Migration, Urbanization and City Growth in China

Nong Zhu, Xubei Luo, and Heng-fu Zou

Abstract: Migration and urbanization have transformed the Chinese economy and society in the past 25 years. This paper intends to explore the determinants of population flows and city growth using a panel data at the provincial level in China. The main findings are: (i) regional disparities of urbanization in China, in particular those between coastal and inland areas, are very significant; (ii) the open-door policy has encouraged urban development in China; (iii) the population of small and medium size cities grows faster than that of large cities; (iv) the role of the secondary and tertiary sectors differs from region to region. In central China, the secondary sector actually serves as the push factor for local urbanization; and in coastal region, however, it is the development of the tertiary sector that pushes urbanization; and (iv) the labor force tends to move to cities with good infrastructures.

JEL classification: J61; O18; R23
Key words: regional disparities; migration; urbanization; city growth

1 INTRODUCTION

Prior to the economic reforms in China, the central government prioritized balanced regional development. With a planned-economy regime, provincial authorities could only implement the economic policies of the central government and they could not take adaptive measures based on regional comparative advantages. The mobility of labor, especially the migration of farm workers, was completely under the control of the central government.

The economic reforms initiated in the late 1970s have brought about many fundamental changes in China's development strategy. During the transition from a planned economy to a market economy, economic policies in favor of the coastal provinces replaced the previously more balanced regional development policies (Fan, 1999; Yang, 1997). Many studies show that inter-regional inequalities have significantly increased since the beginning of the economic reforms (Bhalla, 1990; Cai et al., 2002; Chen and Fleisher, 1996; Lyons, 1991). Chen and Fleisher (1996) argue that inter-provincial wage gaps increased during the period of 1978-1993. Lyons (1991) suggests that the divergence of the provincial GDP per capita accelerated since the 1980s.

The agricultural reforms resulted in great changes in the countryside. The collapse of the "People's Commune" system, as well as the implementation of the Household Responsibility System (HRS) in rural areas (de Beer and Rocca, 1997; Zhu and Jiang, 1993), restored greater liberty to farmers. They had more freedom in allocating their time, choosing their careers, and moving to cities. Moreover, with the development of various non-state economies, the urban labor market was gradually established, which made it possible for rural-to-urban migrants to seek jobs and earn their living in cities. Still, the development of the urban infrastructure required extra labor, and the diversification of consumption that resulted from the improvement of living standards created the niches for the survival of small businesses. All these factors led to an increase in the demand for labor in urban areas, which accommodated the vast movement of agricultural labor from rural areas to cities in China since the 1980s. The spontaneous movement of the rural population progressively broke the constraints on migration. Finally, the relaxing of the control on migration by the Government in 1984 further led to the vast rural-to-urban exodus.

Rural-to-urban labor flow inevitably leads to urbanization. The level of urbanization is usually considered as an indicator of development. Urbanization has accelerated since the economic reforms in 1978. The number of cities increased from 191 in 1978 to 660 in 2003, and the share of urban population in the total population in China increased from 17.9% to 40.5% (National Bureau of Statistics of China, 2004).

As a very populous country, China differs from both developed and the other developing countries in its urbanization process. In the period of 1950-1980, China's urban population growth rate (2.5%) was higher than the average of the developed economies (1.8%), but lower than the average of the developing economies (Mazumdar, 1987). According to the World Development Report (2002), China's urbanization rate from 1998 to 1999 was only 32%, which is lower than the average of the middle-low income economies (40%), but closed to the average of the Asia-Pacific countries 33%. The regional unbalanced development characterized China's urbanization. Some scholars point out that there exist two totally different trends in China: decentralization at the national level and centralization at the regional level (Chang, 1994). During the period of 1960-1970, in economic terms, cities that are located in Southwest China got much of the attention in order to exploit the inland regions. The increased power of the local autonomous authorities, together with the development of small and medium size cities, benefited, to some extent, the even distribution of cities in China. However, a radical change occurred since the economic reforms. Urban development accelerated in the coastal provinces, and the regional disparities widened. Given China's huge population and large surface, the unbalanced development have resulted in high economic and political costs.

In this paper, we try to fill some gaps in the studies of Chinese urbanization. Our objective is to examine the determinants of urbanization and city population growth in different regions.

Urbanization can be measured and studied from two aspects: the number of cities or the city population (Chen and Coulson, 2002; Lin, 2002; Lin and Song, 2002; Song and Zhang, 2002; Zhao et al., 2003), and the ratio of the urban population in total (Zhang, 2002; Zhang and Song, 2003). Each measure has its own advantages and disadvantages. The first captures the development of cities. But the administrative reclassification, such as "turning prefectures into

cities" and "turning counties into cities" across the country since 1980s, blurred the measurement of city population. Quite a few prefectures and counties became "cities" overnight, although many of them did not achieve significant industrial and city function through gradual evolution. As a result, the ratio of non-agricultural population in urban population differs significantly across cities. Furthermore, China's urban population (or non-agricultural population) includes two parts: city population and town population. The growth of the latter, which is made up of residents of towns' neighborhood committee (*juweihui*), also contributes to urbanization. As to the second measure, the data are only available at the national level, and it is also influenced by the administrative reclassification. In our study, we use both measures. We at first examine the regional disparities and labor migration in China. And then we use the panel data from *China Statistical Yearbook* (various issues) to investigate the determinants of urban population share and its effects in different periods and in different regions. We also use data from *China Urban Statistical Yearbook* (various issues) to discuss the city size distribution and the determinants of city population growth.

In the following section, we retrace the unique labor flows in a historical perspective. In section 3, we describe the difference in regional urbanization since the economic reforms and study its determinants. In section 4, we examine the geographical distribution of the cities and the determination of urban population growth in the 1990s. We conclude in section 5.

2 REGIONAL DISPARITIES AND LABOR MOBILITY

Regional disparities, which may be reflected by the difference in job opportunities, result in migration. This section aims at analyzing the effects of regional disparities on domestic labor markets and labor mobility among provinces.

2.1 Economic reforms, regional disparities and migration

The Chinese economy has been gradually transformed into a market economy over the past twenty-five years. Regional policies in favor of the coastal regions effectively encouraged economic growth. In 1980, the first Special Economic Zones established in four coastal cities

(Shenzhen, Zhuhai, Shantou in Guangdong and Xiamen in Fujian) in the provinces of Guangdong and Fujian, hometowns of many oversea Chinese investors, to attract foreign direct investments.[1] In order to spread the success to the entire coastal region, the open-door policy extended to 14 coastal cities in 1984, and to the delta of Yangtze, the delta of the Pearl River, and the delta of Minnan in 1985, and to Hainan in 1988. After the coastal region took-off in the 1980s, the open-door policy was gradually extended to the inland region in the 1990s. As a result of this spatial gradualism of the open-door policies, the economic center of China situates de facto in its coastal side, and the regional development gap has widened (Bhalla, 1990; Chen and Fleisher, 1996; Fan, 1999; Yang, 1997).

The increasing income disparities lead to large rural-to-urban and inland-to-coast labor flows. Before the 1980s, the Chinese authorities strictly controlled the inter-provincial migration and rural-to-urban migration (Liang and White, 1996), using two complementary measures. First, in rural areas, individual's income was determined by his or her participation in the daily work in the collective farms. A high opportunity cost was imposed to those who left the countryside. Second, the *hukou* system in China, which was similar to a domestic passport system, tightly related the place of residence to the access to consumer goods, and the employment opportunities to the social protection; see Chan (1994b).[2] Leaving a village permanently is therefore costly since it means abandoning the claims for ownership without any compensation to the long-held agricultural land and to the profits of local rural industries[3]. Temporary migrations also involve costs. Other restrictions include the hurdles to getting the compulsory permit for becoming a legal immigrant. Most notably, one can mention the necessary permission from one's hometown, a proof of a guaranteed job and specifics on housing and so on. Still, many refrain themselves from migrating because of job restrictions and various additional expenses.

[1] The Special Economic Zones have a status close to that of the duty-free zones where the occidental management modes were allowed to be experimented.

[2] A comprehensive description of the migration restrictions is beyond the scope of this paper. The reader is directed to Liang and White (1996; 1997), Li (1997), Chan (1994a), Fan (1999) and Zhu (1999) for a more comprehensive analysis. Au and Henderson (2002) explain in detail how a person's local "citizenship" and residence are initially defined for a child as a birth right, traditionally in reference to the mother's place of legal residence.

[3] The profits of the local rural industries are in general distributed in-kind, like the case of township housing.

Finally, migrants who are considered as "workers from other cities/provinces" can be required to pay diverse fees to the hosting cities. Au and Henderson (2002) argue that, although most of these fees were officially abolished in 2001, unofficially, a number of them remain in place. All these restrictions sharply raise the costs (and reduce the benefits) of migration. In addition, large cities have controlled migration by various direct and indirect measures, mainly because of the insufficiency of urban infrastructures.

However, the combination of increased freedom of movement and the widening provincial differences in income has led to the amplification of migration flows despite the above restrictions.

Chan and Zhang (1998) argue that the reforms have reduced the capacity of the government to control migration. There has not been any substantial modification of the nature of the *hukou* system. Changes over the 1980s and the 1990s were essentially initiated in order to relax regulations on the conversion of a rural *hukou* into an urban one. This process, called "*nongzhuanfei*", remains however subject to established quotas. The classification of the registration system into agricultural/non-agricultural persists. The socioeconomic integration of a person is still closely related to his *hukou.* However, since the late 1970s, reforms have modified the structure of economic control within which the *hukou* system is integrated. As the state withdrew from the allocation of jobs and the distribution of consumer goods, its capacity to monitor the movement of populations faded significantly.

Thanks to the open-door policy, the coastal provinces developed rapidly. Large inflows of foreign investment led to urbanization and migration (Shen, 2002b; Sit and Yang, 1997; Li 1997): Foregin firms have preferential treatments in Special Economic Zones. The rapid development of the export-oriented sectors, most of which are labor-intensive industries, greatly contributes to the local economy of the SEZs, and attracts workers from the other regions.

Au and Henderson (2002) argue that it becomes easier for a person to be hired as a "contract worker", either in the manufacturing sectors or in the service industry for a three-year term. A rural person may get permission to work temporarily in another local area in activities such as construction, food and domestic services. People may also decide to move

illegally, without registering in the new location, and to work in the informal sector. They are however destined to get a very low wage and to live under poor conditions while always facing the risk of deportation.

Despite all these options and despite recent relaxations of some migration restrictions in some provinces, we argue that impediments to the workers' mobility remain in China. Opposition to the freedom of movement for rural workers is tied to the issue of unemployment in urban areas and can be analyzed only in the context of the reforms of state-owned firms. Moreover, urban residents are very reluctant to share their relatively higher living standards with newcomers from rural areas. As in the case of international migration, inter-provincial migration restrictions reflect the policy stance of authorities in the receiving provinces. Immigration is viewed as being detrimental to the employment and wage conditions of the unskilled workers and threatens political stability in general.

2.2 Inter-provincial migratory flows

According to the push-pull theory (Lee, 1966), the determinants of migration can be classified into two categories. While the push factors encourage migrants to leave their place of origin, the pull factors drive migrants to move to specific destinations. Because of more widely available data, many researchers have studied the determinants of inter-provincial migratory flows in China since the late 1980s[4].

Using the data from the 1987 population sampling survey, Ma and Liaw (1997) analyze the hierarchical and inter-provincial migrations of the Chinese young adults during the period of 1985-1987. They examined the push and pull factors of migration by combining the provincial characteristics with the surge in migration flows. According to their study, the positive effect of income in the place of destination is very strong, particularly for rural-to-urban temporary migration. However, the economic disparities between the coastal and the interior provinces and

[4] Up until now, there are six main datasets on inter-provincial migratory flows in China: (i) The 1988 Fertility and Contraception Sampling Survey, (ii) The 1992 Fertility Sampling Survey, (iii) The 1987 National Population Survey, (iv) The 1990 Population Census, (v) The 1995 1% Population Sampling Survey and (vi) The 2000 Population Census.

between urban and rural stratums (i.e. cities, towns and villages) are more important than the income gap (Ma and Liaw, 1997).

Using a 10% sample from "the 1988 2/1000 Fertility and Birth Control Survey", Liang and White (1997) examine the effects of the characteristics of both the sending and receiving provinces on the individual's decision to move from one province to another or to stay in his province. According to their results, population size, the literacy rate and the development of township and village enterprises (TVEs) can be considered as the push forces for the migrants in the sending provinces; per capita GDP, on the contrary, can be considered as the pull force. In the receiving provinces, migrants from the rural areas prefer moving to provinces with higher literacy rate, higher foreign investment level and higher TVE development level. In another study, using the same dataset, Liang and White (1996) examine the migratory directions in the long-term. Their research shows that, before the 1980s, inter-provincial migrations were deeply influenced by the initiatives of the government. In other words, population migration was controlled by political factors instead of market factors.

Shen (1999) used the gravity model and techniques of Poisson's multi-level analysis to study the inter-provincial migratory flows during the period of 1985-1990. The data source is from the population census of 1990. His results confirm the prediction of the classical gravity model: the population size of the province of origin and that of the province of destination have positive effects whereas the distance between the two places has negative effects. Furthermore, provinces with rapid economic growth are more attractive. In the process of migration, the effects of pull forces are stronger than those of the push forces. Shen argues that regional disparities play a most significant role in migration.

With time-series and cross-section data, Zhang and Song (2003) investigate factors behind the migration boom. They find that rural-to-urban migration contributed to Chinese urban population growth, and inter-provinial migration was encouraged by the urban-rural income gap and discouraged by the geographic distance between the sending and receiving provinces.

In short, since the economic reforms, inter-provincial migration has been essentially

driven by the inter-regional economic disparities that resulted from the implementation of the unbalanced regional development policies.

Based on the data from the population censuses and surveys, we study the migratory flows over a period of 1985-2000. The following maps in Figure 1 describe the twenty most important inter-provincial migratory flows that occurred over the three periods of 1985-1990, 1990-1995 and 1995-2000. Table 1 shows some statistics of the survey data.

Figure 1

Table 1

From Figure 1 and Table 1, it is clear that major migratory flows took place from the inland to the coastal provinces. In the three periods of interest, the three main destinations of most migrants are the Pearl River Delta centered on *Guangdong*, the Yangtze Delta centered on *Shanghai* (the largest city in China), as well as the *Bohai* Gulf Region centered on *Beijing* (China's capital city) .

The open-door policy was first experimented in *Guangdong,*. The outward-oriented activities stimulated the labor demand and induced a wage surge, thereby attracting waves of workers from the rest of the country. The attraction power of the South-East provinces has strengthened over time, reflecting the deepening of the reforms and the globalization process of the 1990s.

Inter-provincial migrations are also characterized by the "proximity effects". Migrations between neighboring provinces are likely to be more intense than those between locations that are further apart.

The major migratory flows tend to take place between provinces that share a common border, which may be linked to the extra-cost of moving far from the departure location and to the issue of developing networks and remaining in the same socio-cultural environment.

The specific case of cities in the provinces of *Beijing*, *Tianjin* and *Shanghai* is worth mentioning because they are important harbors and places of exchange markets, most notably the Shanghai stock exchange. It is furthermore necessary to understand that the borders of these cities at the provincial level are artificial in the sense that these cities are separated administratively from their periphery (*Hebei* for *Beijing* and *Tianjin*; *Jiangsu* and *Zhejiang* for *Shanghai*).

As the important industrial and consumption centers, the influence of these cities goes beyond their administrative borders. The area covering the south of *Jiangsu*, the north of *Zhejiang* and the city of Shanghai constitute a *de facto* coherent economic zone (the Yangtze delta). Large migration flows from the periphery to the center of these economic regions.

In the two periods of 1985-1990 and 1990-1995, the migration destination appeared relatively divergent. But in 1995-2000, *Guangdong*, the experiment base of the open-door policy, attracted extremely large numbers of migrants. Coming not only from the neighboring provinces, such as *Hunan*, *Guangxi*, and *Jiangxi,* but also from the central provinces, such as *Hubei* and *Henan*, which are located further away from the destination, migrants chose *Guangdong* as their migration destination. Meanwhile, the pull power of the Yangtze Delta and that of the *Bohai* Gulf Region also increased. In contrast, the main destination in the North of China has been less important.

3 DETERMINANTS OF PROVINCIAL URBANIZATION LEVEL

3.1 Regional differences in urbanization

Table 2 presents the evolution of the urbanization rate by province in the 1990s. Based on their urbanization level, we classify the thirty provinces in mainland China into four categories. (i) Three provincial cities, namely *Beijing*, *Shanghai*, and *Tianjin*, whose urbanization level is by far the highest in China. (ii) Three provinces in the North-East and some others in the South-East, more precisely *Guangdong, Zhejiang*, *Fujian*, *Jiangsu*. These provinces are ranked second in

terms of urbanization level. In the North-Eastern regions, known also as the hub of the Chinese heavy industry, urbanization is primarily linked to the development of heavy industry and to a better infrastructure. In the South-East provinces, the implementation of the economic reforms, especially the initiation of the open-door policy, serves as the engine of urbanization. (iii) In Central and Western China, many provinces have a more developed manufacturing industry, particularly in *Hubei*, *Shandong*, *Shanxi*, and *Shaanxi*. Other provinces are sparsely populated, including *Qianghai*, *Xinjian*, and *Ningxia.* (iv) The other provinces, whose urbanization rate is less than 30%, are located either in densely populated agricultural provinces, e.g. *Sichuan*, *Henan*, *Hunan*, etc., or in the less-developed western provinces.

Table 2

Urbanization does not simply mean a redistribution of the population. Its causes and consequences are closely linked to the socioeconomic development of the region. Table 3 presents the urbanization level and some economic indicators of the three Chinese regions (the coastal, the central and the western regions).

Table 3

As Table 3 indicates, the eastern coastal region achieves the highest level of urbanization, followed by the central region, which has a level of urbanization that approaches the national average, and the western region with the lowest level. In addition, the gap in urbanization between the eastern and the central region (17.8%) is much wider than the one between the central and western region (8.4%). As for the annual growth rate, we find a gradual decrease among the coastal, the central and the western regions and a divergent trend clearly appears within the three regions in terms of urbanization. Table 3 also shows the difference in the selected economic indicators: per capita GDP, the degree of openness (measured by trade-to-GDP ratio), and the percentage of rural non-farm workers.

3.2 Econometric model and data

In this subsection, we use data covering 29 provinces between 1984 and 2001 from *China Statistical Yearbook* (various issues)[5]. Because the data is bi-dimensional, in the sense that the information is time based (i.e., by year) and space based (i.e., by province), it seems reasonable to use a panel model, which allows us to work with a cross-sectional time-series dataset and to efficiently control the heterogeneity caused by the individual specific effect of the observations.

The general form of the panel model is defined as follows:

$$y_{i,t} = \alpha + \beta X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad i = 1, \cdots, N \quad t = 1, \cdots, T$$

where: i denotes the province and t denotes the year. The residual of the panel model is made up of two parts: the province's specific effect, μ_i, and the traditional error term $\varepsilon_{i,t}$. In the panel estimation, two tests are necessary. First, we must do a Breusch and Pagan Lagrangian multiplier test to verify if the province's specific effect could be neglected. If that is the case, we can immediately use an ordinary least squares regression; otherwise, the panel model is necessary and also we have to do a Hausman's specification test to prove whether the specific effect is fixed or random.

In our model, we use the provincial urbanization rate as the dependent variable. However, only the national urbanization rate, as opposed to the rate by province, is available in the China Statistics Yearbooks. Moreover, the process of "turning prefectures into cities", "turning counties into cities", "turning cities and counties into urban districts" and "turning villages into towns" across the country, not only make the measurement of urban population tends to be not the same, but also contribute to "inflated urbanization" (Chung and Lam, 2004). As a result, the urbanization rate deduced from the ratio of urban population to total population could not necessarily reflect the corresponding level of urbanization. All these factors make it difficult to compare the urbanization rate over time and space. Consequently, we use the ratio of non-agricultural population, i.e. the people whose *hukou* status is non-agricultural, as a proxy of the ratio of urban population. The data are collected in the Chinese Population Statistics Yearbooks of the Public Security Office. Although the urbanization level can be underestimated if

[5] Considering the short history of *Hainan* as a province and *Chongqing* as a provincial city, we incorporate them into *Guangdong* and *Sichuan* provinces respectively. The change does not affect our results because our aim is to study the Eastern, the Central and the Western areas not single provinces.

measured by the ratio of non-agricultural population, under the current conditions of falling migration barriers between rural and urban areas and an increasing labor flow, one can still find some good reasons for using this measure: (i) the non-agricultural population tend to be urban, making it reasonable to replace the latter with the former; (ii) the growth of non-agricultural population and, in particular, the conversion of an agricultural *hukou* status to a non-agricultural one, was under the firm control of the central government, guaranteeing the figure comparable. This measure has also been used in many other studies (Batisse et al, 2002; Chen and Coulson, 2001; Shen, 1995; Wu, 1994).

We introduce the following independent variables.

(i) The logarithm of per capita GDP: we use it to measure the regional development level.

(ii) The proportion of both the secondary and tertiary sectors in the GDP. Agricultural surplus labor tends to flow into the secondary and tertiary sectors as agriculture develops. The secondary and tertiary sectors are often concentrated in specific regions, which accelerates the build-up of production factors and activities and, as a result of economies of scale, it accelerates the development of cities. Therefore, urbanization is significantly related to the development of secondary and the tertiary sectors.

(iii) The degree of openness: it is calculated as the percentage of the total value of imports and exports in the GDP. Opening up to the outside world encourages the development of export-oriented sectors and paves the road for producers in their effort to enter the international market. This gives them a comparative advantage and, as a result, the economic dynamic is reinforced, the labor demand is increased, which pulls the rural-to-urban migration (Wu, 2001).

(iv) Railway and highway densities: they reveal the conditions in the transportation sector. a well-developed infrastructure could reduce transportation costs, and hence decrease migration costs and improve the competitiveness of products. On the other hand, it promotes information exchange and encourages labor mobility.

(v) The proportion of rural non-farm workers: Rural non-farm sectors can influence urbanization in different ways (Liang and White, 1997; Liang et al., 2002; Shen, 1995; Wu and Yao, 2003). First, they absorb a large proportion of the rural labor surplus and therefore slow down the rural-to-urban flow. Second, they can act as an impetus to the development of rural towns and small cities, break rural economic autarky and induce rural labor migration (Liang and White，1997). In addition, it can ameliorate the living standard of farmers and render them more susceptible of moving.

All these data come from *China Statistics Yearbook* (various issues), *Chinese Population Statistics Yearbook* (various issues) and *China Foreign Economy and Trade Statistics Yearbook* (various issues) and cover an 18-year span starting from 1985 to 2002. This panel data set for all provinces includes total population, non-agricultural population, output of both the secondary and tertiary sectors, highway and railway mileage, total value of imports and exports, and rural non-farm labor. The panel has 522 observations in total. Because data from the statistical yearbooks are end-of-the-year figures, in other words, because the data of the dependant and independent variables are simultaneous, we take the lagged value of one year for all the independent variables in order to avoid the problem of endogeneity. Therefore, the urbanization level of the current year is explained by the last year's values of the independent variables.

The final model is as follow:

$$U_{i,t} = C + \beta_1 \log(GDP_{i,t-1}) + \beta_2 PGDP\_II_{i,t-1} + \beta_3 PGDP\_III_{i,t-1} + \beta_4 Open_{i,t-1} + \beta_5 Railway_{i,t-1} + \beta_6 Highway_{i,t-1} + \beta_7 Nonfarm_{i,t-1} + \varepsilon_{i,t}$$

where $U_{i,t}$ is the proportion of non-agricultural population; $GDP_{i,t-1}$ is the per capita GDP; $PGDP\_II_{i,t-1}$ and $PGDP\_III_{i,t-1}$ are respectively the portion of secondary industry output and the tertiary industry output; $Open_{i,t-1}$ is the degree of openness; $Railway_{i,t-1}$ and $Highway_{i,t-1}$ are respectively the density of highways and railways; $Nonfarm_{i,t-1}$ is the proportion of rural non-farm workers.

3.3 Results and discussion

Some previous studies divide China's economic reforms into two stages: 1978-1992 and 1992 onwards (Wu, 2001). The goal of transforming a planned economy into a market economy was set in 1992 in order to promote the growth of the national economy and provide the development of rural-to-urban migration and urbanization with a set of favorable conditions. The year of 1992 is therefore considered as a turning point of China's economic reforms. Considering the characteristics of the transition, we undertake our econometric analysis in six steps. We start with an estimation in Regression 1, that is based on the data of all the 29 provinces over the period of 1985-2001, to examine the general effects of the explanatory variables on urbanization level. Then estimations are run separately for two periods: 1985-1992 and 1993-2001 in Regressions 2 and 3, which help us examine the impact of all explanatory variables on the urbanization level at different stages of the reforms. At last, we separately run estimations for three regions: the coastal, central and western provinces (Regressions 4, 5, and 6), to study the effect of the explanatory variables on the urbanization level in different areas. Regressions results are reported in Table 4.

Table 4

The results indicate that the per capita GDP, which represents the level of regional economic development, has a significant positive effect on the urbanization level in general. In other words, the level of urbanization depends on the regional economic development. A spatial analysis shows that the effect of per capita GDP on urbanization appears to be significantly positive only in the central and western provinces, but not significant in the eastern area. That may be explained by the difference in the influence of the regional development level at different stages. Using the nonweighted, locally weighted and smoothed variables (StataCorp, 2003), we obtained Figure 2 which illustrates the relation between urbanization and per capita GDP. The shape of the curve appears like a growing concave curve. During the time where per capita GDP was low (less than 10 000 *yuans*), the marginal effect of regional development on urbanization was very strong. The curve tends to progressively flatten out, and it finally turns into a horizontal line as per capita GDP grows. That means that regional development hardly has an impact on urbanization when it reaches some critical value. In our sample, there are 9 provinces with a per capita GDP that is greater than 10 000 *yuans*. They are *Shanghai, Beijing, Tianjin, Zejiang,*

Guangdong, Jiangsu, Fujian, Shandong, Liaoning, all of which are located in the coastal area.

Figure 2

Generally, the proportion of the secondary sector output has a positive effect on urbanization. Development in the manufacturing sector promotes a quick piling-up of production factors and various urban industrial sectors attract a large number of rural workers and, as a result, it significantly improves the urbanization level. But the effect is not significant in the western area. It may be due to the fact that, in this area, the secondary industry is not very well advanced and, therefore, cannot act as a push factor for local urbanization.

The effect of the tertiary industry's growth on the urbanization level is generally positive but the coefficient is not significant in the central area. At the early phase of industrialization, most of the rural surplus labor is absorbed by the secondary sector. Since the tertiary sector is not well developed in that phase, its labor absorption power and its effect on economic development are accordingly very weak. Undoubtedly, its effect on urbanization is consequently limited. But when the industry develops to a certain degree, its related sectors, such as transportation, communication, finance, real estate and the like, get the pull power and flourish rapidly. Besides, the diversification of consumption, followed by a rise of the quality of life in urban areas, also pushes the development of the service sector. Being a labor intensive sector with high income elasticity, the tertiary sector covers many industries, making it possible to create a large number of jobs for rural-to-urban migrants. It also acts as an engine for urbanization after the intermediate stage of industrialization (Yang, 2004). The coastal provinces may have been in the middle. It is important to recognize that the impact of the tertiary industry's growth is significantly positive in the western provinces. This outcome may have originated from the weak local industry that makes the influence of the tertiary industry comparatively more significant.

The degree of openness continuously affects urbanization in a positive way and significantly accelerated the pace of urbanization between 1985 and 2001. An analysis by region shows that this positive effect is significant only in the eastern and central provinces and not significant in the western region. The coastal area in East China, where the open-door policy was

implemented very early, benefited enormously from a preferential investment policy of the government, thereby encouraging the development of export-oriented TVEs and foreign firms. Not only did the development of the open economy efficiently promoted the settlement of rural labor in cities and its transfer to the non-farm sectors, it also absorbed a large part of labor outside of the coastal provinces. As a result, the existing cities expanded and new cities mushroomed. The gradual extension of the open-door policy in the central region in the past few years greatly accelerated urbanization within the region. Table 4 shows the positive impact of openness degree in the central region of China. In contrast, following the coastal and central areas, the western area is not much of a competitor. As a consequence, most of the foreign investment is located in the coastal and central provinces. The limited economic development of the West is not sufficient to speed up urbanization in the region in a significant way.

Similarly, the unweighted and locally weighted smoothing can help study the relation between the degree of openness and urbanization level. In Figure 3, we observe that urbanization level first increases linearly with the degree of openness. But the curve becomes a horizontal line from a certain critical value (40% or so). One possible explanation could be the following: small and medium enterprises (SMEs) as well as labor-intensive ones constitute the majority of businesses. At a certain degree, the opening economy, which is observed mostly in the manufacturing industry, has to improve its industrial structure so that it could compete in the international market. It is therefore understood that the turning of the economy into a capital- and technology-intensive one will necessarily reduce its labor absorption power. Only provincial cities, such as *Shanghai, Beijing,and Tianjin,* as well as the coastal provinces, including *Guangdong, Jiangsu, Fujian, and Zhejiang,* have reached the critical level. We therefore conclude that the degree of openness will play a crucial role in urbanization for a very long time in China.

Figure 3

The railway density, as a proxy of infrastructure, has a significantly positive effect on urbanization at all periods in the three areas. This implies that the capacity of railway transportation is an important determinant of urbanization. However, the highway density does

not have any positive influence on urbanization. Its effect is even negative in the central area. The difference may lie in the wide gap in transportation and the different urbanization pattern among the three areas. In the East, the improvement of urbanization does not necessarily depend on the development of transportation because of the existing advanced highway, railway and freshwater lines. Some provinces such as *Hunan*, *Hubei* in the Middle-South of China do not really get the corresponding development in urbanization compared with their rapid growth in highway density. In Western China, highway transportation does not have a significant impact on urbanization because of its high cost, its slow speed and low efficiency, and also because cities in this area have a weak radiation and attraction power. Therefore, in short, highway construction generally does not significantly affect local urbanization when other variables are controlled.

At the national level, the effect of rural non-farm sector is positively significant, but only for the period of 1985-1992. When analyzed by region, its effect is positive in the eastern and western regions, but negative in the central region. This result shows the double role of rural non-farm sector, mostly the role played by the TVEs, on urbanization. In the eastern coastal provinces, TVEs development is largely driven by the industrial sectors of the big cities, thanks to the commercial link between them by the basic means of subcontracting and labor flow. There appeared a kind of rapid rural-industralization, and the non-rural employment independent of agriculture in the countryside increased at a fast speed. Given the fact that their main objective is not to serve agriculture, they do have something in common with their urban counterparts; that is, they are particularly marked by a willingness to invest in low-profit products, something the urban industry is not willing to do. Thus, the TVEs are both complements and competitors of the urban industry. The exchange between the rural non-farm sector and the urban industry is very frequent and, therefore, it encourages rural-to-urban labor mobility. In the central region, the non-farm sector targets the local market and does not depend too much on the rural-urban relations. Most of the TVEs are labor-intensive, absorbing large segments of the surplus labor. Therefore, the development of the rural non-farm sector is rather a substitute of urbanization. In the western region, the ability of the rural labor to move is constrained by low living standards. To some extent, the rural non-farm sector could remove the financial constraint and hence strengthen the motivation and capacity of the rural labor to move, thereby encouraging rural-to-urban migration and, especially, the development of small cities.

To sum up, our analysis suggests that significant regional differences in urbanization exist in China. These differences reflect the economic disparities between the regions, and also constitute an important factor influencing economic development. The effect of the various independent variables (the development of the secondary and tertiary sectors, degree of openness, the improvement of transportation, the progress of rural non-farm sector and the like) on urbanization differs according to the different stages of market reforms and according to the different levels of development.

4 DETERMINANTS OF CITY GROWTH

In section 3, we have analyzed the determinants of the urbanization rate. The rise in urbanization level is essentially determined by the development of cities and the growth of urban population. It is therefore necessary to examine the determinants of urban population growth.

4.1 Geographical distribution and population growth in cities during the 1990s

There were 191 cities in 1978, and the figure amounted to 660 in 2003. Many studies have examined the city system as well as the determinants of the urban population growth in China. Some studies (Wei, 1997; Zhao et al., 2003) argue that, in reality, China's policy of controlling large city growth has not been effectively implemented, and large cities grew at a much faster pace in the past decade, due largely to the economic policies favoring lager cities, such as urban reforms, open door policy, decentralization, and unbalanced regional development.

Some researchers (Lin, 2002; Wong et al., 2003) suggest that China's urban development and urbanization are characterized by a superimposed dual-track system of urban settlements integrating the Maoist legacy of large city dominance at the top with the rapidly expanding component of small cities and towns at the bottom. Although small cities have played a growing role in the absorption of population and land development, large cities have remained the most efficient and productive economic centers for capital investment and production.

Using panel data from *China Urban Statistical Yearbook of China* (various issues) and *Urban Construction Annual Report* (various issues), Chen and Coulson (2002) analyze the determinants of urban non-agricultural population growth. According to their regression results, cities with high ratios of manufacturing and service sectors grow very fast. The job-creation potential of the private sector makes a significant difference in attracting migrants. The housing-market conditions and transport also have explanatory power.

In China, cities are classified into three categories according to their administrative status: provincial level cities (or central municipalities), prefecture-level cities and county-level cities. The higher the level, the more directly the city reports to the central government and the greater are its autonomy and influence. During the period of 1978-2003, China upgraded and reclassified many county towns into cities ("turning counties into cities"), which resulted in a sharp increase in the number of cities (Lin and Song, 2002). As a consequence, many counties earned city status even though their population and industrial ouotput are both relatively low. They therefore cannot represent the real growth of cities and urban population. Furthermore, the data concerning county-level cities is not complete due to their frequent administrative reclassifications. For these reasons, we focus on the cities of prefecture level or above in our study.

In this section, we use the *Urban Statistical Data and Information on 50 Years of New China* (National Bureau of Statistics of China, 1999) and the *China Urban Statistical Yearbook 2000* (National Bureau of Statistics of China, 2001) as the sources of our data. The data cover 223 cities in total, either at the provincial level or at the prefecture level (counties excluded) from 1990 to 1999. The urban population in China experienced a process of rapid growth in the 1990s, which is a result of a combination effect of the natural population growth, the rural-to-urban migration, and the expansion of prefectures. The natural growth of the urban population has been held at a very low level for the past twenty years mainly through the enforcement of a strong family planning policy (Wu, 1994). In some large cities, such as *Shanghai,* the permanent population shrunk. Hence, we come to the conclusion that rural-to-urban migration and administrative reclassification are actually the two principal contributors to urban population growth.

Table 5 summarizes the distribution of cities and urban populations. Four cities at the provincial level, i.e. *Beijing, Shanghai, Tianjin, and Chongqing,* are all excluded from our analysis in order to have a somewhat uniform city composition across the country. We classify all cities in China into four different categories according to the size of its population: small city category (under 0.5 million people), medium city category (0.5 to 1 million people), large city category (1 to 2 million people), and super-large city category (over 2 million people).

Table 5

According to the distribution of cities seen in the "number of cities" columns, city composition in 1990 basically appears like a pyramid. Small cities are at the base of the pyramid, medium cities in the middle, and the large cities and super-large cities on the top. Due to the expansion of cities in terms of space, up until 1999, the number of small cities had been declining while the number of the medium and large cities was on the rise. An analysis by city location shows that half of the super-large cities are located in the coastal provinces. The number of large cities (1.0-2.0 millions) grew faster in the coastal and central provinces and medium cities (0.5-1.0 millions) also grew at a faster pace in the western provinces.

Compared to the average size city, we find that small cities in the coastal provinces, super-large cities in the central provinces, and small and super-large cities in the western provinces respectively expanded more rapidly. One thing in common among the three regions remains the fact that the size of medium (0.5-1.0 millions) and large cities (1.0-2.0 millions) in terms of population changed little.

Finally, we examine the population distribution according to the city size. During the period of 1990-1999, the ratio for population in small and medium cities dropped while the same figure for large cities and super-large cities grew. In light of the regions, the ratio of population for small cities reduced, and the same figure for large (1.0-2.0 millions) cities remained the highest in all three regions, especially in West China. In the coastal provinces, the population is concentrated in large cities (1.0-2.0 millions), while the ratio of population for super-large cities changed very little. In the central provinces, the population in super-large cities achieved a

remarkable growth. In the western provinces, the population of large cities and super-large cities did not increase much and it is mainly centralized in medium cities.

The above analysis reveals that, (i) in the coastal provinces (cities at the provincial level are excluded), the population of large cities grew faster as opposed to the growth of the population of super-large cities; (ii) in the central provinces, despite the fact that only two new super-large cities emerged during the period, the average size of the population for a super-large city increased by 21.7%, leading to an increase of 9.3% of the ratio of population for super-large cities; (iii) in the western region, city development is characterized by the growth of medium cities. The geo-economic structure may be helpful in interpreting the difference that we mentioned earlier between the three areas. For the coastal area, the three existing centers of agglomeration, namely the Pearl River Delta centered on *Guangdong,* the Yangtze Delta centered on *Shanghai* (which is also the largest city in China), and the *Bohai* Gulf Region centered on *Beijing*, work as the main attraction power for population within as well as outside the coastal provinces. The other large cities, therefore, do not play a very important role in attracting migrants. In the central region, large cities and super-large cities that are located in different provinces actually serve as the attraction power within their respective prefectures, which makes them grow relatively faster. As to the western area, the population tends to concentrate in medium cities because of the under-developed infrastructure and limited radiation power of cities. In addition, from 1990 to 1999, a number of cities underwent important administrative reclassifications, which largely depends on local development policies and, to some degree, causes the variance in urban population growth between different areas.

We chose 158 cities whose prefectures changed little over the period of 1990-1999 in order to study the growth of urban population in an exact way. In other words, the impact of administrative reclassifications is accordingly not taken into consideration in our analysis. Based on the natural growth, which is at a very low rate, we consider total population growth as the result of population migration.

Results in Table 6 show that the annual growth rate of urban population changes gradually in a positive way from the western, to the central and the coastal regions. This supports our

previous conclusion that there is a population flow towards the coastal cities. Higher annual growth rates are found in small cities and metropolises, if we base our comparison on city size. It mirrors the two trends existing in labor migration and urbanization in China: on the one hand, individuals move to metropolises that have a high labor demand; on the other hand, as a reaction to the development of rural non-farm sectors, individuals move to medium and small cities. Except for metropolises, the smaller the size of a city, the higher the annual growth rate of the population. Therefore, we argue that, to some extent, the growth of city population is characterized by a tendency of convergence.

Table 6

Finally, we make use of the Gini index to study the distribution of the urban population. For the period of 1990-1999, the Gini index fell as indicated in Table 7. The index changes according to the type of region. In the coastal and western provinces, it was reduced by 5% and 8%, respectively, and rose by 6% for the central provinces. In the first two regions, the reason lies in the fact that the growth of large or medium cities constitutes an advantage. In the last region, one possible interpretation could be the faster growth of metropolises.

Table 7

In brief, during the 1990s, the dominance of super-large cities in China's urban hierarchy has been reduced because of the emergence of numerous medium and large cities to take up a growing share of urban settlement and population. However, super-large cities have remained the most important center of agglomeration in the central provinces. The difference in urbanization can reflect regional economic disparities as mentioned earlier. The growth of the urban population depends on the local socioeconomic development; though it can be somewhat influenced by existing policies. Therefore, by introducing a set of socioeconomic variables in the following sections, we can study their effects on urban population growth, and identify the determinants of city development in China.

4.2 Econometric model and variables

The empirical analysis in this section is done with the aid of the model developed by Glaeser et al. (1995), which is often used to study population growth (Beeson and Dejong, 2000; Chen and Coulson, 2001). In this model, cities are treated as separate economies that share common pools of labor and capital. Because of the assumption of mobile labor and capital, cities differ only in the "level of productivity" and "quality of life". The labor income of a potential migrant is the marginal product of labor. Total utility equals wages multiplied by a quality of life index, which declines with the size of the city. The assumption of free migration across cities ensures constant utilities across space at one point in time; in other words, each individual's utility level in each city must equal the reservation utility level at that time. The final form of this model is as follow:

$$\log\left(\frac{L_{i,t+1}}{L_{i,t}}\right) = \beta X_{i,t} + \varepsilon_{i,t+1}$$

where $L_{i,t}$ denotes population of city i at time t; $X_{i,t}$ is a vector of city characteristics at time t, which determine the growth in both the quality of life and the level of productivity for each city.

It's obvious that the "effect of feedback" exists between the growth of city population and its explanatory variables. For example, the increase of industrial capital would lead to the rise of urban wage and attract more migrants; but on the other hand, the growth of city population may reinforce the economic agglomeration and exert effect on the development of urban sectors. It's difficult to identify this causality in the regressions. In order to avoid the problem of endogeneity, we follow the method of lagged variables. This method supposes that migration responds to changes in the utility of cities with a time difference due to the transmission of information (Rappaport, 1999; Beeson and Dejong, 2000). In other words, any improvement in income or/and in quality of life at the present time will encourage the growth of the influx of migrants in the future. Moreover, time difference also exists between the implementation of some policies and the revelation of its expected effects on the productivity and the quality of life in the cities. This time difference is particularly obvious for investment policies in the urban infrastructure.

For the above reasons, in our estimation, all the explanatory variables ($X_{i,t}$) take their initial values. More precisely, we assume that, during a given period, the growth of city population is determined by certain socioeconomic characteristics at the beginning of that period.

As mentioned before, the growth of city population derives from the following three sources: (i) migration, (ii) natural growth of city population, and (iii) administrative reclassification or change in urban definition. Our objective is to study the growth of urban population resulting from the concentration of population in cities, under the assumption of free migration. Cities that have frequently undergone administrative reclassifications during the 1990-1999 period are excluded and, therefore, all the rest (158 cities) constitutes our sample. Given that the natural growth rate of city population remained relatively low and stable for the past twenty years (Wu, 1994), we can suppose that migration serves as the essential determinant for the growth of urban population in our sample.

The choice of the dependant variable requires a clear definition of urban population. On the one hand, we can see all the people who reside in cities as constituting urban population; on the other hand, as analyzed earlier, we can take the non-agricultural population, more precisely the people whose *hukou* status is non-agricultural, as a proxy of urban population. These two definitions are interwoven. In any given city in China, the figure of the former is normally higher than that of the latter simply because many people holding agricultural *hukou* live in cities.

According to the first definition, people who reside in cities and still keep their agricultural *hukou* are included in the calculation of the urban population. It is commonly known that the process of “turning prefectures into cities” and “counties into cities” make the measurement of the urban population difficult and inconsistent across the country. For example, big differences exist between cities of similar size in the proportion of the non-agricultural population in the urban population. As a result, the urbanization rate deduced from the ratio of urban population to total population could not necessarily reflect the corresponding level of economic development. Nevertheless, the problem is negligible in our study because only provincial-level and prefectural-level cities are concerned, and cities that endure vibrant administrative reclassifications are excluded in our sample.

The second definition, which is used by many scholars (Wu, 1994 ; Chen and Coulson, 2001 ; Batisse et al, 2002), was adopted in our last section when we analyzed the urbanization rate. Based on this definition, the urban population includes the urban permanent population only, which makes the figure comparable through space and time. But, in our view, it tends to more or less underestimate the urban population for two reasons. First, according to this definition, the temporary population in cities is neglected, and in this case it is composed by the rural-to-urban migrants who live in cities and who cannot convert their *hukou* status from agricultural to non-agricultural. In reality, most of the migrants are employed in the urban non-agricultural sectors. Even those who stay in agriculture usually live in the suburb and their activities essentially aim at supplying the urban agricultural fair. Their living standard remains close to that of city-dwellers. They enjoy the urban infrastructure and services, and constitute an important part of urban life. Second, the proportion of the temporary population has been augmenting since the 1980s. The figure was 0.55% in 1982 (Wu, 1994), 1.88% in 1990, and even reached 3.95% in 1995 (Kojima, 1996b).

In the following empirical analysis, we adopt both definitions by defining the dependant variable as the logarithm of the ratio of the 1999 to the 1990 population, i.e. $\log(L_{i,1999} / L_{i,1990})$.

For the independent variables, we introduce the following indicators, which are supposed to determine the urban productivity and qualify of life.

(i) The logarithm of the urban population (or the urban non-agricultural population). This is both a structural variable reflecting the initial dimension of a city and an index of urbanization. Looking back at the history of urban development around the world, one can see that a city cannot infinitely grow in size and there certainly exists a tendency of convergence: the larger the size of a city, the lower the growth rate of the urban population. We therefore assume that this variable influences the growth of urban population in a negative way.

(ii) The logarithm of the number of immigrants during the period of 1985-1990. The original data is taken from the 1990 Population Census. Under the assumption that migration is in

a state of inertia, the variable can represent the contribution of migrants to the urban population growth.

(iii) Per capita GDP. We use this variable to reflect the level of development of the urban economy and the income level of the urban population. Hence, the variable serves as a proxy of the quality of life and could be interpreted as a city's attraction power provided that migration is mainly caused by income differences.

(iv) Per capita foreign direct investment (FDI). The variable is used to measure the openness degree of a city. Foreign capital creates a large quantity of employment positions and, as a result, encourages the inflow of migrant workers (Song and Zhang, 2002).

(v) Fixed investment to GDP ratio. The variable has a direct impact on production power, urban infrastructure and, in particular, it has an impact on urban housing.

(vi) Fiscal expenditure to GDP ratio. A very large portion of government expenditure is used to fund urban education, health, and public utilities. It is also spent on administrative expenses and scientific research. The variable, to some degree, can reflect the level of urban productivity and the quality of life. We must precise though that we were unable to single out government expenditure in different lines. In addition, some studies (Lin and Song, 2002) suggest that this variable measures the government size and therefore appears negatively related to economic growth.

(vii) University student enrollment per 10000 people. This variable indicates the level of local education.

(viii) Number of telephones per 100 people. It reveals the conditions of the local communication channels as well as the power of information transmission in the city in question.

(ix) Passenger traffic. It describes a city's capacity to send passengers, which reflects both the quality of life and the convenience of migrating.

(x) Per capita dwelling space. It is an important index in measuring the quality of life in cities. However, we cannot easily say that the variable has an influence on the decision to migrate. One reason for this is that, with regard to urban housing in China, the living conditions of most of the rural-to-urban migrants do not compare with those of the urban permanent residents due to the segmentation of the labor and housing markets. Furthermore, the housing market in the 1990s in China was not mature enough to make the measurement of real prices of houses and rent possible.

As mentioned in early sections, we try to adopt the initial value (i.e. the figure in 1990) of all the concerned variables in order to avoid the problem of endogeneity, except for annual passenger traffic. Compared to the other variables, passenger traffic holds the characteristic of being sensitive to the economic situation and changes greatly with time. We therefore introduce its three-year average, i.e. the average during 1990-1992 period, instead of its initial value.

4.3 Results and discussion

Table 8 presents the results of the regressions of city growth. The dependant variable is the logarithm of the ratio of the 1999 to the 1990 population. Regressions 7, 8 and 9 use the whole sample; Regression 10 and 11 are run separately for the two sub-samples of the coastal provinces and the inland provinces respectively.

Table 8

The first column presents the regression of city growth on initial urban population and migration. The results show that the effect of urban population on the growth rate is significantly negative. In other words, the population of larger cities grows at a relatively slow rate. This result confirms the prediction of the Economic Geography Models (Fujita et al., 1999; Krugman, 1991): a city cannot grow infinitively. Another possible explanation is the tendency for growth to converge. Barro and Sala-i-Martin (1992) suggest that the regions of a state converge to a common growth rate. Population growth convergence is also found in other research studies

(Beeson and DeJong, 2001; Chen and Coulson, 2001). Furthermore, this result is in line with the current policies in China that consist of controlling the development of large cities and encouraging the development of small and medium cites. We observe that the effect of the initial population remains significantly negative in all the other regressions, thereby implying a strong population convergence.

The coefficient of the number of immigrants is significantly positive, implying that cities that attracted more migrants over the period of 1985-1990 expanded faster in terms of population growth during the following ten years, i.e. in the 1990s. This result justifies the conclusions of a study on population growth in the United States (Beeson and DeJong, 2001). However, the effect of migration in the past is no longer significant in the presence of other explanatory variables, suggesting that future population growth is rather determined by some present factors.

Per capita GDP has a positive effect on urban population growth. Cities whose economy is more advanced are usually more attractive for migrants due to their higher productivity and better quality of life. However, the effect of per capita GDP does not remain significant when the other independent variables are introduced. Per capita GDP as a global index of economic development usually correlates with other explanatory variables. The contribution of other factors may hence have been mixed with the coefficient of GDP in Regression 8.

Other variables reflecting the level of economic and infrastructure development are introduced in Regression 9 and in the following regression equations. The explanatory power (R^2) of the model improves remarkably. Apart from the negative impact of initial population, the effects of other variables are significant.

Per capita FDI affects the city population growth in a significant and positive way, which is consistent with our results in section 3. The history of city development in the other developing economies reveals that the rapid growth of city population is often accompanied with an influx of foreign capital. According to the theory of international trade, developed countries specialize in capital-intensive products; meanwhile, developing states perform better in producing labor-intensive products. Many labor-intensive industries are inclined to transfer their production

to the developing economies in order to benefit from the comparative advantage of cheap labor. This naturally works as an engine for the development of urban economic sectors and urbanization in developing economies. China is not exceptional. With the development of the open-up policy and export-oriented economy, the inflow of a large amount of foreign investment causes some type of "foreign-investment-induced exo-urbanization" (Sit and Yang, 1997). Most of the foreign investment concentrates in SMEs and in the labor-intensive sectors, which leads to the expansion of the job market and, as a result, attracts immigrants. However, the effect of foreign capital in inland China is not significant in Regression 5, partly because of its concentration in cities along the coastline. The openness degree is not high enough to significantly impact city growth, and the increase of the city population in inland cities should be attributed to other factors instead.

The coefficient of fixed-asset-investment-to-GDP ratio is significant and positive in our regression. We obtained this natural result simply because this type of investment influences the city productivity and quality of life at the same time.

Local government expenditure usually concerns expenses on state agencies and public sectors, including administration, education, health, and so on. Therefore, more expenditure necessarily means a better urban administration and a higher quality of life. Even so, the coefficient of this ratio never shows a significant impact in our regressions. Limited by the availability of data, we could collect, it is impossible for us to examine detailed expenditure figures and find out the reason behind. The common sense of government allocating a proportion of its expenditure to civil servants payroll can in part be of help in explaining our result because this type of expenditure has absolutely no impact on rural-to-urban migration.

In our regressions, most of the variables reflecting numerous types of infrastructure have a positive effect on urban population growth. This finding is consistent with the results of other similar studies (Lin and Song, 2002; Shen, 2002b). The first variable, namely the number of university students, significantly favors urban population growth, implying that better education facilities could attract migrants. The accumulation of human capital and the positive externalities (or spillover effect) of education contribute to economic growth. This result is confirmed by

many other authors (Glaeser et al, 1995; Henderson, 1999). Moreover, migrants are sensitive to education facilities since the education of their children is one of their major concerns when making the decision to migrate.

Communication and transportation are two factors that affect both productivity and the quality of life (Gendarme, 1994). In our regressions, the number of telephones per 100 people, which reflects the communication conditions, has a positive effect, particularly in the coastal provinces. A better communication infrastructure can ameliorate productivity by making the diffusion of information easier in the process of production and distribution. Furthermore, better communication facilities can encourage migration because they give access to information about the economic opportunities in cities, such as information about labor supply and demand.

Passenger traffic is a variable expressing the transportation capacity of a specific location. In most cities in China, cars are not a commonly owned good and the majority of city-dwellers, especially migrants, depend on public means of transportation. Therefore, we can say that passenger traffic adequately reflects the quality of life. Our econometrical results prove that advanced public transportation has significant and positive effect on the growth of urban population.

Dwelling conditions work as a crucial indicator of the quality of life. The growth rate of the city population can be reflected, to a large degree, by the rise of housing costs and the decrease of the per capita dwelling space. The effect of per capita dwelling space is positive but not significant in all the regressions that have the grow rate of city total population as the dependent variable. We should highlight the fact that the total city population includes the temporary population, more precisely the rural-to-urban migrants. Their dwelling conditions are generally inferior to those of the urban permanent residents. Given the fact that their employers cannot provide dormitories, most of migrants have to either rent housing or live in some shabby and/or informal places, which naturally are not suited for a prolonged human occupancy. Therefore, it is easy to understand why the per capita dwelling space computed with the data for urban permanent residents does not have an influence on migration.

Finally, we introduce two dummy variables indicating the coastal and central provinces, respectively. The coefficient of the first is significantly negative and that of the second is not significant. In other words, other things being equal, a city in a coastal province has a slower population growth rate than a city in a inland province. This result confirms the finding in Section 4.1.

Table 9

Table 9 presents the results of the regressions that have the growth rate of urban non-agricultural population as the dependent variable. As mentioned before, the urban non-agricultural population refers to the urban permanent population, and all rural-to-urban migrants with no change in *hukou* status are excluded.

In Table 9, we attempt to explain the growth of the urban non-agricultural population. Results show that the effect of the initial non-agricultural population is negative and very significant in all regressions, indicating that there exists also a convergence of growth for the non-agricultural population among Chinese cities. Meanwhile, the effect of migration is not significant, possibly because most of the rural-to-urban migrants stay in cities for having a non-agricultural identification. Therefore, the growth of the urban non-agricultural population is mainly attributed to the natural growth of both its permanent residents and migrants who hold a non-agricultural *hukou* status in their native place.

The positive effect of FDI is only significant for the whole sample (Regression 14), while not significant in the regressions for coastal provinces, or for inland provinces (Regressions 15 and 16), respectively. Built on the results in Table 8, we may conclude that, in coastal cites, FDI shows its extremely significant role in absorbing labors outside.

Education pushes the growth of the urban non-agricultural population because college and university graduates constitute an important portion of the migrant population. Students in rural China are allowed to transfer their agricultural *hukou* to a non-agricultural one when they are enrolled in a college or university and, normally, they stay and work in cities after graduation.

Unlike the results in Table 8, the coefficient of per capita dwelling space turns out to be significantly positive in all regressions. This finding suggests that better dwelling conditions are attractive for migrants whose *hukou* status has changed during migration. Besides, they are usually well-educated and work in the formal sector.

In short, our findings show that the growth of both the non-agricultural population and the total population are determined by different factors. All the variables we introduced significantly influence the growth of the total population but, in contrast, they play a negligible role in the growth of the non-agricultural population. In China, rural-to-urban migrants are regulated by the labor market and, accordingly, this type of migration is sensitive to economic change. Meanwhile, the non-agricultural population is mainly regulated by the *hukou* system, and its growth is more dependent on institutional factors. This can also mirror the existing dualism in Chinese cities.

5 CONCLUSIONS AND POLICY IMPLICATIONS

The process of urbanization reflects a transformation from a dispersed agricultural or rural society into a more concentrated industrial and urban economy (Bardhan and Udry, 1999). Not only topography and natural resources but also the initial socio-economic development level differ across the Chinese regions. Therefore, the regional development of urbanization differs. The reforms in favor of the coastal provinces lead to the widening of the regional disparities. The concerns about the pace of the rural-to-urban migration and urbanization have become one of the major concerns of the policy makers in China. This paper examines the determinants of the urbanization in China at the regional level. The main findings are The above empirical analysis on provincial urbanization level tells that: (i) Regional disparities of urbanization in China, in particular that between coastal and inland areas, are very significant. (ii) The role of the secondary and tertiary sectors however differs from region to region. In central China, the secondary sector actually serves as the push factor for local urbanization; and in coastal region, however, it is the development of the tertiary sector that pushes urbanization. (iii) The open-door policy has markedly encouraged urban development in China, in particular in the coastal

provinces. Nevertheless, its effect is not significant in the western provinces. The speeding-up of that policy in the West of China will hopefully stimulate the development of urbanization in the future. (iv) The development of rural non-farm sector plays a dual role on urbanization, which echoes the finding of some previous studies. We find that this dual role is associated with the regional difference: rural non-farm sector acts as a complement to urbanization in the coastal and western provinces, but a substitute to urbanization in the central provinces. The results suggest the different role of non-farm sector in urbanization in different stages.

We have further studied the determinants of city population growth. The results are as follows. (i) There is a tendency of convergence between different cities; that is to say that the population of small and medium cities grew faster than that of those large cities. On the other hand, the population of cities that attracted more migrants during the period of 1985-1990 continued to grow rapidly after 1990. (ii) The cities that received more foreign direct investment attract more rural-to-urban migrants, which confirms the important effects of the open-door policies on urbanization. However, the positive effects are only significant for coastal provinces. (iii) The labor force tends to move to cities with better education, communication and public transportation facilities. To improve the infrastructures, both in terms of quantity and quality, and thereby enhance the development of urbanization in China, should be an important part of the administration's policy. (iv) Having removed the influence of the administrative reclassification and controlled all the explicative variables, the population growth rate of a coastal city is lower than that of an inland city. In inland provinces, the economic center and FDI often concentrate in one or more relatively big cites such as the capital city. The development of urbanization hence usually equals to the expansion of the large and super-large cities. As for coastal provinces, the economy is in general more developed, and more cities adopt open–door policy. The urbanization in coastal area is therefore the development of city-group (a group of cities located within a region). The group of cities spreading along the Pearl Delta and the Yangtze Delta are the good examples.

Some policy implications regarding urbanization may be drawn from this study. First, regional disparities of urbanization in China are indeed determined by that of the level of economic development. Our analyses show that the differences among coastal, central and

western provinces lie not only in the urbanization level, but also in the city system and in the mode of urban development. Furthermore, the three regions are for the time being at different stage of marketization, and the various factors influencing the development of urbanization may show their different role in different areas. As a developing country characterized by regional imbalances coupled with an imperfect market economy and a large population, a single model of urbanization cannot fit all of the country's regions. Any urbanization models compatible with a market-oriented economy, local conditions and economic rules have to be adopted and encouraged.

Second, the development process of coastal region may be considered as a miniature of China's economic reforms. Its development experience shows that, given a proper combination of internal policies and factors, and external forces, it is possible to achieve rapid regional urbanization. To accelerate urbanization of the central and western provinces and reduce the gap between the coastal and inland areas, equitable policies should be applied to inland areas. In particular, the similar fiscal incentives and administrative autonomy, the policies regarding FDI enjoyed by the coastal region should be extended to the inland region.

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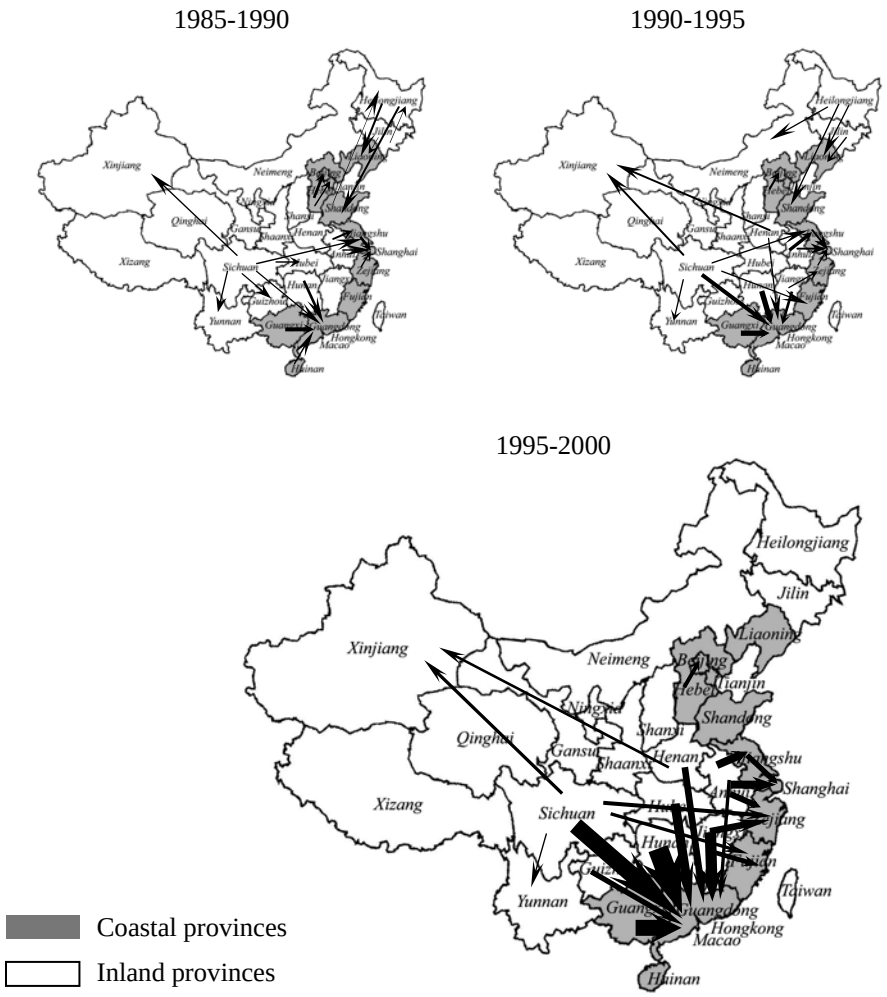
FIGURES AND TABLES

Figure 1 - Main migratory flows between the provinces



The thickness of the arrows reflects approximately the intensity of the corresponding migratory flow

Source: Population Census Office under the State Council, 1991; National Bureau of Statistics of China, 1997; 2002.

Table 1 - Main migratory flows between the provinces

Number of migrants: thousand persons

	1985-1990		1990-1995		1995-2000	
1	*Guangxi→Guangdong*	365.9	*Hunan→Guangdong*	443.3	*Hunan→Guangdong*	2488.2
2	*Hebei→Beijing*	224.5	*Guangxi→Guangdong*	439.5	*Sichuan→Guangdong*	1740.2
3	*Hunan→Guangdong*	207.9	*Sichuan→Guangdong*	351.7	*Guangxi→Guangdong*	1628.5
4	*Jiangshu→Shanghai*	189.8	*Anhui→Jiangshu*	266.8	*Jiangxi→Guangdong*	1213.2
5	*Anhui→Jiangshu*	151.3	*Jiangxi→Guangdong*	194.5	*Hubei→Guangdong*	1149.1
6	*Heilongjiang→Liaoning*	147.2	*Sichuan→Xinjiang*	166.5	*Henan→Guangdong*	808.8
7	*Heilongjiang→Shandong*	133.9	*Hebei→Beijing*	164.6	*Anhui→Jiangshu*	752.5
8	*Sichuan→Yunnan*	124.1	*Jiangshu→Shanghai*	161.3	*Anhui→Shanghai*	686.4
9	*Anhui→Shanghai*	123.7	*Henan→Xinjiang*	161.2	*Jiangxi→Zhejiang*	613.0
10	*Sichuan→Guangdong*	119.4	*Anhui→Shanghai*	160.4	*Anhui→Zhejiang*	560.7
11	*Sichuan→Xinjiang*	113.5	*Heilongjiang→Shandong*	131.2	*Jiangshu→Shanghai*	474.4
12	*Sichuan→Guizhou*	106.8	*Heilongjiang→Liaoning*	119.2	*Guizhou→Guangdong*	453.9
13	*Hebei→Tianjin*	106.0	*Sichuan→Yunnan*	101.5	*Jiangxi→Fujian*	420.3
14	*Sichuan→Jiangshu*	96.6	*Henan→Guangdong*	99.2	*Hebei→Beijing*	373.8
15	*Zhejiang→Shanghai*	96.5	*Zhejiang→Shanghai*	97.5	*Sichuan→Zhejiang*	355.3
16	*Sichuan→Hubei*	92.4	*Sichuan→Fujian*	96.6	*Anhui→Guangdong*	285.7
17	*Hainan→Guangdong*	84.4	*Heilongjiang→Neimeng*	96.3	*Sichuan→Xinjiang*	277.3
18	*Jilin→Liaoning*	82.7	*Sichuan→Jiangshu*	94.6	*Sichuan→Fujian*	261.0
19	*Shandong→Heilongjiang*	78.8	*Jilin→Liaoning*	85.4	*Henan→Xinjiang*	246.7
20	*Jilin→Heilongjiang*	78.0	*Jiangxi→Zhejiang*	84.9	*Sichuan→Yunnan*	245.8

Source: Population Census Office under the State Council, 1991; National Bureau of Statistics of China, 1997; 2002.

Table 2 - Urbanization rate by provinces

	1990 (%)	2000 (%)	Annual growth rate (%)
China	26.2	36.9	3.47
Beijing	73.2	77.5	0.57
Tianjin	68.2	72.0	0.54
Hebei	17.9	26.1	3.83
Shanxi	26.7	34.9	2.73
Neimeng	35.5	42.7	1.85
Liaoning	51.4	54.2	0.54
Jilin	42.8	49.7	1.49
Heilongjiang	49.3	51.5	0.45
Shanghai	66.1	88.3	2.93
Jiangsu	22.6	41.5	6.27
Zhejiang	30.6	48.7	4.76
Anhui	17.7	27.8	4.65
Fujian	22.7	41.6	6.25
Jiangxi	20.9	27.7	2.86
Shandong	26.8	38.0	3.55
Henan	15.2	23.2	4.35
Hubei	29.6	40.2	3.10
Hunan	17.4	29.8	5.53
Guangdong	38.2	55.0	3.52
Guangxi	15.4	28.2	6.20
Hainan	20.6	40.1	6.90
Sichuan	19.7	28.4	3.71
Guizhou	20.1	23.9	1.76
Yunnan	14.7	23.4	4.71
Xizang	18.1	18.9	0.47
Shaanxi	20.7	32.3	4.56
Gansu	20.8	24.0	1.44
Qianghai	25.3	34.8	3.24
Ningxia	28.5	32.4	1.31
Xinjiang	33.0	33.8	0.25

Chongqin is merged in *Sichuan*.

Source: Population Census Office under the State Council, 1991; National Bureau of Statistics of China, 2002.

Table 3 – The average development level of the three regions

	Urbanization rate (%)		Per capita GDP (*yuan*)		Openness degree (%)		Proportion of rural non-farm workers (%)	
	Level in 2000	Annual growth rate (%)	Level in 2000	Annual growth rate (%)	Level in 2000	Annual growth rate (%)	Level in 2000	Annual growth rate (%)
Coastal region	54.2	3.3	16896	16.4	55.0	7.8	46.8	2.2
Central region	36.4	3.0	6667	14.9	8.6	5.7	27.5	3.8
Western region	28.0	2.8	5299	14.5	7.8	6.8	21.8	5.0

The annual growth rate of urbanization is calculated from the population census of 1990 and 2000; the other rates are calculated from the data of 1984 and 2001. The coastal region includes *Beijing*, *Tianjin*, *Hebei*, *Liaoning*, *Shanghai*, *Jiangsu*, *Zhejiang*, *Fujian*, *Shandong*, *Guangdong, Hainan*; the central region includes *Shanxi*, *Neimeng*, *Jilin*, *Heilongjiang*, *Anhui*, *Jiangxi*, *Henan*, *Hubei*, *Hunan*; the western region includes *Guangxi, Sichuan*, *Guizhou,Yunnan*, *Xizang*, *Shaanxi*, *Gansu*, *Qianghai*, *Ningxia*, *Xinjiang*.
Source: Population Census Office under the State Council, 1991; National Bureau of Statistics of China, 2002.

Table 4 - Results of the estimations

Dependant variable: Proportion of non-agricultural population

	Total sample			Coastal provinces	Central provinces	Western provinces
	1985-2001	1985-1992	1993-2001			
	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6
Per capita GDP	1.978***	2.284***	2.992***	-0.721	5.862***	1.451***
	(5.16)	(13.28)	(3.30)	(-0.59)	(9.03)	(6.52)
Portion of secondary industry GDP	0.098**	0.043***	0.111	0.258***	0.469***	0.010
	(2.51)	(2.66)	(1.18)	(2.64)	(8.03)	(0.31)
Portion of tertiary industry GDP	0.131***	0.020	0.137	0.429***	0.113	0.059**
	(2.94)	(1.06)	(1.46)	(2.93)	(1.23)	(2.33)
Openness degree	0.034**	0.038***	0.041*	0.051*	0.279***	-0.002
	(2.41)	(2.63)	(1.66)	(1.88)	(3.12)	(-0.15)
Railway density	4.937***	1.037**	7.250***	6.492***	5.804***	2.297***
	(7.93)	(2.12)	(7.72)	(8.00)	(5.78)	(3.15)
Highway density	-0.006	0.016	-0.086	-0.041	-0.593***	0.023
	(-0.16)	(0.46)	(-1.58)	(-0.54)	(-10.39)	(0.53)
Proportion of rural non-farm workers	0.027	0.055*	-0.019	0.255**	-0.537***	0.162***
	(0.52)	(1.71)	(-0.20)	(2.32)	(-7.38)	(5.17)
Constant	-5.663**	1.381	-15.088**	-11.192*	-30.307***	1.143
	(-2.23)	(0.94)	(-2.52)	(-1.70)	(-8.98)	(0.77)
R^2 (within)	0.579	0.743	0.232	0.411	0.669	0.860
Type of model	Random effect	Fixed effect	Random effect	Random effect	Random effect	Fixed effect
Number of observations	485	229	256	170	153	162

The *t-students* are in brackets. *** indicates significance at 1%; ** indicates significance at 5%; * indicates significance at 10%.

Figure 2 – Relation between urbanization rate and per capita GDP

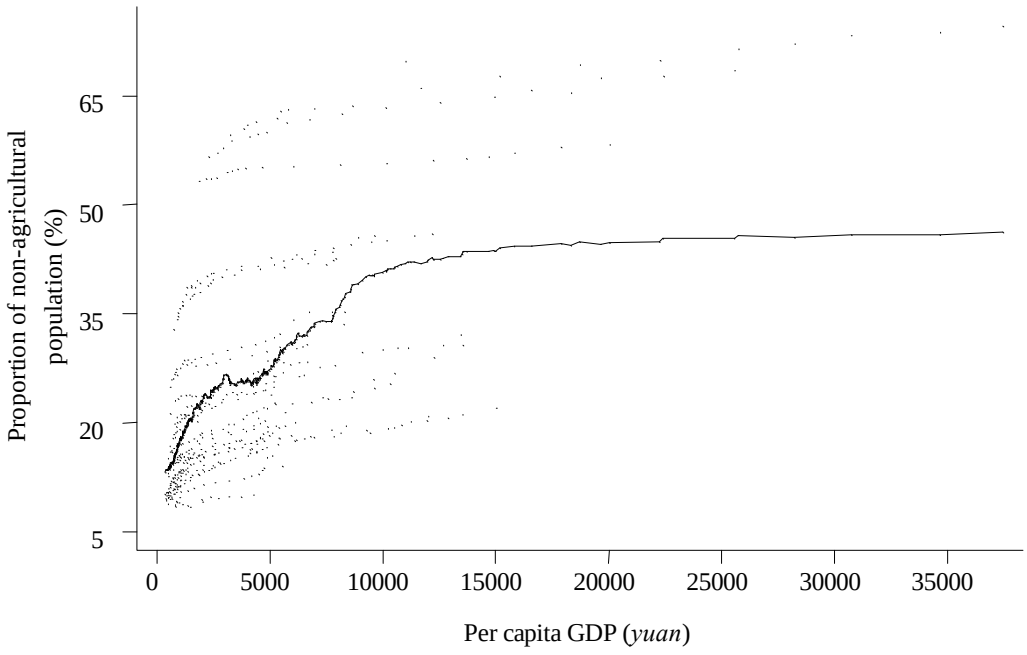


Figure 3 – Relation between urbanization rate and openness degree

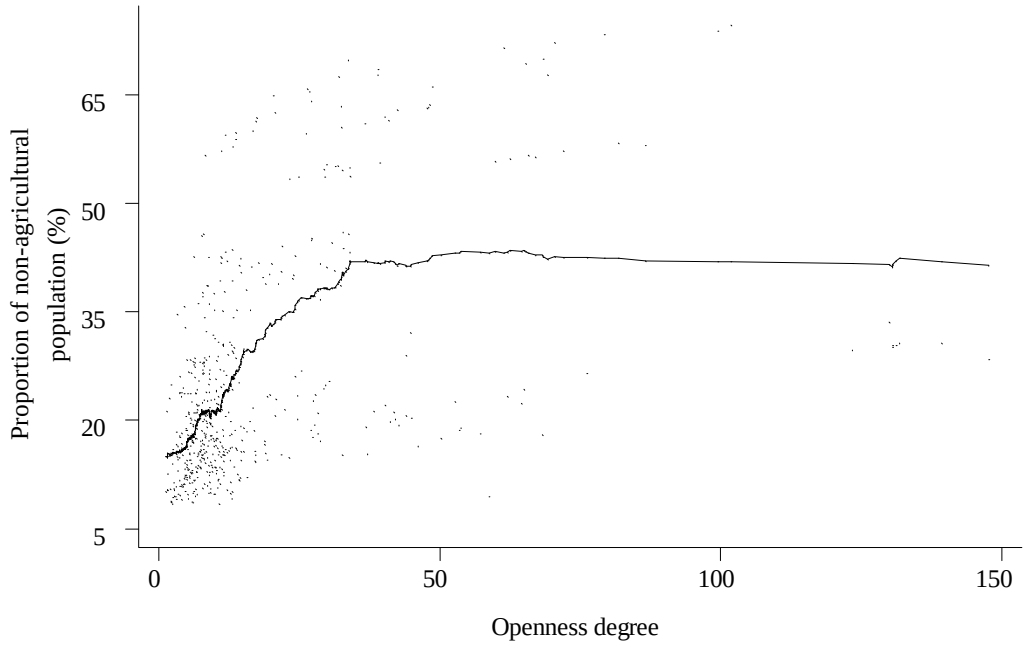


Table 5 – Distribution of cities and city population by region

	Number of cities			Average total population size (in thousands)			Distribution of city population (%)		
	1990	1999	Change (B-A)/A	1990	1999	Change (D-C)/C	1990	1999	Change
	A	B	(%)	C	D	(%)	E	F	F-E
All the cities	222	218	-1.8	814	973	19.5	100.0	100.0	-
2.0 millions or above	12	16	33.3	2842	3172	11.6	20.2	23.9	3.7
1.0 – 2.0 millions	52	61	17.3	1285	1353	5.3	36.4	38.9	2.5
0.5 – 1.0 millions	72	81	12.5	702	694	-1.1	27.5	26.5	-1.0
Below 0.5 millions	86	60	-30.2	340	379	11.5	15.9	10.7	-5.2
Coastal provinces	92	93	1.1	869	992	14.2	100.0	100.0	-
2.0 millions or above	7	8	14.3	2836	2992	5.5	24.8	26.0	1.1
1.0 – 2.0 millions	22	27	22.7	1264	1358	7.4	34.8	39.8	5.0
0.5 – 1.0 millions	28	32	14.3	714	670	-6.2	25.0	23.3	-1.7
Below 0.5 millions	35	26	-25.7	352	391	11.1	15.4	11.0	-4.4
Central provinces	83	81	-2.4	751	938	24.9	100.0	100.0	-
2.0 millions or above	3	5	66.7	2896	3525	21.7	13.9	23.2	9.3
1.0 – 2.0 millions	16	20	25.0	1306	1324	1.4	33.5	34.9	1.3
0.5 – 1.0 millions	32	33	3.1	674	700	3.9	34.6	30.4	-4.2
Below 0.5 millions	32	23	-28.1	350	381	8.9	18.0	11.5	-6.4
Western provinces	47	44	-6.4	818	1001	22.4	100.0	100.0	-
2.0 millions or above	2	3	50.0	2782	3065	10.2	20.6	20.9	0.2
1.0 – 2.0 millions	14	14	0.0	1295	1384	6.9	43.8	44.0	0.2
0.5 – 1.0 millions	12	16	33.3	749	728	-2.8	21.7	26.4	4.7
Below 0.5 millions	19	11	-42.1	303	348	14.9	13.9	8.7	-5.2

This table includes cities at the prefectural level only. Some of them have undergone important administrative reclassifications during the 1990-1999 period.

Table 6 - Growth of urban population by type of cities (1990-1999)

	Number of cities	Average population growth rate
All the selected cities	158	1.96
Coastal provinces	65	2.01
Central provinces	60	1.97
Western provinces	33	1.84
2.0 millions or above	15	2.32
1.0 – 2.0 millions	38	1.57
0.5 – 1.0 millions	48	1.61
Below 0.5 millions	57	2.42

This table examines 158 selected cities at the prefectural level and provincial level that were immune to administrative reclassifications during 1990-1999. The growth rate is equal to population ratio in 1999 to that in 1990.

Table 7 - Gini index of cities' population

	1990	1999
All the cities at prefecture level	0.38	0.37
Coastal provinces	0.39	0.37
Central provinces	0.36	0.38
Western provinces	0.40	0.37

This table includes cities at prefectural level only. Some of them have undergone important administrative reclassifications between 1990 and 1999.

Table 8 – Determinants of urban population growth

Dependant variable: logarithm of the ratio of population in 1999 to that in 1990

	All the provinces			Coastal provinces	Inland provinces
	Regression 7	Regression 8	Regression 9	Regression 10	Regression 11
Total population	-0.040***	-0.026**	-0.054***	-0.054***	-0.084***
	(-3.05)	(-2.30)	(-5.22)	(-4.55)	(-5.70)
Number of immigrants between 1985-1990	0.017***	0.004	0.002	-0.004	0.004
	(3.40)	(0.98)	(0.64)	(-0.86)	(1.02)
Per capita GDP (/10000)		0.218***	-0.030	-0.059	-0.017
		(7.33)	(-0.74)	(-0.93)	(-0.39)
Per capita FDI (/100)			0.004***	0.003**	0.055
			(3.16)	(2.16)	(1.43)
Fixed investment to GDP ratio			0.083**	0.103**	0.094**
			(2.26)	(2.15)	(2.10)
Fiscal expenditure to GDP ratio			-0.048	0.293	-0.091
			(-0.39)	(1.23)	(-0.74)
University student enrollment per 10000 population (/100)			0.033***	0.008	0.027**
			(3.60)	(0.73)	(2.05)
Number of telephones per 100 population			0.015***	0.020***	0.007
			(4.25)	(4.93)	(0.93)
Passenger traffic (/10000)			0.006***	0.005***	0.037***
			(4.38)	(4.32)	(6.54)
Per capita dwelling space			0.008	0.009	0.012
			(1.43)	(1.50)	(1.54)
Coastal provinces			-0.035**		
			(-2.17)		
Central provinces			0.007		
			(0.43)		
Constant	0.246***	0.181***	0.246***	0.217***	0.330***
	(4.67)	(3.90)	(3.92)	(2.81)	(3.73)
R^2	0.089	0.324	0.681	0.884	0.598
Number of observations	158	158	155	63	92

The *t-student* are in brackets. *** significance at 1%; ** significance at 5%; * significance at 10% .

Table 9 – Determinants of non-agricultural population growth

Dependant variable: logarithm of the ratio of non-agricultural population in 1999 to that in 1990

	All the provinces			Coastal provinces	Inland provinces
	Regression 12	Regression 13	Regression 14	Regression 15	Regression 16
Total non-agricultural population	-0.101***	-0.099***	-0.111***	-0.103***	-0.125***
	(-7.11)	(-7.64)	(-7.01)	(-4.45)	(-5.49)
Number of immigrants between 1985-1990	0.006	-0.004	-0.001	-0.012	0.003
	(0.99)	(-0.60)	(-0.24)	(-1.06)	(0.48)
Per capita GDP (/10000)		0.200***	-0.037	-0.018	-0.015
		(5.61)	(-0.62)	(-0.14)	(-0.25)
Per capita FDI (/100)			0.006***	0.002	0.060
			(3.20)	(0.76)	(1.11)
Fixed investment to GDP ratio			0.044	0.084	0.086
			(0.83)	(0.87)	(1.37)
Fiscal expenditure to GDP ratio			-0.112	0.808	-0.216
			(-0.63)	(1.63)	(-1.29)
University student enrollment per 10000 population (/100)			0.025*	0.004	0.046**
			(1.75)	(0.15)	(2.49)
Number of telephones per 100 population			0.001	0.008	-0.026***
			(0.19)	(1.02)	(-2.68)
Passenger traffic (/10000)			0.005***	0.004	0.022***
			(2.75)	(1.57)	(2.81)
Per capita dwelling space			0.025***	0.031**	0.028**
			(3.00)	(2.44)	(2.45)
Coastal provinces			0.038		
			(1.56)		
Central provinces			0.027		
			(1.15)		
Constant	0.617***	0.596***	0.472***	0.382**	0.525***
	(13.72)	(14.43)	(5.37)	(2.48)	(4.48)
R^2	0.294	0.413	0.546	0.654	0.524
Number of observations	158	158	155	63	92

The *t-student* are in brackets. *** significance at 1%; ** significance at 5%; * significance at 10% .