Relationship among National Income, Rural-Urban Divide, and City Size: Lessons from the Differences between Eastern and Western Megacities

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Abstract

The traditional “push and pull” theory successfully illustrates the formation and population dynamics of “city”. However, since we can easily find that the number, size, population growth rate and population density of Asian megacities are bigger than that of Western megacities, these phenomena imply that the application of push-and-pull theory may need some modification in different regions. This research brings the “urban dream” factor into the model of current push-and-pull theory, and via the variant intensity of urban dream between East and West, then the adjusted push-and-pull model with urban dream factor can theoretically explain the differences of Eastern and Western megacities. In order to seek empirical supports of the “urban dream” effects, this research proposes that the intensity of urban dream is a decreasing function of national income level, and an increasing function of rural-urban divide. That is, lower national income and higher rural-urban divide will induce stronger motive of “dream pursuing” migration, then increase the population of megacity in this nation. In the frame of adjusted model with urban dream factor, this research plans to collect these data of national income, rural-urban divide and population dynamics of megacities all over the world. The investigation of the relationship of these variables can provide some evidence for the proposition of “urban dream”.

Key words: national income; rural-urban divide; city size; megacity.

1. INTRODUCTION

As the extent of urbanization expands over time, more and more people live in the so-called “city”. According to the report –“World Urbanization Prospect: The 2009 Revision”(United Nations，2010), in 1950, 28.8％ (730 million) of the population lived in cities; in 1975, it increased to 37.2％ (1.51 billion). It even overpassed the threshold of 50% (3.42 billion) in 2009. The same report also predicts 56.6％ (4.54 billion) of the population will live in the cities in 2025 around the world. And in the relatively developed area the ratio will rise to near 80% (United Nations, 2010).

Regarding to the theory of city formation and size, in general, the advantages of city, such as economies of scale, economies of agglomeration, are thought to be the drivers of urban growth. On the other hand, the increasing cost accompanying population growth suppresses the expansion of city (Geltner et al., 2007). Based on the interaction of centripetal and centrifugal force for urban growth, thus the existence of the steady optimal city size is expected in theory.

Even though the formation and size of city can be explained from the perspective of economies of scale and agglomeration, the existence of megacities in which population are over ten millions still arose many discussions.

Table 1 is the rank, location and population dynamics of all megacities in the world. We can find some interesting differences between West and East. First, there are 26 megacities which populations are over ten million around the world in 2011, while 15 of them locate in Asia. And the six biggest megacities, namely, Tokyo, Guangzhou, Seoul, Shanghai, Delhi, and Mumbai are all in Asia.Second, from the temporal perspective, the Asian megacities, such as Beijing, Shanghai, and Guangzhou in China; Seoul in South Korea; Mumbai, Delhi in India; Karachi in Pakistan; Dhaka in Bangladesh etc., their populations increase along with economic growth until now. However, the population in Western megacities, like New York and London, stay at a relatively stable level.

Besides, in general, the population density of Asian cities is greater than that of European and North American cities (Tan et al., 2008).

These phenomena remind us intuitively that we seem to neglect some implicit factor for urban growth, and the factor is stronger in Asia than that in Europe and North America. This research attempts to explain the persistent growth of Asian megacity population by bringing the “dreaming pursuing” factor into the residents’ utility function. Since the desire of “dream pursuing” (or “making big money”) is part of Asian traditional cultures (especially in China) and have been cultivated from childhood, and many individuals think that the metropolitan area is a place with much more opportunities to make these dreams come true, thus the virtual connection between “success” and “metropolitan area” reinforces their desire of moving into city. And the cultural explanation could also illustrate the variation of population density between East and West.

Table 1 The Rank, Location and Population Dynamics of Megacities in the World

Rank	Megacity	Country	Continent	Population	Annual Growth
1	Tokyo	Japan	Asia	34,300,000	0.60%
2	Guangzhou	China	Asia	25,200,000	4.00%
3	Seoul	South Korea	Asia	25,100,000	1.40%
4	Shanghai	China	Asia	24,800,000	2.20%
5	Delhi	India	Asia	23,300,000	4.60%
6	Mumbai	India	Asia	23,000,000	2.90%
7	Mexico City	Mexico	North America	22,900,000	2.00%
8	New York City	USA	North America	22,000,000	0.30%
9	São Paulo	Brazil	South America	20,900,000	1.40%
10	Manila [21]	Philippines	Asia	20,300,000	2.50%
11	Jakarta	Indonesia	Asia	18,900,000	2.00%
12	Los Angeles	USA	North America	18,100,000	1.10%
13	Karachi	Pakistan	Asia	17,000,000	4.90%
14	Osaka	Japan	Asia	16,700,000	0.15%
15	Kolkata	India	Asia	16,600,000	2.00%
16	Cairo	Egypt	Africa	15,300,000	2.60%
17	Buenos Aires	Argentina	South America	14,800,000	1.00%
18	Moscow	Russia	Europe	14,800,000	0.20%
19	Dhaka	Bangladesh	Asia	14,000,000	4.10%
20	Beijing	China	Asia	13,900,000	2.70%
21	Tehran	Iran	Asia	13,100,000	2.60%
22	Istanbul	Turkey	Europe & Asia	13,000,000	2.80%
23	London	United Kingdom	Europe	12,500,000	0.70%
24	Rio de Janeiro	Brazil	South America	12,500,000	1.00%
25	Lagos	Nigeria	Africa	12,100,000	3.20%
26	Paris	France	Europe	10,197,678	1.00%

Source: Thomas Brinkhoff: The Principal Agglomerations of the World, 2011-07-01 (http://www.citypopulation. de/world/Agglomerations.html)

In order to seek empirical supports of the “urban dream” effects, this research proposes that the intensity of urban dream is a decreasing function of national income level, and an

increasing function of rural-urban divide. That is, lower income level and higher rural-urban divide will induce stronger motive of "dream pursuing" migration, then increase the population of megacity in this nation. In the frame of adjusted push-and pull model with urban dream factor, this research plans to collect these data of national income, rural-urban divide and population dynamics of megacities all over the world. The investigation of the relationship of these variables can provide some evidence for the proposition of "urban dream".

The remainder of this paper is organized as follows: Section two discusses the effect of "urban dreaming" on the traditional push-and-pull theory; section three testes the proposition that the intensity of urban dream is a decreasing function of national income level and an increasing function of rural-urban divide; section four is the empirical results; and section five concludes.

2. EXPANSION, CONTRACTION, AND EQUILIBRIUM OF CITY SIZE

There are two paradigms of city formation and size. One is the competitive model of large-scale land developers operating in national land markets, and the other is the self-organization model of agglomeration（Henderson and Becker, 2000). Researchers usually utilize the concept of the economies of agglomeration and scale to explain urban (population) growth (Moomaw, 1981; Henderson, 1986; Cervero, 2001; Au and Henderson, 2006). However, with regard to the dynamics of urban growth, we still cannot get enough information from these published papers (Tan et al., 2008).

From the perspective of static observation, the size distribution of cities all over the world usually shows a regular pattern of hierarchy or pyramid. That is, many small towns, fewer large towns, even fewer cities, and a small number of major metropolitan areas (McDonald and McMillen, 2010). The phenomenon is known as the "rank-size rule" ($P_i=P_1/i$, P_1 is the population in the biggest city; P_i is the population of ranked i city). The rank-size rule is a special case in the generalized "Zipf's rule"[1]. Most researches regarding this issue in urban economics support the validity of rank-size rule of city (Marshall，2007),[2] but researchers still have many questions about why the pyramid pattern exists in urban development (Geltner et al., 2007).

From the perspective of dynamic urban growth, the city size is affected by many factors. These factors could be categorized into two parts. One part is about the characteristics of the city itself, and the other part comes from the surrounding area of the

1 The generalized "Zipf's rule" is written as $P_i= Ki^a$. K is a constant which roughly equal to P_1; and a is a number near minus one (Marshall, 2007).

2 Soo（2007）is an example that does not support the validity of Zipf's rule. Soo（2007）utilized the demographic statistic of Malasia in 1957, 1970, 1980, 1991, and 2000 to test the validity of Zipf's law. All empirical results do not confirm the Zipf's law except the result of 1957.

city.

The characteristics of the city itself, such as the infrastructure, institution of taxing, each kinds of living cost, the economies of agglomeration and scale, etc. will affect the migration. With regard to the influences of the surrounding area, most of them are due to the pressure of rural poverty. Figure 1 shows the concept of dynamic urban growth and the factors affecting city size. And the content of factors is illustrated as follows:

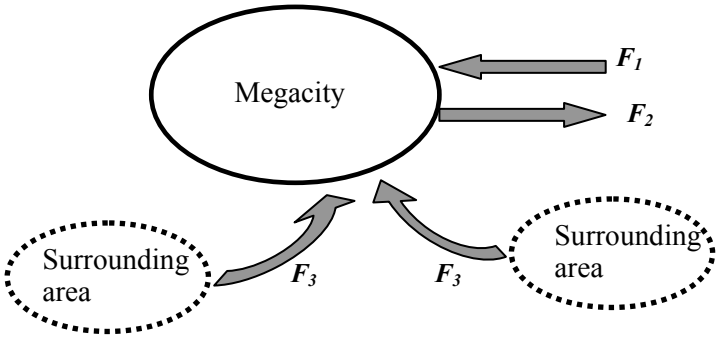

Figure 1 The Driving Forces for Urban Population Growth

2.1 The Effects of City Characteristics on Urban Growth:

(1) Positive effects on urban growth (or the centripetal force for urban growth. F_1 in Figure 1)[3]

a. Economies of scale: If the fixed cost of production is invariable, thus the way of mass production in city will reduce the average cost of production.

b. Economies of agglomeration: When the similar firms cluster together, they usually can reduce the cost of production effectively. There are two types of economies of agglomeration. One type is vertical linkage which means the combination of upstream and downstream firms; the other type is horizontal linkage which generates synergy by sharing know-hows between firms in similar field.

c. Positive locational externalities: It implies that the firms can get some benefits with no cost from some actions of neighboring factories. The positive locational externalities are different from the economies of agglomeration, it usually happens between some firms nearby (Geltner et al., 2007).

3 Compared to the "push factor" for urban growth which comes from surrounding rural region, the economic characteristics of the city itself for promoting urban growth are sometimes called the "pull factor" for urban growth (McDonald and McMillen, 2010).

(2) Negative effects on urban growth (or the centrifugal force for urban growth. F_2 in Figure 1):

The centrifugal force for urban growth includes congestion, pollutions, crimes, high intra-urban transportation costs, and high rent and urban-land cost, etc. (Geltner et al., 2007). In general, the negative effects on urban growth will increase along with the expansion of city (Brueckner and Zenou, 1999; Brueckner and Kim, 2001; Cervero, 2001; Decker et al., 2007; Liu et al., 2010).

2.2 The Effects of Surrounding Rural Area on Urban Growth:

If the land in rural region could not provide enough products to satisfy the basic needs of people, people will be forced by the rural poverty to migrate into the city to pursue a better chance of living (F_3 in Fifure 1). Due to the weakness of socio-economic conditions, those people could not afford the high living cost of the city. Therefore, they usually live in the slums or on the boundary of city (Mak et al., 2007; Grant, 2008; Pyne and German, 2009; McDonald and McMillen, 2010).

2.3. The Effect of Urban Dream on the Size of Megacities

Based on the interactions of factors for urban growth, it is intuitive that the sum of F_1, F_2, and F_3 in Figure 1 will decide the direction and magnitude of urban growth. In other words, the change dynamics of city size is the reflection of relative strength of F_1, F_2, and F_3. Since F_1, F_2, and F_3 are all functions of city size, thus we can find a static optimal city size in which the sum of F_1, F_2, and F_3, is zero in theory.

As shown in Figure 2, in the beginning of city formation, the positive factors for urban growth (F_1+F_3) are greater than the negative factors (F_2), thus the city size will expand over time. On the one hand, the positive factors for urban growth might increase along with the expansion of population; on the other hand, the negative factors which compress urban growth could increase even more sharply. In theory, if the strength of positive factors equals to the negative factors, that is, F_1+F_3=F_2, thus the city size will reach a stable equilibrium *S* in Figure 2.

For sure the equilibrium of city size depends on the exogenous conditions, such as the commuting system, the construction technology for higher buildings, and the tools of communication, etc. The improvement of these exogenous conditions will increase the optimal city size. But we have to note that the improvement of exogenous conditions is not unlimited. In other words, although the new techniques for promoting compact city could progress continuously, we still could expect that the population of city has a maximum value. In the dynamic process of urban expansion, if the population of city overshoots its equilibrium value, then the negative factors for urban growth, for example, the unaffordable living cost and the environmental disamenities will force some residents to move out of city. It means that the equilibrium of city size in Figure 2 is a

stable one.

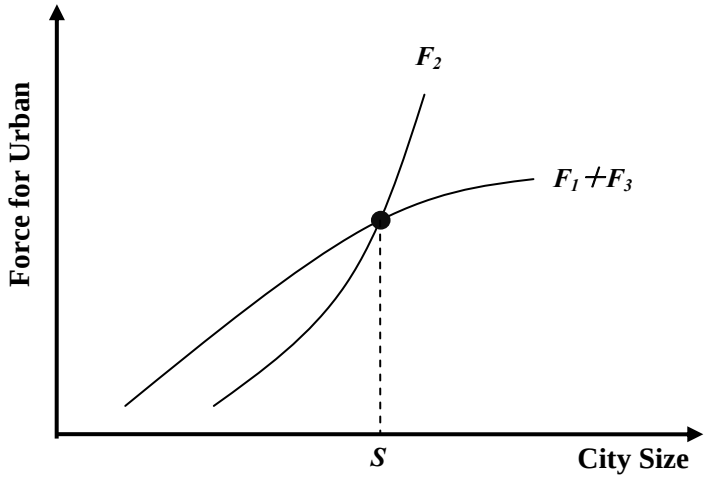

Figure 2 The Static Equilibrium of City Size

Note: F_1: Centripetal force for urban growth
F_2: Centrifugal force
F_3: Effect of rural poverty

Since individuals' migration choice influences the city size and population density, and the migration decision is affected by many social factors, including cultural background, historic tradition, and the policies of government (Tan et al., 2008). The policy factor may play a very important role in the Asian cities. For instance, the policy of "dynamic balance of arable land" in China promotes more compact use of urban land, increases the population density of city effectively (Tan et al., 2008). Most researches regarding urban affairs agree that the growth-management policy could contribute to the prevention of urban sprawl and control the pattern of urban development (Chan et al., 2002; Alig et al., 2004; Frenkel, 2004; Chen and Jia, 2005; Tan et al., 2008; Liu et al., 2010).

Although the policy of government could affect individuals' migration, it cannot be neglected that the effects of policy depend on the characteristics of individual. In other words, because of the different cultural backgrounds, the same policies may have different effects. This paper indicates that the F_1, F_2, and F_3 in Figure 2, will have different strength of effects on individuals with different characteristics. This thought could help us to understand the differences of Eastern and Western megacities.

Since that 15 of the 26 megacities, including the top six, are located in Asia, and among the 20 urban areas with the highest population density in the world, eight are located in mainland China (Tan et al., 2008). It implies that we maybe underestimate the attraction power of city toward individuals in these Asian cities. In other words, Based on the premise of free migration of residents, and we also know that many residents live in the slums or border areas of these cities (Pyne and German, 2009; Brand, 2009), we

can infer that, in Asia, we might underestimate the willingness of people to migrate into city (F_3 in Figure 1), and overestimate the negative effects resulting from high living cost and environmental disamenities (F_2 in Figure 1). Why? Perhaps is due to the cultural background and the relatively poor economic condition in Asia.

Compared to the individualism and pursuing diverse achievements in Western society, in eastern traditional culture, most people emphasizes the harmony of groups, and the definition of "success" is much narrower. In general, an individual will be called a successful guy if he can make a lot of money, besides; the intensity of desire of making money is greater in Asia. Even children are educated that their success is a kind of symbol of filial obedience (Salili, 1996; Ji, 2008; Hofer et al., 2010). The strong making money desire of individuals (especially the weak socio-economic condition individuals) let them have better durability to face the unfriendly urban environment.

For people with strong motive to pursue dreams in metropolitan areas, the negative effect of F_2 on them is relatively smaller, and the positive effect of F_3 is relatively bigger. Therefore, in these countries in which people are with stronger motive of dream pursuing, the equilibrium of city size will be bigger than expected. The phenomenon can be illustrated in Figure 3.

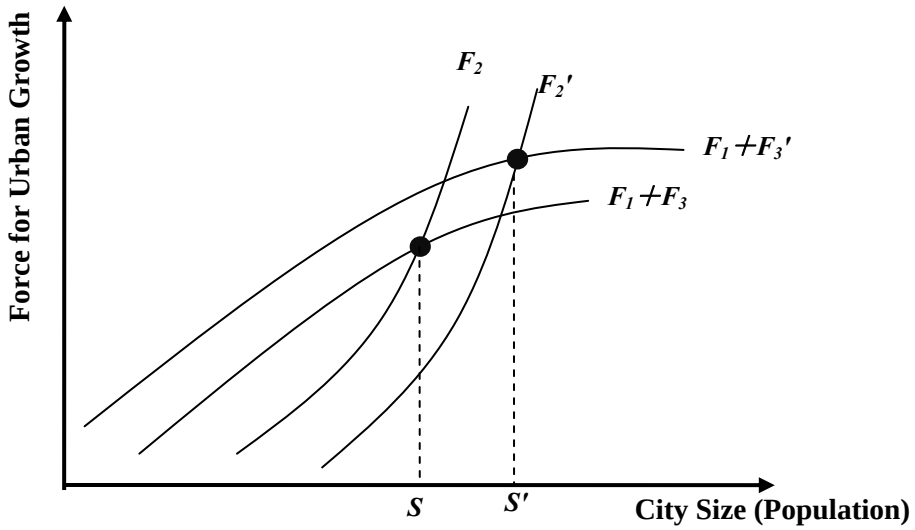

Figure 3 The Effect of Urban Dream on the Forces for Urban Growth

Note: F_1: Centripetal force for urban growth
F_2: Centrifugal force
F_2': Centrifugal force (with dream pursuing)
F_3: Effect of rural poverty
F_3': Effect of rural poverty (with dream pursuing)

3. THE RELATIONSHIP OF INCOME LEVEL, RURAL-URBAN DIVIDE AND CITY SIZE IN MEGACITIES

In relation to the theories of city size and migration, most models suppose that the purpose of individual's migration is to increase their utility level. Individuals will not migrate while they have the same utility value in different regions. Thus the equilibrium of model is reached. In the meantime, the net migration of city is zero, and the city size is fixed in a specific level.

In the previous section, we illustrated the positive and negative factors for urban population growth. It is notable that the nature of these factors which could affect urban growth or people's migration is these factors can influence migrants' utility levels. Naturally, the urban growth forces F_1, F_2, and F_3 in Figure 1 will have different impacts on individuals with variable socio-economic conditions.

In order to explain the differences of city size and population dynamics between Eastern and Western megacities, intuitively we can put the "urban dream" factor into the individual's utility function, that is, if we set up the utility function of individuals as the form $U=U(D, X)$. D represents the "dream pursuing" factor, and X is other attributes which could affect individuals' utility level. In the utility function containing dream pursuing factor, the individual's utility level will be higher as the dream pursuing factor is added with the X is kept at a fixed level.

In many Asian countries, the role of dream pursuing factor on individuals' migration always appears in informal literature, TV shows, and movies (Berry, 2009), such as the very famous Chinese movie entitled "Comrades, almost a love story" (directed by Ke-xin Chen, 1996); the documentary film "My fancy high heels" produced by Chao-ti Ho; and the series of reports about Dhaka (Capital of Bangladesh) at the GlobalPost website (Pyne and German, 2009). These kinds of films describe precisely the role of dream pursuing in the mood of typical immigrants who come from poverty rural areas. These immigrants live in the metropolitan, not only for pursuing a basic job, but also their dreams of success. The desires in the bottom of immigrants' hearts deserve more studies.[4]

However, the modern society is not friendly to those low-educated immigrants (Lin, 2005). If the marginal labors with weak socio-economic condition are forced or attracted to move into the city for better job opportunities, they usually cannot get what they want. But, compared to the poor rural areas, at least, in the metropolitan, there are many low-end jobs can satisfy their basic needs (Wu, 2008; Pyne and German, 2009). In addition, the metropolitan provides the space for their dreams (Chang and Hu, 2006).

Based on this viewpoint, this research proposes that the intensity of urban dream is a

4 Migration for dream pursuing not only happens in different regions of a country, but also appears in different countries. For example, many Taiwanese are eager to pursue the "American dream" during the period of 1949 and 1987 (Berry, 2009).

decreasing function of national income level, and an increasing function of rural-urban divide. That is, lower national income and higher rural-urban divide will induce stronger motive of "dream pursuing" migration, then increase the population of megacity in this nation. In other words, we can set the population growth rate of megacity is a function of national income level and rural-urban divide, that is

$$P = P(U, Y) = P(U(D, X), Y) = P(D, X, Y) = P(D(In, Ru), X, Y)) = P(In_{(-)}, Ru_{(+)}, X, Y)$$

Where

P: population growth rate of megacity;

U: utility function of individuals;

Y: other attributes which could affect population growth rate of megacity;

D: urban dream;

X: other attributes which could affect individuals' utility level ;

In: income level;

Ru: rural-urban divide;

+ : increasing function; - : decreasing function.

4. THE EMPIRICAL ANALYSIS

4.1 Data Description

In order to test the proposition that the "urban dream" affects the megacity size, this paper collects data of national income, rural-urban divide and population dynamics of megacities all over the world.

Table 2 shows the GDP, Gini Index, and Rich/Poor income ratio of megacities in the world. Because it is not easy to collect the GDP of megacity themselves, the GDP values in Table 2 are all national GDP, and had been adjusted according to purchasing power parity (PPP). Besides, since there is not a clear-cut measure of rural-urban divide, we choose the index of income-inequality, such as the Gini index, the Rich/Poor income ratio to be the proxy of rural-urban divide.

In addition, the reason we propose that the urban dream is a decreasing function of income level is based on the assumption that if individual is rich enough and lasting for a long period, he will not overestimate the value of money, thus he will not migrate for pursuing more money. The connection between migration motive and income level reminds us that us that the Human Development Index (HDI) might be an alternative index of this idea.

Table 2 The GDP, Gini Index, and Rich/Poor Income Ratio of Megacities in the World

Megacity	Country	GDP [a] (rank)	Gini Index [b]	R/P (10%) [b]	R/P (20%) [d]
Tokyo	Japan	34,740 (24)	24.9 (2007)	4.5	3.4
Guangzhou	China	8,382 (92)	42.1 (2009)	21.6	12.2
Seoul	South Korea	31,714 (25)	31.1 (2011)	7.8	4.7
Shanghai	China	8,382 (92)	42.1 (2009)	4.5	12.2
Delhi	India	3,694 (129)	33.9 (2010)	8.6	5.6
Mumbai	India	3,694 (129)	33.9 (2010)	8.6	5.6
Mexico City	Mexico	14,610 (63)	47.0 (2012)	21.6	12.8
New York City	USA	48,387 (6)	47.7 (2011)	15.9	8.4
São Paulo	Brazil	11,769 (75)	51.9 (2012)	40.6	21.8
Manila [21]	Philippines	4,073 (126)	43.0 (2009)	15.5	9.3
Jakarta	Indonesia	4,666 (122)	38.1 (2011)	7.8	5.2
Los Angeles	USA	48,387 (6)	47.7 (2011)	15.9	8.4
Karachi	Pakistan	2,787 (137)	30.0 (2008)	6.5	4.3
Osaka	Japan	34,740 (24)	24.9 (2007)	4.5	3.4
Kolkata	India	3,694 (129)	33.9 (2010)	8.6	5.6
Cairo	Egypt	6 ,540 (104)	30.8 (2008)	8.0	5.1
Buenos Aires	Argentina	17,516 (51)	44.5 (2010)	31.6	17.8
Moscow	Russia	16,736 (53)	40.1 (2009)	12.7	7.6
Dhaka	Bangladesh	1,693 (155)	32.1 (2010)	7.5	4.9
Beijing	China	8,382 (92)	42.1 (2009)	21.6	12.2
Tehran	Iran	13,053 (69)	34.5 (2010)	17.2	9.7
Istanbul	Turkey	14,517 (64)	40.0 (2010)	6.6	4.6
London	United Kingdom	36,090 (22)	36.0 (2007)	13.8	7.2
Rio de Janeiro	Brazil	11,769 (75)	54.7 (2009)	40.6	21.8
Lagos	Nigeria	771 (177)	48.8 (2010)	17.8	9.7
Paris	France	35,156 (23)	32.7 (2008)	9.1	5.6

Note: a. GDP are all adjusted according to purchasing power parity (PPP) rule

b. Gini Index: a quantified representation of a nation's Lorenz curve

c. R/P (10%): The ratio of the average income of the richest 10% to the poorest 10%

d. R/P (20%): The ratio of the average income of the richest 20% to the poorest 20%

Source: International Monetary Fund: World Economic Outlook Database in 2011. (18 April 2012)

World Bank Gini index, accessed on November 24, 2011.

Human Development Report 2009, UNDP, accessed on July 30, 2011.

The HDI is a composite statistic of life expectancy, education, and income indices used to rank countries into four tiers of human development. Namely, very high human development, high human development, medium human development, and low human development. Tables 2 and Table 4 illustrate the index of development level of regions and megacities all over the world. Compared to Western countries, except for Japan (Tokyo) and South Korea (Seoul), most of Asian countries which owns megacity, such as Philippines, Indonesia, Pakistan, and Bangladesh etc., are less developed.

Table 3 The HDI, IAHDI, IALEI, and IALI index of Regions in the World

Regions	**HDI** [a]	**IAHDI** [b] **(Overall Loss)**	**IALEI** [c] **(Overall Loss)**	**IAII** [d] **(Overall Loss)**
Arab Sates	0.652	0.486 (25.4%)	0.669 (16.7%)	0.538 (17.5%)
East Asia and the Pacific	0.683	0.537 (21.3%)	0.711 (14.2%)	0.455 (27.2%)
Europe and Central Asia	0.771	0.672 (12.9%)	0.716 (11.7%)	0.594(16.3%)
Latin America and Caribbean	0.741	0.550 (25.7%)	0.744 (13.4%)	0.421 (38.5%)
South Asia	0.558	0.395 (29.1%)	0.531 (27.0%)	0.436 (15.9%)
Sub-Saharan Africa	0.475	0.309 (35.0%)	0.335 (39.0%)	0.308 (30.4%)

Note: a. HDI: Human Development Index, a composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.

b. IAHDI: Inequality-adjusted HDI: HDI value adjusted for inequalities in the three basic dimensions of human development.

Overall loss: The loss in potential human development due to inequality, calculated as the percentage difference between the HDI and the IAHDI.

c. IALEI: Inequality-adjusted life expectancy index: The HDI life expectancy index adjusted for inequality in distribution of expected length of life based on data from life tables listed in Main data sources.

d. IAII: Inequality-adjusted income index: The HDI income index adjusted for inequality in income distribution based on data from household surveys listed in Main data sources.

Source: HDRO calculations based on data from UNDESA (2011), Barro and Lee (2011), UNESCO Institute for Statistics (2012), World Bank (2012a) and IMF (2012). http://data.un.org/DocumentData.aspx?q=gini&id=328 (2014.05.20)

Table 4 The HDI, IAHDI, IALEI, and IALI index of Megacities in the World

Megacity	Country	HDI [a] (Rank)	IAHDI [b] (Overall Loss)	IALEI [c] (Overall Loss)	IAII [d] (Overall Loss)
Tokyo	Japan	0.912 (10)	NA	0.965 (3.05%)	NA
Guangzhou	China	0.699 (101)	0.543 (22.4%)	0.731 (13.5%)	0.455 (29.5%)
Seoul	South Korea	0.909 (12)	0.758 (16.5%)	0.915 (4.3%)	0.679 (18.4%)
Shanghai	China	0.699 (101)	0.543 (22.4%)	0.731 (13.5%)	0.455 (29.5%)
Delhi	India	0.544 (136)	0.392 (29.3%)	0.525 (27.1%)	0.434 (15.8%)
Mumbai	India	0.544 (136)	0.392 (29.3%)	0.525 (27.1%)	0.434 (15.8%)
Mexico City	Mexico	0.775 (61)	0.593 (23.4%)	0.801 (10.9%)	0.463 (35.6%)
New York City	USA	0.937 (3)	0.821 (12.4%)	0.863 (6.6%)	0.681 (24.1%)
São Paulo	Brazil	0.730 (85)	0.531 (27.2%)	0.725 (14.4%)	0.411 (39.7%)
Manila [21]	Philippines	0.654 (114)	0.524 (19.9%)	0.654 (15.2%)	0.375 (30.0%)
Jakarta	Indonesia	0.629 (121)	0.514 (18.3%)	0.652 (16.8%)	0.453 (17.7%)
Los Angeles	USA	0.937 (3)	0.821 (12.4%)	0.863 (6.6%)	0.681 (24.1%)
Karachi	Pakistan	0.515 (146)	0.356 (30.9%)	0.487 (32.3%)	0.426 (11.0%)
Osaka	Japan	0.912 (10)	NA	0.965 (3.05%)	NA
Kolkata	India	0.544 (136)	0.392 (29.3%)	0.525 (27.1%)	0.434 (15.8%)
Cairo	Egypt	0.662 (112)	0.503 (24.1%)	0.724 (13.9%)	0.505 (14.2%)
Buenos Aires	Argentina	0.811 (45)	0.653 (19.5%)	0.796 (9.7%)	0.487 (34.4%)
Moscow	Russia	0.788 (55)	NA	0.689 (10.8%)	0.647 (11.9%)
Dhaka	Bangladesh	0.515 (146)	0.374 (27.4%)	0.595 (23.2%)	0.350 (17.7%)
Beijing	China	0.699 (101)	0.543 (22.4%)	0.731 (13.5%)	0.455 (29.5%)
Tehran	Iran	0.742 (76)	NA	0.703 (16.1%)	NA
Istanbul	Turkey	0.722 (90)	0.560 (22.5%)	0.743 (12.8%)	0.534 (26.5%)
London	United Kingdom	0.875 (26)	0.802 (8.3%)	0.903 (4.8%)	0.709 (16.9%)
Rio de Janeiro	Brazil	0.730 (85)	0.531 (27.2%)	0.725 (14.4%)	0.411 (39.7%)
Lagos	Nigeria	0.471 (153)	0.276 (41.4%)	0.286 (43.8%)	0.295 (34.5%)
Paris	France	0.893 (20)	0.812 (9.0%)	0.930 (4.2%)	0.732 (13.3%)

Source: HDRO calculations based on data from UNDESA (2011), Barro and Lee (2011), UNESCO Institute for Statistics (2012), World Bank (2012a) and IMF (2012).
http://data.un.org/DocumentData.aspx?q=gini&id=328 (2014.05.20)

4.3 Empirical Results

In order to study the relationship among income level, rural-urban divide and city size of megacities, we set up an OLS regression model 1.

$$P = \alpha + \beta \cdot GDP + \gamma \cdot R/P(10\%) + \varepsilon \quad \text{……..……..(model 1)}$$

Where

P: annual growth rate of population of megacity;

GDP: gross domestic product, a proxy of income level;

R/P(10%): the ratio of the average income of the richest 10% to the poorest 10% income level, a proxy of rural-urban divide.;

α, β, γ *:* coefficients of OLS regression.;

ε : error term.

Since there are some alternative indexes which could be used to be the proxy of income level and rural urban divide, equation (2), (3), (4), and (5) are alternative regression models.

$$P = \alpha + \beta \cdot GDP + \gamma \cdot R/P(20\%) + \varepsilon \quad \text{……..(model 2)}$$

$$P = \alpha + \beta \cdot HDI + \gamma \cdot R/P(20\%) + \varepsilon \quad \text{……..(model 3)}$$

$$P = \alpha + \beta \cdot IAHDI + \gamma \cdot R/P(10\%) + \varepsilon \quad \text{……..(model 4)}$$

$$P = \alpha + \beta \cdot IAHDI + \gamma \cdot R/P(20\%) + \varepsilon \quad \text{……..(model 5)}$$

Where

HDI: human development index, a proxy of income level;

IAHDI: inequality-adjusted human development index, a proxy of inco*me* level.

R/P(20%): the ratio of the average income of the richest 20% to the poorest 20% income level, a proxy of rural-urban divide.;

Table 5 shows the results of OLS regression from model 1 to model 5. These are no autocorrelation and multi-collinearity problems in all models.

First, the regression coefficients of GDP in model 1 and model 2, the coefficient of HDI in model 3, and the coefficients of IAHDI in model 4 and model 5 are all significantly negative. According to the proposition of adjusted pull-and-push model with "urban dream" factor, it implies that the income level has negative effect on the intensity of urban dream, therefore the lower income level will induce more people migrate into megacities.

Second, the coefficients of income inequality indexes R/P(10%) and R/P(20%) are all negative, in model 2, model 3, and model 5, these coefficients are significantly negative, it means that the income inequality will suppress the population growth of megacity.

Table 5 The Results of OLS Regression Models

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	3.630***	3.834***	7.743***	6.093***	6.266***
	(0.385)	(0.426)	(0.858)	(0.624)	(0.640)
GDP	-60778E-5***	-6.991E-5***			
	(0.000)	(0.000)			
HDI			-7.438***		
			(1.117)		
IAHDI				-5.851***	-5.933***
				(1.035)	(1.021)
R/P(10%)	-0.031			-0.035**	
	(0.018)			(0.016)	
R/P(20)%		-0.070 *	-0.031	-	-0.072**
		(0.035)	(0.031)		(0.031)
Adjusted-R^2	0.545	0.564	0.638	0.644	0.652
F value	15.996***	17.200***	23.030***	19.979***	20.638***
D-W value	2.112	2.033	1.815	1.889	1.889
Number	26	26	26	22	22

Note: 1. Dependent variable: Annual growth rate of population of megacities,

2. Number in parenthesis is the standard error of regression coefficient.

3. ***, **, and * denote significant at 1%, 5%; and 10% levels, respectively.

5. CONCLUDING REMARKS

Urbanization might be an irreversible process in the civilized world.

In general, we use push-and-pull theory to illustrate the city size and population density. On the one hand, the economies of scale, economies of agglomeration, positive locational externalities, and the pressure of rural poverty, are thought to be the positive drivers for promoting urban growth; on the other hand, each kind of cost accompanying with increasing population constrain the expansion of city.

However, there are some interesting differences of city structure between East and West. First, Among the 26 megacities in the world, 15 of them, including the top six, are located in Asia; second, the population density of city in the East is usually denser than that in the Western cities, of the 20 urban areas with the highest population density in the world, eight are located in mainland China (Tan et al., 2008), and last, the population in Asian

megacities still increases constantly with rapid economic development.

In order to explain the differences of Eastern and Western megacities, this paper brings the "dream pursuing" factor into the residents' utility function, that is, the choice of individual's migration not only depends on some economic reasons, but also on the consideration of dream pursuing factor. The adjusted push-and-pull theory with urban dream factor could be mirrored on the giant city size and the dense population density in Asian megacities.

In addition, in order to seek empirical supports of the "urban dream" effects, this research proposes that the intensity of urban dream is a decreasing function of income level, and an increasing function of rural-urban divide. That is, lower income level and higher rural-urban divide will induce stronger motive of "dream pursuing" migration, then increase the population of megacity in this nation.

According to the empirical results of 26 megacities all over the world, the income level does have negative effect on the population growth rate of megacity. In the frame of adjusted push-and-pull theory with urban dream factor, the empirical results imply that the higher income level will decrease the intensity of urban dream, thus the first part of proposition in this paper is supported empirically here.

With regard the effect of rural-urban divide on the intensity of urban dream, because it is easy to collect the data of rural-urban divide of all megacities, here we use the income inequality index to be the proxy, the empirical results finds that the income inequality has negative effect on the population growth of megacities.

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