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Migration, urban population growth and regional disparity in China

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1. Introduction

Chinese population, especially rural population had been subject to migration controls for a long time. Shortly after the foundation of the People's Republic of China, a household registration system had been initiated. Since the end of the 1950s', this *Hukou* system became the basis of restrictions on population mobility. With the *Hukou* system, the central government manages to exert controls on the migration towards cities, and on the size growth of the cities. The *Hukou* status attributed to each household indicates the rural or urban nature of its resident place, and the agricultural or non-agricultural nature of the occupation of its members. It is forbidden to migrate from rural to urban areas, except for students going to high education institutions, or workers recruited by state enterprises (Chan and Zhang, 1999). Without official urban status, migrant coming from rural areas have no access to urban social welfare system, such as free public education, health care, low rent housing, etc. They could hardly survive in cities especially because of the food ration system. Consequently, till the beginning of the 1980s', besides natural growth, urban population growth derives mainly from official migration governed by local authorities through a quota system, instead of spontaneous migration driven by individual decisions.

At the end of the 1970s', a comprehensive and profound economic reform had been launched, which led to significant changes in migration and urbanization policies. The gradual introduction of market mechanism and the abolishment the food ration system at the beginning of 1990s made the *Hukou* system less justified. The central government began to allow some temporary migrations around 1984, which resulted in a large "floating population" in urban areas. This refers to migrants without getting permanent urban *Hukou* status. During this period of transition from a planned economy to a market economy, the growth of city population derives more and more from the spontaneous migration determined by factors as productivity and quality of life in cities. However, the particular situation of ''temporary migrants" in cities, especially their limited access to urban public services, makes the migration pattern in China distinct from that described in traditional theories. Some papers, like Wong et al (2003), Zhang and Zhao (2003), suggest that in transition economies, the determinants of migration and the growth of urban population are different from other countries.

The main objective of this paper is to study the determinants of city population growth in China during the 1990s', as well as the determinants of migrations towards cities, which constitutes the main source of urban population growth in this period.

A second objective is to identify regional differences in the urban growth and migrations, that is, whether urban growth and migration patterns are different between coastal and inland provinces. Additionally, we are interested in the differences between temporary and permanent migrations towards urban areas.

The paper is organizes in five sections. Section 2 briefly describes regional disparities and inter-provincial migration patterns in China. Section 3 summarizes the main theories explaining urbanisation and rural-urban migration. Section 4 presents data and methodology used for empirical analysis. Section 5 explains the results and concludes.

2. Regional disparities and inter-provincial migrations

The economic openness of China began in the provinces of the South-East, mainly in Guangdong and Fujian. The creation of "Special Economic Zones" and of "Open Economic Zones" was the master piece of the open-door policy.

The first four Special Economic Zones have been established in 1980, along the south-east coast. From 1984, 14 other coastal cities have been covered by the Open Economic Zones. These Special Economic Zones and open cities have since then attracted substantial foreign direct investments (FDI); which helped to create numerous joint-ventures and foreign capital enterprises. Preferential policies such as fiscal advantages were attributed to these enterprises.

During this period, the Chinese government gradually gave up precedent policies based on a balanced regional development strategy of Mao's era. Preferential policies have been accorded to coastal provinces (Fan, 1999; Yang, 1997), which had been considered as key localities of China's economic development. Subsequently, these provinces gained momentum in economic growth, particularly thanks to the massive inflow of foreign capital. Market mechanisms are introduced and established to a greater degree than in other provinces. In fact, the GDP growth rates in these coastal provinces have been much higher than the average national level for years, and the degree of openness of coastal cities keeps growing.

The new development strategy favouring coastal provinces is leading to increasing regional disparities. (Bhalla, 1990; Chen and Fleisher, 1996; Lyons, 1991). The most salient regional disparities appeared between coastal and inland provinces. In Table 1 and Figure 2, we calculate a Theil index to study the unequal distribution of the intra and inter regional development. Two facts can be observed in Table 1: the fast economic growth in the country as a whole during the 1990s, and the GDP per capita is higher in coastal provinces than in other regions. The Theil index shows that despite the high economic growth at the national level, and the increasing openness of western provinces, the regional disparities induced by open door policy kept growing between the three groups of provinces (coastal, central, and western).

Table 1 - Decomposition of the Theil Index : Real GDP per capita

	Real GDP per capita (*yuan*)				Theil Index				
							Intra-provincial		
	Total	Coastal Provinces	Central Provinces	Western Provinces	Total	Inter-provincial	Coastal Provinces	Central Provinces	Western Provinces
1990	2106	2596	1718	1502	0.161	0.027	0.073	0.037	0.024
1991	2349	2905	1908	1661	0.167	0.028	0.078	0.036	0.025
1992	2743	3480	2152	1867	0.181	0.036	0.086	0.033	0.027
1993	3203	4175	2406	2117	0.196	0.045	0.088	0.033	0.031
1994	3487	4537	2606	2401	0.189	0.042	0.077	0.035	0.034
1995	3578	4725	2657	2385	0.194	0.047	0.086	0.031	0.030
1996	3757	4892	2907	2530	0.190	0.041	0.084	0.030	0.034
1997	4088	5309	3113	2716	0.183	0.042	0.085	0.032	0.022
1998	4462	5826	3371	2960	0.191	0.044	0.085	0.031	0.030

Note: The GDP per capita has been deflated by the consumption price index

Moreover, the disparities within the coastal region grew up. Figure 1 shows that more than two thirds of the GDP disparities in China come from inter-regional and intra-coastal disparities. The latter may be explained by the fact that some cities in coastal region are close to Hong-Kong and Macao, thereby receiving more FDI from there, whereas other cities in this region have no such geographical advantage and receive far less FDI.

During this period, it's shown that the migrations to eastern provinces intensified (Map 1) which is the consequence of the open-door policy and the relaxation of control on migration.

Figure 1 - Decomposition of theTheil Index : Real GDP per capita

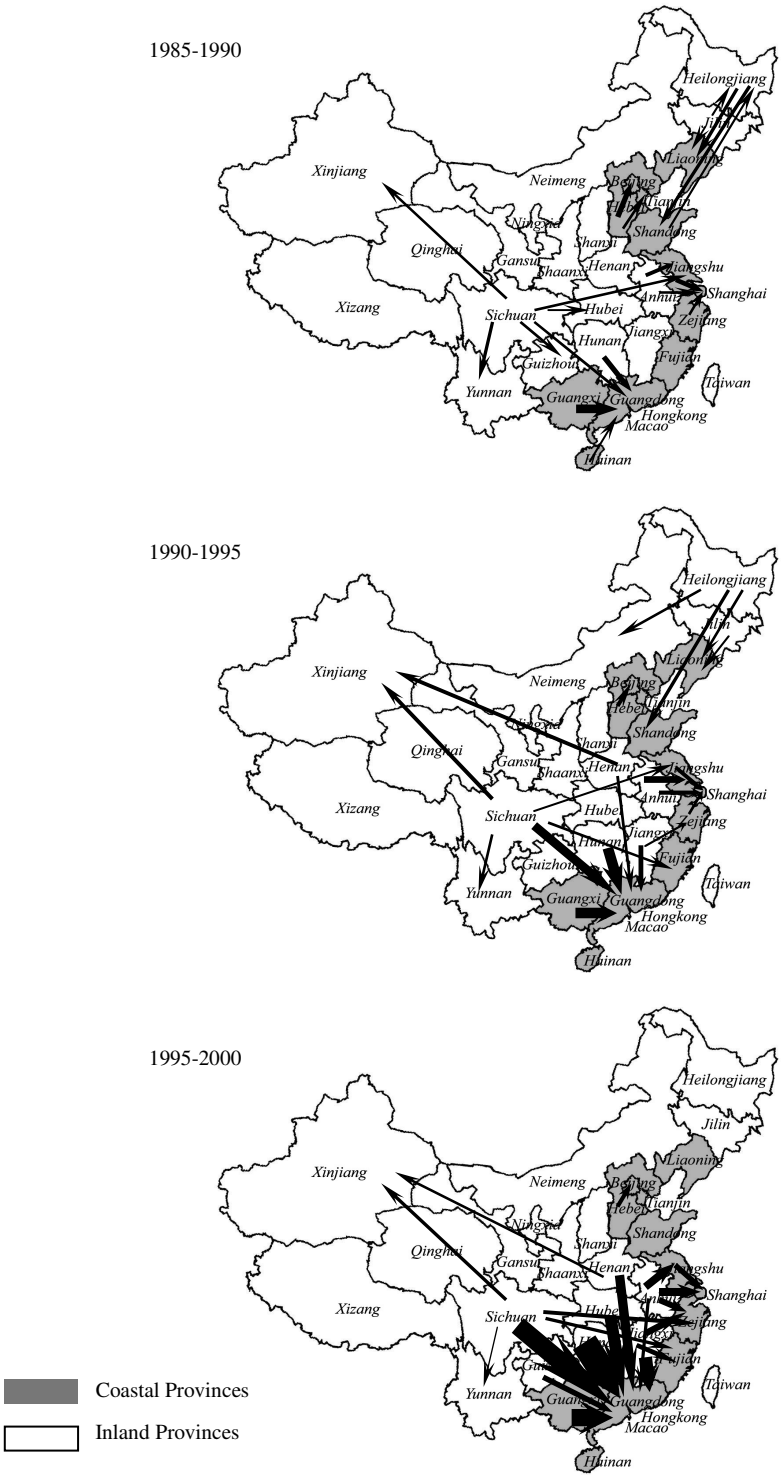
Source : China Statistical Yearbook, several issues.

Map 1 illustrates the twenty largest flows of migrations for each of the period of 1985-1990, 1990-1995 and 1995-2000. We can see that these main migration flows come from inland provinces towards eastern ones. During the first and second periods, migrants tended to concentrate in three main regions: the Pearl River Delta (Guangdong), the Yangtse Delta, around Shanghai, the biggest city in China, and the area around the Bohai Golf, including Beijing.

The open-door policy has been first experimented in Guangdong. This province benefited from preferential policy and enjoined good conditions of openness. Export-based development and massive inflow of foreign capital stimulated the growth of small cities and of labour-intensive sectors. This is in favour of employment, and therefore very attractive to migrants from all over the country.

The most populated province, Sichuan (114.3 million inhabitants in 2000), is the main source of emigrant. According to non-official sources, it seems that more that 5 millions farmers leave the province as temporary migrants. Henan, the second most populated province is another main source of long distance migration. This implies that a large population constitutes an important repulsion force to the emigration of labours.

Map 1 – Main inter-provincial migration flows



The thickness of arrows indicates approximately the magnitude of migration flows

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

3. Theories about urbanization factors

Theories concerning urbanization factors can be found in both spatial economics and development economics literatures. In spatial economics, all geographic concentrations are considered as the result of the interaction between agglomeration forces and dispersion forces. The formation and the growth of cities are a typical spatial agglomeration phenomenon, resulting from the interaction of theses opposing forces: economic actors group together and form cities to benefit from agglomeration advantages, but city size is limited because of urban diseconomies such as congestion and pollution phenomena. Agglomeration advantages derive mainly from increasing returns of scale. There are internal increasing returns in the production at firm level; moreover, scale economies external to firms are essential to their grouping in space. As early as Marshall, three sources of externalities are indicated as driving force of the concentration of industrial activities: (i) the availability of specialized inputs and services, (ii) the formation of a labour pool, (iii) the information exchange and spillover.

On the other side, there are centrifugal forces. Centrifugal forces exist first of all because of transport costs. The existence of transport costs of manufacture goods encourages firms to get nearer to consumers that are sometimes dispersing. Secondly, costs of fixed factors such as land increase with the concentration of production and population, which leads to dispersion. Finally, gains due to agglomeration could be offset by its' negative effect or external diseconomies. These diseconomies take place when city size growth leads to congestion, pollution and others social problems. The congestion is usually represented by phenomena like urban traffic jams.

An important branch in spatial economics, the new geography economic literature, attempts to model formally the agglomeration phenomenon in a monopolistic competition framework. These models predict a centre-periphery spatial structure: those locations having advantages due to historical events, factorial endowment or to geographic positions attract more concentration, and become the centres, and other places less advantageous are reduced to the peripheries. Krugman (1993), Fujita et al (1999) analyse the emergence of the new economic centres following demographic growth. The new centres appear only at certain distance from the original centre, in the limit of this distance, new centres could not exist because centripetal forces of the original centre are too strong, and the area is still in the shade of the original centre. New centres are not likely to be out of the distance limit, since transport costs increasing with distance are excessive there. Therefore, the distance between new centres and the original centres is determined by the equilibrium between centripetal and centrifugal forces.

If theories on spatial concentration of economic activities offer endogenous explanations to the formation and the distribution of urban centres, development economists attach more importance to the role of economic structural change in the urbanization. Neoclassical theories consider migration as a phenomenon of economic development, which improve efficiency by the shift of labour from low productivity sectors to high productivity sectors. The first dual-economy model in neoclassical theories is developed by Lewis (1954), Ranis and Fei (1961), which considers an economy with a traditional agricultural sector and a modern industrial sector. In this model, farmland is limited and there is no capital investment in rural sector, as a result, with the demographic pressure, marginal productivity in agriculture is at negligible level. Given the surplus of agriculture labour, urban sector can obtain the quantity of workers needed with a fixed wage level.

The urbanization being part of structural transformation of the economy, it stems directly from rural/urban migration. Models of Todaro (1969) and Harris and Todaro (1970) are the most influential ones in explaining rural/urban migration. Their models are based on the principle of economic rationality, which assumes that a rural worker makes migration

decisions by comparing the cost and the anticipated income in urban areas. The anticipated income equals to the wage multiplied by the probability of finding a job. The wage level in urban formal sector is higher than in rural sector, owing to institutional factors leading to the urban wage rigidity. This wage gap between rural and urban sector is the source of migration. Todaro also explains why the rural-urban migration persists even when there is unemployment in urban sector: this is due to the existence of an informal sector in urban areas that absorb migrants.

Studies on determinants of rural/urban migration consist mainly of micro-analysis interested in economic or social characteristics of individuals, whereas analyses on urbanization process are concerned about macro-economic conditions influencing internal migration, the latter is the aggregation of individual immigration decisions. If economic factors play essential roles in the determination of rural/urban migration, urbanization and urban growth are affected by the same factors.

Williamson (1988) reviewed macro-economic explicative factors of rural/urban migration and urban growth by classifying them into three categories: 1) external exogenous events such as foreign capital dependence, relative price of exchangeable products in international market; 2) internal exogenous events like the shortage of cultivable land, the consummation structure, policy choices, etc; 3) endogenous limits. What limits urban growth in models of dual economy is the disappearing of rural labour surplus or the rise of product's relative price. These factors are highlighted in order to explain urban growth differences of developing countries. At city level within a country, growth differences are determined by different attractions of cities to the migrants. Migration models based on dual economy (Harris and Todaro, 1970, among others) consider the rural/urban migration as a response to the income difference between rural and urban sectors; individuals make decisions of migration by comparing their anticipated incomes. Consequently, a city's attraction towards migrants lies mainly in economic opportunities – the income level and the employment potentials – that the city provides.

Urban infrastructures are supposed to play an important role in urban growth process. In endogenous growth literature, infrastructures are considered as an explicative variable of the economic growth. Public infrastructure is part of the public capital stock that enters directly into the production function. At city level, urban public infrastructures are shared by all firms in the same city, which constitutes an important source of urbanisation economies. Improvement of infrastructures in cities helps on one hand to realise more agglomeration economies, and on the other hand to reduce diseconomies related to agglomeration, such as congestion and pollution costs, hence to raise the cities' general productivity. The influence of urban infrastructures on migration decisions is also emphasized in the literature. Firstly, urban infrastructures affect directly migration decisions. The living costs including transport costs, housing costs increase as the city population grows, therefore, improvement of infrastructures like public transport services, housing conditions reduces living costs and encourage migration inflow. Secondly, infrastructures intended to serve productive activities affect migration decisions through their effect on productivity and on income level (Small, 1999). Meanwhile, the construction of urban infrastructure creates employment in cities directly by increasing labour demand and indirectly by stimulating the development of other services, which attracts migrants by offering more job opportunities (Eberts and McMillen, 1999).

4. Empirical Analysis

4.1. Econometric model

Empirical analysis are based on a model built by Glaeser and al (1995) and used also by Beeson and Dejong (2000) in their study on population growth in the USA[1]. In this model, cities are considered as separated economies sharing labour and capital markets.

The total production of a city *i* at time *t*, $Y_{i,t}$, is given by

$$Y_{i,t} = A_{i,t} K_{i,t}^{\alpha} L_{i,t}^{\beta} \tag{1}$$

where $A_{i,t}$ represents the productivity level of city *i* at time *t*, $K_{i,t}$, $L_{i,t}$ denote respectively capital and labour level. In this Cobb-Douglas production function, α and β are production parameters at national level. The capital return *r* is supposed to be exogenous and common to all cities, which equals to the marginal production of the capital under perfect competition assumption.

$$r = \alpha A_{i,t} K_{i,t}^{\alpha-1} L_{i,t}^{\beta} \tag{2}$$

Urban salary is given by the marginal production of labour.

$$W_{i,t} = \beta A_{i,t} L_{i,t}^{\beta-1} K_{i,t}^{\alpha} \tag{3}$$

Combining (2) and (3) gives

$$W_{i,t} = \beta r^{\frac{\alpha}{\alpha-1}} \alpha^{\frac{\alpha}{1-\alpha}} A_{i,t}^{\frac{1}{1-\alpha}} L_{i,t}^{\frac{\alpha+\beta-1}{1-\alpha}} \tag{4}$$

The quality of life index in the city

$$Z_{i,t} = Q_{i,t} L_{i,t}^{-\delta} \tag{5}$$

where $Q_{i,t}$ represents amenity index and $L_{i,t}^{\delta}$ captures the congestion effect increasing with urban population size.

The total utility of a resident in a city is determined by the salary level and the life quality, namely

$$U_{i,t} = W_{i,t} Z_{i,t} = \alpha^{\frac{\alpha}{\alpha-1}} \beta r^{\frac{\alpha}{1-\alpha}} A_{i,t}^{\frac{1}{1-\alpha}} Q_{i,t} L_{i,t}^{\frac{\alpha+\beta-1-\delta-\alpha\delta}{1-\alpha}} \tag{6}$$

When the migration is free across cities, at equilibrium, the utility of each individual at a time point is constant for all cities, noted by $\underline{U}_t$.

$$\log\left(\frac{\underline{U}_{t+1}}{\underline{U}_t}\right) = \Delta\Theta + \frac{1}{1-\alpha}\log\left(\frac{A_{i,t+1}}{A_{i,t}}\right) + \log\left(\frac{Q_{i,t+1}}{Q_{i,t}}\right) + \frac{\alpha+\beta-1-\delta-\alpha\delta}{1-\alpha}\log\left(\frac{L_{i,t+1}}{L_{i,t}}\right) \tag{7}$$

Then, $A_{i,t}$ and $Q_{i,t}$ are supposed to evolve as following

$$\log\left(\frac{A_{i,t+1}}{A_{i,t}}\right) = X_{i,t}\beta + \varepsilon_{i,t} \tag{8a}$$

[1] Glaeser and Shapiro (2001) develop another version of the model. The model adopted here bases mainly on the former version with some suggested modifications.

$$\log\left(\frac{Q_{i,t+1}}{Q_{i,t}}\right) = X_{i,t}\theta + \xi_{i,t} \tag{8b}$$

with $X_{i,t}$ representing a set of characteristics influencing levels of productivity and life quality.

The model estimated is derived by combining (7), (8a) et (8b), as follows

$$\log\left(\frac{L_{i,t+1}}{L_{i,t}}\right) = \left(\frac{\theta\alpha - \theta - \beta}{\alpha + \beta - 1 - \delta - \alpha\delta}\right) X_{i,t} + \chi_{i,t} \tag{9}$$

where $\chi_{i,t}$ is an error term not correlated with urban characteristics[2]. In this framework, the regression interprets how cities' characteristics determine urban population growth through the cities' quality of life and the productivity. It should be noted that these are characteristics at the beginning of the period; they affect urban growth during that period, which assumes a lag between changes in urban characteristics and their effects on urban growth. The lag could be due to two facts: firstly, the migration responds to cities' utility changes with a lag because the information transmission is not immediate (Rappaport, 1999; Beeson and Dejong, 2000), in other words, a rise of income level or an improvement of life quality in cities at present encourages a growth of migrant flow in the future. Secondly, the effect of urban characteristics changes on productivity and life quality in cities is not immediate, neither. The lag exists particularly between the time of application of politics and the moment when they begin to take effect.

The using of lagged explicative variables implied by this empirical model permits to mitigate to some extent the endogeneity problem. In fact, most of explicative factors of urban growth are endogenous due to inverse causality. For instance, the level of GDP per capita being an explicative variable, its growth indicates higher economic performance and encourages more migration, but on the other side, the growth of the urban population enhances the agglomeration economies and contributes to the improvement of economic performance and the growth of GDP level. In this way, the explicated variable exerts inverse causalities on the explicative variables.

Based on equation (9), we estimate determinants of city population growth, meanwhile, we regress these factors on migrant flows, in order to know if migration and urban population growth are determined by the same factors.

4.2 Data and variables

In Chinese urban system, there are three administrative levels of cities: cities under direct administration of the central government (*zhi xia shi*) or province-level cities; cities at prefecture level administered by provinces; cities at county level administered by prefectures or provinces. We choose province-level and prefecture-level cities as observation units by excluding counties and county-level cities attached to them. Altogether, there are 223 cities of

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[2] $\Delta\Theta = \log\left(\frac{\Theta_{t+1}}{\Theta_t}\right)$, with $\Theta_t = \alpha^{\frac{\alpha}{1-\alpha}}\beta r^{\frac{\alpha}{\alpha-1}}$.

$\chi_{i,t+1} = \left(\frac{1-\alpha}{\alpha+\beta-1-\delta-\alpha\delta}\right)\left(\Delta\Theta - \log\left(\frac{\underline{U}_{t+1}}{\underline{U}_t}\right) + \frac{1}{\alpha-1}\varepsilon_{i,t+1} + \xi_{i,t+1}\right)$.

theses types in 2000. Our sample covers 158 of these cities during 1990-1999, with other 65 cities excluded because of incoherent variations in their population. The period is not long enough for the examination of long term trend, we choose it for two reasons : firstly, market forces did not begin to play significant roles in Chinese economies until the beginning of 1990s'; before that, urban development had been subject to governments' planning and control, rather than following economic agents' interactions. Therefore, it may be inappropriate to apply economic theories based on market competition assumptions to study Chinese urban system changes before 1990. In fact, city data before 1990 suffer from frequent changes and adjustments, which also makes the study of urban growth prior to the 1990s' difficult. Secondly, since the 1980s', China has experienced unprecedented rapid economic growth, a profound transition has involved all domains of China, especially the urban sector. Hence, within a time span of ten years that appears not so long for most developed countries, dramatic changes may have taken place in a transition economy like China.

Our data on cities are compiled from *Fifty years of Chinese cities* (NSB, 1999) and *Statistical Yearbook of Chinese cities* (NSB, 2000). These sources provide city aggregate data on population, economic development, life quality, geographic and other characteristics. Data on migration are compiled from statistics of population census (1% censor of 1995, NSB, 1997 and censor of 2000, NSB, 2002). Migrants refer to residents for less than five years.

Dependant variables

We make two groups of regressions on city population growth and migrant numbers, respectively.

City population growth

For city population, different measures exist in China. Generally speaking, two main data series are adopted by authors to represent urban population: non-agricultural city population and total city population. If both measures are limited to the same urban areas, the former is strictly based on Chinese unique Hukou (residence register) system, and does not include migrants without official transfer of Hukou status. The latter is based on residence principle, and includes not only official urban Hukou resident, but also part of "temporary" urban residents. Thereby, growth of non-agricultural population stems mainly from official migration, that is, migration between cities and public enterprises; and most of the rural-urban migration can only be reflected in growth of total city population. These two types of migration are assumed to be of different patterns. For comparative purpose, we run regressions on these two different measures.

Migrant numbers

Accordingly, in the migration regressions, we distinguish two components of migrants, namely migrants from rural to urban areas (rural-urban), and migrants from between urban areas (urban-urban), as dependent variables. Rural-urban migrants to a city are defined as residents of the city (with or without permanent local Hukou status) moving from rural areas for less than five years. Urban-urban migrants refer to residents of the city moving from other urban areas (town or city) for less than five years (NSB, 2002).

Independent variables

Four groups of independent variables suggested by theoretical and empirical literatures are introduced in the regressions.

Convergence factors

In population growth regressions, the initial level of the population is the variable to capture the convergence or divergence trend of urban growth. The growth literature suggests that economic growth of different regions or countries tends to converge, in other words, there is a negative correlation between growth rate and the initial level of economic development. The convergence phenomenon in the growth is the subject of lots of empirical works. Urban population growth being an aspect of economic growth of cities, we can make the analogy and expect the same convergence phenomenon in urban growth.

We also introduce migrant number of the period precedent as an explicative variable, in population growth as well as migration regressions, to see if there is any correlation between migrant numbers over time. In other words, we'd like to know if cities having absorbing more migrants in the past keep attracting migrant inflows. This allows to compare migration patterns before and after 1990.

Geographic factors

We introduce a distance variable to represent the economic geographic factor of the city. This variable measures the distance between the city and the capital of its province. It's the normalized distance constructed as following,

$$D_j^a = \frac{D_{ij}}{D_j^M}$$

where D_{ij} indicates the distance (by road) between city i of province j and the capital city, D_i^M the maximum value of D_{ij} (in province i). D_j^a takes the value of 0 if j is the capital city, and equals to 1 if j is the furthest city from the capital of the province; for other cities, it takes values between 0 and 1. The capital city of a province is in general the centre of the province, both in political and economic terms. According to centre-periphery model in new economic geography theories, new agglomeration centres mostly likely to appear at a certain distance from the original centre, where centripetal and centrifugal forces exerting by the original centre are in equilibrium. Following this reasoning, we suppose that existing urban agglomerations are also subject to these opposing forces of their provincial centres, and their growth is affected by the distance to these provincial centres.

Economic factors

GDP per capita is a general indicator of economic development, which reflects at the same time the income level and the productivity level in a city. Given that income level factor is essential in the determination process of the migration, we expect a positive effect of this variable on urban growth.

We introduce then a variable of open degree represented by the ratio of foreign direct investment to GDP of the city. Foreign direct investment is supposed to contribute to attracting migrants by creating employment and by raising the productivity level. Then, the human capital level of the city is approximated by the number of university students in the city.

Urban Infrastructure factors

Finally, the ratio of fiscal expenditure on GDP is introduced to reflect urban infrastructure level. More fiscal expenditure implies better city infrastructure conditions, and is expected to improve both productivity and life quality levels and to encourage migration inflow.

5 Results and conclusion

The results of the regressions concerning the growth of total city population and non-agricultural population for inland and eastern provinces are presented in Table 3. As proposed by Gleaser et al. (1995), the convergence hypothesis, that means a negative relationship between the population growth and its size, holds for the cities in coastal and inland provinces and for total and non-agricultural population and these results are highly significant. This convergence principle may derive from two facts: first, the technological evolution is slower in the advanced cities, and second, the quality of life decreases with the size of the population because of increasing costs of the migrations; there is a lag between the arrival of the migrants and the construction of new infrastructures.

None of the regressions shows significant effect of the number of migrants arrived during 1985-1990 on city population growth. So, the cities receiving more migrants in that period didn't grow more quickly; there is no persistence of city population growth before and after 1990.

As for city characteristics that determine the productivity and the level of economic development, they have positive effects on the growth of city population. GDP per capita has a positive effect on the growth of total city population (both for cities of inland and coastal provinces), whereas its coefficients are not significant in the regressions of non-agricultural population growth. Higher GDP per capita implicates higher wage levels in cities, but the growth of non-agricultural population derives mainly from permanent migrations, which is official and controlled by the authorities to a large extent. These are not exactly induced by individual decisions. Most of the migrants have a stable job, often in State enterprises and benefit from social protection programs; so the wage is not an essential element in their migration determination. Zhang (2000), Chen and Coulson (2000) also find that a high GDP level is in favour of the population growth of Chinese cities, while Zhang and Song (2003) and Li and Zahniser (2002) consider that the income gap motivates migrations. Nevertheless, our results of our regressions indicate that GDP has a significant effect on growth of non-agricultural population of the cities in coastal provinces. That may be explained by the development of market mechanisms in these provinces, thanks to the openness and the development of non-state enterprises. The growth of non-agricultural population in these regions is thus also affected by market mechanism, mainly the wage gap.

As expected, Foreign Direct Investment (FDI) variable has a positive effect on the growth of the city population, because it helps to augment wages and create jobs. This result consists with those of several authors, like Zhang (2000), Sit and Yang (1997), Ma and Lin (1993). The coefficients are significant for coastal and inland provinces to explain the growth of total city population; but for the growth of non-agricultural population, its effect is only significant for inland cities. As explained ealier, permanent migrants often work in state enterprises and are not attracted by cities with a large inflow of FDI. n coastal provinces, cities are not so different in terms of FDI, so difference in population growth is rather explained by other factors than FDI. In inland provinces, distribution of FDI is quite unequal, and explains significantly population growth differences.

Fiscal expenditures, which are generally used in financing public services and infrastructures; especially public education services and health care, have a positive effect on the growth of population, in coastal provinces as well as in inland ones. This finding is similar to that of Chen and Coulson (2002).

The number of college students, an indicator of human capital of the city, is supposed to have a positive effect on the growth of population. Nevertheless, in our regressions, this variable is not significant except for the total city population estimation. May be this is an

indictor that only reflects the college education infrastructure level, but not the quality of general educational environment. As a result, it has no significant effect on growth. Chen and Coulson (2002) also found that some indicators concerning life quality didn't have any effect on growth.

Table 3 – Determinants of city population growth

Dependant variable: Logarithm of the growth of urban population 1990-1999

	Total city population			Non-agricultural population		
	Total	Coastal provinces	Inland provinces	Total	Coastal provinces	Inland provinces
Log (total population 1990)	-0.060***	-0.064***	-0.067***			
	(-3.98)	(-2.69)	(-3.66)			
Log (non agricultural population)				-0.141***	-0.138***	-0.127***
				(-8.61)	(-5.13)	(-5.95)
Log (number of migrant 1985-1990)	0.001	-0.008	-0.005	-0.002	-0.013	-0.007
	(0.20)	(-0.91)	(-0.83)	(-0.31)	(-1.16)	(-0.90)
Log (GDP per capita)	0.066***	0.111***	0.081***	0.022	0.091**	0.031
	(3.17)	(3.10)	(3.05)	(0.94)	(2.02)	(1.03)
Log (FDI per capita)	0.009**	0.017**	0.010*	0.024***	0.016	0.027***
	(2.03)	(2.02)	(1.77)	(4.38)	(1.48)	(3.67)
Fiscal expenditure/GDP)	0.330**	0.926**	0.783**	0.065	1.089**	0.807**
	(2.01)	(2.25)	(2.43)	(0.34)	(2.11)	(2.03)
College sutdents number per 100 persons	0.037**	0.018	0.026	0.008	-0.014	0.010
	(2.53)	(0.77)	(1.42)	(0.45)	(-0.44)	(0.42)
Ajusted Distance	-0.104	-0.039	-0.180	-0.146	-0.248	-0.090
	(-0.98)	(-0.19)	(-1.34)	(-1.14)	(-0.97)	(-0.53)
Ajusted Distance squared	0.091	0.030	0.133	0.063	0.199	-0.009
	(0.96)	(0.15)	(1.08)	(0.54)	(0.81)	(-0.06)
Constant	-0.178	-0.578*	-0.257	0.608***	0.048	0.425*
	(-0.91)	(-1.84)	(-1.05)	(3.27)	(0.14)	(1.76)
R^2	0.345	0.503	0.446	0.451	0.529	0.481
N	155	62	95	155	62	95

Notes: Inland provinces include central and western provinces. *t* student values are indicated in parenthesis.
*** : significant at 1% level; ** :significant at 5% level; * : significant at 10% level.

The adjusted distance between a city and the provincial capital has a negative effect on the growth of the cities population. This result could reveal a gravity force of the capital. But these effects are not significant.

As expected, in our regressions, more variables are significant in explaining the growth of total city population than in explaining the growth of non-agricultural population. As explained earlier, the main source of the growth of non-agricultural population is not the rural-urban migration but the permanent migration, controlled by the government, which seems to be less influenced by market mechanisms than temporary migration. Then, in a socialist economy in transition, the traditional theories are not sufficient to explain all the migration and population growth in cities. So, it is important to distinguish permanent and temporary migration.

In general, the determinants of population growth of cities in coastal provinces and inland ones are almost the same. This implies that regional differences between coastal and

inland provinces in urban growth come mainly from disparities in population size, GDP level, FDI, mainly the factors related to government policies. Particularly, these are related to the discriminatory policies in economic openness.

On the contrary, our results show significant differences between total city population and non-agricultural population growths. For total population, the significant factors are the same for the two types of provinces. For non-agricultural population, the GDP effect is significant for coastal provinces, but not for inland ones; the FDI effect is significant for inland provinces and not for the coastal ones.

We now turn to the estimation of migrant number, the main source of the population growth of cities. The results of the regressions of (all migrants, rural/urban migrants and urban/urban migrants), are presented in Table 4.

The coefficient of the number of migrants in the past (1985-1990) toward cities is only significantly positive for the urban/urban migration in coastal provinces. There are two possible explanations. First, rural-urban migration is determined by the situation of labour market, which had a lot of changes during the 1990s; as a result, some cities having been attractive during the period 1985-1990 became less attractive thereafter. Second, as we can see on the map 1, Pearl River Delta, Yangtsé Delta and Bohai Golf area were the three most attractive regions in 1985-1990. The East-Southern provinces became more and more attractive in the second half of the 1990s. During this period, not only migrations coming from neighbouring provinces were increasing, but also the long distance migrations coming from central provinces grew considerably. On the contrary, the role of Bohai Golf area aroud Beijing and Tianjin as a migration destination became less important. It turns out that the migration flows before 1990 only persist after 1990 in coastal provinces.

GDP per capita level plays an important role in attracting migrants, regardless of migration types and regions. The coefficient for FDI per capita is significant for rural/urban migrations but not for urban/urban migrations. This can be explained by the fact that the urban/urban migrants remain controlled by the government, and less influenced by the labour market. As mentioned above, the effect of FDI on migrations is mainly owing to job creation.

Fiscal expenditures show inverse results to the FDI variable: they have a positive and significant effect in the urban/urban migration regressions but not in the rural/urban migrations. Urban/urban migrants are consisted of mostly permanent migrants working in state sectors, therefore, cities with a high level of fiscal expenditure are attractive to them. Fiscal expenditures are also an indicator of life quality in cities; this result consists with that of Chen and Coulson (2002), which find that several indicators of life quality have little influence on the city population growth. Moreover, temporary migrants can hardly benefit from these public goods, financed by fiscal expenditures. As a result, these indicators of life quality are not attractive to such type of “temporary migrants”.

The effect of the number of college students (per 100 persons) is weak but significant and positive. In fact, the enrolment in colleges and universities constitutes another way to become a permanent urban resident. This may explain why the variable is significant in the regressions of urban/urban migrations, but not in those of rural/urban migrations.

The impact of adjusted distance and squared distance between a city and the provincial capital is significant for inland provinces. The positive and significant coefficient indicates a U-form relationship between the adjusted distance and the number of migrants arriving in the cities. That means that new centres could appear in inland provinces and around the big cities in these provinces. In coastal provinces, the development is unbalanced and large cities are highly attractive, then the coefficient of distance is not significant.

Table 4 – Determinants of city migrants' numbers

Dependant variable: Logarithm of city migrants' number during 1995-2000

	All migrants			Rural-urban migrants			Urban-urban migrants		
	Total	Coastal Provinces	Inland Provinces	Total	Coastal Provinces	Inland Provinces	Total	Coastal Provinces	Inland Provinces
Log (total population	0.787***	0.782***	0.776***	0.656***	0.699***	0.672***	0.873***	0.866***	0.859***
	(13.77)	(8.04)	(10.14)	(7.64)	(4.97)	(6.18)	(15.35)	(10.83)	(13.14)
Log (number of migrants 1985-1990									
All migrants	0.005	0.008	-0.013						
	(0.26)	(0.22)	(-0.51)						
Rural-urban migrants				-0.013	-0.036	-0.030			
				(-0.94)	(-1.50)	(-1.61)			
Urban-urban migrants							0.026**	0.028*	0.017
							(2.53)	(1.81)	(1.35)
Log (GDP per capita)	0.741***	0.744***	0.739***	0.564***	0.592***	0.519***	0.911***	0.970***	0.976***
	(9.31)	(5.07)	(6.64)	(4.83)	(2.94)	(3.47)	(11.85)	(8.57)	(10.97)
Log (FDI)	0.082***	0.144***	0.105***	0.127***	0.240***	0.172***	0.013	0.008	-0.007
	(4.77)	(4.06)	(4.27)	(4.80)	(4.81)	(4.89)	(0.76)	(0.29)	(-0.31)
Fiscal expenditure/GDP	2.150***	1.254	1.017	0.231	-1.972	-1.733	3.896***	5.436***	4.706***
	(3.45)	(0.74)	(0.75)	(0.25)	(-0.84)	(-0.93)	(6.37)	(4.05)	(4.23)
College student number per 100 person	0.191***	0.095	0.151*	0.178**	0.093	0.150	0.308***	0.271***	0.286***
	(3.45)	(0.97)	(1.95)	(2.15)	(0.67)	(1.38)	(5.63)	(3.44)	(4.41)
Ajusted Distance	-1.291***	-0.749	-1.591***	-1.918***	-0.788	-1.940**	-0.458	-0.558	-1.062**
	(-3.19)	(-0.89)	(-2.81)	(-3.17)	(-0.67)	(-2.42)	(-1.16)	(-0.84)	(-2.24)
Ajusted Distance in square	1.018***	0.281	1.210**	1.431***	0.057	1.312*	0.495	0.528	1.059**
	(2.81)	(0.35)	(2.35)	(2.65)	(0.05)	(1.80)	(1.40)	(0.83)	(2.46)
Constant	0.195	0.021	0.503	1.783	1.167	2.292	-2.683***	-3.297***	-3.072***
	(0.26)	(0.02)	(0.49)	(1.56)	(0.63)	(1.57)	(-3.54)	(-3.15)	(-3.48)
R^2	0.865	0.828	0.847	0.735	0.714	0.738	0.878	0.892	0.895
N	155	62	95	155	62	95	155	62	95

Note: t student values are indicated in parenthesis.

*** : significant at 1% level; ** :significant at 5% level; * : significant at 10% level.

As in population growth regressions, the differences between inland and coastal provinces in migration patterns towards cities are also insignificant. However, differences between two types of migration patterns are obvious. Cities attractive to rural-urban migrants are not the same as those attractive to urban/urban migrants. The explanation lies always in the status of the migrants. As the official migration is still under the control of the government, there are great differences between permanent and temporary migrants. For temporary migrations (rural-urban), the economic factors are very important; therefore, population growth is more affected by GDP and FDI levels. This kind of migration is, to a large extent, the result of individual decisions driven by market forces, and the migrants have limited access to urban public services and infrastructures. For permanent migrants, the influence comes from factors such as fiscal expenditures. As a result, cities along east coast have been attractive for temporary migrants, but permanent migrants are leading to cities where governments spend more money on public infrastructures and services. These results underline the crucial role of the policy applied the government with the Hukou system.

Conclusion

By using a panel data of about 150 cities in China, we estimate the determinants of city population growth, as well as migration towards cities. Factors suggested by theories relative on urbanization and migration are introduced to test their effect in the case of Chinese.

Our empirical results show that, in general, the determination of urban growth and migration are not quite different between coastal and inland provinces. Regional differences observed in urban growth and migration come mainly from disparities in GDP and FDI level, factors that are largely affected by government policies in regional development and economic openness.

In the meantime, our results show significant differences between different types of migrations and city population growth. More precisely, total city population growth comes mainly from spontaneous rural/urban migration, whereas non-agricultural population growth depends to a great extent on official urban/urban migration. The former is more subject to market behaviours, and the latter is more affected by government policies. Rural-urban migrants still have "temporary" status in cities, and have limited access to urban public services, which hampers the unification of urban labour market and the urban growth

Our findings suggest that urban growth process in China remains restricted by the government, particularly by regional development policies and migration limitations. To encourage a rapid and more balanced urban growth and economic development, control on rural/urban migrations should be removed, and more importance should be attached to inland provinces.

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