Xingna Nina Zhang

Analysis of urban-rural divide and interprovincial migration in China from 2000 to 2010 with gravity models

Abstract. This paper investigates how China's interprovincial migration indicators changed between 2000 and 2010, and compares 2010's four different categories of migration streams (urban-rural, urban-urban, rural-urban and rural-rural), using censuses and gravity models and focusing on rural-urban divide. The results show that the (average) effect of rural/urban segment populations are remarkably significant and responsive to interprovincial migration, and that income is an increasingly significant factor, while distance gradually falls in prominence between 2000 and 2010. As with 2010's four migration streams, besides the constant deterrent impact of distance across all the models, the results confirm that destination urban population and income each has bigger impacts than their origin counterparts overall, while destination rural population and income are less significant than their origin counterparts respectively, proving that the pull force plays a bigger role than push force for urban factors. These findings are closely related to the unbalanced regional development in China, where the rural-urban divide has remained pronounced for a few decades. To conclude, rural/urban segment populations and incomes are realistic measures of directional and network-induced interprovincial migration within China, and the attraction from urban areas increases over time with income's rising significance while both pull and push forces are getting weaker in rural areas from 2000 to 2010, which mirrors the dynamics of interprovincial migration.

Keywords. China, interprovincial migration, gravity models, census data, rural-urban divide

1. Introduction

Internal migration has been an important topic in population studies, and many efforts have been made to quantitatively estimate it with different approaches and models in China's context (Huang, Li, Li *et al.* 2015; Jiang, Wang, Le *et al.* 2013; Li, Liu and Tang 2014; Shen 2015; Shi, Zheng, Sun *et. al.* 2014; Song and Liu 2014; Sun, Wang and Bai 2014; Wang, Chen and Li 2013; Yang, Han and Song 2014). These models basically fall into two categories: one group seeks to identify the motivational factors underpinning population movement, and to provide insights into migration's mechanism; the other attempts to simulate or project migration flows based on current or historical trends, aiming to uncover their spatiotemporal patterns (Stillwell 2005; Stillwell and Congdon 1991). Both strands are important (Kleinwechter and Grethe 2015; Mai, Peng, Dixon *et. al.* 2014), but a brief review of the former only is provided here as it is closely relevant to this paper.

In modelling China's internal migration mechanism, many researchers focus on identifying its contributing factors (Liu, Xie, Zhang *et. al.* 2014; Song and Liu 2014; Sun, Wang and Bai 2014; Wang, Chen and Li 2013). One common theme of these studies addresses the significance of rural migrants, and a lot of work has been done to utilise census data to look into internal migration on the whole (Bao, Shi and Hou 2005; Cai and Wang 2003a; 2003b; Chan 2011; Li 2009; Pang 2001; Song and Wang 2005). However, there is still a lack of investigation directly relating migration flows, rural-urban migration for instance, to motivational factors such as rural-urban divide, which leads to a limiting effect on the explanatory analysis.

The lack of proper exploration in this aspect, especially the rural-urban divide, is quite conspicuous in the current literature, despite the sound theoretical basis of the rural and urban classification of the space and economy (Wu and Yao 2003). Although there are many rural-urban migration studies around the world (Christian and Braden 1966; Claeson 1969; Fitzgerald, Leblang and Teets 2014; Flores, Zey and Hoque 2013; Ginsberg 1972; Johnston 1970; Peeters 2012; Poprawe 2015), few explicit investigations about the role of rural-urban divide in China's internal migration system have been made, while the majority are based on the unfounded assumption of homogeneous interprovincial migration flows.

Consequently, the ongoing task of recognising the inherent heterogeneity within interprovincial migrants based on their rural or urban origins and destinations as well as identifying determinants of different migration streams, still remains unfulfilled in studying China's interprovincial migration flows. This is the challenge that this paper has taken up by using different measures of independent and dependent migration variables with gravity models, drawing on knowledge and lessons from former studies.

The reason to choose the gravity model lies in its ability in incorporating origin and destination factors when migration itself is directly modelled, as it could be combined well with different model specifications and estimation methods (Fitzgerald, Leblang and Teets 2014; Flores, Zey and Hoque 2013; Peeters 2012; Poprawe 2015; Shen 2015). Although only distance and populations are used in its general form, its extended forms have much potential in explaining migration by adding in other socio-economic factors (Christian and Braden 1966; Claeson 1969; Ginsberg 1972; Johnston 1970). In fact, it is widely agreed as a good tool and the most popular model in describing and analysing migration flows (Fan 2005).

Gravity models could also find good grips from migration stock and push-pull theories. The former refers to the propensity of migrants to go to specific destinations is expected to be negatively correlated with distance (Fan 2005), while the latter bases its hypothesis on the positive relation between migration magnitude and origin or destination populations. Namely, apart from spatial frictions, a specific migrant flow receives the push from the origin and the pull from the destination at the same time (Diamantides 1992a, 1992b; Dorigo and Tobler 1983; Fan 1996; Heisler 1992; Mohtadi 1990).

However, studies using it to directly model China's internal migration flows are relatively scarce (Fan 2005). The majority of previous studies have focused on the exploration of migration determinants (Li, Liu and Tang 2014; Liu, Stillwell, Shen *et. al.* 2014; Shen 2015), its influences on sending or receiving areas (Song and Liu 2014; Sun, Wang and Bai 2014), spatial patterns (Fan 2005; Liu and Shen 2014; Wang, Chen and Li 2013; Yang, Han and Song 2014), and future trends (Jiang, Wang, Le *et. al.* 2013). In the few studies directly modelling

China's internal migration with gravity model, total population and GDP (or GDP *per capita*) are extensively used (Fan 2005; Mi, Zhou and Shi 2009; Shen 2015; Wang 1993), which might be imperfect measures of migration determinants and could be replaced with rural/urban segment populations and incomes. Two reasons account for this: first, it is impossible to estimate internal migration in China without taking into account of urban-rural divide; second, China's internal migration is inherently rural/urban segmented, with rural migrants being a major part of total migration population (for example, rural migrants account for 74.21 per cent of the total in 2010's census).

Similar to international migration, a variety of socio-economic variables play a key role in observed patterns of internal migration (Fitzgerald, Leblang and Teets 2014). But internal migration seems to more obey Zelinsky's mobility transition theory, which emphases the effects of urban-rural divide (Gedik 2005). As a country with vast rural population and urban-rural divide, China has been experiencing huge internal migration for the past few decades. Thus the fact that little research has studied the effects of rural-urban divide upon interprovincial migration on the national scale could be detrimental, as the joint relationship between population and income across provinces can bias estimates and unobserved variation could further complicate the separate identification of across province interactions. This makes it impossible to investigate the full picture of China's internal migration.

In view of this, this paper adopts a different approach to estimate the contribution of segmented rural/urban populations and incomes in China's interprovincial migration for the year of 2000 and 2010, by taking a step further to validate their relationships based on former gravity model studies (Mi, Zhou and Shi 2009; Shen 2015; Wang 1993; Wang, Chen and Li 2013). Additionally, this paper also extends the investigation to different interprovincial migration streams in 2010, aiming to uncover their unique mechanisms, which is the first ever attempt in this field.

This paper's structure is as follows: the next section provides a description of data, followed by a detailed explanation of gravity models and results, ending with discussion of key findings and conclusion of possible future research plan in studying China's internal migration.

2. Data

All the variables are listed in Table 1, drawn from Census and China Statistical Yearbook in the year of 2000 and 2010.

Censuses have 2 datasets, long-form (10 per cent sampling) and short-form (whole population), and the unit difference between them has been eliminated in this study. Most population data are directly from short-form dataset, with the exception of urban-rural, rural-urban, rural-rural and urban-urban migration streams. Instead, they are calculated based on detailed rural and urban origin and destination information in 2010's long-form dataset, where «Street» and «Neighbourhood committees of the town» are recognised as urban areas and «Township» and «Village committees of the town» as rural areas. But no such information is available in either 2000's long-form or short-form dataset.

In total, 961 migration streams are formed between 31 provinces for each year, among which 930 are interprovincial and used to analyse the longitudinal change from 2000 to 2010.

Meanwhile, 897 inter-provincial migration streams, with detailed rural/urban origin and destination information, are used to analyse their relationships in 2010.

Income data are from yearbooks. With temporal and rural/urban specific deflators, the average *per capita* income for rural/urban households is re-measured to consolidate the comparison between 2001 and 2011 across time and space. Additionally, origin-destination distance is calculated by the distance between provincial capitals.

All the variables are taken Euler Number logs before they are modelled, in order to facilitate the conduct of linear regression, which will be further explained in the next section.

TABLE 1 • VARIABLE LIST

Dependent variables	Units	Independent variables	Units
Interprovincial migration	000s persons	Origin-destination distance	000s m
Urban-rural migration	00s persons	Origin urban population	000,000s persons
Rural-urban migration	00s persons	Origin rural population	000,000s persons
Rural-rural migration	00s persons	Origin urban income	000s yuan
Urban-urban migration	00s persons	Origin rural income	000s yuan
		Destination urban population	000,000s persons
		Destination rural population	000,000s persons
		Destination urban income	000s yuan
		Destination rural income	000s yuan

3. METHODS

In modelling migration, the original gravity model could be written as

$$m_{ij} = \mathrm{k}\frac{p_i p_j}{d_{ij}^2} \quad (1)$$

or the more general form

$$m_{ij} = \mathrm{k} \times p_i^a \times p_j^b \times d_{ij}^c \quad (2)$$

where

- a, b and c are parameters;
- m_{ij} is migration flow between place i and place j;
- p_i is the population in origin place i;
- p_j is the population in destination place j;
- d_{ij} is the distance between place i and place j.

If incomes I_i and I_j of origin i and destination j are added in, plus their parameters g and f, the equation becomes

$$m_{ij} = \mathrm{k} \times p_i^a \times p_j^b \times {I_i}^f \times {I_j}^g \times d_{ij}^c \quad (3)$$

If taken logs on both sides, Equation 3 becomes

$$log\, m_{ij} = logk + \mathrm{a}\times log\, p_i + \mathrm{b}\times log\, p_j \quad (4)$$

The main reason for using log-linear modelling is that it can provide information on main and interaction effects as part of the same analysis (Flores, Zey and Hoque 2013), and here both linear and multi-variate linear regressions are used.

Based on push-pull and migration stock theories, the decomposition of population and income in Equation 4 is essential in order to investigate the effects of rural-urban divide, and it becomes

$$log\, m_{ij} = logk + \mathrm{a}_1\times log\, p_{ir} + \mathrm{a}_2\times log\, p_{iu} + \mathrm{b}_1\times log\, p_{jr} + \mathrm{b}_2\times log\, p_{ju} + \mathrm{c}\times log\, d_{ij} + \mathrm{f}_1\times log\, I_{ir} + \mathrm{f}_2\times log\, I_{iu} + \mathrm{g}_1\times log\, I_{jr} + \mathrm{g}_2\times log\, I_{ju} \quad (5)$$

$$M_{2000} = 21.117\times {p_{or}}^{0.943}\times {p_{ou}}^{0.166}\times {p_{dr}}^{0.017}\times {p_{du}}^{0.636}\times {I_{or}}^{0.492} \times {I_{ou}}^{-1.118}\times {I_{dr}}^{0.155}\times {I_{du}}^{2.002}\times d^{-1.096} \quad (6)$$

where

- k, a_1, a_2, b_1, b_2, c, f_1, f_2, g_1 *and* g_2 are parameters;
- p_{ir} and p_{iu} are the rural and urban population of origin province i respectively;
- p_{jr} and p_{ju} are the rural and urban population of destination province j respectively;
- I_{ir} and I_{iu} are the rural and urban household income *per capita* of origin province i respectively;
- I_{jr} and I_{ju} are the rural and urban household income *per capita* of destination province j respectively.

Thus, the extended and enhanced gravity model of migration is established, where distance measures the friction in space while rural and urban segment incomes and populations measure economic and migration stock impacts respectively, with the underlying hypothesis that China's internal migration is so highly directional and social network-induced that rural and urban segment incomes and populations are more responsive to it than their total counterparts.

4. Results

4.1 Interprovincial migration in 2000 and 2010

This section features exploring 2000 and 2010's comparison with linear regression models. First, models without taking logs on variables are run with both years' data, results confirming that they could not explain interprovincial migration as well as its log-linear counterparts with adjusted R^2 being 0.143 and 0.192 (Table 6 of the Appendix), but rising to 0.653 (Model 1) and 0.737 (Model 2) for 2000 and 2010 respectively after taking logs.

$$M_{2010} = 1.725 \times p_{or}{}^{0.669} \times p_{ou}{}^{0.480} \times p_{dr}{}^{-0.330} \times p_{du}{}^{0.942} \times I_{or}{}^{0.104} \times I_{ou}{}^{-1.715} \times I_{dr}{}^{-1.437} \times I_{du}{}^{4.327} \times d^{-1.002} \quad (7)$$

Thus the choice of log-linear regression models is consolidated, with results presented in Table 2. Both years' models predict interprovincial migration significantly well, with most coefficients being significant. Coefficients of origin rural and destination urban populations are significant and positive in both models, while destination rural population is significant and negative in 2010. About incomes, more variations are shown: coefficients of destination urban income are always significant and positive while origin urban income remains to be significantly negative in both years; coefficients of destination rural income change from being insignificantly positive to significantly negative from 2000 to 2010. Additionally, both coefficients of distance are significant and negative, proving its adverse effects in interprovincial migration. When transformed back to gravity models, their equations (6 and 7) could be written as above, with changes in coefficients presented in Table 3.

TABLE 2 • INTERPROVINCIAL MIGRATION MODEL COEFFICIENTS

	2000		2010	
Parameter	**B**	**S. E.**	**B**	**S. E.**
Origin urban population	0.166	0.113	0.480***	0.091
Origin rural population	0.943***	0.083	0.669***	0.077
Destination urban population	0.636***	0.113	0.942***	0.091
Destination rural population	0.017	0.083	-0.330***	0.077
Distance	-1.096***	0.067	-1.002***	0.053
Origin urban income	-1.118**	0.322	-1.715***	0.377
Origin rural income	0.492	0.272	0.104	0.289
Destination urban income	2.002***	0.322	4.327***	0.377
Destination rural income	0.155	0.272	-1.437***	0.289
Constant	3.05	0.912	0.545	1.052

Note: all the parameters are from Table 2, so please refer to the earlier table for their coefficients and standard errors. *** denotes p<0.001, ** represents p<0.01, and * symbolises p<0.05.

Here,

- M_{2000} and M_{2010} are interprovincial migration flows in 2000 and 2010 respectively;
- all the independent variables follow definitions in Equation 5 but in according years.

In 2000, for every time's increase in each independent variable, interprovincial migration's responses are detailed by holding all other variables constant in turn: for origin and destination rural and urban populations, 1.923, 1.122, 1.012 and 1.554 times' changes are predicted; for origin and destination urban and rural incomes, 0.461, 1.406, 4.006 and 1.113

time(s)' changes are expected; and a 0.468 time's change for distance. Similarly, 2010's interprovincial migration's responses are: 1.395, 1.590, 1.921 and 0.796 time(s)' change for origin and destination urban and rural populations, 0.305, 1.075, 20.070 and 0.369 time(s)' change for origin and destination urban and rural incomes, and 0.499 time's change for distance.

TABLE 3 • INTERPROVINCIAL MIGRATION'S RESPONSES FOR EVERY TIME'S INCREASE IN INDEPENDENT VARIABLES

	Changes in dependent variable	
	2000	2010
Origin urban population	1.122	1.395
Origin rural population	1.923	1.590
Destination urban population	1.554	1.921
Destination rural population	1.012	0.796
Distance	0.468	0.499
Origin urban income	0.461	0.305
Origin rural income	1.406	1.075
Destination urban income	4.006	20.070
Destination rural income	1.113	0.369

Note: all the parameters are from Table 2. Please refer to it for their coefficients and standard errors.

As independent variables might have gone through significant changes within 10 years, directly comparing interprovincial migration models between 2000 and 2010 could be difficult. However, provincial capital distances changed little, and rural populations remained almost the same with a 0.6 per cent national increase. That is to say, the reason that interprovincial migrants are more than doubled between 2000 and 2010 lies in other dependent variables' changes, with urban population, and rural and urban income each experiencing a 26.0, 162.7 and 204.3 per cent growth respectively. In summary, distance and origin and destination rural population gradually fall in significance, origin and destination urban populations and incomes rise in prominence by comparison, while origin and destination rural incomes decrease in the estimated parameter values despite their remarkable growth from 2000 to 2010.

4.2 Interprovincial migration streams in 2010

In this section, 2010's four specific interprovincial migration streams, namely rural-urban, rural-rural, urban-rural and urban-urban, is extensively studied with multi-variate linear regression (Table 4), with each accounting for 44.24, 29.97, 3.42 and 22.38 per cent of the total and evidencing rural-urban stream's predominance in 2010. It is also logically valid to compare with 2010's interprovincial model (Table 5), as they all use the same set of variables.

TABLE 4 • INTERPROVINCIAL MIGRATION STREAM MODEL COEFFICIENTS

	Urban-urban migration		Urban-rural migration		Rural-urban migration		Rural-rural migration	
Parameter	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Origin urban population	0.635***	0.079	0.804***	0.104	-0.071	0.116	0.316*	0.134
Origin rural population	0.16*	0.064	0.12	0.085	1.361***	0.094	0.954***	0.108
Destination urban population	1.037***	0.079	0.249*	0.104	0.687***	0.115	0.586***	0.133
Destination rural population	-0.438***	0.064	0.213*	0.084	-0.219*	0.093	0.036	0.108
Distance	-0.854***	0.043	-1.045***	0.057	-0.991***	0.063	-1.302***	0.073
Origin urban income	-2.258***	0.313	-1.491***	0.413	-3.535***	0.457	-0.951	0.528
Origin rural income	1.119***	0.24	-0.067	0.316	1.012**	0.35	-1.046**	0.404
Destination urban income	3.738***	0.312	2.417***	0.41	4.455***	0.455	3.457***	0.525
Destination rural income	-1.42***	0.24	-0.89**	0.316	-1.084**	0.35	-0.938**	0.405
Constant	5.586***	0.869	6.749***	1.145	6.049***	1.268	5.395***	1.466

In urban-urban migration equation 8 (Model 3, Adjusted $R^2 = 0.718$), for every time's increase in each independent variable, urban-urban stream's responses are presented by holding all other variables constant in turn: for origin/destination urban/rural population, 1.553, 1.117, 2.052 and 0.738 time(s)' changes are predicted; for origin/destination urban/rural incomes, 0.209, 2.172, 13.343 and 0.374 time(s)' changes are expected; a 0.553 time's change for distance. Similarly, urban-rural stream's responses are (Model 4, Adjusted $R^2 = 0.566$): 1.746, 1.087, 1.188 and 1.159 time(s)' change for origin/destination urban/rural population, 0.356, 0.955, 0.540 and 5.341 for origin/destination urban/rural incomes, and 0.485 for distance.

$$M_{uu} = 2.666 \times {p_{or}}^{0.160} \times {p_{ou}}^{0.635} \times {p_{dr}}^{-0.438} \times {p_{du}}^{1.037} \times I_{ou}^{-2.258} \times I_{or}^{1.119} \times I_{du}^{3.738} \times I_{dr}^{-1.420} \times d^{-0.854} \quad (8)$$

$$M_{ur} = 8.534 \times {p_{or}}^{0.120} \times {p_{ou}}^{0.804} \times {p_{dr}}^{0.213} \times {p_{du}}^{0.249} \times I_{ou}^{-1.491} \times I_{or}^{-0.067} \times I_{du}^{2.417} \times I_{dr}^{-0.890} \times d^{-1.045} \quad (9)$$

Where,

- M_{uu} and M_{ur} are the number of migrants from origin province's urban to destination province's urban and rural areas respectively.

In rural-urban migration equation 10 (Model 5, Adjusted R^2 =0.711), for every time's increase in each independent variable, rural-urban stream's responses are presented by holding all other variables constant in turn: for origin/destination urban/rural population, 0.952, 2.569, 1.610 and 0.859 time(s)' changes are predicted; for origin/destination urban/rural incomes, 0.086, 2.017, 21.933 and 0.472 time(s)' changes are expected; a 0.503 time's change for distance. Similarly, rural-rural stream's responses are (Model 6, Adjusted R^2 = 0.634): 1.245, 1.937, 1.501 and 1.025 time(s)' change for origin/destination urban/rural population, 0.517, 0.484, 10.981 and 0.522 for origin/destination urban/rural incomes, and 0.406 for distance.

$$M_{ru} = 4.236 \times p_{or}{}^{1.361} \times p_{ou}{}^{-0.071} \times p_{dr}{}^{-0.219} \times p_{du}{}^{0.687} \times I_{ou}^{-3.535} \times I_{or}^{1.012} \times I_{du}^{4.455} \times I_{dr}^{-1.084} \times d^{-0.991} \quad (10)$$

$$M_{rr} = 2.202 \times p_{or}{}^{0.954} \times p_{ou}{}^{0.316} \times p_{dr}{}^{0.036} \times p_{du}{}^{0.586} \times I_{ou}^{-0.951} \times I_{or}^{-1.046} \times I_{du}^{3.457} \times I_{dr}^{-0.938} \times d^{-1.302} \quad (11)$$

Where,

- M_{ru} and M_{rr} each is the number of migrants from origin province's rural to destination province's urban and rural areas.

TABLE 5 • COMPARISON OF DEPENDENT VARIABLES' RESPONSES FOR EVERY TIME'S INCREASE IN EACH INDEPENDENT VARIABLE

	Responses in dependent variable				
	Model 3	Model 4	Model 5	Model 6	Model 2
Origin urban population	1.553	1.746	0.952	1.245	1.395
Origin rural population	1.117	1.087	2.569	1.937	1.590
Destination urban population	2.052	1.188	1.610	1.501	1.921
Destination rural population	0.738	1.159	0.859	1.025	0.796
Distance	0.553	0.485	0.503	0.406	0.499
Origin urban income	0.209	0.356	0.086	0.517	0.305
Origin rural income	2.172	0.955	2.017	0.484	1.075
Destination urban income	13.343	5.341	21.933	10.981	20.070
Destination rural income	0.374	0.540	0.472	0.522	0.369

Note: all the parameters are from Table 4. Please refer to it for their coefficients and standard errors.

As shown by Table 5, Model 2 describes 2010's total interprovincial migration, while Model 3, 4, 5 and 6 are its subsets with specific urban and rural destinations and origins. Thus, Model 2 could act as the baseline when conducting comparisons: Model 3 has smaller rural but bigger urban population impacts, and bigger rural but smaller urban income effects in both origin and destination, with evidently the smallest adverse effect of distance; Model 4 has bigger origin urban and destination rural population and income effects but smaller origin rural and destination urban population and income impacts at the same time, with bigger distance adverse effect; Model 5 has bigger rural population and income impacts but smaller urban population effects in both origin and destination, with the biggest destination but smallest origin impacts as for urban income and the second smallest distance adverse effect; Model 6 has bigger rural but smaller urban population impacts in both origin and destination, and bigger origin urban and destination rural but smaller origin rural and destination urban income effects, with the largest distance adverse influence.

Thus, several important messages are drawn: destination urban income plays a predominant facilitating role, while origin urban and destination rural incomes act as obstructers for all the streams; origin rural income acts as the facilitator in streams of urban destination but the obstructer in streams of rural destination simultaneously; although distance always remains as the deterrent, rural-destination streams have bigger distance decay compared with their urban-destination counterparts; destination urban and origin rural populations are facilitators for all the streams, and so is origin urban population except for rural-urban stream, while destination rural population acts as the stimulus in rural-destination streams but the deterrent in urban-destination streams. Overall, destination urban population and income seems to be more significant than their origin counterparts, so does origin rural population and income compared with their destination counterparts, suggesting that the pull force plays a bigger role than push force for urban factors, and that bigger push force exists as for rural factors.

5. Discussion

From 2000 to 2010, interprovincial migration is more than doubled in volume, with results above confirming: as distance and (both origin and destination) rural populations fall in prominence, spatial friction decreases and rural populations provide less facilitating over time, probably owing to infrastructure improvement and countryside's decline; interprovincial migration is shifting to urban areas as the centre for both sending and receiving interprovincial migrants, as urban populations and incomes rise while rural incomes decrease in prominence at both origins and destinations. During this period, China's economy and society experienced great improvement (Lin, Cai and Li 2003; Luo, Shen and Gu 2014), accompanied by a declining origin but increasing destination effect on the whole. Thus, it is proved that income facilitates the production of migrants and economy is getting increasingly important in relocating populations, and that the tide is changing as destination economy is gaining force in attracting migrants.

As with 2010's four migration streams, the results confirm that the pull force plays a bigger role than push force for urban factors, and that bigger push force exists for rural factors in comparison, indicating that urban areas are in the predominant position among all the four migration types. This is closely related to the unbalanced regional development in China, where the urban-rural divide has remained to be pronounced for the past few decades and rural areas are usually rated as the sending origin while their urban counterparts receiving destinations.

In summary, the attraction from urban areas increases over time from 2000 to 2010 accompanying booming economy and society while both pull and push forces are getting weaker in rural areas, the (average) effect of rural and urban segment population and income is markedly significant in 2010. As economic factors get increasingly significant, it is facilitating the mobilization of resources, humans (labour or human capital) included, and with technology is redefining «distance» to a large extend to make space ever smoother for the mobilization and relocation of resources. In other words, places have to take on greater responsibility for strategizing and implementing economic development activities to produce attraction to «stick» those migrating resources and make them settle down and get involved with local development.

6. Conclusion

This paper's empirical analysis has shown that the extended and enhanced gravity model is indeed effective to describe and explain interprovincial migration from 2000 to 2010 and its four categories of streams in 2010 in China, which also helps to explain migrant's directional movement and what factors affect their destination choices. In this sense, this paper enhances both the theoretical and empirical understanding of China's internal migration.

Certainly, internal population movement is not only unique to China, but its magnitude and massiveness is stunning even in the whole human history. China's case is also special in that its fast urbanization and industrialization process has made the whole nation hastily plunge into rapid population relocation, with lingering socio-economic and institutional barriers inflaming rural migrants' inferiority and social issues in rural China such as brain-drain and people left-behind.

Rather, more unknown could be explored in relation to the socio-economic transitions that China have been experiencing for decades. Future research is needed to reveal how much the change of migration patterns is due to demographic and socio-economic indicators, and fruitful work could also be done in improving estimation precision by combining multilevel modelling to investigate origin/destination effects.

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Appendix

TABLE 6 • INTERPROVINCIAL MIGRATION MODEL COEFFICIENTS – WITHOUT TAKING LOGS

	2000		2010	
	B	S.E.	B	S.E.
Origin urban population	-1153.473	1871.119	-2990.402	2612.489
Origin rural population	1620.645***	458.608	3439.309***	841.18
Destination urban population	8543.815***	1871.119	17445.65	17895.62
Destination rural population	-351.475	458.608	857.848	705.603
Distance	-29.193**	8.972	-58.578***	13.768
Origin urban income	-7158.314	7806.751	-24164.92**	7371.542
Origin rural income	5906.455	18647.03	35979.49*	14141.54
Destination urban income	51622.01***	7806.751	38747.6***	7253.301
Destination rural income	-66902.26***	18647.03	-33959.62**	13713.5
Constant	-189019.1***	45326.22	-355741.6**	175037