

**REFORM AND OPENNESS OF THE CHINESE ECONOMY: EFFECTS ON
REGIONAL CONVERGENCE.
BETA AND SIGMA CONVERGENCE, 2000-2010**

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Abstract:

Over the past years, the economy of the People's Republic of China has maintained a remarkable rate of growth which has made China the new economic and commercial power of the world. Nevertheless, China's growth cannot hide the clear disparity in terms of participation and territorial distribution of this economic growth or the inequality in level of development in different Chinese provinces. However, at the beginning of 21st century a series of public policies to stimulate and to adjust the transformations, it has had an effects on economic convergence between different chinese regional economies. In this article the methodological proposals of Barro and Sala i Martin (1992, 2003) are followed regarding the need to differentiate between the effects of what they call Beta (β) and Sigma (σ) convergence in order to qualify regional economic movements.

Keywords: Chinese economic development, Regional convergence, Social inequality, Openness, Reforms

1. Introduction.

Over the past years, the economy of the People's Republic of China has maintained a remarkable rate of growth which has made China the new economic and commercial power of the world. This transformation has meant a profound change in the existing international economic order and has led to a new vision of international economic relations based on the consolidation of the G-2, composed of the supposedly declining power, the USA, and the emerging power, China, who are fighting to become the world's major commercial partner. Indeed, China has developed so quickly that the rest of the world has paid a great deal of attention to China and its "economic miracle".

Nevertheless, China's growth cannot hide the clear disparity in terms of participation and territorial distribution of this economic growth or the inequality in level of development in different Chinese provinces. Regional inequality is the result of the model of growth followed based on the conversion of a planned economy into a market economy, from a relatively closed economy to an increasingly open one, inspired by the economic reform process which started at the end of 1978.

In fact, the current situation is actually the result of the intense economic transformations that China has undergone since the Revolution of 1949 led by Mao Zedong. During the early revolutionary period, Mao's government wanted to build a socialist nation with a planned economy, creating a welfare state system based on public spending. That is to say, the government covered all of the population's needs in in terms of education, pensions, housing, health, etc. in a relatively closed economic system with no economic contact with Western countries, a relatively fair system with no profound differences between rural residents and urban residents, nor in income

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between Shanghai or Tibet or between the salaries of state employees and other workers. Moreover, private economic activity was not allowed, all “work units” (*Danwei*) were public and a rationing system was enforced for families.

This situation persisted until the 1970s when economic problems started to make their presence felt – particularly in terms of providing food for the population (a population which reached the figure of one billion in 1980) – and the gap in economic growth widened between China and advanced capitalist nations, and the first reforms began under the leadership of Deng Xiaoping. Since then, and despite some political changes and fluctuations, China has undergone a continuous and ongoing process of economic reform and opening-up to the outside world, as well as improving its relations with Western countries.

Over the last years, profound reforms have been made in order to progress towards an economic system based on the free market which has had a direct impact upon the welfare state and social services (education, housing, social security) and the growing importance of the ability to pay for these services has created serious disparities between the population, specifically between the rural and urban population. Furthermore, the Chinese government has devoted too much interest and energy to the development of the Eastern Region (the coastal region) which has led to a loss of jobs in the Western Region and the Central Region (which are both inland) and has worsened the economic imbalances between the different economic areas into which the country is organized and has encouraged internal migration. It could be stated that the country has opted for migrations as a mechanism to assign factors and to balance incomes.

These transformations mean that it would be interesting to conduct a study of their effects on economic convergence between different Chinese regional economies. Therefore, will follow the methodological proposals of Barro and Sala i Martin (1992, 2003) regarding the need to differentiate between the effects of what they call Beta (β) and Sigma (σ) convergence in order to qualify regional economic movements.

The study is organized into three parts. The first one reviews the changes that have taken place in the Chinese economy which have led to the transformation from a planned and closed economy to an open market economy. Thus, we will offer a context in which to assess regional convergence, which will be the subject of the second part of the study. In this second part, we will analyze the evolution of the economic disparities between the different provinces in China during the first decade of the 21st century. The study finishes with the conclusions obtained regarding regional convergence in the Chinese economy.

2. Economic reforms: Orientation to the market and internationalization.

Since the second half of the 20th century, the Chinese economy has undergone major changes which are a result of the profound transformations which have taken place as a consequence of the different political guidelines that arose from the Revolution of 1949. The resulting policies transformed China’s economic structure and its productivity, and the country went from being an essentially agricultural one to an economy based first on heavy industry and then on more modern light industry.

Without entering in too much detail into the political and social conflicts that accompanied this period, after the death of Mao Zedong the new policies of *Reform and Openness* were consolidated under the leadership of Deng Xiaoping, which was

confirmed in the Third Plenary Meeting of the Central Committee of the Communist Party (1978)¹. The main objective of the new policy was to modernize the economy and boost decentralization, as well as dealing with the problems derived from demographic growth without altering political stability.

The demographic problem was solved through a programme of *Family Planning* based on the “one-child” policy. Consequently, the birth rate control imposed by the government of Deng Xiaoping produced significant results in terms of the rate of demographic growth and placed this rate lower than levels in the rest of the world.

The policy of economic transformation includes a set of decisions that affected agriculture, rural businesses, state owned enterprises and wide-ranging programme of openness to the international economy. Moreover, in order to solve the problem of unemployment², particularly the kind generated by the profound reforms in state owned enterprises (SOEs) between 1992 and 1996, the government modified its policies related to social welfare and human capital. All of these reforms are summarized in the expression *Reform and Openness*.

The policy of family planning has been maintained so far in the 21st century, and therefore the Chinese population is increasing at a lower rate than in the 20th century, although the demographic keeps changing. The reforms related to investment in human capital and the establishment of a new system of social welfare boosted immigration for economic reasons as people expected to find better living conditions in the more prosperous regions. The rural population of the country has gone from 63.8% of the total population in 2000 to 50.3% in 2010. During the same period, the urban population increased and reached 49.7% (Table 1); furthermore, the inter-regional population mobility worsened the regional demographic imbalance which has accompanied the process of economic development.

Table 1. Evolution of demographic structure in 21st century China.
(Total, Urban and Rural Population in Millions of people. Distribution in percentage)

Year	Total population	Population growth rate	Urban population	Urban weight	Rural population	Rural weight
2000	1267.43	0.8%	459.06	36.2%	808.37	63.8%
2001	1276.27	0.7%	480.64	37.7%	795.63	62.3%
2002	1284.53	0.6%	502.12	39.1%	782.41	60.9%
2003	1292.27	0.6%	523.76	40.5%	768.51	59.5%
2004	1299.88	0.6%	542.83	41.8%	757.05	58.2%
2005	1307.56	0.6%	562.12	43.0%	745.44	57.0%
2006	1314.48	0.5%	577.06	43.9%	737.42	56.1%
2007	1321.29	0.5%	593.79	44.9%	727.50	55.1%
2008	1328.02	0.5%	606.67	45.7%	721.35	54.3%
2009	1334.74	0.5%	621.86	46.6%	712.88	53.4%
2010	1339.72	0.4%	665.57	49.7%	674.15	50.3%

Source: Own elaboration based on data from the National Bureau of Statistics of China, China Statistical Yearbook.

The basic components of the transition from a planned economy to a market economy were:

¹ On the 13th of December 1978, Deng defended his plans to the Central Committee of the Chinese Communist Party.

² Naughton 2006, 301.

a) *Agricultural reforms* included the transformation of collective agriculture to new systems of “family responsibility”. Through these reforms, publicly owned agricultural land was handed over to peasants. At the end of 1982, a system of private allotments was inaugurated and more than 90% of rural families signed up for this new productive method of family responsibility. At the same time, the progressive extension of agricultural markets also started. At the end of 1983, the plan had spread throughout the country³ and by the middle of the 1990s there was a widespread liberalization of markets and agricultural prices.

b) *Reforms in Township and Village Enterprises (TVEs)* consisted of granting autonomy to local authorities in terms of management. The result was a notable expansion of their activities, which was encouraged by the opening-up of the labour market as a consequence of agricultural reforms. Thus, from 1980 onwards there was an incipient process of liberalization of the labour market in rural areas which encouraged the expansion of *Township and Village Enterprises (TVEs)*, which were very important in the economic activity of villages. In this new context, these companies played a very important role in economic growth and economic reform in the country. Between 1978 and 1983, TVEs increased the rural work force by 14%, reaching a figure of 32 million people, and the value of their production increased from 49.3 billion yuan to 101.7 billion yuan, with an annual growth rate of 21% during those years. These notable results accelerated reforms in such a way that between 1984 and 1988 the annual growth rate in the number of TVEs was 52.8%, growth in employment was 20.8%, and growth in total income generated was 54.8%⁴. This explains how TVEs became the main driver of economic growth in China during that period and a powerful competitor for state owned enterprises who were unable to avoid reforms.

c) *Reforms in State-Owned Enterprises* sought to reduce the burden of bureaucracy and achieve greater flexibility in management.⁵ The *Southern Tour* by Deng in 1992 and the adoption of the *Company Law* in 1994⁶ started a profound reform in SOEs by facilitating a certain corporative privatization and orientation to a gradually liberalized market, with negative consequences in terms of maintaining their activity and employment. In 1996, the central government promoted the policy of “*catching the big ones, freeing the small ones*”, aimed at maintaining control of the major companies that dominated the country’s strategic resources such as energy, electricity, water, telecommunications etc, liberating the rest from government control and opening them up to competition on the free market⁷. Nevertheless, as a consequence of this, numerous urban collective enterprises were closed down, 40% of the workers were made redundant and the contribution of SOEs to total industrial production fell from 77% in 1978 to 33% in 1996⁸.

d) *Reforms in education and human capital* contributed towards improving productivity and provided the opportunity to reach higher levels of income, a fact recognized by all authors. In the case of China, education was also included in the

³ Naughton 2006, 89.

⁴ National Bureau of Statistics of China, 18 September 1999.

⁵ Naughton 2006, 300.

⁶ *People’s Daily*, 1994.

⁷ Wang 2009, 42-45.

⁸ National Bureau of Statistics of China, 17 September 1999.
Naughton 2006, 301.

programme of reforms and, therefore, in 1980 the process of decentralizing education began. Prior to these reforms, central government was responsible for designing, managing and allocating educational resources. Until the reforms of 1985, there was no private activity related to education. This reform radically changed the relation between central government and local governments, since through decentralization financial responsibilities regarding education were delegated from central government to local governments. Thus, public spending on education by central government was reduced while, through this reform, private institutions started to participate in education and this led to a reduction in total public spending on education⁹. The main reforms started in 1985¹⁰ when the State Council published a document called *On the decision to reform the educational system*, joining the educational system with the market economy system, and they continued with the instructions included in the 1993 *Programme for reform and development in Education in China*, and the 1995 *Education Law*, Article 25 of which confirmed that the State gave its full support to companies, social institutions, local communities and private entities who wanted to set up schools within the new legal framework. From this year onwards, the number of private educational institutions has increased significantly and this is a basic component of the process of *decentralization and privatization*¹¹.

e) *Public spending on social security* (unemployment and pensions) was also subject to reform. This high level of spending was unsustainable with the evolution of the country's demographic structure dictated by the policy of *Family Planning* which has led to an aged population and a need for increased spending by the government. The reform of the pensions system began in 1991 with the introduction of the novel principle of *PAY-AS-YOU-GO (PAYGO)* in the social security system, through which workers devoted 3% of their salary to pensions and the other 8% was paid for by the government and employers¹². In 2005, the government reinforced the changes by applying a funding policy linked to personal income. From that date onwards, the government defined two types of contributors to the pensions system: workers and employers, stipulating a contribution of 20% from personal salaries to pension accounts, and a contribution of 8% of workers' salaries and 12% as the contribution of the company¹³.

f) Furthermore, the system of *protection against unemployment* has been subject to reforms. Although since 1950 the government had allocated work to citizens over the age of 18 and employers did not have the right to dismiss workers, along with the first reforms in companies came the first signs of unemployment in Chinese society. In 1986, the government passed for the first time the *Law on Unemployment Insurance* organized by the Social Security system¹⁴ which has continued through further

⁹ Zhao 2009, 366-373.

¹⁰ *People's Daily*, 1985, 1993, 1995

¹¹ Painter and Mok 2008, 137-150.

¹² Gov.cn. 2012. "The Social Security of China", http://www.gov.cn/test/2012-04/20/content_2118401.htm. Accessed 20 April 2012.

¹³ Gov.cn. 2012. "The Social Security of China", http://www.gov.cn/test/2012-04/20/content_2118401.htm. Accessed 20 April 2012.

¹⁴ Mohrss.gov.cn. 2012. "The Interpretation of Social Insurance Law of People's Republic of China", http://www.mohrss.gov.cn/SYrlzyhshbzb/rdzt/syshehuibaoxianfa/bxfguiguijijiedu/201208/t20120815_28575.htm. Accessed 15 August 2012.

legislation adopted in later years. In January 1999, the central government introduced the *Regulations on unemployment insurance*¹⁵ which are applicable to private and state owned enterprises in urban areas and mean that workers must contribute 1% of their salary to unemployment insurance, whereas employers must contribute with 2% of staff costs. Since the implementation of this legislation, workers who were made redundant no longer had any link with the company when they lost their job and directly entered the Social Security network. Nevertheless, it was not until 2009 that the government put into practice the *New insurance for social, rural and urban pensions*¹⁶. This initiative was started experimentally and benefits more than 110 million rural residents¹⁷, a modest number if we consider that rural residents represent almost 50% of the total population of the (600 million people). These changes have boosted demographic mobility and worsened the inter-regional demographic imbalance (Table 1).

g) Along with the migratory movements, there has been a notable tendency towards the consolidation of a *private housing market*, as the country went from a system of public property to one in which private property is increasingly important. These reforms had begun in 1978¹⁸ and accelerated from 1990 onwards with the authorization of rentals and mortgages, In 1993, taxes were established for the conveyance of real estate property and, above all, in 1994 the publication by the State Council of the *Advice on the extension of the reform of the system of urban housing to accelerate the construction of houses* gave a notable boost to the private sector. For the application of this policy, the government established a *Provident Fund for Urban Housing*¹⁹ which facilitates the participation of private institutions and individuals in the marketing and sales of housing. Subsequently in 2003, the State Council published *The notification on the promotion of sustainable and healthy development of the housing market*²⁰, which indicated that local governments should accelerate the development of the housing market and satisfy the demands of housing investment. Thus, from 2003 onwards, local governments have facilitated the construction of houses and thereby consolidated the residential system on a national level. The marketing and sale of houses has meant that immigrants have kept moving towards the richest regions and that through investment in housing they have continued to boost urban economic growth. That is to say, the reform of the housing system has improved social stability and this has increased the economic gap between rich and poor regions.

These changes were accompanied and accelerated by a commitment to insert the Chinese economy into the international economy. In 1980²¹, the central government established the Special Economic Zones (SEZs) in the provinces of Guangdong and

¹⁵ Mohrss.gov.cn. 2012. "The Interpretation of Social Insurance Law of People's Republic of China", Ibid.

¹⁶ Gov.cn. 2012. "The Social Security of China", Ibid.

¹⁷ Ye 2011, 678-693.

¹⁸ Chinatax.gov.cn. 1993: "Provisional Regulations on Land Value Appreciation Tax of the People's Republic of China", <http://hd.chinatax.gov.cn/guoshui/action/GetArticleView1.do?id=1430&flag=1>. Accessed 13 December 1993.

¹⁹ Gov.cn. 2006. "Actively develop affordable housing", http://www.gov.cn/ztlz/2006-06/30/content_323687.htm. Accessed 30 June 2006.

²⁰ Gov.cn. 2005. "The notification on the promotion of sustainable and healthy development of the housing market", http://www.gov.cn/zwgk/2005-08/13/content_22259.htm. Accessed 13 August 2005.

²¹ People's Daily, 1980

Fujian²². The SEZs offered a range of incentives for foreign investments which boosted economic growth and international trade in these regions. Later, in 1987 in order to broaden the scale of international trade and take advantage of the geographical advantages, the government implemented the “Coastal Development Strategy”²³, based on fiscal and labour policies which were favourable to foreign investors, along with the construction of infrastructures.

Moreover, although during the 1980s the government implemented a stable exchange rate of between 3 and 4 yuan per dollar, from the 1990s onwards there was an increase in exchange rate flexibility and the yuan was devalued to 5 yuan per dollar, and especially so after the guidelines given by Deng after the Southern Tour (1st of January 1994) when the Chinese currency was devalued to 8.6 yuan per dollar.

In 2001, China joined the World Trade Organization (WTO) and, from that point onwards, underwent acceleration in the transformation of its economic structure towards an increasingly liberal market economy accompanied by a spectacular rate of economic growth. Since that period, China has continued to reduce its commercial barriers in almost all sectors and has improved the ease of access to its national market of goods and services, improved the protection of intellectual property rights, the transparency of its commercial practices and eliminated non-tariff barriers²⁴. As an indicator of these changes, the clause tariffs of the most favoured nations (MFN) in the case of agricultural products went from 48.6% in 2000 to 24.5% in 2001 and 15.7% in 2010, whereas those applicable to industrial products the decrease was from 41.4% to 14.5% and 8.7% in the same years²⁵.

In its process of openness, China has improved its revealed comparative advantage²⁶ in such a way that low quality, labour intensive exports produced by unqualified workers have begun to give way to products which make intensive use of high quality human capital and technology which are increasing the country's international competitive capacity and its insertion into global value chains.

Through its incorporation into the WTO, China also committed itself to opening up its market to a wide range of services and eliminated many of the limitations on access to the national market and has also eliminated many of the discriminatory practices faced by foreign companies operating in the service sector. The full implementation of the GATS²⁷ commitments by China has obviously meant important reforms which have led to benefits both for China and for its commercial partners.

Since 2000, China has received more foreign direct investment (FDI) than other developing countries and the world financial crisis that started in 2007 had little effect upon its reception of direct foreign investment, and this is shown by the fact that is in the first position as the favourite destination in the trust list of the FDI²⁸ between 2002 and 2012. According to official figures, the FDI received by China in 2010 was higher

²² The Guangdong province contains the cities Shenzhen, Zhuhai and Shantou which are near to Hong Kong and Macao. The Fujian province contains the city Xiamen which is near to Taiwan.

²³ *People's Daily*, 1987

²⁴ Mattoo and Subramanian 2011, 2-41.

²⁵ OECD 2012, 53.

²⁶ Kowalski and Bottini 2011, 81-119.

²⁷ GATS: General Agreement on Trade in Services.

²⁸ A.T. Kearney. 2012. “FDI Confidence Index, 2012,” <http://www.atkearney.com/es/research-studies/foreign-direct-investment-confidence-index>.

than 1 billion dollars (1.0574 billion) for the first time. The main attraction of China for foreign investors is, obviously, the plentiful and cheap workforce which has been an incentive for the installation of labour intensive manufacturing processes e.g. final assembly production processes. Due to this advantage, China can play the role of the world's factory in a chain of values for many years.

Moreover, Chinese domestic companies are also raising their competitive level as they are swapping the role of subcontracted assembly for manufacturing of the “*full-package*”. That is to say, Chinese companies control all of the stages of the process, from the purchase of materials up to design and production. This activity has grown very quickly and between 2005 and 2010 the ratio of “*full-package*” increased by 20%²⁹. Foreign investments are also helping to consolidate China's position in the global value chain (GVCs³⁰) as well as improving the quality of this participation. Thus, China has progressed from an isolated position to a nuclear one in commercial networks and GVCs among 217 countries in just 25 years (1980-2005)³¹. In this way, its rapid integration into the value chain has contributed to the rapid growth of Chinese exports. As a summary of the aforementioned transformations, it should be noted that:

- During the first decade of the 21st century, average growth has registered annual rates of 10%, which is much higher than that of other emerging countries and OECD countries. Evidently, this success is directly related to the structural reforms of the 1980s and 1990s.
- Per capita GDP was 7,858 yuan in 2000 and increased to 29,992 yuan in 2010, approximately four times more. (Table 2)
- In three decades, Chinese GDP (measured according to the criteria of Purchasing Power Parity (PPP) has increased its participation in world production from 2% in 1980 to more than 13% in 2010, making China the second biggest economy in the world after the USA.³²
- The rural population represented 63.8% of the total in 2000 and 50.3% in 2010. During the same period, the urban population increased to 49.7%.
- These changes have also influenced the distribution of the working population by sectors since, with the decrease in the rural population, agricultural work has decreased from 50% in 1999 to 37% in 2010. At the same time, the industrial employment rose from 20% in 1999 to 29% in 2010 and employment in the services sector rose from 26% in 1999 to 35% in 2010.
- The contribution of industrial production to total GDP increased to 47%, while production of services 43% of total GDP. Exports increased their share in world trade from 3.9% in 2000 to 10.6% of world exports in 2010³³.
- In 1990 China received 1.7% of FDI and another 1.6% was located in Hong Kong. In 2000, the figures were 2.9% and 5%, respectively, but in 2010 China received 8.1% while Hong Kong received 5.8% of FDI³⁴.
- Furthermore, China has increased its role as a foreign investor and has gone from contributing just 0.3% of FDI in 1990, with another 1% from Hong Kong. In

²⁹ OECD 2012, 80.

³⁰ GVCs: Global Value Chains.

³¹ Reyes, Garcia and Lattimore 2008, 13-38.

³² UNCTAD 2012.

³³ OECD 2012, 50-51.

³⁴ UNCTAD 2012.

2000, the participation of the mainland was still quite scarce (0.7%,) compared to 5.6% from Hong Kong. However, in 2010, China accounted for 4.7% and Hong Kong 6.7% of world FDI.³⁵

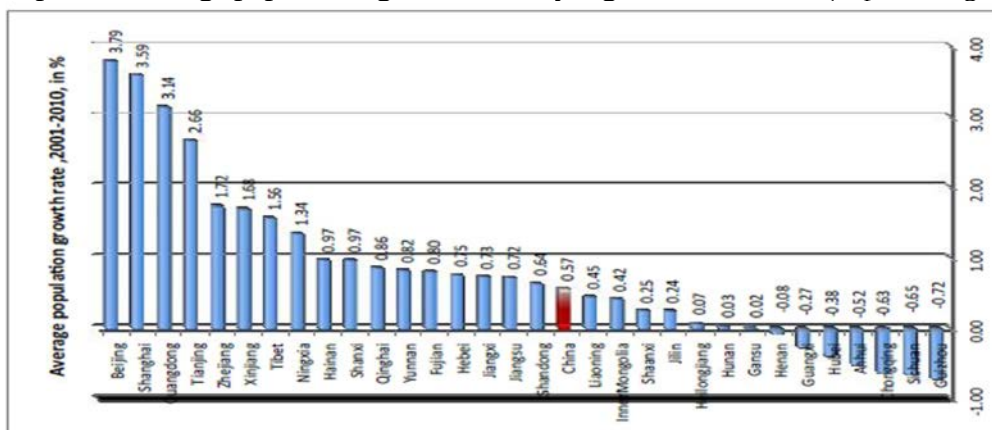
In summary, the policy of *Reform and Openness* has encouraged the sustained economic growth of the Chinese economy whilst simulating a strong and vibrant export sector.

3. Regional convergence

As has been noted, the demographic changes derived from the policies on birth rate and population mobility which stemmed from the reforms have changed the distribution of the population between different regions of China.

In Graphic 1, and with data from all of the 31 regions (cities and provinces) in China, it can be seen that from 2001 to 2010, the average population growth rate in China was 0.57%. Beijing with 3.8%, Shanghai with 3.6%, Guangdong with 3%, and Tianjing with 2.7% are the regions in the Eastern Region – the coast- which have registered the greatest demographic growth. Nevertheless, it is interesting to note the data from Xinjiang (1.7%), Tibet (1.6%) and Ningxia (1.3%), are three regions from the Western Region – inland- which have population growth rates over 1%, higher than other regions in the coastal area and, obviously, higher than the national average..

Graphic 1. Average population growth rate, by regions, 2001-2010, (in percentages)



Source: Own elaboration with data from the National Bureau of Statistics of China, China Statistical Yearbook.

Furthermore, it can be observed that population growth rates of 1% and 0.57% (national rate) were registered in the other regions in the Eastern Region, in two regions in the Western Region (Qinghai and Yunnan) and in two regions in the Central Region (Shanxi and Jiangxi). These figures indicate that seven regions in the internal Regions have figures above the national population growth rate (0.57%), which implies that the governmental strategies applied in the first decade of the 21st century³⁶ are

³⁵ Ibid.

³⁶ Chinese public policies and the new guidelines contained in the *Tenth and Eleventh Five Year Plan* which have marked a new direction in the development of China in the first decade of the 21st century, whereas the policies of “*Development of the Western Region*”, the “*Resurgence of the Central Region*” and the “*Revitalization of the old industrial basis of the North East Region*” should contribute to a reduction in inter-regional differences within the strategy entitled “*using the rest of the capacities for*

working and that the economic development of the internal Regions is beginning to attract population.

Moreover, the evolution of per capita GDP in China and by regions (Table 2 and Figure 1), shows that during the years studied the economic growth of China was extremely impressive. Indeed, the growth of regional per capita GDP in 21 regions is higher than the national figure. These regions include 9 in the Western Region (Inner-Mongolia, Shaanxi, Ningxia, Chongqing, Guizhou, Qinghai, Sichuan, Gunagxi, Gansu) and all of the 6 regions that make up the Central Region (Shanxi, Henan, Hunan, Hubei, Jiangxi, Anhui), and of the remaining 6 regions, 4 are in the Eastern Region (Jiangsu, Shandong, Tianjing, Zhejiang), and the other 2 are in the North East Region (Jilin, Liaoning).

Table 2. Evolution of GDP per capita by regions.(In Yuan.)

Regiones	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	A 2000	B 2010
Beijing	24122	26998	30840	34892	41099	45444	50467	58204	66797	70452	75943	3.07	2.53
Tianjing	17353	19141	21387	25544	30575	35783	41163	46122	58656	62574	72994	2.21	2.43
Hebei	7592	8251	8960	10251	12487	14782	16962	19877	22986	24581	28668	0.97	0.96
Shanxi	5722	6226	7082	8642	10742	12495	14123	16945	21506	21522	26283	0.73	0.88
InnerMongolia	6502	7216	8162	10039	12767	16331	20053	25393	35263	40282	47347	0.83	1.58
Liaoning	11177	12015	13000	14270	15835	18632	21788	25729	31736	35239	42355	1.42	1.41
Jilin	7351	7893	8714	9854	11537	13348	15720	19383	23521	26595	31599	0.94	1.05
Heilongjiang	8294	8900	9541	10638	12449	14434	16195	18478	21740	22447	27076	1.06	0.90
Shanghai	29671	32201	35329	39128	46338	51529	57695	66367	75109	78989	76074	3.78	2.54
Jiangsu	11765	12882	14396	16830	20223	24560	28814	33928	40499	44744	52840	1.50	1.76
Zhejiang	13416	14713	16978	20444	24352	27703	31874	37411	42166	44641	51711	1.71	1.72
Anhui	4779	5313	5736	6375	7682	8670	10055	12045	14448	16408	20888	0.61	0.70
Fujian	11194	11892	12938	14333	16469	18646	21471	25908	30122	33840	40025	1.42	1.33
Jiangxi	4851	5221	5829	6624	8097	9440	10798	12633	15900	17335	21253	0.62	0.71
Shandong	9326	10195	11340	13268	16413	20096	23794	27807	32936	35894	41106	1.19	1.37
Henan	5450	5959	6487	7376	9201	11346	13313	16012	19181	20597	24446	0.69	0.82
Hubei	6293	6867	7437	8378	9898	11431	13296	16206	19858	22677	27906	0.80	0.93
Hunan	5425	6120	6734	7589	9165	10426	11950	14492	18147	20428	24719	0.69	0.82
Guangdong	12736	13849	15361	17795	20870	24435	28332	33151	38748	41166	44736	1.62	1.49
Guangxi	4652	5058	5558	6169	7461	8788	10296	12555	14652	16045	20219	0.59	0.67
Hainan	6798	7052	7781	8592	9812	10871	12654	14555	17691	19254	23831	0.87	0.79
Chongqing	5616	6219	7052	8091	9624	10970	12457	14660	20490	22920	27596	0.71	0.92
Sichuan	4956	5376	5890	6623	7895	9060	10546	12893	15495	17339	21182	0.63	0.71
Guizhou	2759	3000	3257	3701	4317	5052	5787	6915	9428	10309	13119	0.35	0.44
Yunnan	4769	5015	5366	5871	7012	7835	8970	10540	12570	13539	15752	0.61	0.53
Tibet	4572	5324	6117	6893	8103	9114	10430	12109	13824	15295	17319	0.58	0.58
Shaanxi	4968	5506	6145	7028	8587	10161	12138	14607	19480	21688	27133	0.63	0.90
Gansu	4129	4386	4768	5429	6566	7477	8757	10346	12075	12872	16113	0.53	0.54
Qinghai	5138	5774	6478	7346	8693	10045	11762	14257	18421	19454	24115	0.65	0.80
Ningxia	5376	6039	6647	7734	9199	10242	11847	14649	19609	21777	26919	0.68	0.90
Xinjiang	7372	7945	8457	9828	11337	13108	15000	16999	19797	19942	25034	0.94	0.83
China	7858	8622	9398	10542	12336	14185	16500	20169	23708	25575	29992	1	1

$A_{(Región i)}_{2000} = \text{Region } i_{2000} / \text{China}_{2000}$ $B_{(Región i)}_{2010} = \text{Region } i_{2010} / \text{China}_{2010}$

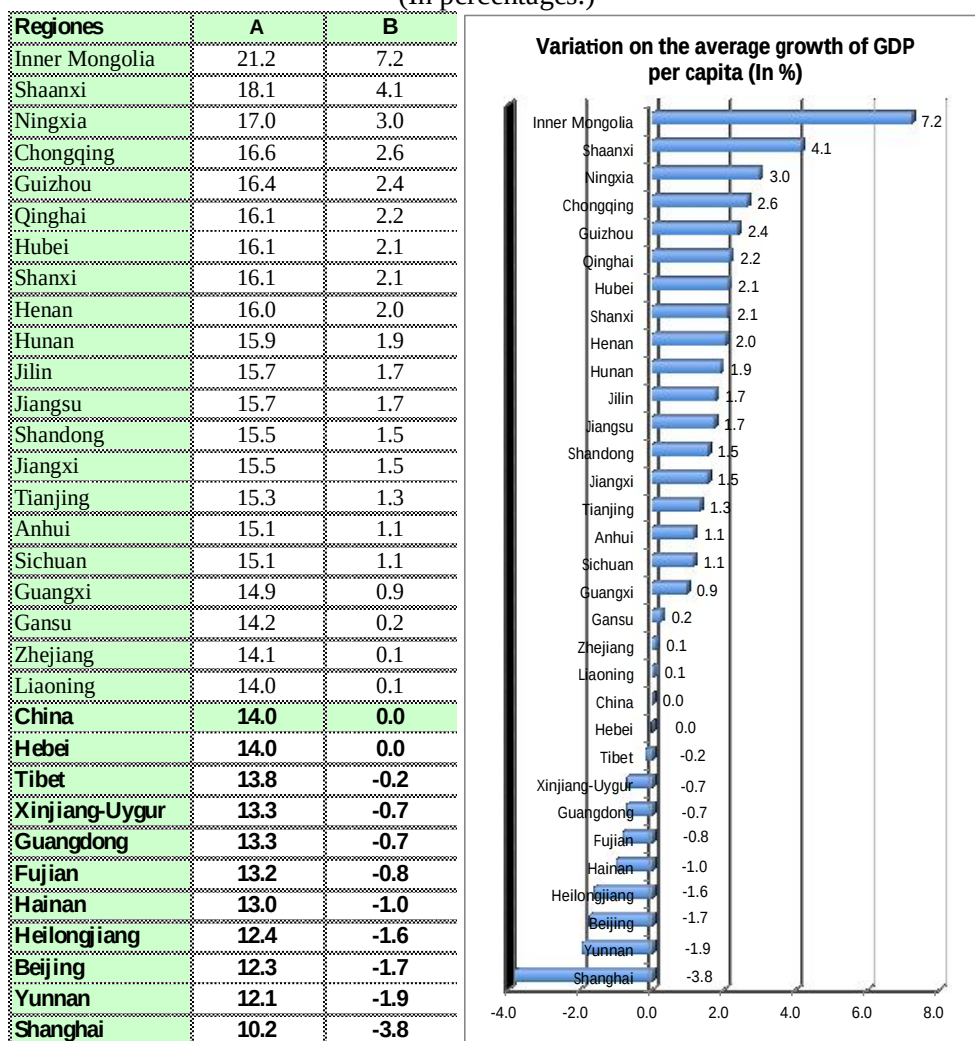
Source: Own elaboration with data from the National Bureau of Statistics of China, China Statistical Yearbook.

Meanwhile, of the 10 regions in the Eastern Region, the 6 regions with growth which is slower than the national level are Shanghai, Beijing, Hainan, Fujian, Guangdong and Hebei. Moreover, Heilongjiang in the North East Region does not

economic development (spillover effect) of the Eastern coastal Region, in order to improve social and economic development in the internal Regions”.

show significant growth. And of the inland regions, there are also some regions that are growing slowly, namely Yunnan, Xingjiang and Tibet, in the Western Region, which register a growth in per capita GDP below the national level. This means that some rich regions in China such as Beijing and Shanghai are slowing down their rate of growth and, on the contrary, some poor regions are accelerating their rate of development.

Figure 1. Average growth rate annual of GDP per capita by regions, 2000-2010.
(In percentages.)



A: Average growth rate of GDP per capita in the period 2000-2010, by regions. B: Variation on the average growth rate of GDP per capita, by regions. $B_{(region\ i)} = A_{(region\ i)} - A_{(China)}$

Source: Own elaboration with data from the National Bureau of Statistics of China, China Statistical Yearbook.

Using this data, we have carried out an analysis of regional convergence. Empirical research i.e. the measurement of convergence, has clarified the concepts related to convergence and has differentiated two fundamental concepts in terms of

convergence, according to the proposal made by Sala i Martin³⁷: Beta (β) convergence and Sigma (σ) convergence which order the results of the checks, thus facilitating their interpretation.

With the term *absolute convergence* –commonly called non-conditional β convergence because of the parameter used in the econometric models– we mean the *approximation of levels of per capita incomes* in the most backward regions in relation to the most advanced regions. Moreover, it indicates whether or not an initially lower income is associated with a higher rate of growth. It measures the results of a region's economic growth and, therefore, registers whether or not the most backwards regions grow more quickly than the more advanced ones. It should be noted that convergence takes place regardless of the initial conditions of each region except for the level of income.

If the *inter-regional distance* decreases over time, it is said that the economies or regions in question tend towards σ convergence. On the contrary, if the result shows a tendency towards growth, increase and inter-regional distance this is interpreted as a sign that the economies or regions do not show Sigma convergence.

With *absolute β convergence*, we analyze the process through which the most backward regions approach the most advanced ones i.e. if there is any “*catching-up*” process of the former in regard to the latter. In both cases, the aim is to analyze whether or not regional disparities are reduced. According to Barro and Sala i Martin, the regions are supposed to be homogeneous, to use similar technologies and to share a similar stationary status. The function of governments consists of using public policies to stimulate or cause the economic convergence of regions. That is to say, the strategies that allow poor economies to reach the economic level of rich nations through incentives that are sustained over a long period of time. Therefore, based on the model of Solow-Swan on long term growth, Barro and Sala i Martin³⁸ describe the dynamic transition of economic convergence.

With these assumptions, the convergence equation is expressed as follows:

$$(1/T) \cdot \log(y_{it}/y_{i0}) = \alpha - \left[\frac{1 - e^{-\beta T}}{T} \right] \cdot \log(y_{i0}) + w_{i0,T}$$

Where, the sub-index t indicates the year; T signifies the time length; i indicates the regions and y_i is the per capita rate of growth. The sub-indexes 0 and T represent the growth of the initial year and the final year.

α is a coefficient of interception which is supposed to be the same for all of the region as $\alpha_{it} = \alpha_t$. That is to say, the stationary states are defined by technological process and are the same in each region.

$w_{i0,T}$ is the random disturbance term which has an average of zero and is distributed independently from the $\log(y_{i0})$, the endogenous variable.

The equation of absolute β convergence, allow us to estimate the parameter of β convergence.

³⁷ Sala i Martin 2000.

³⁸ Barro and Sala I Martin 2003, 37-39.

Moreover, if the term $\left[\frac{1-e^{-\beta T}}{T} \right] \cdot \log(y_{t0})$ which multiplies the initial entry in the equation turns out to be negative, we can conclude that the poor economy tends to grow more quickly than the rich one. That is to say, the **β convergence** is fulfilled, and β is the speed of convergence.

In the analysis, it has been established that the time variable T includes the period from 2000 to 2010; that is to say, we observe the relation between per capita GDP at the beginning of 2000 and the rate of growth of the annual per capita GDP in an interval of 11 years. The hypothesis of inter-regional and intra-regional absolute Beta convergence of the country is:

Null hypothesis: $H_0: \beta \geq 0$

This means that when β is equal to or greater than zero the null hypothesis is accepted. From the point of view of the theory of convergence, it means that no initial result indicates convergence, or that among the regions of China there is no sign of the phenomenon of absolute convergence.

On the contrary, if β has a value lower than zero, a negative value, this indicates that the sense of convergence is correct, which means that absolute inter-regional convergence occurs in the country.

If β convergence occurred, then the reduction of the dispersion of incomes between different regions should occur, thus registering **Sigma (σ) convergence**. That is to say, if β convergence occurs then there will be σ convergence, except if other factors act in the opposite direction.

The σ convergence measures the evolution of the inter-regional distance in terms of per capita income. It is calculated as the standard deviation of the values observed in the regional per capita incomes.

$$\sigma_i = \sqrt{\frac{\sum_{i=1}^n (x_i - \mu)^2}{n}}$$

Where n is the size of the sample; x_i is the per capita GDP in logarithm by regions; μ represents the average of the sample equal to $\bar{x}$.

The measure of Sigma convergence shows a result with an evolution of general dispersion. That is to say, just as with absolute Beta convergence, in the calculation of Sigma convergence Sigma we only observe one variable, per capita GDP.

The results were:

a) Beta convergence

As has been stated previously, in the first decade of the 21st century, the Chinese government tried to boost *regional development* and to help internal Regions to develop more quickly than coastal ones in order to reduce the inter-regional economic distance by taking advantage of the spillover effects from the rich regions to the poor ones. They tried to make the rates of economic growth in the Central Region and the Western Region higher than those of the Oriental Region (the grouping of the Eastern Region and the North Eastern Region), thus generating an inter-regional “*catching-up*” phenomenon.

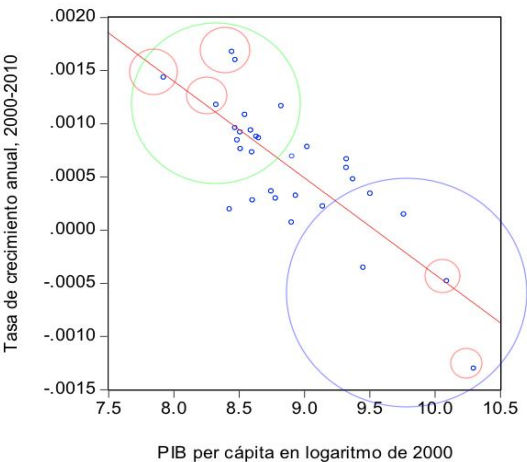
In Figure 2 we include the results of the model of inter-regional convergence for the 31 provinces in China.

Figure 2. Results of the model of *absolute* β convergence applied to the 31 provinces in China
(Regression of inter-regional per capita GDP in China)

Dependent Variable: CP
Method: Least Squares
Date: 09/13/12 Time: 16:02
Sample: 1 31
Included observations: 31
White Heteroskedasticity-Consistent Standard Errors & Covariance
CP=C (1) + C (2)*PP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (1)	0.008668	0.001258	6.889718	0.0000
C (2)	-0.000909	0.000142	-6.404137	0.0000

R-squared 0.627364 Mean dependent var 0.000591
Adjusted R-squared 0.614514 S.D. dependent var 0.000613
S.E. of regression 0.000381 Akaike info criterion -12.84691
Sum squared resid 4.20E-06 Schwarz criterion -12.75439
Log likelihood 201.1270 Hannan-Quinn criter. -12.81675
F-statistic 48.82391 Durbin-Watson stat 1.907551
Prob(F-statistic) 0.000000



“Tasa de crecimiento anual” means “Growth rate anual” “PIB per cápita en logaritmo” means “GDP per capita in logarithm”. Source: Own elaboration

C(1) is the interception in each region. In the model it is a constant and its ρ -value (prob.) ≈ 0 , which means that the intervals of each region are not the same and are significant.
C(2) is the β coefficient, which is the index of convergence. In the model, $\beta < 0$ is **0.000909**, which means that the 31 provinces of China are converging in their per capita product growth. Furthermore, the p -value of c (2) ≈ 0 and $\leq 0,05$, which means that we can reject the null hypothesis with a possibility of more than 95%. That is to say, this model is statistically significant.

Moreover, the fact that the value of the coefficient of determination R^2 is $0.627364 \approx 63\%$, means that the explained variability is 63% of the total, which indicates that, from a practical point of view, the groups explain a great deal of the variability.

In Figure 2, the descending line of regression indicates that as per capita GDP rises this indicates that the coefficient of convergence is negative, ($\beta=-0.000909$). The blue spots (provinces) around the line of regression and the dots found on the left-hand circle represent the poor provinces, those which have the lowest per capita GDP in the initial moment, but which show a high rate of growth in per capita GDP during the period observed. Moreover, the dots on the lower right-hand circle correspond to the rich provinces which have the highest initial per capita GDP, but which register slower growth than that represented by the dots on the left-hand circle, the poor provinces. The dots that are on the small circles correspond to provinces that show a significant effect of absolute convergence.

Therefore, according to the definition of convergence and the results shown in Figure 1.1, in general terms, during the years of the 21st century which have been examined, the 31 provinces in China have converged at a very slow speed (0.09%).

b) Sigma convergence

In the previous section, we saw how during the first years of the 21st century, due to spillover effects, the poor regions are reaching the rich ones, and therefore it is reasonable to state that from 2000 to 2010 the 31 regions of China will show Sigma convergence in their per capita GDP (Figure 3).

Figure 3: σ convergence of per capita GDP among the 31 provinces of China.



Source: Own elaboration

The downwards inclination of the adjusted line of convergence Sigma indicates this: that is to say, in the first decade of the 21st century, the 31 provinces of China are reducing the inter-regional distance in their per capita GDP.

Furthermore, the interprovincial distance maintained a fairly stable level between 2000 and 2006. Afterwards, because of the boost provided by regional policies and the appreciation of the national currency, the rich regions started to produce spillover effects towards the inland regions. Consequently, from 2006 onwards, the Sigma convergence σ is significant. Moreover, due to the influence of the world financial crisis on the most dynamic regions, the inter-regional distance decreased more over the last years.

In summary, the result of the σ convergence of the per capita GDP between the provinces of China coincides with the result of the absolute β convergence of China. The inter-regional economic distance is decreasing since the poor regions are reaching the per capita incomes of the rich ones. The inter-regional distance began to decrease swiftly from 2006 onwards. Hence, it can be observed that the speed in the decrease of the inter-regional economic distance is not rapid, which affects the speed of inter-regional Beta convergence in the same period which is also slow.

4. Conclusions

China started the 21st century intensifying its economic policy of *reform and openness* which has its origins in 1979, during the first government of Deng Xiaoping. The international insertion of the Chinese economy was further strengthened in 2001, the year in which China was accepted as a member of the World Trade Organization (WTO), which reinforced the policy of external openness. One of the keys to this strategy for the support for economic activity in the coastal regions as a space for economic integration with the international economy, boosting foreign trade and attracting foreign investment to these regions, whereas the inland regions have suffered the consequences of the emigration of their population.

The downside of this policy has been the increase in inequality between rural and urban areas, which has been exacerbated by market oriented policies. These policies, to the extent that they influence the welfare state system (education, housing, social security), are having negative effects upon social equality, which has led to an increase in internal differences, and the current Chinese government has started to apply policies and strategies (*Tenth and Eleventh Five Year Plan*) for regional development in the poor areas in order to stimulate their rapid economic trying to take advantage of the spillover effects of rich areas.

In this strategy, regional convergence would be the result of the general liberalization of the Chinese economy and the combination of the spillover effects of economic growth from the most dynamic centres towards the least dynamic ones, along with internal migratory movement in the opposite direction, from the least prosperous areas to the most dynamic ones.

In fact, the results of the analysis of the absolute inter-regional β convergence in China show that all of the 31 regions (provinces and cities) show absolute inter-regional β convergence, confirming the prediction of the theory.

The σ convergence of the per capita GDP between the provinces of China coincides with the result of the absolute β convergence of China. The inter-regional economic distance is decreasing as the poor regions are gradually reaching the economic level of the rich regions. This convergence has accelerated since 2006 when

the inter-regional distance began to decrease thus confirming the results of the β convergence analysis.

In summary, the new strategies and public policies of the Chinese government which seek to produce inter-regional spillover effects have worked in the first decade of the 21st century. The results of the model of inter-regional convergence inter-regional have verified this effect with a significant result, although the speed of convergence is weak and slow, which means that the distance in terms of inter-regional economic development will not be eliminated in the short term.

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Annexes 1. Basic statistic data:

Note: 0 means no figure available.

A.1.1. The sectorial production in China, 1952-2010.

(100 million yuan, at currante price)

	GDP	Agriculture	Industry	Service		GDP	Agriculture	Industry	Service
1952	614	335	140	139	1982	5323	1777	2383	1163
1953	735	363	189	182	1983	5963	1978	2646	1338
1954	791	384	214	194	1984	7208	2316	3106	1786
1955	856	422	228	206	1985	9016	2564	3867	2585
1956	970	442	281	247	1986	10275	2789	4493	2994
1957	1045	453	327	266	1987	12059	3233	5252	3574
1958	1282	472	511	300	1988	15043	3865	6587	4590
1959	1473	437	682	354	1989	16992	4266	7278	5448
1960	1547	379	801	368	1990	18668	5062	7717	5888
1961	1141	401	431	309	1991	21782	5342	9102	7337
1962	1103	447	373	283	1992	26924	5867	11700	9357
1963	1169	476	413	280	1993	35334	6964	16454	11916
1964	1310	525	488	297	1994	48198	9573	22445	16180
1965	1509	599	593	318	1995	60794	12136	28680	19979
1966	1676	657	682	337	1996	71177	14015	33835	23326
1967	1576	663	585	327	1997	78973	14442	37543	26988
1968	1522	658	546	318	1998	84402	14818	39004	30581
1969	1736	667	715	354	1999	89677	14770	41034	33873
1970	2014	728	905	381	2000	99215	14945	45556	38714
1971	2181	760	1011	410	2001	109655	15781	49512	44362
1972	2270	776	1060	434	2002	120333	16537	53897	49899
1973	2433	836	1136	461	2003	135823	17382	62436	56005
1974	2471	862	1132	477	2004	159878	21413	73904	64561
1975	2699	891	1299	509	2005	184937	22420	87598	74919
1976	2727	892	1307	528	2006	216314	24040	103720	88555
1977	3004	917	1501	586	2007	265810	28627	125831	111352
1978	3645	1028	1745	873	2008	314045	33702	149003	131340
1979	4063	1270	1914	879	2009	340903	35226	157639	148038
1980	4546	1372	2192	982	2010	401202	40534	187581	173087
1981	4892	1560	2256	1077					

A.1.2. GDP per capita by regions of China, 1996-2010.

(In yuan)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Beijing	14254	16609	19118	21397	24122	26998	30840	34892	41099	45444	50467	58204	66797	70452	75943
Tianjing	11734	13142	14243	15405	17353	19141	21387	25544	30575	35783	41163	46122	58656	62574	72994
Hebei	5345	6079	6501	6849	7592	8251	8960	10251	12487	14782	16962	19877	22986	24581	28668
Shanxi	4177	4723	5104	5229	5722	6226	7082	8642	10742	12495	14123	16945	21506	21522	26283
Inner Mongolia	4457	4980	5406	5861	6502	7216	8162	10039	12767	16331	20053	25393	35263	40282	47347
Liaoning	7730	8725	9415	10086	11177	12015	13000	14270	15835	18632	21788	25729	31736	35239	42355
Jilin	5178	5591	5983	6382	7351	7893	8714	9854	11537	13348	15720	19383	23521	26595	31599
Heilongjiang	6382	7133	7375	7578	8294	8900	9541	10638	12449	14434	16195	18478	21740	22447	27076
Shanghai	19779	22583	24513	26527	29671	32201	35329	39128	46338	51529	57695	66367	75109	78989	76074
Jiangsu	8471	9371	10049	10695	11765	12882	14396	16830	20223	24560	28814	33928	40499	44744	52840
Zhejiang	9552	10624	11394	12214	13416	14713	16978	20444	24352	27703	31874	37411	42166	44641	51711
Anhui	3524	3929	4235	4495	4779	5313	5736	6375	7682	8670	10055	12045	14448	16408	20888
Fujian	7646	8775	9603	10323	11194	11892	12938	14333	16469	18646	21471	25908	30122	33840	40025
Jiangxi	3452	3890	4124	4402	4851	5221	5829	6624	8097	9440	10798	12633	15900	17335	21253
Shandong	6746	7461	7968	8483	9326	10195	11340	13268	16413	20096	23794	27807	32936	35894	41106
Henan	3978	4389	4643	4832	5450	5959	6487	7376	9201	11346	13313	16012	19181	20597	24446
Hubei	4311	4884	5287	5452	6293	6867	7437	8378	9898	11431	13296	16206	19858	22677	27906
Hunan	3963	4420	4667	4933	5425	6120	6734	7589	9165	10426	11950	14492	18147	20428	24719
Guangdong	9139	10130	10819	11415	12736	13849	15361	17795	20870	24435	28332	33151	38748	41166	44736
Guangxi	3706	3928	4346	4444	4652	5058	5558	6169	7461	8788	10296	12555	14652	16045	20219
Hainan	5346	5567	5912	6294	6798	7052	7781	8592	9812	10871	12654	14555	17691	19254	23831
Chongqing	4130	4733	5016	5207	5616	6219	7052	8091	9624	10970	12457	14660	20490	22920	27596
Sichuan	3550	4032	4294	4540	4956	5376	5890	6623	7895	9060	10546	12893	15495	17339	21182
Guizhou	2048	2250	2364	2545	2759	3000	3257	3701	4317	5052	5787	6915	9428	10309	13119
Yunnan	3779	4121	4446	4558	4769	5015	5366	5871	7012	7835	8970	10540	12570	13539	15752
Tibet	2688	3144	3666	4180	4572	5324	6117	6893	8103	9114	10430	12109	13824	15295	17319
Shaanxi	3446	3834	4070	4415	4968	5506	6145	7028	8587	10161	12138	14607	19480	21688	27133
Gansu	2946	3199	3541	3778	4129	4386	4768	5429	6566	7477	8757	10346	12075	12872	16113
Qinghai	3799	4122	4426	4728	5138	5774	6478	7346	8693	10045	11762	14257	18421	19454	24115
Ningxia	3926	4277	4607	4900	5376	6039	6647	7734	9199	10242	11847	14649	19609	21777	26919
Xinjiang	5102	5848	6174	6443	7372	7945	8457	9828	11337	13108	15000	16999	19797	19942	25034

A.1.3. GDP by regions of China, 1996-2010.

(100 million yuan, at currante price)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Beijing	1789	2076	2376	2678	3161	3711	4330	5024	6060	6886	7870	9353	11115	12153	14114
Tianjing	1122	1265	1375	1501	1702	1919	2151	2578	3111	3698	4359	5050	6719	7522	9224
Hebei	3453	3954	4256	4514	5044	5517	6018	6921	8478	10096	11660	13710	16012	17235	20394
Shanxi	1292	1476	1611	1667	1846	2030	2325	2855	3571	4180	4753	5733	7315	7358	9201
Inner Mongolia	1023	1154	1263	1379	1539	1714	1941	2388	3041	3896	4791	6091	8496	9740	11672
Liaoning	3158	3583	3882	4172	4669	5033	5458	6003	6672	8009	9251	11023	13669	15212	18457
Jilin	1347	1464	1577	1673	1952	2120	2349	2662	3122	3620	4275	5285	6426	7279	8668
Heilongjiang	2371	2668	2774	2866	3151	3390	3637	4057	4751	5512	6189	7065	8314	8587	10369
Shanghai	2958	3439	3801	4189	4771	5210	5741	6694	8073	9154	10366	12189	14070	15046	17166
Jiangsu	6004	6680	7200	7698	8554	9457	10607	12443	15004	18306	21645	25741	30982	34457	41425
Zhejiang	4189	4686	5053	5444	6141	6898	8004	9705	11649	13438	15743	18780	21463	22990	27722
Anhui	2093	2347	2543	2712	2902	3247	3520	3923	4759	5375	6149	7364	8852	10063	12359
Fujian	2484	2871	3160	3414	3765	4073	4468	4984	5763	6569	7615	9249	10823	12237	14737
Jiangxi	1410	1606	1720	1854	2003	2176	2450	2807	3457	4057	4671	5500	6971	7655	9451
Shandong	5884	6537	7021	7494	8337	9195	10276	12078	15022	18517	22077	25966	30933	33897	39170
Henan	3635	4041	4308	4518	5053	5533	6035	6868	8554	10587	12496	15012	18019	19480	23092
Hubei	2500	2856	3114	3229	3545	3881	4213	4757	5633	6520	7581	9231	11329	12961	15968
Hunan	2540	2849	3026	3215	3551	3832	4152	4660	5642	6511	7569	9200	11555	13060	16038
Guangdong	6835	7775	8531	9251	10741	12039	13502	15845	18865	22367	26204	31084	36797	39483	46013
Guangxi	1698	1817	1911	1971	2080	2279	2524	2821	3434	4076	4829	5956	7021	7759	9570
Hainan	390	411	442	477	527	558	622	693	799	895	1053	1223	1503	1654	2065
Chongqing	1187	1360	1441	1492	1603	1766	1990	2273	2693	3070	3492	4123	5794	6530	7926
Sichuan	2872	3241	3474	3649	3928	4293	4725	5333	6380	7385	8638	10505	12601	14151	17185
Guizhou	723	806	858	938	1030	1133	1243	1426	1678	1979	2282	2742	3562	3913	4602
Yunnan	1518	1676	1831	1900	2011	2138	2313	2556	3082	3473	4007	4741	5692	6170	7224
Tibet	65	77	92	106	118	139	162	185	220	251	291	342	395	441	507
Shaanxi	1216	1364	1458	1593	1804	2011	2253	2588	3176	3676	4524	5466	7315	8170	10123
Gansu	723	794	888	956	1053	1125	1232	1400	1688	1934	2277	2702	3167	3388	4121
Qinghai	184	203	221	239	264	300	341	390	466	543	642	784	1019	1081	1350
Ningxia	203	225	245	265	295	337	377	445	537	606	711	889	1204	1353	1690
Xinjiang	901	1040	1107	1163	1364	1492	1613	1886	2209	2604	3045	3523	4183	4277	5437

Furthermore, it can be observed that population growth rates of 1% and 0.57% (national rate) were registered in the other regions in the Eastern Region, in two regions in the Western Region (Qinghai and Yunnan) and in two regions in the Central Region (Shanxi and Jiangxi). These figures indicate that seven regions in the internal Regions have figures above the national population growth rate (0.57%), which implies that the governmental strategies applied in the first decade of the 21st century³⁹ are working and that the economic development of the internal Regions is beginning to attract population

³⁹ Chinese public policies and the new guidelines contained in the *Tenth and Eleventh Five Year Plan* which have marked a new direction in the development of China in the first decade of the 21st century, whereas the policies of “*Development of the Western Region*”, the “*Resurgence of the Central Region*” and the “*Revitalization of the old industrial basis of the North East Region*” should contribute to a reduction in inter-regional differences within the strategy entitled “*using the rest of the capacities for economic development (spillover effect) of the Eastern coastal Region, in order to improve social and economic development in the internal Regions*”.

Annexes 2. Economic indices:**A.2.1. GDP per capita by regions in logarithm. (PP).**

	1999	2000 (PP)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Beijing	9,971006	10,0908796	10,2035181	10,3365678	10,4600129	10,6237391	10,7242361	10,8290749	10,9717094	11,1094134	11,1626869	11,2377383
Tianjing	9,64244741	9,76152068	9,85958791	9,97053854	10,1481577	10,237938	10,4852282	10,6252951	10,7390453	10,9794452	11,0441051	11,1981325
Hebei	8,83185794	8,93485034	9,01808968	9,10052551	9,23513054	9,43244338	9,6011655	9,73873083	9,89731856	10,0426406	10,1097291	10,2635368
Shanxi	8,56197533	8,65207367	8,73648935	8,86531163	9,06438932	9,28191657	9,43308384	9,55555995	9,73772808	9,97608724	9,97683095	10,1766676
Inner Mongolia	8,67607552	8,7798651	8,88405606	9,00724452	9,21423279	9,454619	9,70082042	9,90613405	10,1422288	10,4705895	10,60366	10,7652587
Liaoning	9,2189036	9,32161337	9,39391115	9,47270464	9,56591471	9,66997796	9,83263581	9,98911464	10,155374	10,365207	10,4699087	10,6538418
Jilin	8,76123681	8,90259164	8,97373157	9,07268621	9,19563274	9,35331454	9,49912184	9,66268907	9,87215167	10,0656489	10,1884785	10,3608808
Heilongjiang	8,93300459	9,02328764	9,09380656	9,16335358	9,27218778	9,42939558	9,57734181	9,69245783	9,82433611	9,98690916	10,0189123	10,206403
Shanghai	10,1859184	10,2979254	10,3797528	10,4724594	10,5745936	10,7437176	10,8499	10,9629258	11,1029552	11,2266957	11,2770639	11,2394618
Jiangsu	9,27753162	9,3728843	9,46358627	9,57470567	9,73091829	9,91457585	10,1088744	10,2686167	10,4319959	10,6090326	10,7087126	10,8750238
Zhejiang	9,41033811	9,5042033	9,59648674	9,73967367	9,92544472	10,1003693	10,229296	10,3695459	10,5297201	10,6493695	10,706408	10,8534258
Anhui	8,41072095	8,4719866	8,57791193	8,65451738	8,76013937	8,94663521	9,06762407	9,2158253	9,39640492	9,57831128	9,7055243	9,94693011
Fujian	9,24212969	9,3231332	9,38362118	9,467924	9,57031985	9,7092351	9,83338692	9,97448599	10,1623071	10,3130111	10,4293988	10,5972595
Jiangxi	8,38981426	8,48694023	8,58604423	8,67060074	8,7984547	8,9992489	9,15271126	9,28711621	9,44406772	9,67407439	9,76048286	9,96425334
Shandong	9,04581944	9,14056148	9,22965268	9,33609158	9,4931104	9,70582898	9,90827607	10,0771887	10,2330431	10,4023216	10,4883254	10,6239094
Henan	8,48301574	8,60337089	8,69265796	8,77755545	8,90598677	9,12706745	9,33662054	9,49649628	9,68109372	9,86167548	9,93290071	10,1042219
Hubei	8,60373779	8,74719318	8,83448261	8,91422282	9,0333645	9,200088	9,34408424	9,49521852	9,69313682	9,89636223	10,0291065	10,236597
Hunan	8,5037026	8,59877318	8,71931738	8,8149246	8,93445511	9,12314716	9,25205797	9,38848656	9,58135205	9,80626054	9,92466179	10,1153275
Guangdong	9,34268356	9,45218791	9,53596831	9,63958711	9,7866728	9,946068	10,1037718	10,2517472	10,4088282	10,5648344	10,625368	10,7085338
Guangxi	8,39931015	8,44585125	8,52872643	8,62299361	8,72729203	8,91744473	9,08114243	9,23951075	9,43787427	9,59233212	9,68315255	9,91437804
Hainan	8,74735208	8,82438373	8,86106654	8,95944014	9,05858682	9,19136141	9,29385397	9,44572865	9,58568986	9,78081131	9,86547411	10,0787425
Chongqing	8,55775915	8,63337495	8,7353644	8,86106654	8,99850761	9,17201526	9,30291955	9,43003799	9,59287798	9,76992224	10,0397652	10,2254261
Sichuan	8,42068229	8,50835421	8,58969988	8,68101128	8,79830372	8,97398493	9,1116244	9,26350192	9,46443981	9,64827267	9,76071358	9,96090704
Guizhou	7,84188593	7,92262357	8,00636757	8,08856181	8,21635833	8,370316	8,52753948	8,6633693	8,84144824	9,15143926	9,24077258	9,48181684
Yunnan	8,42463921	8,46989192	8,5201887	8,58783803	8,67778026	8,85537825	8,96635615	9,10164096	9,26293282	9,4390683	9,51332969	9,66472262
Tibet	8,33806653	8,42770602	8,57998018	8,71882706	8,83826168	8,99989664	9,11756697	9,25244155	9,40170426	9,53416149	9,63528126	9,75955944
Shaanxi	8,39276311	8,51077262	8,61359369	8,72339402	8,85765745	9,05800471	9,22631214	9,40409631	9,58925614	9,87714358	9,98451439	10,208506
Gansu	8,23695005	8,32579053	8,38617293	8,46968221	8,59951023	8,7896601	8,91958692	9,07760866	9,24435525	9,39889248	9,46280969	9,68738168
Qinghai	8,46125756	8,54441918	8,66112036	8,7761671	8,90191123	9,07027338	9,21483028	9,37629298	9,56500329	9,8212466	9,87580798	10,0905893
Ningxia	8,49699048	8,58969988	8,7059371	8,8019209	8,95338147	9,12685006	9,23425219	9,37982995	9,59212735	9,83784392	9,98860965	10,2005876
Xinjiang	8,77074955	8,90544432	8,98029808	9,04274978	9,19299073	9,33582699	9,48097801	9,61580548	9,7409098	9,89328569	9,90058334	10,1279902

A.2.2. The growth rate in logarithm of GDP per capita by regions. (CP).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	CP=(Ln2010-Ln2000)/11
Beijing	0,01202221	0,01116241	0,0130396	0,01194255	0,01565258	0,00945966	0,00977588	0,01317143	0,01255083	0,00479534	0,00672342	-0,000481708
Tianjing	0,01234886	0,01004631	0,01125307	0,0178144	0,01771555	0,01522959	0,0133585	0,01070561	0,02238558	0,00588919	0,01394657	0,000145246
Hebei	0,01166147	0,00931625	0,00914116	0,01479091	0,02136546	0,01788742	0,01432798	0,01628423	0,01468297	0,00668036	0,01521383	0,000322943
Shanxi	0,01052308	0,0097567	0,01474531	0,0224558	0,0233998	0,01628621	0,01298368	0,0190641	0,0244779	7,4548E-05	0,02003108	0,000864364
Inner Mongolia	0,01196273	0,01186703	0,01386624	0,0229802	0,02608858	0,02604033	0,02116456	0,02383319	0,0323756	0,01270898	0,0152399	0,000297924
Liaoning	0,01114121	0,00775593	0,00838772	0,00983986	0,01087855	0,01682091	0,01591423	0,01664406	0,02066225	0,01010127	0,01756778	0,000584233
Jilin	0,01613412	0,00799092	0,01102714	0,01355128	0,01714747	0,01558884	0,01721919	0,02167747	0,01960031	0,01220285	0,01691219	7,15615E-05
Heilongjiang	0,01010668	0,00781521	0,00764774	0,01187711	0,01695477	0,0156899	0,01201962	0,01360628	0,01654799	0,0302045	0,01871368	0,000782455
Shanghai	0,01099626	0,00794601	0,00893149	0,00975264	0,01599343	0,00988321	0,01041722	0,012773	0,01114482	0,00448647	-0,0033344	-0,001302786
Jiangsu	0,01027781	0,00967706	0,01174179	0,01631514	0,01887361	0,01959726	0,01580218	0,01591054	0,01697054	0,00939577	0,01553045	0,000477513
Zhejiang	0,00997469	0,00970975	0,01492077	0,01907364	0,01762385	0,01276456	0,01371061	0,01544659	0,01136302	0,00535605	0,01373176	0,000341552
Anhui	0,00728423	0,01250301	0,00893055	0,01220426	0,02128914	0,01352339	0,016344	0,01959451	0,01935914	0,01328136	0,02487303	0,0001598982
Fujian	0,00876459	0,00648795	0,00898404	0,01081503	0,01451522	0,01278698	0,01434618	0,01883296	0,0148297	0,01128552	0,01609496	0,000666397
Jiangxi	0,01157664	0,00866085	0,01286808	0,01474569	0,02282153	0,0170528	0,01468471	0,01689992	0,02435462	0,00893196	0,02087709	0,000845495
Shandong	0,01047357	0,0097468	0,01153228	0,01681847	0,02240768	0,0208583	0,01704763	0,01546605	0,01654234	0,00826776	0,01292713	0,000223051
Henan	0,01418778	0,01037815	0,00976657	0,01463179	0,02482383	0,02295952	0,01712351	0,01943848	0,01865303	0,00722243	0,01724785	0,000278188
Hubei	0,01667361	0,00997914	0,00902602	0,01336535	0,01845641	0,01565162	0,01617433	0,020844	0,02096591	0,01341344	0,02068883	0,00036502
Hunan	0,0111799	0,01401877	0,01096499	0,01356001	0,02111959	0,01413008	0,01474576	0,02054277	0,02347356	0,01207405	0,0192113	0,000730127
Guangdong	0,01172087	0,0088636	0,0108661	0,01525851	0,01628697	0,01585589	0,01464556	0,01532236	0,01498788	0,00572972	0,00782711	-0,000353978
Guangxi	0,00544597	0,00990804	0,0110529	0,01209538	0,02178828	0,01835702	0,01743925	0,02146905	0,01636575	0,00946802	0,02387915	0,001675744
Hainan	0,0080628	0,00415698	0,01101078	0,01106617	0,01465732	0,01115097	0,01634141	0,01487741	0,02035549	0,00865601	0,02161766	0,00116467
Chongqing	0,00883593	0,01181339	0,01439903	0,01551067	0,01928182	0,01427214	0,01366436	0,01726822	0,03490238	0,01128892	0,01849256	0,000877875
Sichuan	0,0104115	0,00950608	0,01063034	0,01351138	0,01996762	0,01533761	0,01666854	0,02169135	0,01942353	0,01165399	0,02051013	0,000918057
Guizhou	0,01029569	0,01057024	0,01026611	0,01579966	0,01873794	0,01878346	0,01592837	0,02055539	0,03506111	0,00976167	0,02608486	0,001435379
Yunnan	0,00537147	0,0059383	0,00793989	0,01047321	0,02046583	0,01253226	0,01508805	0,01772119	0,01901509	0,00786745	0,01591377	0,000958391
Tibet	0,01075063	0,01806828	0,01618266	0,01369847	0,01829662	0,01306412	0,01479283	0,01613225	0,01408864	0,01066005	0,01289824	0,000195237
Shaanxi	0,01406087	0,01208128	0,01274733	0,01539119	0,02261854	0,01858107	0,01926926	0,01968928	0,03002187	0,01087063	0,0224339	0,000761185
Gansu	0,0107856	0,00725245	0,00995797	0,01532856	0,02211171	0,01478178	0,01771626	0,018369	0,01671693	0,0068005	0,02373206	0,001176951
Qinghai	0,00982852	0,01365818	0,01328312	0,01432791	0,01891303	0,01593744	0,01712446	0,02052509	0,02678967	0,00555544	0,02174823	0,00108361
Ningxia	0,01091085	0,01353875	0,01101852	0,01720767	0,01937465	0,01176771	0,01576498	0,0226334	0,03040166	0,01060992	0,0212197	0,000937375
Xinjiang	0,01535727	0,00840539	0,0069543	0,01661452	0,01553752	0,01554774	0,01422084	0,01301028	0,01564288	0,00737674	0,02296903	0,000939179