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Migration, Agglomeration and Attractiveness of Cities in China*

Xubei Luo | Nong Zhu

Xubei Luo, The World Bank.
Email: xluo@worldbank.org

Nong Zhu, Institut National de la Recherche Scientifique (INRS), Centre Urbanisation Culture Société.
Email: nong.zhu@inrs.ca

Abstract

This study aims to identify drivers of spatial migration in the context of regional structural transformation towards clean and connected cities. Using two surveys of floating population covering all cities, conducted by China Family Planning Commission in 2010 and 2014, we examine the effect of city characteristics and local policies on the mobility of migrants. Our analyses show that city size, wage level, sectoral composition, ownership structure of enterprises, and healthcare service provision are important factors that condition migratory inflow; their effect varies across migrants with different characteristics. While most of migrants moved to the regional hubs, migration to cities other than hubs has increased in the 2010s and many medium and small cities have become more attractive.

Keywords: Migration; Agglomeration; City; Structural Transformation; China.

* The findings, interpretations, and conclusions expressed in this presentation are entirely those of the author's. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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1. Introduction

Labor mobility plays a strategic role in the development of China. Since the economic reforms, market economy started to develop; especially, labor market became more efficient (Cai et al., 2009; Poncet, 2006). Hundreds of millions of Chinese people moved for better job opportunities. It is estimated that each year about 20 percent of the total population migrate within the country (Lucas, 2015). In 2015, there are 277 million rural workers in China, of which 168 million are rural migrant workers work or look for employment in places other than their Hukou (Su et al., 2018).

The China population censuses show two trends of migration. First, the majority of the migrant population concentrated in the coastal region (Li et al., 2017; Qi et al., 2018), while the migration flow to the inland region increased in the 2010s. Second, long-distance interprovincial migrants are increasingly clustered in large cities (municipalities, provincial capitals and cities at prefecture level), while small cities are more likely to be the destinations of the short-distance intra-provincial migrants (Wang, 2016). However, according to some recent research (Ren, 2019), internal migration in China shows new trends since 2010. First, migration has generally slowed down; meanwhile, migrants have increasingly concentrated in some metropolitan areas or city clusters. Second, as a result of the changes of the "push" factor - industrial upgrading in coastal regions – and the "pull" factor - rapid development of inland provinces - the attraction of inland cities increased. A large share of migrants who had moved to coastal regions have gradually returned to inland provinces. Third, while inter-provincial migration, largely rural to urban and inland to coastal, dominated in the early years, around 2010, intra-provincial migration started out-numbering inter-provincial migration to become the dominant form of rural migration (Li et al., 2017). The Hukou reform in 2014 was designed to encourage migration to small or medium size cities, and away from large urban centers. The general preferences of the Chinese migrants is moving to richer places closer to their hukou registration locations (Chen et al., 2018).

At the macroeconomic level, migration is a mechanism that allows the movement of labor from low productivity sectors to high productivity sectors; and at the microeconomic level, migration is a response to higher individual (or household) utility. Thus, migration decision depends on both individual characteristics and factors related to places of origin and destination. In particular, for rural-to-urban migrants, their mobility results from the interaction between individual characteristics and those of destination cities. Since most rural-to-urban migrants aim to seek better income and employment opportunities, sectoral composition and labor

market conditions of cities play an important role in their choice of destination. In other words, migration is essentially guided by the "invisible hand" in urban labor market, which is conditioned by the transformation and adjustment of regional industrial structure. The hubs/cities have different macroeconomic characteristics, which influence migration flows in different ways. At the individual level, the decision to migrate is a product of individual characteristics and that of destination place. It would be important and interesting to analyze the mechanism that attracts migrants for the various centers.

The objective of this article is to study drivers for migration. While the data used are in 2010 and 2014, the results could shed light on informing the establishment of new governance arrangements for sustainable employment "hubs" consistent with the "dual circulation" agenda. We examine the role of city characteristics, including service delivery, on the decisions to move to cities. Our hypothesis is that: (i) the utility of migrants' depend on the characteristics of the destination city and the preferences of the individuals; (ii) the decision to migrate and the choice of the destination result from an evaluation of utility levels associated with the destination city (for example city type, population, sector composition, average wage, enterprise ownership, education and health care services, environmental conditions…); however, this evaluation would vary across the individuals. This analysis allows us to answer the following research questions: what types of cities are most attractive to migrants? Is the effect of city characteristics different according to the characteristics of the migrants? This would facilitate a discussion of the creation of high-tech export-oriented zones in existing metropolitan coastal hubs, and more labour intensive manufacturing for employment maximization in new interior "hubs".

The migration decision is an individual or household response to external environment, including perceptions of income, access to services and quality of life. It depends both on the intrinsic characteristics of migrants or the migrant households (human capital, socio-professional category, etc.), and the socio-economic characteristics of destination place. However, most previous studies aim to analyze either the former or the latter. They do not explicitly deal with the complex relationships between the two aspects. This study will fill gaps addressing the questions of the determination of location choices of migration, with a focus on the "hubs". This study adds to the literature from two aspects: first, it will combine macroeconomic analysis with microeconomic analysis to examine the role of both governance and characteristics at the city level and individual characteristics in the choice of the destination of the migrant workers. It will examine the interactions between individual characteristics and city characteristics. This analysis allows us to study how the macroeconomic factors of cities

influence individual decision of various groups of migrants. Second, it will draw on a large data set covers all cities in China, focusing on the determinants of migration from the receiving side. The sample is nationally representative, which allows to avoid sample selection bias and provides an overview of worker mobility in China. The findings will shed light on the formation of the regional hubs with a focus on the patterns of internal migration of different characteristics.

The rest of this paper is organized as follows. Section 2 reviews the theoretical framework related to migration and spatial agglomeration. Section 3 presents the econometric model and data used. Section 4 presents the regression results. Section 5 discusses the results and concludes.

2. Migration and spatial agglomeration

The most well-known theories of rural-urban migration are the dual-sector model (Lewis, 1954) and the migration model based on the expected income (Todaro, 1969). The push-pull migration theory (Lee, 1966) divides the forces that influence migration decisions into the push- and pull- factors. The "pull" factors, particularly income, in the top destinations, namely the hubs, have played an important role in the expanding migration in China, especially to export oriented activities in coastal regions.

New Economic Geography has provided a new theoretical foundation to examine the causes of migration with a core-periphery model, with the center and the periphery characterized by industry and agriculture, respectively (Fujita et al., 1999; Krugman, 1991; Venables, 1996). The center-periphery structure, including the size the location of the center and the periphery, is determined by the equilibrium of factors such as economy of scale, industrialization, and transaction costs (Krugman, 1991). Production activities and workers concentrate in the economic centers due to the "agglomeration effect": agglomeration results in higher wages and more human capital accumulation (Carlino and Kerr, 2014; Diodato et al., 2016); higher wages and more human capital in core areas in turn result in further agglomeration. For an economic center, the centripetal force maintains its existence while the centrifugal force disintegrates it (Krugman, 1991). The first is the desire of enterprises to locate near larger market; the second is the motivation of enterprises to relocate to serve agricultural periphery market. Agglomeration generally strengthens the mobility of workers towards the center. This process continues until centripetal force and centrifugal force reach equilibrium. As the center expands, the centrifugal force gradually strengthens and emerges new centers of agglomeration in certain locations where centripetal and centrifugal forces balance again (Fujita

et al., 1999). The location of the centers of agglomeration thus spreads from the original center to the peripheral zones, responding to market needs, and therefore representing an efficient process for economic development.

The patterns of migration in China is consistent with the theory of the New Economic Geography predicting that population agglomeration follows industrial concentration (Giacomin, 2017). In the transition from a planned economy to a market economy, the Chinese government has adopted preferential policies for the coastal provinces. Moreover, economic reforms and opening up have reduced the geographic barriers and promoted the free movement of the capital and labor. The center of gravity of the Chinese economy has gradually shifted to southeast coastal regions, and some centers of agglomeration – hubs – have formed in these regions, which attracted large numbers of migrants from inland areas. Changes in national economic strategies, including the development of inland cities, will support the formation of new agglomeration centers, thereby changing the flow of production factors.

There is a rich literature on internal migration in China. Broadly speaking, the studies can be divided into four different groups. The first group examines interregional migratory flows through macroeconomic analyzes (Zhang et al., 2018; Zhu, 2003; etc.). The second group studies the motivation of migrants using micro-data (Lu and Song, 2006; Zhao, 2003; Zhu, 2002; etc.). The third focuses on the performance of migrants in cities, such as employment, income, and living conditions (Démurger et al., 2009; Magnani and Zhu, 2012; Zhu and Batisse, 2010 ; 2017 ; etc.). The fourth investigates the relationship between migration and other economic activities, for example, trade, industrial agglomeration, urban and rural development (Meng and Zhang, 2010; Wang and Fu, 2019; Zhu and Luo, 2010; etc.).

However, researches on the choice of destination are not common. Some studies show that more migrants concentrate in big cities (Xing and Zhang, 2013). Some others show that both job opportunities and amenities play important roles in the choice of destination of the migrant's, while highly skilled migrants tend to attach more importance to urban amenities (Shen and Liu, 2016; Su et al., 2019). This paper aims to analyze the role of the characteristics of destination cities on the mobility of migrants. It combines macroeconomic and macroeconomic analyses to examine spatial migration in the context of regional structural transformation in China.

3. Methodology

This study focuses on the role of destination characteristics in individual decisions to migrate. We examine the effect of destination attributes, including population, economic development level, production structure, public services provision, and environmental conditions, etc., on individual decision to migrate. We use conditional logit model to explore the effect of city attributes on individual decision to migrate. This analysis allows us to examine the relationship between individual characteristics and those of destination city by interacting with each other. It aims to identify the specificities of destination cities that attract migrants and, for each city, the specificities that favor immigration. The model is written as follows:

$$P_{j,i} = \frac{e^{\beta_j W_k + \gamma_j X_{k,i}}}{\sum_{k=1}^{m} e^{\beta_j W_k + \gamma_j X_{k,i}}} \qquad k = 1, 2, \dots, j, \dots, m; \; i = 1, 2, \dots, n$$

In this analysis, $P_{j,i}$ represents the probability that individual i chooses city j as destination place; W_k and $X_{k,i}$ are city attributes and city attributes in relation to individual, respectively. More specifically, W_k represents the characteristics of city; $X_{k,i}$ represents the interactions between individual characteristics and those of city.

The study will be based on data from two surveys of floating population in China, conducted by China Family Planning Commission in 2010 and 2014, respectively. The two surveys covered all Chinese provinces. The 2010 sample covers 122548 migrants in 106 cities; and the 2014 sample includes 200937 migrants in 335 cities. Both samples are nationally representative. Migrants are defined in the surveys as follows: residents in the cities surveyed for more than one month, whose Hukou place is different from current place of residence, and whose age is between 15 and 59 years. Our analysis is limited to respondents who held a job during the survey.

City-level data are from the China City Statistical Yearbook. According to the administrative structure in China, there are three types of cities: municipalities (Beijing, Tianjin, Shanghai and Chongqing), prefecture-level cities and county-level cities. This study mainly focuses on the municipalities and prefecture-level cities and includes part of the county-level cities.

In the conditional logit model, we firstly introduce the dummy variables indicating the destinations to examine the attractiveness of various centers of agglomeration for migrants. We also introduce a dummy variable indicating whether the destination city is located in Hukou province. Then we introduce the following characteristics at the city that can influence migration. (i) The population of a region. It is considered as proxy for the size of labor market

and urbanization and industry resources. (ii) The average wage. It is used as proxy for the level of local development and living standard. (iii) The share of workers in secondary sector and share of workers in tertiary sector. They are used to measure sector composition. (iv) The level of economic opening-up measured by per capita foreign direct investment. (v) The ratios of workers in private enterprises and self-employed individuals to that in urban units. They are used to measure the share of the non-state economies. (vi) Per capita real estate investment. It is used as a measure of housing market development. (vii) The internet users per 1000 people. It is used as an indicator of communication facilities. (viii) The provision of education and health services. It is measured by two indicators: per capita expenditure for education, science and technology, and hospital beds per 1000 people. (ix) The environmental condition. It is measured by two variables: per capita green area, and Sulphur dioxide emission per squared kilometer. (x) The interactive terms to examine the individual reactions to city attributes. (xi) The interactive terms between the industry that the respondent works in (dummy variable) and the share of workers in same sector as a proxy of sectoral concentration of migrants.

Agglomeration, as indicated in the new geography economy, is an auto-reinforcing process. An increase in investment in the urban industrial sector will increase urban wage, which will attract more migrant workers. The increase in population (before reaching the threshold where congestion dominates) will make the urban hubs more attractive to firms (with a larger pool of labor and a wider market). This raises the challenges to unravel the causes and effects in regression. To address the issues of endogeneity, we introduce lagged variables, assuming that migration responds to changes in city characteristics with a time-lag due to information transmission (Beeson and Dejong, 2001); in other words, an improvement in income or quality of life in city in the present time encourages a growth of migratory influx in the future. Moreover, the time-lag also exists between the implementation of policies and their expected effects on productivity and quality of lives in cities. For these reasons, in the estimations for 2010 and 2014 samples, the explanatory variables take 2002 and 2007 values, respectively.

In this study, we introduce a dummy variable for each city into another set of conditional logit model to capture the role of the social-economic characteristics in migration following the "Chinese city tier system". This hierarchical classification ranks all cities in mainland China, from top to bottom, in 6 tiers[1]. In general, the higher the tier, the bigger the city. The first tier

[1] The tiered list was based on the latest business data from 160 commercial brands, customer behavior data from 17 internet companies and Big Data on cities compiled by research institutions (see https://en.wikipedia.org/wiki/Chinese_city_tier_system).

includes 4 cities: Beijing, Shanghai, Guangzhou and Shenzhen. The next five tiers include 15, 30, 70, 90 and 129 cities, respectively.

4. Results

In this study, we consider Beijing, Shanghai, and cities in Guangdong, Jiangsu, and Zhejiang as hubs for migration[2]. Table 1 shows the distribution of migrants by province of destination. Migration to Beijing, Shanghai, Guangdong, Zhejiang, and Jiangsu – represents 78.7% and 68.3% of total migration in 2010 and 2014, respectively. More than 80% of interprovincial migrants flocked to these five provinces. However, during the period of 2010-2014, migration to large metropolitan areas in these provinces has weakened, while migration to other cities has increased. It seems that the floating population tends to shift to non-hub cities and to inland. Another trend during this period is that smaller cities absorbed the majority of migrants within the province, suggesting that the shift towards non-hubs to some extent started to take place in the 2010s. As the pattern of migration flows continues to evolve, the development of the supporting governance measures is crucial.

Table 1 – Distribution of migratory flows

(Weighted values)

2010				2014			
Region	All the migrations	Interprovincial migration	Migration within the province	Region	All the migrations	Interprovincial migration	Migration within the province
Hubs in				Hubs in			
Beijing	7.5	10.0	…	Beijing	6.7	9.9	…
Shanghai	8.7	11.7	…	Shanghai	8.8	12.9	…
Jiangsu	13.3	12.5	15.8	Jiangsu	7.3	7.4	7.3
Zhejiang	18.8	22.4	7.8	Zhejiang	18.5	23.9	6.6
Guangdong	30.4	27.9	38.1	Guangdong	27.0	27.8	25.1
Sub-total	78.7	84.4	61.7	Sub-total	68.3	81.8	39.0
Other regions	21.3	15.6	38.4	Other regions	31.7	18.2	61.0
Total	100.0	100.0	100.0	Total	100.0	100.0	100.0

Note: "…" signifies that the value is less than 0.1.
Source: China Floating Population Survey (2010, 2014), China Family Planning Commission, calculations and presentation by authors.

[2] In Jiangsu, Zhejiang and Guangdong, most of the migrant workers concentrate in three to four cities. If the hubs like Beijing and Shanghai are characterized by a single megacity, the hubs like the three provinces are composed of city cluster or city group.

In this analysis, we combine micro-data and macro-data to study the interaction between characteristics of migrants and those of destination cities to shed light on the following questions: what city characteristics are most attractive for migrants, and how do these characteristics affect different groups of migrants? Table 2 presents estimation results.

Table 2 – Effect of city-level characteristics on migration probability

(Conditional logit model)

	2010		2014	
Migrations to hubs (Reference: Migrations to other regions)				
Beijing	0.997***	(3.19)	1.511***	(4.75)
Shanghai	0.765**	(2.00)	2.674***	(7.84)
Cities in Jiangsu	0.608***	(3.67)	0.752***	(3.88)
Cities in Zhejiang	0.960***	(5.31)	1.511***	(6.80)
Cities Guangdong	0.803***	(4.43)	1.790***	(8.80)
Hukou province	2.951***	(178.16)	2.987***	(203.12)
The characteristics of destination city				
Population	0.105***	(3.86)	0.084***	(7.36)
Average wage	1.757***	(10.39)	0.338***	(3.03)
Share of workers in secondary sector	0.023***	(18.58)	-0.004***	(-3.49)
Share of workers in tertiary sector	0.049***	(18.69)	-0.009***	(-3.95)
Per capita foreign direct investment	0.025*	(1.78)	0.006	(0.57)
Ratio of number of engaged persons in private enterprises and self-employed individuals to that in urban units	-0.069**	(-2.23)	0.168***	(13.99)
Per capita real estate investment	-0.572***	(-8.17)	1.212***	(32.97)
Internet users per 1000 people	0.189***	(15.07)	0.017	(1.57)
Per capita expenditure for education, science and technology	-0.094***	(-11.13)	-0.064***	(-12.60)
Hospital beds per 1000 people	0.117***	(26.98)	0.030***	(6.19)
Per capita green area	0.056***	(9.13)	-0.019***	(-5.02)
Sulphur dioxide emission per squared kilometer	-0.103	(-0.96)	0.033	(0.05)
Interaction between individual characteristics and city-level characteristics				
Senior middle school or above				
× Migrations to Beijing	0.285***	(3.35)	0.110	(0.98)
× Migrations to Shanghai	-0.507***	(-4.77)	-0.346***	(-2.78)
× Migrations to Jiangsu	-0.134**	(-2.46)	-0.155**	(-2.16)
× Migrations to Zhejiang	-0.407***	(-5.13)	-0.694***	(-10.48)
× Migrations to Guangdong	0.359***	(5.53)	0.009	(0.13)
× Population	0.016**	(2.21)	0.029***	(7.04)
× Average wage	0.150**	(2.00)	-0.061	(-1.27)
× Foreign direct investment per capita	0.049***	(7.41)	0.013***	(4.17)

× Ratio of number of engaged persons in private enterprises and self-employed individuals to that in urban units	-0.005	(-0.09)	-0.069***	(-3.14)
× Per capita real estate investment	-0.640***	(-4.98)	0.365***	(5.92)
× Per capita expenditure for education, science and technology	0.027*	(1.67)	-0.013**	(-2.11)
× Hospital beds per 1000 people	0.040***	(4.58)	0.045***	(5.19)
× Per capita green area	-0.007***	(-2.99)	0.007***	(3.42)
× Sulphur dioxide emission per squared kilometer	-0.268***	(-7.23)	-0.011	(-0.07)
Nonagricultural Hukou				
× Migrations to Beijing	-0.190*	(-1.83)	-0.393***	(-2.67)
× Migrations to Shanghai	0.221*	(1.67)	0.409**	(2.56)
× Migrations to Jiangsu	0.052	(0.72)	-0.094	(-0.95)
× Migrations to Zhejiang	-0.128	(-1.24)	-0.647***	(-6.62)
× Migrations to Guangdong	-0.014	(-0.16)	-0.311***	(-3.03)
× Population	0.053***	(5.89)	0.038***	(7.41)
× Average wage	-0.406***	(-4.16)	0.057	(0.88)
× Foreign direct investment per capita	-0.041***	(-4.73)	-0.010**	(-2.26)
× Ratio of number of engaged persons in private enterprises and self-employed individuals to that in urban units	0.314***	(4.10)	-0.142***	(-4.87)
× Per capita real estate investment	0.359**	(2.10)	0.047	(0.62)
× Per capita expenditure for education, science and technology	0.046**	(2.18)	0.040***	(5.27)
× Hospital beds per 1000 people	0.003	(0.25)	-0.047***	(-3.98)
× Per capita green area	0.010***	(3.61)	-0.011***	(-4.51)
× Sulphur dioxide emission per squared kilometer	-0.059	(-1.27)	-1.560***	(-6.53)
Worker in secondary sector				
× Migrations to Beijing	0.851***	(2.65)	0.404	(1.23)
× Migrations to Shanghai	0.339	(0.87)	-1.127***	(-3.20)
× Migrations to Jiangsu	0.887***	(5.29)	0.711***	(3.59)
× Migrations to Zhejiang	1.902***	(10.41)	1.784***	(7.94)
× Migrations to Guangdong	1.144***	(6.22)	0.636***	(3.10)
× Population	0.037	(1.32)	0.040***	(3.41)
× Average wage	-0.132	(-0.75)	0.189	(1.64)
× Foreign direct investment per capita	0.082***	(5.76)	0.002	(0.20)
× Per capita green area	-0.115***	(-18.46)	-0.002	(-0.42)
× Sulphur dioxide emission per squared kilometer	0.121	(1.11)	2.678***	(4.12)
Worker in tertiary sector				
× Migrations to Beijing	0.349	(1.10)	-0.837***	(-2.60)
× Migrations to Shanghai	-1.987***	(-5.15)	-2.362***	(-6.80)
× Migrations to Jiangsu	-0.127	(-0.76)	-0.774***	(-3.92)
× Migrations to Zhejiang	-0.127	(-0.69)	-0.034	(-0.15)
× Migrations to Guangdong	-0.819***	(-4.43)	-0.746***	(-3.62)
× Population	0.066**	(2.41)	0.053***	(4.51)
× Average wage	0.486***	(2.81)	0.582***	(5.15)
× Foreign direct investment per capita	0.073***	(5.18)	0.020*	(1.92)
× Per capita green area	-0.085***	(-13.63)	0.007*	(1.78)

× Sulphur dioxide emission per squared kilometer	-0.008	(-0.07)	0.892	(1.38)
Worker in secondary sector× Share of workers in secondary sector	0.058***	(18.85)	0.025***	(10.14)
Worker in tertiary sector × Share of workers in tertiary sector	-0.027***	(-10.11)	…	(0.10)
Log pseudo-likelihood	-335745.35		-227896.78	
Pseudo R^2	0.324		0.341	
Number of individuals	102702		58798	
Number of observations	10616025		19774979	

Notes: The t-students are presented in parentheses. *** indicates coefficient significant at 1% level; ** indicates coefficient significant at 5% level; * indicates coefficient significant at 10% level. "…" signifies that the absolute value is inferior to 0.001. Duo to the limit of computer capacity, we take one third of 2014 sample by a systematic draw to create a sub-sample, on which the estimation of conditional logit model is based.
Source: China Floating Population Survey (2010, 2014), China Family Planning Commission, calculations and presentation by authors.

The effects of Beijing, Shanghai, cities in Guangdong, Jiangsu and Zhejiang are all significant in a positive manner, which suggest that they are more attractive to migrants compared with other cities. In 2010, the attractiveness of each hub was roughly the same; in 2014, the attractiveness of Shanghai was particularly prominent, followed by Guangdong. Moreover, mobility within Hukou province – or intra-provincial mobility – was stronger than interprovincial mobility.

Overall, migrant workers chose to migrate to cities with a large population and high wage income. The effects of secondary and tertiary sectors are positive in a significant manner in 2010, but negative in 2014. One possible reason for such change is the shift of the expansion of the secondary sectors and tertiary sectors to the smaller cities starting in the early 2010s. As most of the migrants work in secondary and tertiary sectors, in 2010, migrants were more likely to migrate to cities with higher shares of the secondary and tertiary sectors due to "industry agglomeration effect" for employment. In 2014, migrants moved to cities with less developed secondary or tertiary sectors to fill the gaps as more employment opportunities newly opened up there due to the "industry complementarity effect". However, more research is needed to examine the causal effect.

Foreign direct investment (FDI) per capita played a positive role only in 2010, but not in 2014. This reflects the increased importance of domestic financing especially for investments at the local levels, as the central government's response to the global economic crisis began to have an impact. We use the ratio of number of persons engaged in private enterprises and self-employed individuals to the total in urban units as a proxy of the importance of individual and private-owned economy. This variable played a negative role in the inflow of migrants in 2010

in a significant manner. This suggest that, in 2010, most of the migrant workers worked in urban formal sector (including doing low-end work or employed as temporary worker). However, in 2014, this ratio played a positive role, which suggests that individual and private-owned enterprises started to be a more important employer of the migrants.

Investment in real estate per capita can be considered as a proxy of housing supply. The effect of this variable is negative in a significant manner in 2010, but positive in 2014. This might be related to the housing reform in cities and the changes in migrants' composition. In fact, current urban housing policies favor urban permanent residents, but not migrants. The latter face high barriers to purchase housing, such as local Hukou, minimum duration of social insurance contribution, higher prepayment to purchase, difficulties in obtaining mortgages, etc. In 2010, the provision of medium and high-end housing predominated the urban housing markets in most cities. As the supply of urban land, especially that of residential land in cities, was tightly controlled, and housing demand was always high, housing prices often increased with real estate investment (Fu et al., 2000; Zhang and Zhang, 2015; 2019). The increase in investment in real estate therefore reduced migration. However, in the recent years, the housing policies in several cities started to change in favor of migrant workers to attract more labor. Barriers to buying homes are gradually decreasing, and a larger share of migrants started purchasing houses/apartments in cities. In addition, as we observed in Table 1, migration to the cities other than Beijing, Shanghai, and hubs in Guangdong, Jiangsu and Zhejiang (where housing is more affordable) and that within the province experienced a significant increase in 2014. According to Song (2016), intra-provincial migrants have a stronger motivation to buy housing than inter-provincial migrants. Moreover, housing prices in inland cities are much lower than those in Beijing, Shanghai, and the hubs in Guangdong, Jiangsu and Zhejiang, which facilitates housing purchase among migrants.

Internet users per 1000 people is used as a proxy of telecommunication development in the city. This variable played a positive role only in 2010. Per capita expenditure on education, science and technology played a negative role. In both 2010 and 2014, hospital beds per 1000 people played a positive role, which suggests that healthcare provision is an important factor for migration.

We use two indicators – "per capita green area" and "Sulphur dioxide emission per squared kilometer" – as proxies of environment in the city. The first indicator played a positive role in 2010 and negative role in 2014; and the second was not significant in the two years. This

suggests that environment, for most migrants, is not a critical factor that drives the decision of migration.

For different types of migrants, the role of city characteristics differed. In 2010, only Beijing and cities in Guangdong attracted migrants with higher education (high school and above); for other hubs, the level of education played a negative role in their probability of immigration. In 2014, things changed. The role of education level in Beijing and Guangdong became insignificant too. This result suggests that most migrants with higher education moved to cities other than the hubs. There are two possible explanations. First, the thresholds for migration in some hubs were high, but most migrants only had low education level. In fact, the share of migrants with tertiary education accounted for only 2.8% and 4.5% in 2010 and 2014, respectively. Second, the hubs are more developed areas where (local) skilled workers are relatively abundant, so a large share of the employment opportunities for migrant workers are for those with low-skills. Most of the migrants from the countryside came first to urban informal labor market as temporary residents, and generally held lower positions (most of which city dwellers might not be interested in taking) to meet urban demand for unskilled labor (Meng and Zhao, 2018). Therefore, for the skilled migrant workers, they might choose to migrate to other cities for better opportunities.

The high-skilled migrants mainly moved to cities with large population and high wage. The role of per capita FDI is positive in a significant manner. One possible explanation is, in recent years, as a large share of foreign owned enterprises and joint ventures have upgraded their position in the value chain and transitioned from labor intensive to capital and technology intensive production. These enterprises have therefore offered more opportunities to skilled migrant workers. In contrast, the role of the ratio of the number of individuals engaged in private enterprises and self-employed individuals to the total number in urban formal sector was not significant in 2010 and became negative in 2014. This result suggests that migrants with better education did not choose the cities with developed individual and private economies; in other words, they were more likely to work in urban formal sector.

As mentioned above, overall, the role of per capita expenditure for education, science and technology is negative for migrants. However, for migrants with high school education and above, the role is significantly positive. This suggests that investment in education and technology is only attractive to migrants of higher skills.

Similarly, the role of "per capita green area" and "Sulphur dioxide emission per squared kilometer" became marginally significant in 2014 for high-skilled migrants. This suggests that

environment might have started becoming one of the factors that conditions decision of migration choices of the high-skilled over time.

Among the hubs in our study, it seems only Shanghai is attractive to the migrants with non-agricultural Hukou. Most of this subgroup moved to larger cities. The role of FDI per capita is negative. As for the ratio of number of engaged persons in private enterprises and self-employed individuals to that in urban units, although its effect is positive in 2010, it became negative in 2014. These results suggest that, all other things being equal, migrants holding a non-agricultural Hukou did not choose foreign owned enterprises or joint ventures and individual/private enterprises; in other words, they are more likely to work in public institutions and state enterprises. The effect of per capita real estate investment was significantly positive only in 2010. The role of investment in education and technology per capita is significantly positive. This suggest that public expenditure in education and technology may improve the employment opportunity for this subgroup of migrants, and cities with higher investment in education and technology are more attractive to them. The role of Sulphur dioxide emission per squared kilometer is negative. This may be related to two possible reasons: (i) this subgroup of migrants are more likely to take into consideration the environment of the receiving city when they make decisions of migration; (ii) cities with high level of Sulphur dioxide emissions are likely to be areas with high concentration of the secondary sector (such as manufacturing and mining), which are less attractive to this subgroup.

Jiangsu, Zhejiang, and Guangdong (particularly Zhejiang) were most attractive to workers in the secondary sector. Beijing was attractive to them only in 2010. The role of Sulphur dioxide emission per squared kilometer was positive. It is possible that, as Sulphur emission was positively association with the concentration of the secondary sector, migrants in secondary sector were more likely to move to cities with large secondary sector for job opportunities.

For workers in the tertiary sector, the effects of the hubs were negative or not significant: most of migrants in the tertiary sector moved to cities other than the hubs. They preferred to move to cities with large population and high wage. This result might be related to the fact that those cities had larger labor and consumption market. The role of FDI was significantly positive. This is likely because that FDI supported the development of the tertiary sector in cities.

Finally, the role of the interactive term between workers in the secondary sector and the share of the same sector was significantly positive, which suggests workers in the secondary sector were more likely to cluster in cities with a more developed secondary sector due to

"agglomeration effect". As to the tertiary sector, the effect of the interactive term was significantly negative in 2010. This suggests that workers in the tertiary sector were more likely to move to cities with a less developed tertiary sector due to "complementary effect". However, in 2014, the role of the interactive term was no longer significant. One possible explanation is linked to the change in industrial composition of migrants engaged in the tertiary sector between 2010 and 2014. The proportion of "emerging services" rose from 15% to 21%. This category mainly includes new emerging industries resulting from the diversification of social life, such as information transmission, software and information technology services, leasing and business services, scientific research and technical services, resident services and repairs services, etc. This change made the mobility and distribution of workers in the service sector more stochastic.

Table 3 presents the effect of city classification on mobility. This analysis allows us to examine the attractiveness of various tiers of cities. In 2010, all the first four tiers (large and medium cities) had a significantly positive coefficient compared to the last two tiers (small cities); their effect decreased from first-tier to fourth-tier. This result shows that the main destinations of floating population are large cities with higher development levels. In 2014, the effect of the fifth-tier cities became negative compared to sixth-tier cities (reference group), which suggests that migrants have started to flock to small cities. Migrants with higher education mainly chose first-tier and second-tier cities (megacities); however, some medium and small cities were also attractive to them.

Table 3 - Effect of city classification on migration probability

(Conditional logit model)

	2010		2014	
Classification of cities (Reference: Sixth-tier cities)				
First-tier cities	3.616***	(25.40)	2.983***	(33.28)
Second-tier cities	2.115***	(18.76)	1.672***	(24.81)
Third-tier cities	1.693***	(15.75)	1.381***	(22.96)
Fourth-tier cities	0.331***	(3.31)	0.145*	(1.88)
Fifth-tier cities	0.136	(0.96)	-1.155***	(-13.83)
Interaction between individual characteristics and rank of destination city				
Senior middle school or above				
× First-tier cities	0.675***	(5.73)	0.774***	(25.05)

× Second-tier cities	0.572***	(4.87)	0.452***	(16.88)
× Third-tier cities	0.087	(0.75)	0.061**	(2.28)
× Fourth-tier cities	0.194*	(1.66)	0.046	(1.42)
× Fifth-tier cities	-0.038	(-0.31)	0.252***	(7.95)
Nonagricultural Hukou				
× First-tier cities	0.050	(0.37)	0.107***	(2.90)
× Second-tier cities	-0.534***	(-3.95)	-0.498***	(-14.58)
× Third-tier cities	-0.437***	(-3.28)	-0.553***	(-15.85)
× Fourth-tier cities	-0.207	(-1.55)	-0.323***	(-7.64)
× Fifth-tier cities	-0.396***	(-2.83)	-0.037	(-0.91)
Worker in secondary sector				
× First-tier cities	0.386**	(2.50)	2.342***	(25.04)
× Second-tier cities	0.826***	(6.50)	2.623***	(37.06)
× Third-tier cities	0.809***	(6.63)	2.641***	(41.53)
× Fourth-tier cities	-0.723***	(-6.22)	1.691***	(20.73)
× Fifth-tier cities	-0.229	(-1.48)	1.612***	(18.28)
Worker in tertiary sector				
× First-tier cities	1.125***	(7.20)	2.021***	(22.15)
× Second-tier cities	1.166***	(8.98)	1.772***	(25.78)
× Third-tier cities	0.868***	(6.95)	1.533***	(24.83)
× Fourth-tier cities	0.463***	(3.90)	0.990***	(12.49)
× Fifth-tier cities	0.768***	(4.94)	1.603***	(18.88)
Log pseudo-likelihood	-397748.92		-780463.01	
Pseudo R^2	0.199		0.250	
Number of individuals	102702		176395	
Number of observations	10616025		61032670	

Note: The t-students are presented in parentheses. *** indicates coefficient significant at 1% level; ** indicates coefficient significant at 5% level; * indicates coefficient significant at 10% level.
Source: China Floating Population Survey (2010, 2014), China Family Planning Commission, calculations and presentation by authors.

For migrants with non-agricultural Hukou, it seems that the relationship between their probability of migration and the tier of cities is U-shaped: they chose either first-tier cities or sixth-tier cities. In fact, this sub-group is composed of two segments: an upper segment (managers, professionals, civil servants, etc.), and a lower segment having all the characteristics of secondary jobs (low-paid, precarious employment…). This heterogeneity leads to the divergence of their destination places.

In 2010, the effect of the first three tiers on the mobility of worker in secondary sector was significantly positive, which suggests that migrants in the secondary sector were mainly concentrated in large cities. In 2014, the coefficient of fourth-tier and fifth-tier cities also became significantly positive. Since the movement of workers is generally accompanied by that of industries, this result seems to suggest that the secondary sector has begun to move to medium-sized cities. Two possible reasons can explain that the effect of first-tier cities was always lower than that of second-tier and third-tier cities. First, as land prices and labor costs has increased in large cities, traditional manufacturing firms may have relocated from megacities (primary centers of agglomeration) to large and medium-sized cities (secondary centers of agglomeration) to reduce production costs (Fujita et al., 1999). Second, due to industrial upgrading, the manufacturing industry in megacities has gradually shifted to a more capital-intensive and high-tech mode of production, which has reduced their demand for (low-skilled) migrant workers. As for the tertiary sector, both in 2010 and 2014, the effect of all tiers is positive, that of the first three tiers is larger in magnitude. This result suggests that migrants in the tertiary sector have flocked mainly to big cities. A more developed socio-economy and/or a larger demographic dimension generally require more diversified services, and thus more workers in the tertiary sector. We can observe that the role of fifth-tier cities, which consists mainly of medium-sized cities, was reinforced in 2014.

5. Discussions and conclusions

With regard to the characteristics of cities that attract migrants, industry structure is an important factor that conditions migratory inflow. On the one hand, migrants might move to cities with a high share of secondary and/or tertiary sectors due to the "clustering and agglomeration effects"; on the other hand, migrants might move to cities where the share of secondary and/or tertiary sectors are low, and the potential labor demand is high due to the "complementary effects". Our results show that for the secondary sector, the "aggregation effects" dominate; while for the tertiary sector, the "complementary effects" are more important. One possible explanation is that, for the secondary sector, especially manufacturing, the fixed costs and economy of scale are high; while for the tertiary industry, the entry barriers are relatively low, and migrants can develop their own markets.

Ownership structure of enterprises is another important factor. FDI per capita played a positive role in attracting migrants in 2010, but not in 2014. One possible explanation is that, foreign invested enterprises might have gradually moved away from labor-intensive industries

to capital- and technology-intensive industries, therefore their role in job creation for unskilled workers started to decline. In contrast, individual and private ownership enterprises played an increasingly important role in absorbing immigrants.

Overall, investment in education and R&D do not play a significant role in attracting migrants. There are two possible explanations. First, as most of the migrants have low level of education, and they are not likely to be employed in education or R&D industry, investment in those areas, even if results in more job creation, will not benefit migrants. Second, for most migrants, the main objective of migration is to look for better job opportunities or higher income, but not to get further training for themselves or better education for their children (in fact, the majority of migrants still had to leave their children behind in their hometowns), so higher investment in education and R&D, even if it results in better public education service, will not benefit migrants from the public service delivery aspects. However, for migrants with high educations and with non-agricultural Hukou, typically those working in urban formal sector with well-paying jobs, higher investment in education and R&D is an important factor of their decision of migration choice.

Healthcare service provision plays an important role in attracting migrants, particularly for those with higher education level. In general, the higher the education level, the higher the income level, and the stronger the demand for healthcare services. According to Grossman (1972), an increase in education level is expected to proportionally increase marginal products of medical care and time available to consumer: the most educated individuals are also the most effective health producers. In other words, demand for medical care increases with the education level; so, better healthcare provision is an important pull factor for skilled migrants.

To a certain extent, environment plays a role in migration flows. Overall, good environment (less pollution) is a contributing factor for migration decision of the migrants with better education. However, for most migrants, the main factor is employment opportunity and expected income in the destination city, not better environment.

While the majority of the migrants concentrated in the five provinces, between 2010 and 2014, migration to cities other than hubs and migration within the same province have increased. This result can be explained by several factors. First, after more than thirty years of rapid development, the hubs gradually moved towards a more capital-intensive mode of production, which inevitably reduced their capacity to absorb labor. Second, as a result of increase in land prices and wages in the hubs, production costs increased, which stimulated some firms to relocate to other regions to maximize their profit. Third, it may be that economic

development in inland regions was accelerating, increasing the demand for labor, especially in second-tier and third-tier cities. Therefore, the choices of rural laborers were increasing, and migration flow tended to be dispersed. More people have chosen within-provincial migration or local jobs. For a long time in the past, labor force mainly flowed to the cities with developed outward-oriented economy, that is, the cities with relatively large foreign trade dependence and high foreign investment (Sit and Yang, 1997). These cities were mainly concentrated in coastal areas.

It is to note that not all hubs have absorbed skilled workers. Workers' composition was determined by sectoral composition. In some hubs such as Beijing, Shanghai and cities of Guangdong, sectoral structure has gradually shifted to high value-added industries (high-end manufacturing and high-end services), which has increased barriers to entry in terms of worker qualification. However, the cities of Jiangsu and Zhejiang continued to absorb unskilled migrants. That is to say, traditional industries still remain in these hubs. Moreover, as we have seen above, most migrants with higher education moved to cities other than the hubs. It is thus possible that the industrial transfer from coastal regions to inland provinces did not necessarily involve traditional labor-intensive industries (Wang and Mao, 2017). In fact, before the economic reforms, Chinese government pursued policies that aimed at relatively balanced regional development and established good industrial bases in some inland provinces/cities. These regions have strong potential to accept high-tech industries and skilled workers.

Our results show that medium and small cities have occupied an increasingly important place in worker mobility, which to some extent confirms the prediction of new economic geography model: the emergence of secondary centers of agglomeration and the industrial transfer to these new ones. The industrial transfer is not only a change of the structure of production and a reorganization of the industrial chain, it also has profound impacts on various markets (employment, capital, consumption, housing...), and the distribution of the various resources. The development of small and medium-sized cities will play an important role in the envisaged rebalancing.

Migration is an inherent part of the economic development process. From a macroeconomic point of view, migration is a mechanism for improving economic efficiency and regional dynamism; and from a microeconomic point of view, it is an individual response to better income and employment opportunities. Through migration and agglomeration, more human resources will be used effectively and more people can benefit from economic development. Identifying the driving factors that attract migrants of different characteristics is

important for devising policies in the context of "dual circulation" for creating inclusive and sustainable employment.

Declaration

The findings, interpretations, and conclusions expressed in this presentation are entirely those of the authors'. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

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