobless growth pattern into an inclusive growth process. After more than thirty years since the Green Revolution, the agrarian question is still open for India.

References

Ahluwalia M. (2000), "Economic Performance of States in Post-Reforms Period", *Economic and Political Weekly,* Vol. 29, No. 10, pp. 1637-1648.

Ahluwalia M. (2002), "Economic Reforms in India Since 1991: Has Gradualism Worked?" *Journal of Economic Perspectives,* Vol. 16, No. 3, pp. 67-88.

Ahluwalia I.J. and Rangarajan C. (1989), "A Study of Linkages Between Agriculture and Industry: The Indian Experience", in J.G. Willamson and V.R. Panchmukhl (ed.) "*The Balance Between Industry and Agriculture in Economic Development"*, MacMillan Press, London.

Ahn S. and Schmidt P. (1995), "Efficient Estimation of Models for Dynamic Panel Data", *Journal of Econometrics,* Vol. 68, pp. 5-27.

Alessandrini M. and Buccellato T. (2008), "China, India and Russia: Economic Reforms, Structural Change and Regional Disparities", Economics Working Papers No. 97, UCL SSEES, Centre for the Study of Economic and Social Change in Europe, University College London.

Alessandrini M., Buccellato T. and Scaramozzino P. (2008), "Whither the Indian Union? Regional Disparities and Economic Reforms", *Rivista Italiana degli Economisti,* Vol. 13, No. 3, pp. 367-400.

Aneesh A. (2000), "Rethinking Migration: High-Skilled Labor Flows from India to the United States", CCSI Working Paper No. 18, The Center for Comparative Immigration Studies, University of California, San Diego.

Arellano, M., and Bond S. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, Vol. 58, No. 2, pp. 277-297.

Arellano M. and Bover O. (1995), "Another Look at the Instrumental Variables Estimation of Error-Components Models", *Journal of Econometrics,* Vol. 68, pp. 29-51.

Basu K. and Maertens A. (2007), "The Pattern and Causes of Economic Growth in India", *Oxford Review of Economic Policy*, Vol. 23, No. 2, pp. 143-167.

Basu K. and Mallick S. (2008), "When Does Growth Trickle Down to the Poor? The Indian Case", *Cambridge Journal of Economics,* Vol. 32, No. 3, pp. 461-477.

Bhalotra S.R. (1998) "The Puzzle of Jobless Growth in Indian Manufacturing", *Oxford Bulletin of Economics and Statistics*, Vol. 60, No. 1, pp. 5-31.

Bhalotra S.R. (2003) "The Impact of Economic Liberalization on Employment and Wages in India", Working Paper No.12, Policy Integration Department, International Labour Office, ILO, Geneva.

Besley T. and Burgess R. (2004), "Can Labour Regulation Hinder Economic Performance? Evidence form India", *Quarterly Journal of Economics,* Vol. 119, No. 1, pp. 91-134.

Bhattacharya B.B. and Sakthivel S. (2004), "Regional Growth and Disparity in India: Comparison of Pre- and Post Reform Decades", *Economic and Political Weekly*, Vol. 39, No. 10, pp. 1071–1077.

Bhaumik S.K., Gangopadhyay S. and Krishnan S. (2006), "Reforms, Entry and Productivity: Some Evidence from the Indian Manufacturing Sector", Working Paper No. 822, The William Davidson Institute, University of Michigan.

Bhattacharjea A. (2006), "Labour Market Regulation and Industrial Performance in India. A Critical Review of the Empirical Evidence", *The Indian Journal of Labour Economics,* Vol. 49 No. 2, pp. 211-232.

Bhattacharjea A. and Ray S. (2003), "Surplus Labor in Indian Manufacturing: Evidence from the Annual Survey of Industries", Working Paper Series No. 2003-14, Department of Economics, University of Connecticut.

Blundell R.W. and Bond S.R. (1998), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, 87, 115-143.

Bolton P. (1997), "A Theory of Trickle-Down Growth and Development", *Review of Economic Studies,* Vol. 64, No. 2, pp. 151-172.

Bond S., Hoeffler A., and Temple J. (2001), "GMM Estimation of Empirical Growth Models", Economic Papers 2001-W21, Economics Group, Nuffield College, University of Oxford.

Bosworth B., Collins S. and Virmani A. (2007), "Sources of Growth in Indian Economy", NBER Working Paper No. W12901, National Bureau of Economic Research.

Bowsher C.G. (2002), "On Testing Overidentifying Restrictions in Dynamic Panel Data Models", *Economic Letters,* Vol. 77, pp.211-220.

Chang H.J. (2003), *Kicking Away the Ladder: Developing Strategy in Historical Perspective,* Anthem Press, London.

Chauvin, S., and Lemoine F. (2003) "India Bets on Technology Niches", Centre d'Etudes Prospectives et d'Informations Internationales, Working Paper No. 221.

Clements K.W. and Selvanathan S. (1994), "Understanding Consumption Patterns", *Empirical Economics,* Vol. 10, pp. 69-110.

Dasgupta S and Singh A. (2005), "Will Services Be the New Engine of Economic Growth in India?", Center for Business Research, Working Paper No.310, University of Cambridge.

Dasgupta S. and Singh A. (2006), "Manufacturing, Services and Premature De-Industrialization in Developing Countries: A Kaldorian Empirical Analysis", Working Paper No. 327, Centre for Business Research, University of Cambridge.

Deb S. (2002), "The Debate on Agriculture-Industry Terms of Trade in India", Working Paper No. 109, CDE, Centre for Development Economics, Department of Economics, Delhi School of Economics.

Dutt P. (2003), "Labor Market Outcomes and Trade Reforms: the Case of India", in Hasan R. and Mitra D. (ed) *The Impact of Trade on Labor: Issues, Perspectives and Experiences from Developing Asia,* Elsevier Science B.V., North-Holland.

Dutta D. (2002), "Effects of Globalization on Employment and Poverty in Dualistic Economies: the Case of India", Working Papers No. 8, ASACR, Australia South Asia Research Centre, Research School of Pacific and Asian Studies, The Australian National University.

Dutta Roy S. (2004), "Employment Dynamics in Indian Industry: Adjustment Lags and the Impact of Job Security Regulations", *Journal of Developing Economics*, Vol. 73, pp. 233-256.

Echevarria C. (1997), "Changes in Sectoral Composition Associated with Economic Growth", *International Economic Review,* Vol. 38, No. 2, pp. 431-452.

Erumban A.A. (2009), "Productivity and Unit Labour Cost in Indian Manufacturing: A Comparative Perspective", *Economic and Political Weekly,* Vol. 44, No 15., pp. 39-48-

Foellmi R. and Zweimuller J. (2008), "Structural Change, Engel's Consumption Cycles and Kaldor's Facts of Economic Growth", *Journal of Monetary Economics,* Vol. 55, No. 7, pp. 1317-1328.

Grabowski R. and Yoon B.J. (1984), " Intersectoral Terms of Trade, Industrial Labor Supply, and the Classical Model: Early Japanese Experience", *The Developing Economics,* September, pp. 264-273.

Hamermesh D. (1993), *Labour Demand*, Princeton University Press, Princeton.

Hansen L. (1982), "Large Sample Proprieties of Generalized Method of Moments Estimators", *Econometrica,* Vol. 50, No. 3, pp. 1029-1054.

Iscan T.B. (2004), "Understanding Economic Growth and Economic Development", *Review of Income and Wealth,* Vol. 50, No. 4, pp. 585-596.

ILO (2005), *World Employment Report 2004-05: Employment, Productivity and Poverty Reduction*, International Labour Organization, Geneva.

ILO (2009), "The Fallout in Asia: Assessing Labour Market Impacts and National Policy Responses to the Global Financial Crisis", ILO Regional Office for Asia and the Pacific.

Joshi S. (2004), "Tertiary Sector-Driven Growth in India: Impact on Employment and poverty", *Economic and Political Weekly,* Vol. 39, No. 37, pp. 4175-4178.

Kaldor N. (1967), *Strategic Factors in Economic Development*, Cornell University Press, Ithaca, NY.

Kaldor N. (1975), "What is Wrong with Economic Theory", *Quarterly Journal of Economics,* August.

Kaldor N. (1979), "Equilibrium Theory and Growth Theory", in *Economic and Human Welfare: Essays in Honour of Tibor Scitovsky,* (ed.), Baskia M., Academic Press.

Khan A.R. (2007), "Asian Experience on Growth, Employment and Poverty – An Overview with Special Reference to the Findings of Some Recent Case Studies", UNDP Regional Centre in Colombo, International Labour Office, Geneva.

Kochhar K., Kumar U., Rajan R., Subramanian A. and Tokatlidis I. (2006), "India's Pattern of Development: What Happened, What Follows?", *Journal of Monetary Economics,* Vol. 53, No. 2, pp. 981-1019.

Kohli A. (2006*a*), 'Politics of Economic Growth in India, 1980–2005. Part I: The 1980s', *Economic and Political Weekly*, Vol. 41, No. 13, pp. 1251–1259.

Kohli A. (2006*b*), 'Politics of Economic Growth in India, 1980–2005. Part II: The 1990s and Beyond', *Economic and Political Weekly*, Vol. 41, No.14, pp. 1361–1370.

Layard P.R.G. and Nickell S.J. (1986), " Unemployment in Britain", *Economica*, Vol. 53, pp. 121-169.

Manas K., Jaiswal A., Shah N. and Mahal A. (2008). "High-End Physician Migration from India", *Bulletin of the World Health Organization*, Vol. 86, No. 1, pp. 40-45.

Majumder R. and Mukherjee D. (2007), "State Intervention and Labour Market in India: Issues and Options", in K.K. Bagchi (ed.) *State, Labour and Development: An Indian Perspective,* Abhjeet Publications, New Delhi.

Mathur A. (1990), "The Interface of Agriculture and Industrial Growth in the Development Process: Some Facets of the Indian Experience", *Development and Change,* Vol. 21, No. 2, pp. 247-280.

Mitra A. (2006), "Labour Market Mobility of Low Income Households", *Economic and Political Weekly,* Vol. 41, No. 21, pp. 2123-2130.

Mitra A. and Murayama M. (2008), "Rural to Urban Migration: A District Level Analysis for India", IDE Discussion Paper No. 137, Institute of Developing Economies, Japan External Trade Organization.

Mitra D. and Ural B.P. (2007), "Indian Manufacturing: A Slow Sector in a Rapidly Growing Economy", World Bank Policy Research Working Paper 4233, World Bank.

NCEUS (2007), "Report on Conditions of Work and Promotion of Livelihoods in the Unorganised Sector", National Commission for Enterprises in the Unorganised Sectors, New Delhi.

Nickell S.J. and Wadhwani W. (1991), "Employment Determination in British Industry: Investigations Using Micro Data", *Review of Economic Studies,* Vol. 58, pp. 955-969.

NSSO (2003), "Condition of Urban Slums 2002", NSS 58th Round, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation Government of India.

NSSO (2007*a*), "Household Consumer Expenditure Among Socio-Economic Groups: 2004-2005", NSS 61st Round, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation Government of India.

NSSO (2007*b*), "Nutritional Intake in India 2004-2005", NSS 61st Round, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation Government of India.

NSSO (2008), "Employment and Unemployment Situation in India 2005-05", NSS 62nd Round, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation Government of India.

Oshima H. (1981), "A. Lewis' Dualistic Theory and Postwar Asian Growth", *Malayan Economic Review,* Vol. 26, No. 2.

Panagariya A. (2004), "India in the 1980s and 1990s: A Triumph of Reforms", IMF Working Paper, WP/04/43.

Pieper U. (2003), "Sectoral Regularities of Productivity Growth in Developing Countries – A Kaldorian Interpretation", *Cambridge Journal of Economics,* Vol. 27, pp. 831-850.

Proto E. (2007), "Land and the Transition from a Dual to a Modern Economy", *Journal of Development Economics*, Vol. 83, pp. 88-108.

Purfield C. (2006), "Mind the Gap - Is Economic Growth in India Leaving Some States Behind?", IMF Working Paper, WP/06/103.

Rada C. (2007), "A Growth Model for a Two-Sector Economy with Endogenous Productivity", DESA Working Papers No. 44, Department of Economic and Social Affairs, United Nations, New York.

Rangarajan C. (1982), "Agricultural Growth and Industrial Performance in India", Research Report No. 33, International Food Policy Research Institute, Washington DC.

Rao S.S. (2005), "Bridging Digital Divide: Efforts in India", *Telematics and Informatics,* Vol. 22, No. 4, pp. 361-375.

Rattso J. and Torvik R. (2003), "Interactions between Agriculture and Industry: Theoretical Analysis of the Consequences of Discriminating Agriculture in Sub-Saharan Africa", *Review of Development Economics,* Vol. 7, No. 1, pp. 138-151.

Rodrik D., and Subramanian A. (2004), "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition", NBER Working Paper No. 10376, March.

Roodman D. (2006), "How to Do Xtabond2: An Introduction to 'Difference' and 'System' GMM to Stata", Working Paper No. 103, Center for Global Development.

Roodman D. (2007), "A Short Note on the Theme of Too Many Instruments", Working Paper No. 125, Center for Global Development.

Rouvien P. (2002), "R&D-Productivity Dynamics: Causality, Lags and 'Dry Holes'", *Journal of Applied Economics,* Vol.5, No. 1, pp. 123-156.

Sakthivel S. and Joddar P. (2006), "Unorganised Sector Workforce in India – Trends, Patterns and Social Security Coverage", *Economic and Political Weekly,* Vol. 41, No. 21, pp. 2107-2114.

Sala-i-Martin X. (2006), "Global Inequality Fades as the Global Economy Grows", in *2007 Index of Economic Freedom,* Heritage Foundation.

Sargan J. (1958), "The Estimation of Economic Relationship Using Instrumental Variables", *Econometrica,* Vol. 26, No. 3, pp. 393-415.

Sharma A.N. (2006), "Flexibility, Employment and Labour Market Reforms in India", *Economic and Political Weekly,* Vol. 41, No. 21, pp. 2078-2085.

Targetti F. (2005), "Nicholas Kaldor: Key Contributions to Development Economics", *Development and Change*, Vol. 36, No. 6, pp. 1185-1199.

Thirlwall A.P. (1982), "The Harrod Trade Multiplier and the Importance of Export-Led Growth", *Pakistan Journal of Applied Economics,* Vol. 1, No. 1, pp. 1-21.

Thirlwall A.P. (1986), "A General Model of Growth and Development on Kaldorian Lines", *Oxford Economic Papers*, New Series, Vol. 38, No. 2, pp. 199-219.

Unel B. (2003), "Productivity Trends in India's Manufacturing Sectors in the Last Two Decades", IMF Working Paper No. WP/03/22, International Monetary Fund.

Verdoorn P.J. (1949), "Fattori che regolano lo sviluppo della producttivita del lavoro", *L'industria,* Vol. 1,, pp. 3-10.

Virmani A. (2004), "Sources of India's Economic Growth: Trends in Total Factor Productivity", Working Paper No. 131, Indian Council for Research on International Economic Relations.

Von Grebmer K., Fritschel H., Nestorova B., Olofinbiyi T., Pandya-Lorch R. and Yohannes Y. (2008), "Global Hunger Index. The Challenge of Hunger 2008", The International Policy Research Institute, Washington DC.

Wlliamson J. and Zagha R. (2002), "From the Hindu Rate of Growth to the Hindu Rate of Reform", Working Paper No. 144, Center for Research on Economic Development and Policy Reform, Stanford University.

World Bank (1989), *India: Poverty, Employment and Social Services, A World Bank Country Study,* The World Bank, Washington DC**.**

Chapter 4

The Changing Pattern of Foreign Trade Specialization in Indian Manufacturing

4.1 Introduction

The high and sustained rate of growth of the Indian economy in recent decades and the spectacular performance of some of its technologically advanced service industries have attracted considerable attention among economists. It has been argued that India may be able to leapfrog the traditional pattern of development, according to which resources are first transferred from the agricultural to the manufacturing sector. India is experiencing a rapid growth in the service sector, apparently without going through the intermediate phase of a significant expansion of manufacturing.

At the same time, despite the opening up of trade since the reforms of the 1980s and 1990s, India can still be regarded as a relatively closed economy (Cerra *et al.*, 2005; Schiff, 2005). In 2005, it accounted for only about 1½ per cent of the global trade in good and services. Its share of intra-industry trade is also relatively modest. There could therefore be untapped potential for growth from further expansion of its trade with the rest of the world. This effect could be enhanced by the positive gain in efficiency for firms from international exposure. Alcalà and Ciccone (2004) find a positive correlation between openness and total factor productivity, mainly through trade and scale effects. For India, Krishna and Mitra (1998) and Topalova (2004) found that the lowering of trade restrictions had a positive impact on firm level productivity, while Tucci (2005) shows that firms that are engaged in export and import activities display higher productivity than the firms that are not.

The debate on the potential gains to India from international trade often tends to look at whether the sectors that are experiencing a rapid growth in trade are also more likely to bring employment benefits to the country in terms of their labour-intensive content. Kochhar *et al*. (2006), for instance, specifically look at the role of the policies adopted after India's independence in promoting skill-intensive manufacturing, such as the creation of industries producing capital goods and the relatively large investment on higher education (see also Banerjee, 2006).

This paper considers the pattern of foreign trade specialization in India since the mid-1980s, when the early economic reforms by Rajiv Gandhi were implemented. In our view, the vast diversity in education and skills in the Indian labour force, and the extreme variety in technological content across sectors, warrant a detailed analysis of the sources of comparative advantage across the production sectors. Indeed, some recent literature on endogenous growth has argued that the long-term growth potential of an economy can be positively related to its specialization in technologically advanced sectors (Young, 1991; Grossman and Helpman, 1991; Lall, 1992).

We mainly concentrate our attention on the export and import performance of three-digit industries in the manufacturing sector. The focus on the manufacturing sector is motivated by the consideration that, since the 1980s, growth has been driven by states with a higher level of manufacturing activity (Rodrik and Subramanian, 2004). A strong manufacturing sector appears thus to be an important condition for development.

The measure of trade specialization used in this paper is Lafay's index (Lafay, 1992), which does not just look at exports but also considers the size of the intra-industry trade. We examine the pattern of specialization in the last couple of decades and discuss the changes that have occurred during this period. In particular, we explore whether there has been a significant shift in the pattern of specialization towards those sectors that have experienced the fastest growth in world demand. This would signal that trade specialization in India has improved precisely among those sectors that could bring the largest benefits to the economy, in terms of their export potential.

Our main findings confirm some recent concerns about the quality of the pattern of specialization of Indian trade. The sectors in which India specialises still tend to be characterised by a relatively low technological content. Furthermore, the manufacturing sectors in which India does not specialise tend on average to possess a high technological content. This could limit the potential for trade to generate positive technological externalities. On the other hand, there is increasing evidence of specialization in a number of selected high-tech sectors. Furthermore, India's index of specialization has increased precisely in those sectors that have exhibited the fastest growth in world demand, and could therefore be regarded as the most dynamic sectors in world trade.

The structure of the paper is as follows. Section 2 looks at the main stylized facts of trade flows since the mid-1980s. Section 3 considers the role of the service sector and its relationship with manufacturing. Section 4 examines the pattern of trade specialization in the Indian manufacturing sector according to the Lafay index. Section 5 explores the changes in

the pattern of specialization across sectors, whereas section 6 provides evidence on the dynamics of comparative advantages and world demand. Section 7 draws some conclusions.

4.2 Foreign trade in India

The process of globalisation which started in the early 1980s has seen a rapid increase in the process of economic integration and in the volume of international trade, that expanded threefold during the last couple of decades (UNCTAD, 2005). LDC's have played an active role in the expansion of world trade, and indeed the opening up to trade has often constituted one of the key aspects of their growth strategy.

In this context, India was a relative newcomer to the process of expansion of trade, since its opening up to world trade only began after the crisis in 1991. However, the Indian economy had already experienced an acceleration in its rate of growth during the 1980s, as shown by DeLong (2004), Panagariya (2004) and Rodrik and Subramanian (2004). The opening up to international trade should be seen as a crucial aspect of the new approach to economic policy, and as an integral part of the programme of reform.

Under this respect, the year 1991 marked a watershed between the pro-business orientation of the Indian government during the 1980s and the pro-market orientation that became prevalent during the 1990s (Rodrik and Subramanian, 2004, and Kohli, 2006a and 2006b). The former approach sought to increase the productivity and the profitability of the existing industrial and commercial establishments. This tended to favour incumbent producers and businesses, by protecting them from foreign competition and by promoting the modernisation of existing domestic establishments and the creation of new ones. This strategy, initially proposed by Indira Gandhi and implemented by Rajiv Gandhi during the second half of the 1980s, was essentially based on the simplification of the complex system of licences required for production, and in particular of those regarding investment and product diversification. These initiatives were mainly targeted to large firms, as confirmed by the reduction in 1985 of a number of restrictions on monopolies that were contained in the Monopolies and Restrictive Trade Practices Act (MRTP). The government of Rajiv Gandhi also introduced some measures of external liberalization, for instance the expansion of the Open General Licensing (OGL), that includes the list of commodities for which no formal licence was required for foreign trade[26]. The number of commodities for which the

[26] The OGL was reintroduced in 1976 when it only listed 79 products. By 1988 it already included 1170 capital goods and 949 intermediate goods (Panagariya, 2004).

government has monopoly rights for imports declined (the so-called "canalized" imports) and several incentives to export were introduced. Furthermore, the rupee experienced a real depreciation by about 30%. It is important to note that these measures were mainly directed to intermediate and capital goods. Consumption goods remained highly protected throughout the decade. A significant exception is medicinal and pharmaceutical products (Das, 2003, table 5), that was to experience a very rapid growth during the following decade.

By contrast, the pro-market orientation of the 1990s sought to pursue economic liberalization with the aim of removing impediments to markets. The previous initiatives towards liberalization and the removal of the system of licences were intensified. However, the main aim of the strategy was now decisively shifted to give a high priority to the lowering of the barriers to trade and to the enhancement of international integration. Tariff and non-tariff barriers were reduced for most intermediate and capital goods, even in those sectors that were more heavily protected during the 1980s such as iron and steel. Some sectors remained canalized: these included fertilizers and pesticides and selected sectors of strategic importance, such as petroleum products and those sectors related to national security and defence. Consumption goods were only liberalized starting from 2001. During the 1990s, many sectors remained under a licence regime, including leather. By contrast, medicinal and pharmaceutical products, together with cotton fabrics, followed the trend of the 1980s and were already free of restrictions by the mid-1990s.

Numerous initiatives were also put in place to attract foreign capital, especially in services. Banking, telecommunications and infrastructure, where the Indian state sector was operating under conditions of monopoly, were open to the private sector and to Foreign Direct Investment (FDI). In Information Technology (IT), in particular, the share of foreign investment in units dedicated to exports was allowed to reach 100% (Panagariya, 2004). These units can be established under a number of possible schemes, including Export Oriented Units (EOUs), Export Processing Zones (EPZs), Special Economic Zones (SEZs), Software Technology Parks (STPs), and Electronics Hardware Technology Parks (EHTPs).

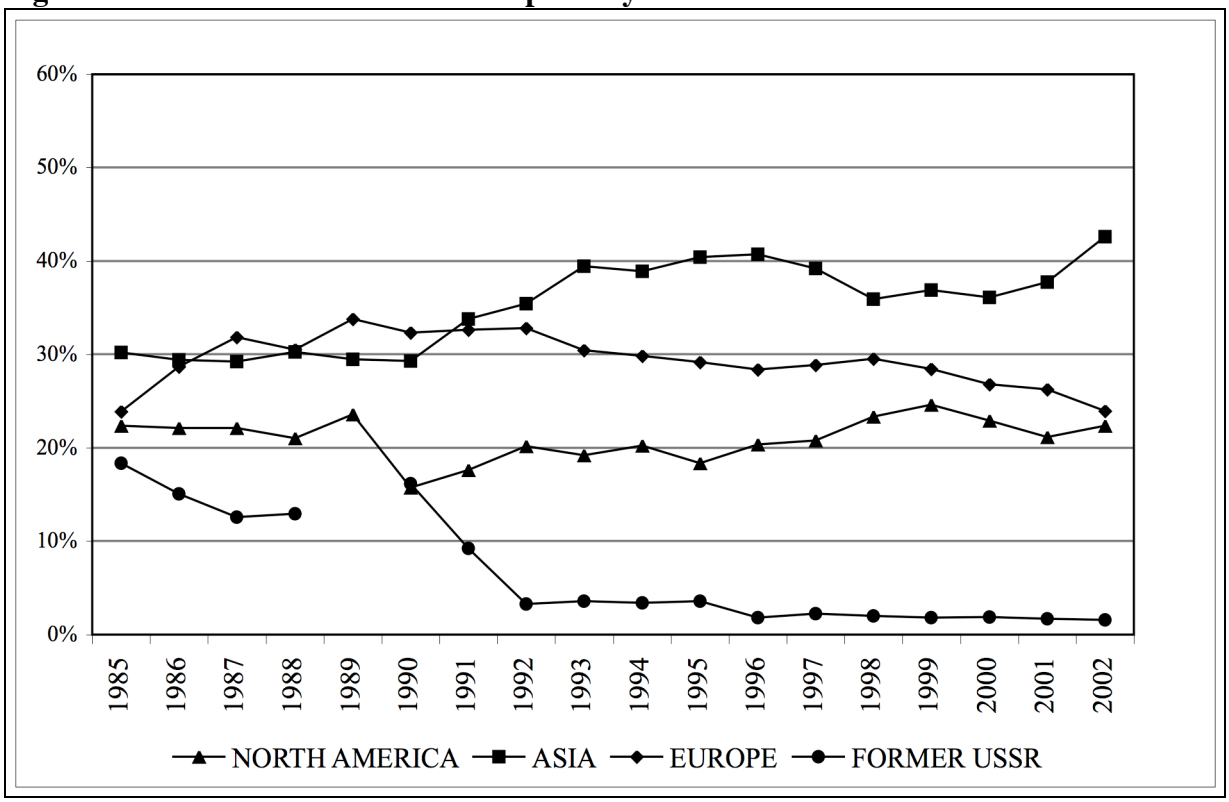
Despite India still being a relatively closed country when compared to other developing economies[27], the reforms implemented in the 1990s have enabled the country to abandon the policy of import substitution that had characterised the previous decades and to adopt a clear market-oriented approach. This fundamental shift in policy, that made it possible

[27] According to Kohli (2006b, page 1361): "By India's own past standards, the changes were quite dramatic. In a comparative and global perspective, however, India's opening to the world remains relatively modest" (see also Ahluwalia, 2002, and Kohli, 2006a).

to face the challenges placed by international integration, can be apparent from the analysis of a number trade figures.

A first important consequence of liberalization was the increase in the degree of openness of the Indian economy. The sum of exports and imports, which never exceeded 15% of GDP throughout the 1980s, had more than doubled during the last few years exceeding 30% in 2002. This ratio is however still lower than that for other LDC's. In China, for instance, total trade to GDP increased from 24% in 1985 to 47.7% in 2002. To put these figures in perspective, the openness ratio for the USA exhibited a modest upward trend and increased from 17% in 1985 to 23% in 2002, whereas for the UK the ratio was well over 55% during most of the period (World Development Indicators, 2006). India's share of world exports also increased, from 0.5% in 1985 to 0.8% in 2002, whereas the share of world imports has also marginally increased from 0.8% in 1985 to 0.9% in 2002. (WTA, 2004)[28].

Figure 1. Destination of Indian exports by area.



Source: WTA 2004 (1989 not available for former USSR).

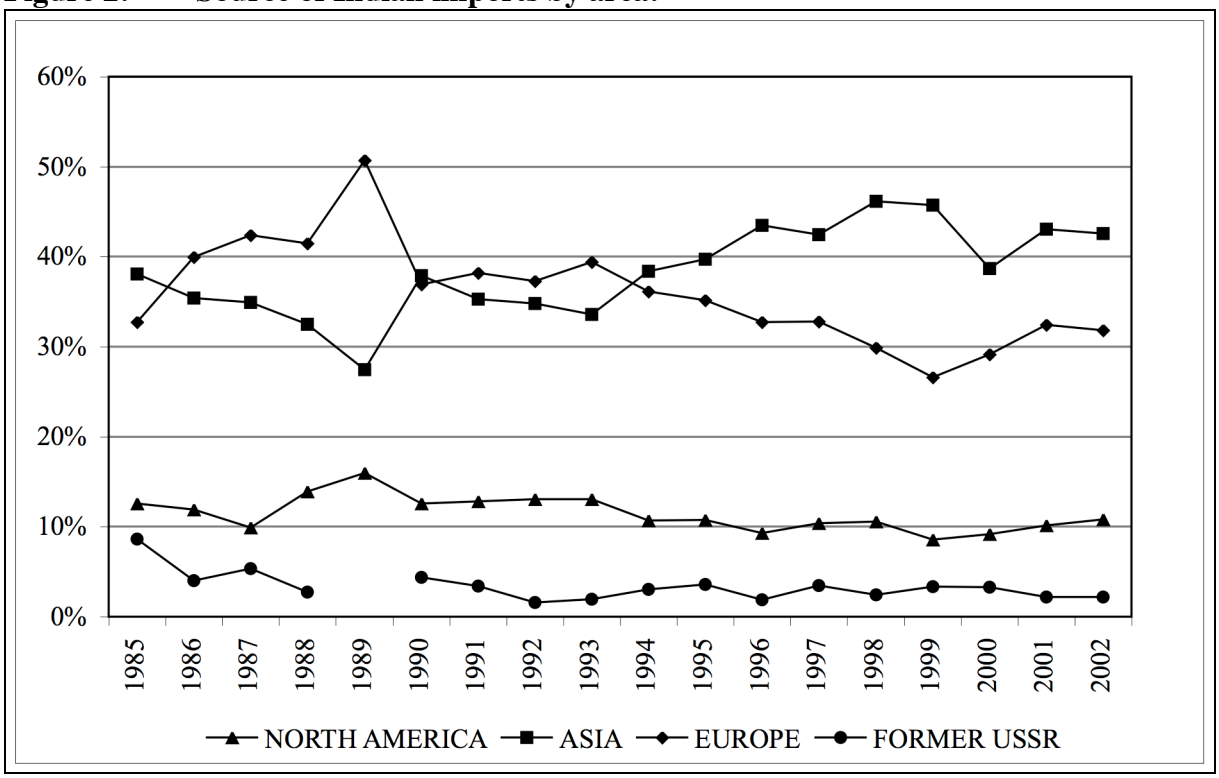
A second important change that occurred during the 1990s concerns the direction of trade flows, especially regarding exports. In the beginning of the 1990s the main trading

[28] By contrast, the share of exports had actually declined from 2.2% to 0.5% between 1948 and 1985 (WTO, International Trade Statistics, 2001).

partner for India was Europe, which attracted in excess of 30% of exports (Figure 1). By the beginning of the new millennium the main area of destination for Indian exports was Asia, with over 40% of exports. By contrast, the share of Europe declined to 24% by 2002. The share of exports towards North America also increased by about seven percentage points during the 1990s. In this context, it is important to consider the collapse of trade with the former Soviet Union countries, which used to attract about 18% of Indian products in the mid-1980s. In 2002, the corresponding share was only 1.5%.

A similar pattern emerges for Indian imports (Figure 2). Import flows from Asia increased, whereas those from Europe declined. Contrary to the trend for exports, imports from North America actually declined by about three percentage points.

Figure 2. Source of Indian imports by area.



Source: see Figure 1

A third important feature of the opening of trade is represented by changes in the structure of trade in goods (Table 1). The share of agriculture-based products has declined, mainly to the advantage of manufacturing products. This change is especially noticeable for exports, where the share of manufactured goods has increased to 75% in 2002. Within manufacturing, the increase in the share of Chemicals and related products is especially remarkable, whilst the share of Textiles is fairly stable (sector 65). Regarding imports, there are not large changes on the whole. India had already achieved food independence by the late

1970s when, thanks to the Green Revolution, the share of food products had declined from 25% to about 10% of imports. During the 1990s about one quarter of imports was accounted for by fuels, whose share exceeded 32% in 2002. This figure reflects the large increase in demand for energy due to the sustained rate of growth of the economy. Within manufacturing, the share of Chemicals and related products declined (in parallel with the increase in exports) and the share of sector 7 (Machine and transport equipment) remained largely unchanged, but there was a large increase in sectors 75 (Office machines and automatic data processing) and 76 (Telecommunications and sound recording apparatus), both linked to IT, and in sector 77 (Electrical machinery, apparatus and appliance).

Table 1. Structure of exports and imports, 1985-2002 (percentages)

EXPORTS	**1985**	**1990**	**1995**	**2002**
Agricultural raw materials (2 excl. 22, 27, 28)	2.8	4.0	1.3	1.1
All food items (0, 1, 22, 4)	25.2	15.4	18.5	12.2
Fuels (3)	6.0	2.9	1.7	5.1
Manufactured goods (5, 6 ,7, 8 excl. 68)	58.2	69.9	73.3	75.0
5-Chemicals and related products, n.e.s.	*3.6*	*7.4*	*8.1*	*11.1*
6-Manufactured goods classified chiefly (excl.68)	*33.7*	*36.8*	*38.6*	*37.3*
7-Machinery and transport equipment	*6.2*	*7.3*	*7.4*	*8.2*
8-Miscellaneous manufactured articles	*14.6*	*18.4*	*19.2*	*18.4*
Ores and metals (27, 28, 68)	7.6	5.7	3.6	4.3
IMPORTS	**1985**	**1990**	**1995**	**2002**
Agricultural raw materials (2 excl. 22, 27, 28)	3.0	3.4	3.7	2.9
All food items (0, 1, 22, 4)	8.4	3.4	4.3	5.7
Fuels (3)	25.4	27.0	22.5	32.3
Manufactured goods (5, 6 ,7, 8 excl. 68)	56.7	54.6	61.7	52.6
5-Chemicals and related products, n.e.s.	*13.9*	*11.9*	*14.9*	*9.1*
6-Manufactured goods classified chiefly (excl.68)	*15.9*	*17.7*	*18.1*	*17.2*
7-Machinery and transport equipment	*23.5*	*20.8*	*24.3*	*20.6*
8-Miscellaneous manufactured articles	*3.4*	*4.1*	*4.4*	*5.8*
Ores and metals (27, 28, 68)	5.6	7.4	6.6	4.5

Source: WTA 2004 (Sectors are classified according to UNCTAD, 2005)

Finally, the last important consequence of trade liberalization is the increase in Foreign Direct Investment (FDI). In the late 1980s, FDI amounted to about 0.07% of GDP. By 2002, their share had increased to 0.6% of GDP (WDI, 2006). Furthermore, the sectoral composition of FDI changed significantly over this period. During the 1980s, about 85% of FDI was concentrated in the secondary sector, with the chemical sector accounting for about one third, and with only 5% going into the service sector. By contrast, during the 1990s the service sector attracted the largest share of FDI (more than 58% on average). The sectors that have benefited the most from FDI are Power generation and Telecommunications (Sharma,

2000). Directly related to the FDI in the service sector is the rapid growth of the IT sector. In 2000, about 21% of world exports of IT services originated in India, which by then had become the largest IT exporting country (Chauvine and Lemoine , 2003)[29].

4.3 Manufacturing, services and growth

The debate on the performance of the Indian economy and on its growth potential often tends to emphasize the role played by the service sector. The latter has grown at very fast rates during the past couple of decades, and this trend is expected to be maintained over the foreseeable future. The most dynamic components of the service sectors are information technology (IT) and IT-enabled business services (ITES), whose exports were projected to grow at a rate of about 32-33% during 2005-06 (NASSCOM, 2006). The development of high-tech services is also regarded as critical for facilitating the technology transfers associated with the return migration of highly-qualified Indian scientists who had previously migrated abroad and who are bringing back their knowledge and expertise (Arora and Gambardella, 2004, and Commander *et al*., 2004), as well as for the financing of ventures in IT-ITES by members of the Indian diaspora (Saxenian, 2002).

Table 2 shows that the share of services in India's trade has increased during the last few years. The share of services out of total exports increased from around 21% in 1990 to more than 28% in 2002. Quite interestingly, the share of services out of total imports has also witnessed similar growth increasing from 20.5% in 1990 to 27% in 2002.

Table 2. Share of Trade in Services out of Total Exports and Imports

	1990	1995	2000	2002
EXPORT				
Services share	20.47%	18.11%	28.25%	28.34%
Goods share	79.53%	81.89%	71.75%	71.66%
IMPORT				
Services share	20.53%	22.83%	27.13%	27.13%
Goods share	79.47%	77.17%	72.87%	72.87%

Source: UNCTAD, Handbook of Statistics 2005

The service sector has overtaken industry both in terms of value added and employment. The share of value added of the manufacturing sector on GDP amounted to 16.3% in 1980 and to 15.9% in 2000 (Kochhar *et al*., 2006). By contrast, the value added

[29] See Patibandla and Petersen (2002) for a discussion of the role of transnational corporation in stimulating the growth of the software industry.

share of services on GDP increased from 36.6% in 1980 to 48.8% in 2000. The shares of employment however tell a somewhat different story, with an increase both in manufacturing (from 13.9% in 1980 to 18.2% in 2000) and in services (from 18.6% to 22.4%). The increase in employment was comparatively stronger for manufacturing. Thus, it might appear that the manufacturing sector could still play a significant role for job creation.

More generally, it is important to analyse whether it is conceivable that the Indian economy might follow an unconventional pattern of development, whereby the intermediate phase of industrialization is passed over and the economy directly transforms from being a prevalently agricultural one to being mainly based on the service sector. According to the influential Kaldorian analysis of development, industrialization is a necessary stage of development, since the industrial sector represents the key for growth (in Kaldor's own words, "the kind of economic growth which involves the use of modern technology and which eventuates in high real income per capita is inconceivable without industrialization": Kaldor, 1967, p. 54). High-productivity agriculture cannot employ more than a fraction of the available labour force. The establishment of domestic industries is thus essential for productivity improvements and for the realization of learning-by-doing and increasing returns associated with product differentiation, new processes, and new subsidiary industries.

There is however a debate on whether services might replace industry as an engine of growth, in the light of the recent technological developments and of the changing nature of many service activities. It is argued, for instance, that IT could lead to even greater spillovers that manufacturing. Dasgupta and Singh (2005, 2006) specifically examine the role of manufacturing *versus* services in LDCs, with particular regard to India. Their empirical evidence is supportive of the view that both manufacturing and services can act as engines of growth for the Indian economy. They argue that high-tech information and communication technology (ITC) services, in particular, can be regarded as dynamic sectors in Kaldor's sense and can thus be instrumental for growth.

Rowthorn (2006) considers that the strength of India in IT activities has a number of advantages, both in terms of their direct contribution to exports and growth and as a complement and stimulus for other activities. Rowthorn also examines the potential changes to the structure of comparative advantage that can emerge as a result of the relative increase in productivity in "knowledge-intensive" goods and services as compared to "labour-intensive" ones, as well as of the relative pattern of earnings for educated and uneducated workers. A possible implication is that the relative pay of uneducated workers may increase in the future as compared to the pay of educated workers, which would trigger changes in the relative

supply of skilled *versus* unskilled labour. In the long run, this could lead to an increase in the relative cost of labour-intensive products and to a rise in their price relative to knowledge-intensive items. India's comparative advantage may therefore shift towards more sophisticated export activities.

The analysis of manufacturing and services is also the object of the investigation of India's pattern of development by Kochhar *et al*. (2006). They control for GDP *per capita* and for country size in cross-country regressions on shares of output and employment in order to assess the specific role of manufacturing. They find that in the early 1980s the India dummy attracted a positive but statistically insignificant coefficient in manufacturing and a negative coefficient in services, both for output and employment. Hence, India was a *negative* outlier in services *vis à vis* countries that were comparable for income and size. In 2000, India was still not an outlier for its shares of output and employment in manufacturing, but it was now a *positive* outlier for output and a *negative* outlier for employment in services. These findings reflect the extremely large increase in productivity that took place in the service sector, but at the same time raise concerns about the low elasticity of the demand for labour in service sector and the possibility of jobless growth (concerns already present in Dasgupta and Singh, 2005).

A very informative analysis of the relative role of manufacturing and services in Indian growth at the state level has been carried out by Rodrik and Subramanian (2004). They examine the effect on the state growth rate of the share of registered manufacturing in total output. After introducing a number of controls, they find that the manufacturing shares had a *positive and significant* effect on state growth during the 1980s and the 1990s[30]. Hence, the presence of a strong manufacturing sector can be an important determinant of the different growth performance across Indian states, despite the growing importance of the service sector. Manufacturing activities can still be regarded as a critical engine of growth for the economy. The development of manufacturing might also be crucial in order to allow India to expand supply and reduce the risk that the current growth spurt might be unsustainable because of supply-side and capacity constraints (The Economist, 2007). It would therefore appear that a detailed examination of the pattern of trade specialization in the manufacturing sector is essential in order to assess the growth potential of the Indian economy.

[30] Interestingly, the share of manufacturing had an insignificant effect during the 1960s and 1970s.

4.4 Trade specialization

The literature suggests a large number of indicators to measure the comparative advantage of different countries. A widely used indicator is the Revealed Comparative Advantage (*RCA*) index proposed by Balassa (1965). This indicator compares the national export structure with that of the world and thus focuses only on export data. However, in the current context of increasing intra-industry trade, any indicator that just focuses on exports is likely to throw out valuable information especially if the analysis is carried out at a high level of disaggregation.

Thus, instead of relying on *RCA*, we base our analysis on the Lafay index. Rather than just looking at exports, the Lafay index also includes imports and thus is able to capture intra-industry trade flows. Another advantage of the Lafay measure is that it is able to control for distortions due to the business cycle (Lafay, 1992). We construct the following Lafay index (*LFI*) for India[31]

$$(1) \quad LFI_j = 100\left(\frac{x_j - m_j}{x_j + m_j} - \frac{\sum_{j=1}^{N}(x_j - m_j)}{\sum_{j=1}^{N}(x_j + m_j)}\right)\frac{x_j + m_j}{\sum_{j=1}^{N}(x_j + m_j)}$$

where x_j is Indian exports of product j towards the rest of the world, m_j is imports from the rest of the world towards India and N is the number of traded goods. According to the above formula, the comparative advantage for India in product j is the deviation of the product j normalized trade balance from the overall normalized balanced trade. Thus, the sum of *LFI* index across j for any year must by construction be equal to zero. Positive values of the *LFI* index imply specialization and higher values of the *LFI* imply higher degree of specialization with the sector making a bigger contribution the trade balance. On the other hand, negative values imply reliance on imports. One possible shortcoming of the index is that it may take a value close to zero for a sector in which India is both an importer and an exporter of equivalent amounts of commodities, in different sub-segments of the sector. However, this issue is likely to be less crucial if the analysis is carried out at a sufficiently detailed level of disaggregation.

The source of our data is the World Trade Analyzer by Statistics Canada (see the Data Appendix). The data span over the period 1985-2002. The *LFI* has been computed at a highly

[31] Batra and Khan (2005) carry out an analysis of comparative advantage for India and China in terms of the Balassa index.

disaggregated level: 221 items from the 3-digit SITC classification. In order to reduce the impact of outliers and the impact of wide variation in exchange rates or prices, we use the 2-year average of the LFI index.

Tables 3a-3c report the top 15 and bottom 15 categories according to *LFI* for years 1985-86, 1995-96, and 2001-02. The tables also report an indicator of the technological content of the sectors, computed according to OECD (2001, Annex A) and Khondaker (2005, Appendix 1). We have elected to concentrate on these periods because 1985-86 and 2001-02 are the beginning and the end of the time span in our analysis, and 1995-96 is a critical period since it already captures some of the transformations that took place in the aftermath of the implementation of reforms in the early 1990s. The tables show some interesting patterns in terms of the sectors that are represented in the top and bottom groups. First, in 1985-86, Food and live animals (category 0) featured prominently among the top 15 with five product groups. By 1995-96, this number had fallen to three and by 2001-02 only. Crustaceans and molluscs and Rice were in the top 15. Second, Table 3a shows the importance of manufacturing goods (categories 6 and 8) in 1985-86, with nine out of the top fifteen product groups. By 2001-02 manufacturing dominated with eleven out of the top fifteen products (Table 3c). Third, India has only one category of crude material (category 2) in the top 15 (iron ore and concentrates) and its ranking has steadily declined. Fourth, in 1985-86 Chemicals and related products (category 5) did not feature in the top 15 group. By 1995-96, Medicinal and pharmaceutical products appeared in the top 15, moving up to 8th position in 2001-02. Finally, regarding the dynamics of the various product groups, Tables 3a-3c show a mixed picture. Some product groups maintained their position in the top 15 throughout the three periods examined. More importantly, a number of product groups have dropped out from the top group while other industries have entered and remained in the top group[32].

The analysis of the technological content of the product groups at the top and the bottom of the distribution is very revealing (see the Appendix for details on the classification of sectors according to their technology). In 1985-86 the top 15 groups exclusively included categories with a *low* technological content. By contrast, the most import dependent groups included numerous categories with a medium-high or high technological content (seven out of fifteen), and a further four with a medium-low technological content. This situation did not improve greatly with nine out of fifteen bottom ranking groups being medium-high or high

[32] For instance, the categories Rice, Medicinal and pharmaceutical products, and Jewellery, goldsmiths and other articles of precious metals did not feature in the top 15 in 1985-86, but entered the top group in 1995-96 and 2001-02. Also a number of products have dropped from the top 15 especially in the category of Food and live animals but also in the manufacturing goods category such as Leather and Manufacturers of leather.

Table 3a. Top 15 and Bottom 15 Products Groups Based on Lafay Index, 1985-86.

TOP 15	LFI 85/86	Technological Content	Bottom 15	LFI 85/86	Technological Content
667-Pearls, precious& semi-precious stones	3.81	*	061-Sugar and honey	-0.62	*
074-Tea and mate	2.44	*	583-Polymerization and copolymerization products	-0.64	**
281-Iron ore and concentrates	2.32	N/A	874-Measuring, checking, analysing instruments	-0.66	****
844-Under garments of textile fabrics	2.31	*	793-Ships,boats and floating structures	-0.74	**
611-Leather	1.75	*	424-Other fixed vegetable oils, fluid or solid	-0.74	*
036-Crustaceans and molluscs, fresh, chilled, frozen	1.71	*	764-Telecommunications equipment and parts	-0.80	****
652-Cotton fabrics, woven	1.65	*	423-Fixed vegetable oils, soft, crude, refined	-0.81	*
659-Floor coverings, etc.	1.30	*	678-Tubes,pipes and fittings, of iron or steel	-0.82	**
071-Coffee and coffee substitutes	1.13	*	749-Non-electric parts and accessories of machinery	-0.96	***
843-Outer garments, women's, of textile fabrics	1.09	*	792-Aircraft & associated equipment and parts	-1.03	****
075-Spices	1.06	*	522-Inorganic chemical elements, oxides & halogen salts	-1.10	***
057-Fruit & nuts(not include. Oil nuts),fresh or dried	1.04	N/A	728-Mach.& equipment specialized for particular industries	-1.46	***
612-Manufactures of leather/of composition leather	1.00	*	674-Universals,plates and sheets, of iron or steel	-1.63	**
658-Made-up articles, wholly/chiefly of text.materials	0.97	*	562-Fertilizers,manufactured	-2.06	***
654-Textil.fabrics,woven,oth.than cotton	0.80	*	333-Petrol.oils & crude oils obt. from bituminous minerals	-6.60	**N/A**

Note: * Low tech; ** Medium-low tech; *** Medium-high tech; **** High tech
N/A It is not possible to assign a technological content

Table 3b. Top 15 and Bottom 15 Products Groups Based on Lafay Index, 1995-96.

TOP 15	LFI 95/96	Technological Content	Bottom 15	LFI 95/96	Technological Content
651-Textile yarn	2.24	*	874-Measuring, checking, analysing instruments	-0.57	****
844-Under garments of textile fabrics	2.23	*	682-Copper	-0.60	**
667-Pearls,precious& semi-precious stones	2.21	*	511-Hydrocarbons nes,& their halogenated, sulphonated, nitrated or nitrosated derivatives	-0.62	***
042-Rice	1.74	*	736-Machine tools for working metal or metal carbides	-0.62	***
652-Cotton fabrics, woven	1.46	*	424-Other fixed vegetable oils, fluid or solid	-0.64	*
036-Crustaceans and molluscs, fresh, chilled, frozen	1.28	*	674-Universals,plates and sheets, of iron or steel	-0.65	**
081-Feed.stuff for animals	1.26	*	764-Telecommunications equipment and parts	-0.65	****
658-Made-up articles,wholly/chiefly of text.materials	1.04	*	583-Polymerization and copolymerization products	-0.68	**
846-Under garments, knitted or crocheted	1.03		728-Mach.& equipment specialized for particular industries	-0.80	***
843-Outer garments, women's, of textile fabrics	1.02	*	724-Textile & leather machinery and parts	-0.86	***
659-Floor coverings, etc.	0.98	*	522-Inorganic chemical elements, oxides & halogen salts	-0.98	***
897-Jewellery,goldsmiths and other art. of precious or semiprecious materials	0.79	N/A	792-Aircraft & associated equipment and parts	-1.03	****
281-Iron ore and concentrates	0.74	N/A	562-Fertilizers, manufactured	-1.23	***
848-Art.of apparel & clothing accessories of other than textile fabrics	0.71	*	322-Coal,lignite and peat	-1.34	N/A
541-Medicinal and pharmaceutical products	0.66	****	333-Petrol.oils & crude oils obt. from bituminous minerals	-9.44	N/A

Note: See Table 3a

Table 3c. Top 15 and Bottom 15 Products Groups Based on Lafay Index, 2001-02.

TOP 15	LFI 01/02	Technological Content	Bottom 15	LFI 01/02	Technological Content
667-Pearls,precious& semi-precious stones	1.90	*	681-Silver,platinum & oth.metals of the platinum group	**-0.44**	**
651-Textile yarn	1.59	*	341-Gas,natural and manufactured	**-0.45**	*
844-Under garments of textile fabrics	1.54	*	423-Fixed vegetable oils, soft, crude, refined	**-0.47**	*
846-Under garments, knitted or crocheted	1.47	*	751-Office machines	**-0.48**	****
897-Jewellery, goldsmiths and other art. of precious or semiprecious materials	1.29	N/A	874-Measuring, checking, analysing instruments	**-0.50**	****
658-Made-up articles, wholly/chiefly of text.materials	1.22	*	776-Thermionic,cold & photo-cathode valves, tubes	**-0.55**	****
036-Crustaceans and molluscs, fresh, chilled, frozen	1.07	*	752-Automatic data processing machines & units thereof	**-0.57**	****
541-Medicinal and pharmaceutical products	1.04	****	792-Aircraft & associated equipment and parts	**-0.65**	****
652-Cotton fabrics, woven	0.95	*	323-Briquettes;coke and semi-coke of coal,lignite	**-0.79**	**N/A**
042-Rice	0.91	*	424-Other fixed vegetable oils, fluid or solid	**-0.85**	*
842-Outer garments, men's, of textile fabrics	0.87	*	522-Inorganic chemical elements, oxides & halogen salts	**-0.85**	***
845-Outer garments and other articles, knitted	0.74	*	335-Residual petroleum products	**-0.86**	**
843-Outer garments, women's, of textile fabrics	0.71	*	764-Telecommunications equipment and parts	**-1.33**	****
659-Floor coverings, etc.	0.63	*	322-Coal,lignite and peat	**-4.59**	**N/A**
281-Iron ore and concentrates	0.63	N/A	333-Petrol.oils & crude oils obt.from bituminous minerals	**-7.48**	**N/A**

Note: See Table 3a

tech in 1995-96. By 2001-02 seven were in this category, of which six were high tech sectors. Thus, sectors with a high or a medium-high technological content are dramatically over-represented among the most import dependent sectors of the Indian economy. On the positive side, the high tech Medical and Pharmaceutical products has become one of the industries in which India specialises most heavily.

Table 4 shows the trade balance of each technological group. This is computed as the difference between exports and imports in each sector, divided by the total sum of exports and imports for India. Whilst the trade surplus of low-tech sectors remains roughly constant over the sample period (but it did experience a large increase during the period 1995-96), the trade deficits of the remaining sectors display a notable improvement, which is particularly remarkable for medium-low and medium-high tech sectors.

Table 4. Trade balance by technological content.

Technological content group	1985-86	1995-96	2001-02
*	0.138	0.193	0.144
**	-0.096	-0.036	0.002
***	-0.148	-0.084	-0.022
****	-0.067	-0.045	-0.044
N/A	-0.065	-0.092	-0.105
Total balance of trade	**-0.239**	**-0.066**	**-0.026**

Note: See Table 3a.

Table 5. Average Lafay index by technological content.

Technological content group	No. observations	Average LFI		
		1985-86	1995-96	2001-02
*	80	0.28	0.27	0.19
**	46	-0.13	-0.06	0.01
***	44	-0.23	-0.16	-0.04
****	24	-0.19	-0.16	-0.17
N/A	29	-0.08	-0.28	-0.34

Note: See Table 3a.

Table 5 illustrates the changes over time in the average specialization index by technological content. In 1985-86, sectors with a low technological content were relatively specialized (the LFI was positive at 0.28). By contrast, high-technology sectors are prevalent

among the categories for which India is import-dependent. This was particularly true for medium-high and high technological content, where the index was –0.23 and –0.19 respectively. During the sample period there has been a decline in the extent of trade specialization for low-tech group (LFI was equal to 0.19 in 2001-21) and an improvement for medium-low and medium-high group (in the latter, the LFI index increased sharply to –0.04), whereas the index has seen only a marginal improvement for the high-tech sectors (–0.17). Together with the evidence from Table 4, these findings reinforce the perception that there was a shift in the sectoral contribution to foreign trade away from low-tech sectors and towards sectors with a medium technological content[33].

4.5 The changing pattern of specialization

To assess whether India has become more specialized for the period under study, we first run the following simple OLS regression:

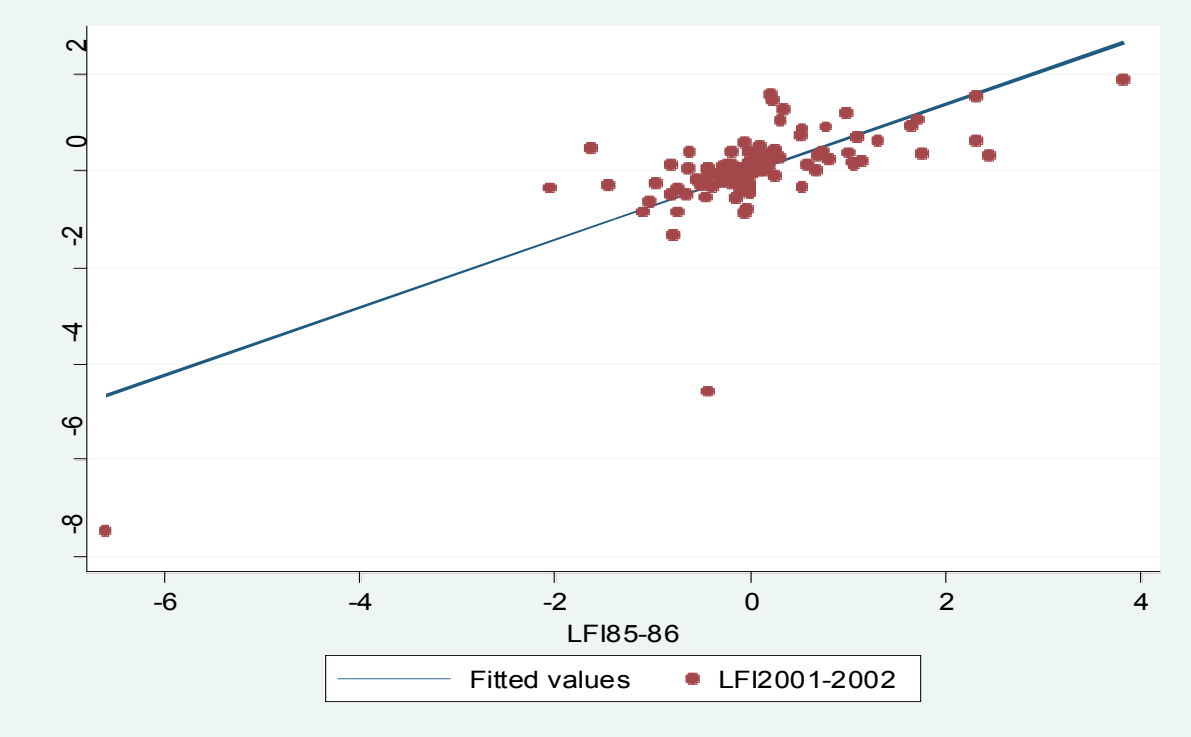
$$(2) \quad LFI_j^{2001-2002} = \alpha + \beta LFI_j^{1985-1986} + \varepsilon \quad , \quad j = 1,\ldots,221$$

where $LFI^{2001-2002}$ and $LFI^{1985-1986}$ are the Lafay indices in the final and initial period of our sample respectively. Since variables on both sides of the equation have a zero mean, the estimate of α should also have a zero value, whereas the value of β would capture the changes over time in the pattern of specialization. If β is greater than one then the degree to which India has specialised or not specialised in certain industries has increased; if β is less than one the existing pattern of specialisation in particular industries has lessened. If β is 0 then there is no relation between the pattern of specialisation in the two periods.

Figure 3 presents the scatter diagram with a fitted regression line while Table 6 reports the regression results. As can be seen from this table, the estimated coefficient is 0.70 and highly significant. The table also shows that we can reject both the null hypothesis that the slope is equal to zero (at the 1% level) as well as the null hypothesis that the slope is equal to unity (also at the 1% level).

[33] An important *proviso* to the previous analysis is that one must be cautious in interpreting trade flows data as providing evidence of trade specialization, when barriers to trade are present. Hence, it could be highly debatable whether the early figures from the mid-1980s can provide information on the pattern of comparative advantage. However, the figures from the more recent periods arguably offer a closer picture of the underlying structure of sectoral comparative advantage, following the removal of barriers to trade during the 1990s.

Figure 3. Lafay index, 2001-02 against 1985-86.



The scatter diagram points to the possibility that these results might be influenced by the existence of two potential outliers. To check the robustness of our findings, the equation is re-estimated after dropping the outliers (these are Petroleum oils and crude oils and Coal, lignite and peat). The estimated coefficient declines in value from 0.70 to 0.42 and we can again reject both the null that the slope is equal to zero and the null that the slope is equal to unity at the 1% level. In any case, both the estimated results and the scatter diagram suggest that the estimated regression line is positive and lies below the 45 degree line. This indicates that although the *LFI* has shown some improvement for items with initial low values and showed some retreat for those with initial high values, on average the specialization pattern remained the same (see Caselli and Zaghini, 2005, for a similar interpretation).

A more precise analysis of the evolution of the *LFI* distribution over the sample period can be obtained by using transition probabilities (as in Redding, 2002). These measure the probabilities that individual sectors become more or less specialized over time, as a function of their initial degree of specialization. Sectors have been grouped into quartiles on the basis of their initial specialization. The I Quartile includes those sectors with the lowest value of the Lafay index in 1985-86, and the IV Quartile contains the sectors with the highest initial values of the index. Table 7 is a four-by-four Markov transition matrix showing the estimated

transition probabilities from 1985-86 to 2001-02. Each cell (*i, j*) describes the probability that an item in the relative specialization group *i* at time *t* moves to group *j* in time *t*+1. Thus, the elements of the transition matrices represent the probabilities of moving from one quartile to another, conditional on the initial level of specialization. For instance, the first row measures the probability of a product starting from first quartile remaining in the first quartile or transiting into the second, the third or the fourth quartile.

As can be seen from Table 7, the largest values of the transition probabilities occur along the main diagonal. This implies a certain degree of persistence in specialization. However, the highest values of the diagonal elements correspond to the III and the IV quartiles. It might be relatively easier for a specialized sector to remain specialized than it is for a previously import-dependent sector to become a sector in which India specialises: once India has achieved specialization in a certain product, it is likely to maintain this specialization over time. However, the largest off-diagonal element for the lowest quartile corresponds to the IV quartile, which suggests that a number of sectors for which India was relatively import dependent at the beginning of the period had experienced a remarkable improvement in specialization by the beginning of the last decade.

Table 7. Transition Matrix Transition Probabilities from 1985-86 to 2001-02.

	I Quartile	**II Quartile**	**III Quartile**	**IV Quartile**
I Quartile	0.527	0.163	0.054	0.254
II Quartile	0.163	0.400	0.290	0.145
III Quartile	0.054	0.109	0.709	0.127
IV Quartile	0.017	0.017	0.089	0.875

$M^1 = (K - \text{trace (transition matrix)})/(K-1) = 0.496$
$M^2 = 1 - \det \text{(transition matrix)} = 0.901$

A measure of mobility across specialization levels is provided by the indicators M^1 and M^2, originally proposed by Shorrocks (1978). The indicator M^1 captures the relative magnitude of the diagonal and off-diagonal elements by calculating the trace of the transition matrix whereas M^2 is based on the determinant of the transition matrix.[34] High values of the indices imply a large degree of mobility across specialization groups. These indices allow us

[34] Table 7 reports the formulae and the values of these indices.

to compare the mobility across specialization groups in India with studies that analyse trade specialization in other countries. Zaghini (2005) computes the two mobility indices for a group of new EU member states[35]. Comparing our results with those of the new EU member states can be informative since, like India, in recent years these states have also experienced structural economic and institutional transformations. Comparing our findings with Zaghini's results, we find that the mobility indices for India are larger in value than any other country in his sample. The estimated value for M^1 for India is 0.496 and the value for M^2 is 0.901. By comparison, the highest values in Zaghini's sample over the period 1993-2001 are 0.411 and 0.815 respectively, and are obtained for Latvia. These findings could indicate a relatively high degree of dynamism in the Indian economy, even when compared to economies that experienced a radical process of transition.

There is therefore evidence of changes in the global pattern of specialization, with import dependent sectors gradually becoming more specialized over time.

4.6 Specialization and world demand

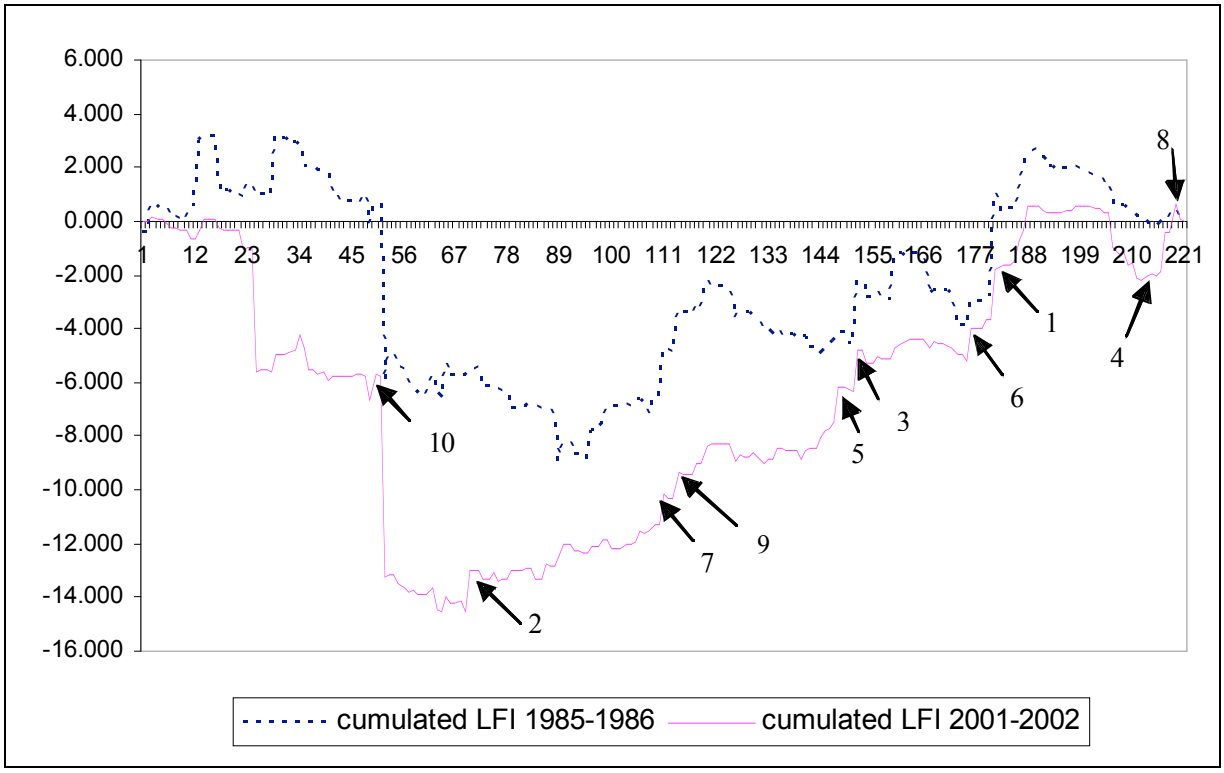
The results in the previous section are suggestive of high mobility in the specialization pattern, especially towards an increase in specialization. But have these changes in specialization been towards the most dynamic product groups? An answer to this question can be obtained by comparing the evolution over time of the specialization index against world demand for the product items. A specialization model can be labelled as 'efficient' when the country gains comparative specialization in product groups for which global demand has grown the fastest (Zaghini, 2005). On the other hand, a specialization model is labelled 'inefficient' when the country gains specialization advantage in products groups in which global demand growth has been in decline.

An effective way to check for the efficiency of the specialization model is to examine the cumulative distribution of the Lafay index ranked according to the average growth rates of world imports for the period 1986-2002. The graph starts with the Lafay index of the item with the slowest growth and must end at zero by construction for the item with the fastest growth. If India systematically specialised in products which showed slow growth on a world scale then the beginning of the distribution would show positive values. If India was highly

[35] These are: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Cyprus, and Malta.

import dependent on slowly growing products then the graph would show negative values initially.

Figure 4. The cumulated Lafay Index: Items ordered by world import growth over the period 1985-86 to 2001-02



Notes:
1. **Pearls,precious& semi-precious stones**
2. Textile yarn
3. Under garments of textile fabrics
4. Under garments, knitted or crocheted
5. Jewellery, goldsmiths and other art. of precious or semiprecious materials
6. Made-up articles, wholly/chiefly of text.materials
7. Crustaceans and molluscs, fresh, chilled, frozen
8. Medicinal and pharmaceutical products
9. Cotton fabrics, woven
10. Rice

Figure 4 plots the cumulative distribution of the Lafay index for the years 1985-86 and for the years 2001-02 against world import growth. These graphs yield some very interesting results. The pattern of specialization has improved over the period in the sense that, on average, India has not specialized in sectors that have experienced the lowest growth in world demand. On the other hand, India did improve its trade specialization in the very product groups that have witnessed the highest global growth. The average value of *LFI* for the slowest-growth sectors was –0.097 in 1985-86, and had decreased to –0.245 in 2001-02

(Table 8). Thus, India has not specialised in the sectors whose world demand grew more slowly. By contrast, the index has improved for the medium growth, medium-high growth and fastest growth sectors. The values of *LFI* for the last two categories improved from 0.095 to 0.125 and from 0.022 to 0.078 respectively. Hence, it would appear that India is improving its pattern of specialization in the very sectors that grew fastest in terms of world demand.

Table 8. Average Lafay Index by World Demand, 1985-86 and 2001-02.

Groups	**Average LFI 85-86**	**Average LFI 01-02**
Slowest Growth (Mean Growth: 1.80%)	–0.097	–0.245
Medium Growth (Mean Growth: 5.25%)	–0.020	0.040
Medium-High Growth (Mean Growth: 7.40%)	0.095	0.125
Fastest Growth (Mean Growth: 10.00%)	0.022	0.078

In order to illustrate the profile of specialization of Indian sectors in relation to world demand, Figure 4 also indicates the position of the ten sectors in which India showed the highest degree of specialisation in 2001-02. These correspond to the items on the cumulated Lafay curve which exhibited the largest positive jumps. It can be seen that most sectors can be found in the upper half of the distribution, which contains the medium-high and fastest growth groups. This confirms that the Indian manufacturing sector tends to present a pattern of specialization that is consistent with the dynamics of world demand.

4.7 Conclusions

In 1999, the late Sanjaya Lall argued that "a technology-intensive structure is desirable for a country with a substantial industrial base. India has such a base, but its export structure is dominated by low-technology products and concentrated in slow growing market segments" (Lall, 1999, p. 1784). Recent enthusiasm for the performance of some high-tech service sectors has generated great optimism on India's trade potential and on the possible impact for the continued growth prospects of the country. Our analysis of trade flows over the last couple of decades confirms Lall's critical observations on the modest technological content of Indian exports. Low-technology sectors dominate the categories for which India exhibits the largest degree of trade specialization, while high-technology sectors are over-represented among the categories for which India appears to be import-dependent.

However, we find that India did experience an improvement in the degree of specialization in some of the most dynamic sectors of world trade. Its index of specialization has increased, on average, for the sectors that have grown the fastest since the mid-1980s. Thus, the impact of the relationship between India's trade potential and growth needs cautious examination. The technological content of India's best performing sectors remains dominated by traditional activities. The few but significant exceptions, such as Medicinal and pharmaceutical products, could signal for a shift towards a more widespread adoption of advanced technologies. This will be especially true if India succeeds in realising its potential for original innovation, already confirmed by the number of patents that are earned by the Indian subsidiaries of multinational firms (The Economist, 2004) and by such imaginative projects as the "one lakh" car (The Economist, 2006), which would be by far the cheapest car currently produced in the world.

Data Appendix

1. Lafay Index.

The main source of the data used for the construction of the Lafay index is the "World Trade Analyzer 1985-2002", Statistics Canada (CD-ROM, November 2004). The classification of the sectors is based on SITC-2. The total value of imports for sector 3 (Fuels) has been obtained from the World Development Indicators 2006 (World Bank, 2006), since the WTA data for this sector exhibited a large difference from the data from different sources. In particular, the WTA data showed a sharp reduction of fuel imports during the 1990s, with a consequent underestimation of total imports. The figures for two- and three-digit sectors within sector 3 have been computed by using the shares from WTA.

2. Index of technological content.

The taxonomy of technological content for sectors follows the OECD classification presented in "*OECD Science, Technology and Industry Scoreboard 2001 – Towards a Knowledge-Based Economy*, Annex A. Classification of Manufacturing Industries Based on Technology". The methodology uses two indicators of technology intensity: (1) R&D expenditures divided by production and (2) R&D expenditures divided by value added. The classification of the sectors is based on the analysis of R&D expenditure and output in 12 OECD countries[36] for the period 1991-1999. Manufacturing industries are classified as low-technology, medium-low-technology, medium-high-technology and high-technology groups. Sectors included in higher categories have a higher intensity for both indicators than sectors included in lower categories. Some sectors belonging to mining or agricultural industries present no expenditure in R&D and are classified as N/A. OECD makes use of the ISIC-3 classification. In order to convert the figures from ISIC-3 to SITC-2 we have made use of the conversion table in Khondaker (2005), Appendix 1.

[36]Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Spain, Sweden, United Kingdom, and the United States.

References

Ahluwalia, M.S. (2002), "Economic Reforms in India since 1991: Has Gruadualism Worked?", *Journal of Economic Perspectives*, 16(3), Summer, 67-88.

Alcalà, F., and A. Ciccone (2004), "Trade and Productivity", *Quarterly Journal of Economics*, 119(2), 613-646.

Arora, A., and A. Gambardella (2004), "The Globalization of the Software Industry: Perspectives and Opportunities for Developed and Developing Countries", NBER Working Paper No. 10538.

Balassa, B. (1965), "Trade Liberalization and 'Revealed' Comparative Advantage", *The Manchester School of Economic and Social Studies*, 32(2), 99-123.

Banerjee, A.V. (2006), "The Paradox of Indian Growth: A Comment on Kochhar *et al*.", *Journal of Monetary Economics*, 53(5), 1021-26.

Batra, A., and Z. Khan (2005), "Revealed Comparative Advantage: An Analysis for India and China", ICRIER Working Paper No. 168, August.

Caselli, P., and A. Zaghini (2005), "International Specialization Models in Latin America: The Case of Argentina", Banca d'Italia, Discussion Paper No. 558.

Cerra, V., S.A. Rivera and S.C. Saxena (2005), "Crouching Tiger, Hidden Dragon: What Are the Consequences of China's WTO Entry for India's Trade?", IMF Working Paper No. 05/101, Washington, International Monetary Fund.

Chauvin, Sophie and Françoise Lemoine (2003) "India Bets on Technology Niches", Centre d'Etudes Prospectives et d'Informations Internationales, Working Paper No. 221, March.

Commander, S., R. Chanda, M. Kangasniemi, and A. Winters (2004), "Must Skilled Migration Be a Brain Drain? Evidence from the Indian Software Industry", IZA Discussion Paper No. 1422, December.

Das, D.K. (2003), "Quantifying Trade Barriers: Has Trade Protection Declined Substantially in Indian Manufacturing?", Indian Council for Research on International Economic Relations, Working Paper No. 105.

Dasgupta, S., and A. Singh (2005), "Will Services Be the New Engine of Economic Growth in India?", Centre for Business Research, University of Cambridge, Working Paper No. 310.

Dasgupta, S., and A. Singh (2006), "Manufacturing, Services and Premature De-Industrialisation in Developing Countries: A Kaldorian Empirical Analysis", Centre for Business Research, University of Cambridge, Working Paper No. 327.

DeLong, B. (2004), "India since Independence: An Analytic Growth Narrative", chapter. 7 in D. Rodrik (ed.), *In Search of Prosperity*, Princeton, Princeton University Press, pp. 184-204.

Grossman, G. and E. Helpman (1991), *Innovation and Growth in the Global Economy*, Cambridge (MA), MIT Press.

Kaldor, N. (1967), *Strategic Factors in Economic Development*, Itacha, New York State School of Industrial and Labor Relations, Cornell University.

Khondaker, J. A. (2005), "Technology Intensity of Canadian Exports: A Comparative Investigation (III-G)", International Trade Division, Statistics Canada, 2005.

Kochhar, K., U. Kumar, R. Rajan, A. Subramanian and I. Tokatlidis (2006), "India's Pattern of Development: What Happened, What Follows?", *Journal of Monetary Economics*, 53(5), 981-1019.

Kohli, A. (2006a), "Politics of Economic Growth in India, 1980-2005. Part I: The 1980s", *Economic and Political Weekly*, April 1, 1251-1259.

Kohli, A. (2006b), "Politics of Economic Growth in India, 1980-2005. Part II: The 1990s and Beyond", *Economic and Political Weekly*, April 8, 1361-1370.

Krishna, P., and D. Mitra (1998), "Trade Liberalisation, Market Discipline and Productivity Growth: New Evidence from India", *Journal of Development Economics*, 56(2), 447-462.

Lafay, G. (1992), "The Measurement of Revealed Comparative Advantage", in M.G. Dagenais and P.A. Muet (eds.), *International Trade Modeling*, London, Chapman and Hill.

Lall, S. (1992), "Technological Capabilities and Industrialization", *World Development*, 20(2), 165-186.

Lall, S. (1999), "India's Manufacturing Exports: Comparative Structure and Prospects", *World Development*, 22(10), 1769-1786.

NASSCOM (2006), *Strategic Review 2006. The IT Industry in India*, New Delhi, National Association of Software and Service Companies.

OECD (2001), *OECD Science, Technology and Industry Scoreboard 2001.*

Panagariya, A. (2004), "India in the 1980s and 1990s: a Triumph of Reforms", International Monetary Fund, Working Paper No. 04/03, March.

Patibandla, M., and B. Petersen (2002), "Role of Transnational Corporations in the Evolution of a High-Tech Industry: The Case of India's Software Industry", *World Development*, 30(9), 1561-1577.

Redding, S. (2002), "Specialization Dynamics", *Journal of International Economics*, 58(2), 299-334.

Rodrik, D., and A. Subramanian (2004), "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition", NBER Working Paper No. 10376, March.

Rowthorn, R. (2006), "The Renaissance of China and India: Implications for the Advanced Economies", University of Cambridge, mimeographed.

Saxenian, A. (2002), "Transnational Communities and the Evolution of Global Production Networks: The Cases of Taiwan, China and India", *Industry and Innovation*, Special Issue on Global Production, 9(3), 183-202.

Schiff, J. (2005), "India Going Global: Its Expanding Role in the World Economy", International Monetary Fund, mimeographed.

Sharma, K. (2000), "Export Growth In India: Has FDI Played A Role?", Economic Growth Center, Yale University, Discussion Paper No. 816, July.

Shorrocks, A.F. (1978), "The Measurement of Mobility", *Econometrica*, 46(5), 1013-1024.

Statistics Canada (2004), *World Trade Analyzer, 1985-2002,* Statistics Canada.

The Economist (2004), "Innovative India: Please Don't Call It Oursourcing", *The Economist*, 1st April.

The Economist (2006), "A Different Route: While China's Carmakers Copy, India's Are Inventing", *The Economist*, 13th December.

The Economist (2007), "India on Fire", *The Economist*, 1st February.

Topalova, P. (2004), "Trade Liberalization and Firm Productivity: The Case of India", International Monetary Fund, Working Paper No. 04/28.

Tucci, A. (2005), "Trade, Foreign Networks and Performance: A Firm-Level Analysis for India", Centro Studi Luca D'Agliano, Development Studies Working Paper No. 199, March.

UNCTAD (2005), *UNCTAD Handbook of Statistics*, Geneva, United Nations.

World Bank (2006), *World Development Indicators*, Washington DC, World Bank.

WTO (2001), *International Trade Statistics,* Geneva, World Trade Organization.

Young, A. (1991), "Learning-by-Doing and the Dynamic Effects of International Trade", *Quarterly Journal of Economics*, 106(2), 396-405.

Zaghini, A. (2005), "Evolution of Trade Patterns in the New EU Member States", *Economics of Transition*, 13(4), 629-658.