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Megacities and Countries: Urbanization and Real Convergence

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“MEGACITIES AND COUNTRIES: URBANIZATION AND REAL CONVERGENCE”

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ABSTRACT. A new urban revolution begun in the second half of the XX century and it is going to challenge the relation between the size and economic role of cities: on one side, the last decades have witnessed the emergence and the never seen growth of a number of Mega-cities, with more than 9 million inhabitants, most of them being located in less developed countries. On the other side, the globalization of the post-industrial economy generates a new urban spatial organization where a few number of cities concentrate a disproportionate part of economic power, creation, decision and control. These global cities have been called World-cities or World metropolises. Most of the largest cities are in the less developed countries, while the most powerful world cities are mainly located in the developed countries. It results that size seems to be neither a necessary nor a sufficient condition for obtaining the status of global city. A condition to be a global city is the access to the economic power. The convergence or divergence processes among Mega and Global cities could be related to the level of development of the countries where Mega-cities are located, and its globalization degree. The main aim of this paper is to analyze the comparison between the real convergence-divergence among 43 Mega-cities of the World, and the convergence-divergence among its corresponding countries, using several growth models, studying the possible existence of Clubs convergence among Megacities.

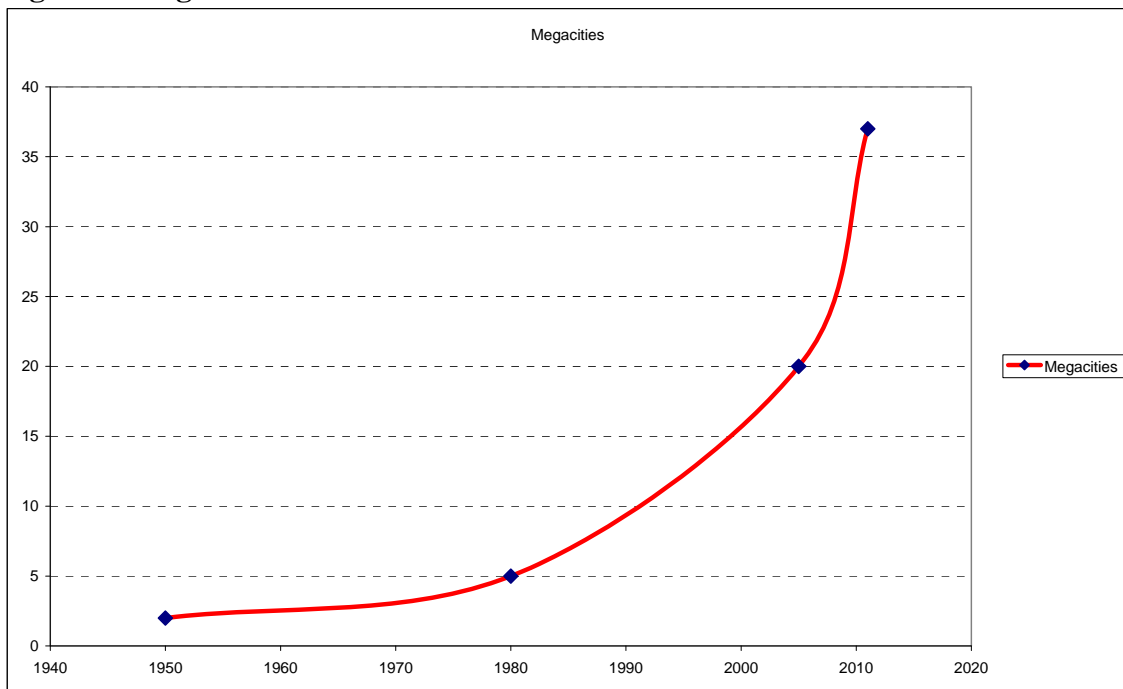
JEL Class: R11, O18, O47, J11

Keywords: Urban economics, Globalization, Clubs convergence, Economic growth, Mega-cities, Competition.

1. Introduction

According to the theorists of global capitalism it was during the 1960's that the organization of economic activity entered a new period expressed by the altered structure of the world economy: the dismantling of industrial centers in the United States, Europe and Japan; accelerated industrialization of several Third World nations; and increased internationalization of the financial industry into a global network of transactions. On the other hand, the globalization of the post-industrial economy generates a new urban spatial organization where a few number of cities, so-called Global cities, concentrate a disproportionate part of economic power, creation, decision and control. Throughout the XX Century these global cities were growing in quantity and inhabitants until transforming in megacities. At the same time, other cities without economic power, generally belonging to emergent and poor countries were growing until become megacities. (see Figures 1 and 2)

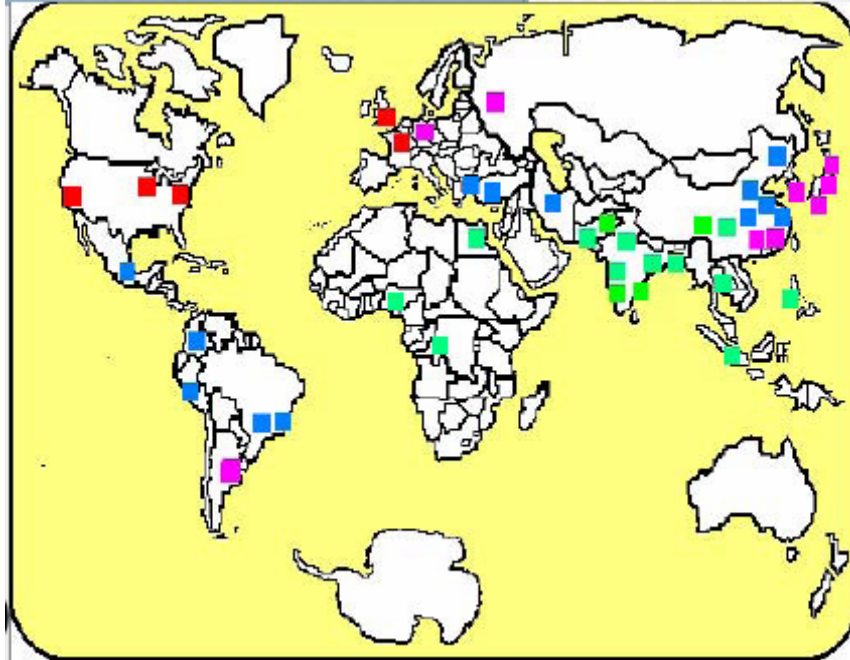
Figure 1. Megacities evolution



A global city, also called World city or sometimes alpha city, is a city generally considered to be an important node in the global economic system. The most complex of these entities is the Global city, whereby the linkages binding a city have a direct and tangible effect on global affairs through socio-economic means. The use of Global city, as opposed to Mega-city, was popularized by Saskia Sassen (1991), though the term

World city to describe cities that control a disproportionate amount of global business is used by Patrick Geddes (1915).

Figure 2. Distribution of the Megacities across the World (2012)



With the emerging spatial organization of the new international division of labor, John Friedmann (1986) identified a set of theses known as the World city hypotheses concerning the contradictory relations between production in the era of global management and political determination of territorial interests. Saskia Sassen (2001, 2000), Brenner 1998, Yeoh 1999, Hall 1996, and Friedmann 1995) have further re-elaborated the global city hypotheses. Global cities, it is argued, have acquired new functions beyond acting as centers of international trade and banking. They have become: 1) concentrated command points in the organization of the World-economy that use advanced telecommunication facilities; 2) important centers for finance and specialized producer service firms; 3) coordinators of state power; 4) sites of innovative forms of industrialization and production, and 5) markets for the products and innovations produced. These structural shifts in the functioning of cities are argued to have impacted both the international economic activity and urban form where major cities concentrate control over vast resources, while financial and specialized service industries have restructured the urban social and economic order. The big cities enter in some specialization and competition processes. It occurs that during the 1990's New York has specialized in equity trading, London in currency trading, and Tokyo in size of bank deposits. A similar situation happened with Hong Kong: it was said, before China

regained control of Hong Kong, that their financial services centers would be in international competition with each other. It turns out that Hong Kong is today the international financial centre for China, while Shanghai is the national financial center. It could be said that there's a comparable difference in the UK between London and Edinburgh. Within the US, again in the financial sector, Chicago is the centre for commodities futures, while New York is the centre for futures on interest rates. Chicago is a centre for commodity futures because of its history as the meatpacking and food processing centre for the mid-west. There exist a kinds of strategic games among the World cities. Some economists argue that competition between cities is indirect, as it derives from competition among businesses based chiefly on productivity. One of these economists is Krugman (1996), who has been critical of promoting competitiveness between cities. His view of competition is between companies, not between cities, regions or countries. Krugman states that cities do not have competitive advantages, only comparative advantages. Comparative advantages occur due to the access of resources others don't have. A competitive advantage can be realized when superior value for customers and profits are achieved by efforts from the provider of the service or product. The competitiveness of cities is, according to Krugman, nothing more than an appropriate aggregate of the competitiveness of the firms they contain. Other economists disagree with Krugman and claim that cities compete directly with other cities. Porter (1996), for example, states that the environment affects the competitive position of firms. Governments can play a role in shaping an environment in which firms can operate optimally. Therefore, cities have according to Porter competitive advantages and do compete with other cities. The behavior of the World cities among them could be explained by means of a spatial competition model, like the core-periphery model in Krugman and Venables (1990), by substituting regions by metropolitan areas. In the other side, like the Mega cities are not necessarily Global or World cities, it can occur that Mega cities and World cities could be diverging, depending partially of its globalization degree. The sequence of this work is the following: section 2 analyses the role of the globalization in general and on the urban process. Section 3 studies the impact of globalization on the convergence-divergence process in the most important World metropolises, and finally section 4 contains some findings.

2. The Role of the Globalization

The major driving force of economic globalization is the reduction of the transport costs in the private sector, due basically to the fact that technological progress and innovation has reduced the costs of transport and communication. Although globalization was a defining term of the 1990s, O'Rourke and Williamson (2000) distinguish at least three waves of the phenomenon which have taken place through the modern and contemporary history: From 1400 to the 18th century, facts such as the Renaissance of sciences and arts, the creation of the modern concept of state and the discovery of America gave rise to the first wave of globalization in the modern era which generated a series of small bordering states in the European zone that had similar cultures, technologies and were of a similar size. From this perspective, one can say that Europe was the focus of globalization in its first wave and although not the focus continues to have an important role. The second wave of globalization started in the early 19th century when the rise of trade was centred in basic tradable goods, coincided with the Industrial Revolution, and it was slowly being felt in other regions, besides Europe, especially in North America with USA as a leading country. The third wave of globalization applies to recent times in which trade takes place in both basic and highly differentiated manufactured commodities. This current wave is also generating a new focus of globalization in the Pacific Rim zone. This wave is characterized by the management of the financial markets and the production of the new technologies controlled by Multinational companies (MNCs) established in zones with high levels of human capital, population density and very low levels of labour costs. In this zone, Japan was the initial leading country with Hong Kong and the rest of China, Singapore, Taiwan, and Malaysia following. This third wave of economic globalization shows some specific stylized events. In basic terms these are the fact that trade, investment in research and development (R&D), foreign direct investment and technology links are increasing on a worldwide basis. Other factors include the liberalization of the telecommunications system and the rise of the internet which creates a truly global marketplace that has given rise to new opportunities for the international exchange of information. In addition, the enormous advances made in computer technologies, the fall in computer prices and recent technical progress in telecommunications facilitate access to information and reduce the price of communication, especially in those countries where deregulation and privatization has taken place. Similarly, the worldwide

web is reducing cross border barriers to zero. However, distance is still an important barrier to trade, not only due to the existence of transport costs but also due to the role of what is called social distance. There are two forms to eliminate the physical distance: good communications and telecommunications, or to generate cities that contain all goods, markets, services and amenities. Perhaps it can explain the high growth rate and size of some cities until transforming in Mega cities. Another driving force of the globalization is the reduction of policy barriers to trade and investment. The economic analysis of the impact of informational barriers to trade, following Rauch and Cassella (1998), is different to that of conventional barriers because the impact of trade on relative wages across countries causes changes in relative labour supplies. The combined effects of efficient communication systems spanning the globe and the emergence of an internationally mobile community of professionals work towards cultural globalization. These unleashed forces of globalization are crucial drivers in the intensified competition between regions and even more so between big cities which are vying for the best talents and high potentials in the workforce, tourists, grant money from national or international organizations and seek to attract or retain business corporations or mega events. In addition, new telecommunication systems are creating a great service sector that does not depend on the locations of technology production sites but does require advanced technological solutions. This structural change is also accompanied by an increasing proportion of highly qualified employees and an associated increase in wages. These changes are also related to a migration process of skilled labour. Apart from the symptoms of informational globalization in labour markets, capital flow volumes are in themselves an important indicator of globalization, and following Baldwin and Martin (1999), the most spectacular indications of financial globalization in the 1990s are the consecutive financial crisis around 1994 in Latin-America and 1997 in the Pacific Rim countries. Starting from 2007, it is necessary to add to these crises, the current financial crises that affect the developed countries of Europe and North America, among others. The accelerated speed of data exchange and transactions, the upturn of the service sector at the expense of the manufacturing industries as well as the multinational organization of production processes are among the major attributes of the current phase of globalization. With the fall in industrial jobs in large cities, a relatively small group of selected World cities serve as home bases for many multinational headquarters with important ramifications for the local and regional economies of those Global cities.

3. The convergence-divergence process among Global cities

With regard to the last two waves of globalization several authors have analyzed the effects of globalization on income per capita distribution and they have studied some types of resulting disparities. The second wave of globalization (1820-1914) resulted in the industrialized of the North (Europe and the North-American continents) and the de-industrialization of the South, a pattern that was not changed during the period between the second and third waves (1914-70). In the present wave of globalization some income divergence between groups of countries that were not initially disparate has been generated and this amounts to the most important implication of the Industrial Revolution in Europe. The second wave is also influenced by high transport costs and the fact that there was little trade and primitive industry. In the second stage of the process the cost of exchanging goods fell faster than the cost of exchanging ideas and innovations and, once transport costs were sufficiently diminished, the distribution of the industry was achieved by means of agglomeration forces. The third wave of globalization (from 1970 to the present day) began with the consequences of the second wave. In specific terms, it resulted from a very large income gap and a consequential de-industrialization of the North and industrialization of the South, largely caused by the significant fall in the transports costs of technological innovations. In the South, industrial investment rose and income grew whereas the North experienced some de-industrialization and tended to specialize in services. It is in this way that globalization forces first generated a huge divergence of real incomes and later tended to cause an increase in the development and likelihood of income convergence. Considering that, we will observe now if among the big cities of the World there is divergence or convergence in terms of real GDP per capita during the period 2005-2011.

The concept of convergence is based on the principle that poor economies with steady-state low production levels *per capita* tend to grow more rapidly than wealthier economies. Barro (1991) in his first empirical work on growth showed that if differences in the initial level of human capital are controlled for, then the correlation between the initial level of income and subsequent growth rate turn out be negative even in wider sample of countries. This is called absolute beta convergence (also called unconditional convergence because it implies that all countries or regions are converging to common steady state level of income). However, these structural parameters differ across countries and regions and countries may not converge to a

common level of income per capita but to their own steady state level (long run potential level of income). When steady states vary from one economy to the next, the concept of convergence used is that of conditional convergence, being a more real concept. The first contributions to this debate came from W. Baumol (1986), who studied convergence among certain countries (Japan and Italy versus the U.S. and Canada), and J. De Long (1988). Barro and Sala-i-Martin (1992) analyzed convergence among the different states in the U.S., whereas Barro (1991) and N.G. Mankiw, D. Romer, and D.N. Weil (1992) point at the importance of educational levels to explain divergence in terms of growth. Boldrin and Canova (2001) using a similar methodology severely criticized the previous results. Using a different data set, which includes 185 EU regions during the period 1980-1986, they concluded that the results are mixed and not supportive of convergence on regional per capita income. Canova and Marcet (1995) also, basing the analysis on per capita incomes for 144 EU regions, found only limited signals of convergence during the period 1980-1982. Others have studied different regions of new developed countries: Keller (1994) for Austria and Germany, Cashin (1995) for Australia and Coulombe and Lee (1993) for regions in Canada; Kangasharju (1999) for Finland and Sala-i-Martin (1996) for the Japanese Prefectures. The concept of conditional convergence found its more explicit formulation in Barro and Sala-i-Martin (1992) and Mankiw, Romer and Weil (1992). Both these papers emphasized the fact that the neoclassical growth model did not imply that all countries are converging to the same steady state per capita income. Instead what it implied is that countries would reach their respective steady states. Notwithstanding, from Quah (1996) other concept of convergence emerges: Clubs convergence. This concept explains that the countries belonging to a group spread not to one but to a few steady states. The present study tests the convergence of GDP per-capita within and across 43 Mega cities (population more high than 9 million inhabitants), and other 10 World cities or agglomerations with some economic power: Toronto, Sydney, Amsterdam-Rotterdam, Frankfurt, Zurich, Hong Kong, Johannesburg, Milan, Singapore and Madrid (see Table 1).

Formally, the starting point for analyzing real convergence is the neoclassical growth model, which we consider to be the only one able to predict conditional convergence if the speed (β) at which any given economy converges towards its own steady state is inversely proportional to the time difference separating the current economy from its own steady state.

Table 1. Population of the agglomerations analyzed

Agglomerations ordered by population	Population 2012 (millions)	Agglomerations ordered by population	Population 2012 (millions)
TOKYO-YOKOHAMA	37.126	TIANJIN	13.266
CHONGQUING	29.101	RIO JANEIRO	12.700
JAKARTA	28.019	LAHORE	12.500
GUANGZHOU	25.800	PARIS	11.940
SHANGHAI	25.700	KOLN-RUHR	11.215
SEOUL	25.600	CHENGDU	11.001
MEXICO	24.178	IZMIR	10.046
DELHI	23.500	NAGOYA	10.027
MUMBAI	22.376	WUHAN	10.020
KARACHI	22.100	HARBIN	9.874
NEW YORK	22.000	CHICAGO	9.800
METRO-MANILA	21.951	KINSHASA	9.518
BEIJING	21.900	LIMA	9.400
SAO PAULO	21.100	CHENNAI	9.182
CAIRO	20.384	BANGALURU	9.044
LOS ANGELES	18.100	BOGOTA	9.009
OSAKA-KOBE	17.550		
MOSKOW	17.000	MILAN	8.014
KOLKATA	15.835	JOHANNESBURG	7.900
DHAKA	15.414	HONG KONG	7.134
SHENZHEN	15.250	MADRID	6.600
LONDON	15.211	SINGAPORE	6.500
BANGKOK	14.566	TORONTO	5.900
BUENOS AIRES	14.300	SYDNEY	4.700
ISTANBUL	13.855	FRANKFURT	4.323
TEHRAN	13.500	AMSTERDAM-ROTT	3.004
LAGOS	13.400	ZURICH	1.470

Source: United Nations-Habitat and Price Waterhouse Cooper.

According to Barro (1997), convergence speed is an indicator of the time spent by a country or region to achieve its own steady state. On the other hand, non neoclassical or endogenous growth models are not able to predict convergence, except for the endogenous growth model with technological dissemination, where technology is spread gradually at no cost; for instance, Rebelo's AK endogenous growth model predicts zero convergence speed, that is, no convergence at all. If we assume some heterogeneity and differences in development levels among the cities analyzed in the present paper, it would be unwise to assume identical steady states for all, and consequently we resorted to the concept of conditional convergence. As we mentioned above, the best model to predict such convergence is the neoclassical growth model developed by R.M. Solow (1956) and T.W. Swan (1956), subsequently widened by N.G. Mankiw, D. Romer and D.N. Weil (1992) through the introduction of the capital production factor, including human capital (H). The way these authors incorporated

human capital into the equation was through an indicator (S_H) that remains constant so that no increasing returns to scale are generated in the production function, which would in turn result in creating an endogenous growth model unable to predict convergence. The human capital indicator is related to the steady state in such a way that the interaction parameter is not necessarily related to the steady state, already linked to the human capital indicator. Our aim is to model the growth and convergence processes of any given economy endowed with exogenous technical progress, promoting the labor factor and neutral in the sense of Harrod, symbolized by the letter A, which we assume to grow externally at a constant rate, g_A . In order to maintain the basic hypotheses for the neoclassical growth model, we need the production function to include globally constant returns to scale, nevertheless decreasing with respect to physical capital, which may be expressed as follows:

$$y = K^\alpha \cdot H^\gamma \cdot [A \cdot L]^{1-\alpha-\gamma} \quad (1)$$

Where y stands for production, L for labor factor, K for physical capital factor and α and γ for two parameters such that: $\alpha + \gamma = 1$. Expressing (1) in values *per capita*, we find that:

$$Y = \frac{y}{L} = K^\alpha \cdot H^\gamma \cdot A^{1-\alpha-\gamma} \cdot L^{-(\alpha+\gamma)} \quad (2)$$

Using natural logarithms and operating according to Mankiw, Romer and Weil's method (1992), we obtain the expression for the conditional convergence equation, which explains in turn the value for the real income *per capita* logarithm during a generic period t as a function of some determining factors of the steady state:

$$\ln Y_t - \ln Y_0 = [g_A \cdot t + (1-b) \ln A_0] + \sigma \ln(n + 0.05) + \lambda \ln S_K + \mu \ln S_H - (1-b) \ln Y_0 \quad (3)$$

But the growth rate of real per capita income with respect to the average per capita income accumulated during the period $(0, T)$ will be $\sum_{t=0}^{t=T} \frac{\Delta Y_t}{Y_t}$; and taking the limit we have:

$$\int_0^T \frac{dY}{Y} = \ln Y_T - \ln Y_0 = \ln \frac{Y_T}{Y_0} \quad (4)$$

Once the equation (3) has been regressed, convergence speed rate (β) is measured by

estimator b for the initial income logarithm, since the relationship between both is: $b = e^{-\beta t}$. If coefficient β is larger than or equal to zero then, given convergence, relatively poorer regions should grow faster than wealthier ones. If coefficient β takes on a negative value, it means that for the period analyzed the regions should be experiencing a divergence process in their income *per capita*. In equation (3), S_K and S_H stand for certain levels of physical and human capital that reveal a steady state, staying constant in order to avoid the appearance of increasing returns in these accumulative factors; S_K and S_H are ratios between final and initial amounts; t reflects the time lapsed between the initial and final situation and the current one. We can chose as indicator of human capital the enrollment rate in high schools that takes into account the proportion of individuals with high school and university education. The indicator can be obtained from the 2000-2011 reports on human development for the United Nations Development Program (UNDP). As for physical capital, we used the ratio between private investment and real income as a *proxy* for the frequency of use of the capital factor in the steady state. A_0 is the initial value for the coefficient of technical progress; n represents population growth rate; and Y_0 stands for initial level of real income *per capita*. The interaction parameter of the equation's regression (3) is $[g_A \cdot t + (1 - b) \ln A_0]$. Moreover, into a globalization process, many world cities tend to have similar determinants of their steady-states, mainly on the determinants on the human capital, like education, enrollment in schools or high quality in secondary schools. Hence it could be interesting testing absolute convergence among these world cities rather conditional convergence, although it is know that it does not occur among their respective countries. In this sense we will take as the intercept parameter (a) the term:

$$a = ([g_A \cdot t + (1 - b) \ln A_0] + \sigma \ln(n + 0.05) + \lambda \ln S_K + \mu \ln S_H) / T \quad (5)$$

And the parameter (a) embodies all the determinants of the common steady-state. The equation to determine the speed of absolute convergence has hence the following aspect:

$$\ln \frac{Y_T}{Y_0} = \ln B - (1 - b) \ln Y_0 \quad (6)$$

where $b = e^{-\beta T}$, and β is, in the dynamic transition toward the steady-state, the coefficient that indicates the speed of convergence of the real per capita income towards steady state. Then, the average rate of per capita real income in relative terms will be:

$$\frac{1}{T} \cdot \ln \frac{Y_T}{Y_0} = a - \left[\frac{1 - e^{-\beta \cdot T}}{T} \right] \cdot \ln Y_0 \quad (7)$$

By developing the term $e^{-\beta T}$ by means of a Taylor-McLaurin series we have that:

$e^{-\beta t} = 1 - \beta t$, that is, $\beta = \frac{1 - e^{-\beta t}}{t}$. And the equation (7) will be transformed then in:

$$\frac{1}{t} \sum_{t=0}^t \frac{\Delta Y_t}{Y_t} = \frac{1}{t} \ln \frac{Y_t}{Y_0} = a - \beta \ln Y_0 \quad (8)$$

This expression denotes how the growth rate of relative real per capita income is related negatively with the logarithm of the initial level of relative real per capita income ($\ln Y_0$). Alternatively explained, for a determined level of the interaction term (a) related with each steady state, the higher the per capita income in a country the lower the growth rate will tend to be. If the value of b is positive, and a is the same in all countries of the sample, then there will exist absolute convergence; if b is zero or negative it means that there is divergence. The coefficient β represents the speed of convergence, and if $\beta \geq 0$ and the interaction term (a) is the same for all countries, then the poor economies grow more quickly than the richer ones, and in such cases absolute convergence is said to exist.

Notwithstanding, our purpose in this analysis is to verify whether among the group of World cities considered can exist one only or several steady states. In this sense we can remember the concept of clubs convergence. Quah (1996, 1997) noticed that, in 1960, the world distribution of income was uni-modal whereas, in the 1990s, the distribution became bi-modal. He then used Markov transitional matrices and non-parametric methods to estimate the probabilities that countries improve their position in the world distribution. Using these matrices, he then forecasted the evolution of this distribution overtime. His conclusion was that, in the long run, the distribution would remain bi-modal. Cheung and Pascual (2004), however, use panel time series procedures for cross section correlated panels because their ability to reject a false null hypothesis is higher than the corresponding univariate procedures.

In our analysis we will use panel data techniques applied to the absolute convergence equation (8) across 47 World cities and Mega-cities during the period 2005-2011 with

annual data, using a fixed effects model for knowing the fixed effect of each city. These fixed effects reflect the complete determinants of the steady state of the corresponding city. Therefore when after the regression of the convergence equation, some fixed effects appear concentrated around a certain value, this will reflect the existence of a steady state common to the cities that belong to this group of concentrated fixed effects. On the contrary, big separations among groups of fixed effects will reflect different steady states. Hence the fixed effects model can help us to find clubs convergence in our sample. Other subject is the estimation of the speed of convergence. In this case, compared with cross country analysis, the time series approach generally used to predict clubs convergence, yields less convincing findings for the absolute and conditional convergence hypothesis. Consequently, with a panel data, we will use first a fixed effects model to find in our sample some clubs convergence corresponding to several steady states, and secondly, we will use a panel cross sectional model (between groups) to analyse the speed of convergence among cities towards one or several steady states. The equation used to estimate the speed of convergence among all cities considered, by means of panel data techniques, came from the equation (8):

$$\left(\frac{\Delta Y}{Y}\right)_{it} = \alpha + \mu_i - \beta \ln Y_{0it} + \varepsilon_{it} \quad (8)$$

Where the endogenous variable is the real per capita GDP growth rate measured in power parity purchasing units, Y_{0it} is the initial real per capita GDP (in 2005) and its coefficient β reflects the speed of convergence towards the steady state; α is the intercept parameter when there is not significant the fixed effects model, and μ_{it} are the spatial fixed effects when the fixed effects model is significant. The data necessary for analyzing the structure of the world city system are difficult to obtain because most statistical information is aggregated at the national level rather than at the city level, mainly with respect to the indicators of the human and physical capital at the respective steady states. However, the data of the 53 metropolitan areas for the period 2005-2012 on GDP, population, and per capita GDP at power parity purchasing has been collected by several data bases: Penn. World Tables version 7.1, International Monetary Found, United Nations, United Nations-Habitat, U.S. Department of Commerce, Brookings Institution, and Price Waterhouse Coopers. The results of the estimation are collected in Table 2. Following the Table 2, the best regression to predict is coming from the fixed effects model. Notwithstanding, between groups model explain convergence better than fixed effects, excepting Clubs convergence.

Table 2. Estimation of the absolute convergence among Mega and World cities

<i>Endogenous variable</i>	<i>OLSQ-ARI</i>	<i>Between Groups</i>	<i>Fixed Effects model (within groups)</i>	<i>Random Effects model (variance component model)</i>
<i>Growth rate Explanatory Variables</i>				
Ln Yo (-β)	-0.034066 (-4.015)	-0.025534 (-2.706)	-0.301895 (-14.871)	-0.093257 (-4.284)
Rho	-0.29825 (-0.288)			
Intercept	0.15416 (6.199)	0.130772 (4.729)	Fixed Effects	0.316767 (4.872)
Tests				
DW	2.0128			
Lagrange Multiplier			1.08	1.08
Hausman			152.417	152.417
R ² -Adjusted	0.13	0.12	0.84	-
R ²	0.14	0.14	0.92	0.28

Note: t ratios in parenthesis

The high value of the Hausman test rejects the random effect model in favour the fixed effects model. Moreover, the low value of the Lagrange multiplier test does not reject the OLSQ plains, nor the between groups models. The best model to predict the economic growth rate in cities is also the fixed effects model ($R^2 = 92\%$). All methods yield absolute convergence among all cities because the coefficient of LnYo (-β) is negative and significant in all cases. The value of this coefficient in the fixed effects model is overestimated with respect to the speed of convergence because it embodies a temporary component in the variable LnYo. Notwithstanding, the intercepts estimated this model (the fixed effects) reflect the determinants of each steady state corresponding with each city. When the values of several fixed effects are very similar, this minds the existence of a steady state common to the cities which its fixed effects appear together. In reverse, when the separation between two groups of fixed effects is too large, this reflects different steady states for each group. Table 3 collects the ordered fixed effects of cities coming from the estimation of the within groups model, and the first differences among these fixed effects, for assessing the existence of several steady states in the sample (clubs convergence). In this sense, from Table 3 we can deduce seven groups of fixed effects separated by intervals more high than 0.04, which reflect seven possible steady states for all considered cities, although it can be reduced to tree: the first, which contains cities of high economic power and development level.

Table 3. Ordered Fixed Effects by City and Steady States selection

	Agglomerations ordered by fixed effects	MARKETS		Population Ranking 2012	Per capita GDP-PPP US\$ 2012	Fixed Effects ordered	First Differen- ces
1	NEW YORK	SE	CM	10	65.891	1.25790	
2	LOS ANGELES		CM	16	59.184	1.22708	0.03082
3	CHICAGO		CM	34	56.333	1.21171	0.01537
4	ZURICH	SE		47	63.236	1.20476	0.00695
5	PARIS	SE		30	54.430	1.19193	0.01283
6	SINGAPORE		CM	42	57.505	1.19094	0.00099
7	LONDON	SE	CM	22	51.466	1.18422	0.00672
8	FRANKFURT	SE		45	50.411	1.17033	0.01389
9	AMSTERDAM-R	SE	CM	46	47.523	1.16051	0.00982
10	HONG KONG	SE	CM	40	49.342	1.15535	0.00516
11	SYDNEY	SE	CM	44	43.267	1.12972	0.02563
12	NAGOYA		CM	33	42.777	1.12423	0.00549
13	MILAN	SE		38	41.540	1.12022	0.00401
14	MADRID	SE		41	40.978	1.11845	0.00177
15	TORONTO	SE		43	41.323	1.11727	0.00118
16	TOKYO	SE	CM	1	40.543	1.11135	0.00592
17	KOLN-RUHR			31	39.183	1.09556	0.01579
18	OSAKA		CM	17	34.372	1.06064	0.03492
19	BUENOS AIRES		CM	23	32.696	1.02834	0.03230
20	SHENZHEN	SE		21	25.945	1.01199	0.01635
21	GUANGZHOU			4	22.164	0.97625	0.03574
22	MOSKOW	SE		18	26.128	0.97117	0.00508
23	SEOUL	SE		5	26.183	0.97016	0.00101
24	SAO PAULO	SE	CM	12	22.472	0.92988	0.04028
25	MEXICO			7	21.551	0.91497	0.01491
26	SHANGHAI	SE	CM	6	19.344	0.88086	0.03411
27	WUHAN			35	14.419	0.87706	0.00380
28	BEIJING			14	19.311	0.87406	0.00300
29	RIO JANEIRO			29	18.755	0.86877	0.00529
30	JOHANNESBURG	SE		39	17.067	0.84656	0.02221
31	TIANJIN			27	18.561	0.83755	0.00901
32	ISTANBUL			25	15.964	0.81468	0.02287
33	TEHRAN		CM	26	15.875	0.80082	0.01386
34	LIMA			37	14.817	0.79581	0.00501
35	IZMIR			32	14.526	0.78562	0.01019
36	BANGKOK		CM	24	12.505	0.74429	0.04133
37	MANILA			11	11.214	0.71345	0.03084
38	DELHI			8	9.982	0.68333	0.03012
39	CAIRO			15	9.295	0.66044	0.02289
40	JAKARTA		CM	3	9.044	0.64715	0.01329
41	MUMBAI	SE	CM	9	6.326	0.53468	0.11247
42	CHONGQUING			2	7.017	0.52893	0.00575
43	KOLKATA			19	3.744	0.34254	0.18639
44	KARACHI		CM	13	3.110	0.32263	0.01991
45	DHAKA			20	2.908	0.28222	0.04041
46	LAGOS			28	2.800	0.25907	0.02315
47	KINSHASA			36	1.429	0.09077	0.16830

Notes: 1) Main Stock Exchanges in the World (SE). 2) Main Commodity Markets (CM)

Source: International Monetary Found, Brookings Institution, and own elaboration.

The second group contains Mega cities corresponding to emerging economic areas, and the third group with Mega cities belonging to less developed areas. The highest steady state is common to the cities 1 (New York) to 23 (Seoul), included. The following group is separated from the first one by an interval of 0.04028. The cities belonging to the first group have high economic power. These cities have the most important stock exchanges (SE) and commodity markets (CM) in the World (see Table 3). All these cities are World or Global cities and are situated generally in developed areas. The most part of these agglomerations are also Mega-cities (more than 9 million inhabitants) but others have less inhabiting, like Zurich, Frankfurt or Amsterdam-Rotterdam. In the following group, the cities belong to some emerging countries or areas. In this group only a few number of cities have World economic power: mainly Sao Paulo, Shanghai and Mumbai. The group includes cities from 24 (Sao Paulo) to 42 (Chongqing). The separation between this second group and the third is very high (0.18639), but into the second group there are other two irrelevant separations. The third group of cities contains the poorest Mega cities in the World, which belong to less-developed countries: Kolkata (India), Karachi (Pakistan), Dhaka (Bangladesh), Lagos (Nigeria) and Kinshasa (Congo Democratic Republic).

With respect to the estimation of the speed of absolute convergence, we must use cross country regression approach instead time series approach, which is used to analyze clubs convergence. The speed of convergence obtained from a panel data by means of the fixed effects model is related with the clubs convergence concept, but not with the absolute convergence, because the initial per capita GDP is different for each panel data time period. In this sense, knowing that in the regression of the equation (8), the Lagrange Multiplier statistic does not reject OLSQ neither Between groups, the cross country regression must be applied to estimate the speed of absolute convergence, and the best method for that is the Between groups model, rather than OLSQ. The results of the regression of the equation (8) indicate that there is absolute convergence among all cities of the sample, and the speed of convergence towards a hypothetical common steady state is 0.0255. That implies a speed of convergence among all cities of 2.55 % annually. This speed of convergence among the Mega cities considered is higher than among the corresponding countries, where there is normally divergence. Moreover, following the clubs convergence concept, the speed of absolute convergence towards the specific steady state of each group of cities must be bigger and significant than among all cities considered in this work.

Table 4. Cross estimation results for Megacities and Countries convergence

Megacities Convergence toward its own Steady States		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (RICHEST)	-0.034960	-3.897
LnYo (RICH)	-0.033708	-3.671
LnYo (POOR)	-0.031784	-3.307
LnYo (POOREST)	-0.029788	-2.496
Population Growth (POOR)	-0.078814	-2.496
Population Growth (POOREST)	0.151105	6.025
Intercept parameter	0.276868	3.450
R² Adjusted: 0.66		
Convergence among all Megacities (37)		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.021591	-3.121
Intercept parameter	0.196648	2.782
R² Adjusted: 0.13		
Convergence among all Megacities and World cities (47)		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.025534	-2.706
Intercept parameter	0.130722	4.729
R² Adjusted: 0.14		
Convergence among Countries that have Megacities		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.0070035	-2.109
Intercept parameter	0.0410390	5.279
R² Adjusted: 0.18		

In the other hand, the evidence seems to be unequivocal: different regions in different countries are converging. Most rates of convergence are around 2% per annum. However, the same cannot be said about the whole world. With data of the past 30 years for 110 countries, the evidence shows that the world is not converging. They are diverging. Poor countries are getting relatively poorer and the rich countries getting richer. The argument put forth to reconcile these two facts is that there is no too much diffusion of technology across different countries. However, within a country, regions are more closely related. But due to the globalization, the rise of high technology applied to the telecom networks, the expansion of the financial markets, generally located around the big cities, together the great multinational companies, and the strong development in multimodal transportation networks, cause a great growth in some places of the World, attracting immigration and amenities. Nevertheless, although it seems to have convergence among all big cities considered in this work, not all these cities are similar. There are many differences among the three groups of cities above mentioned and within each group. Measuring inequality, whereas the Gini coefficient of

Johannesburg is 0.75 (strong social inequality), in Beijing is only 0.22. Or with respect to the poverty, while Mexico has a 14.4 percent of slum population in the urban area, Dhaka has 70.8 percent.

4. Findings

At the end of the XX Century, a great part of the global economic activity is developed mainly around metropolitan areas, which are converting in big cities that compete among them for the economic power. Competition makes economic convergence, and it explains that although among the different countries of the World usually exist divergence, this is not the case among the Global cities, as the results of this work indicate. Due to the revolution in communication and transportation technologies the Global city has more in common with, and more closely integrated with other Global cities than its own hinterlands. A conventional city has a region behind, and there is no region without city, neither city without region. But a Mega city has, at least, a country behind. When in a country there are several Mega cities, competition for the specialization emerges among them. However, as the results of this work indicate, there are at least three steady states among the group of 53 cities analysed. Globalization mainly affects to the cities which have the steady state more high. Almost all of these 23 cities have high economic power and possess strong indicators of a globalization process, such as the major stock exchanges in the World, the main commodity markets, the most important airports and hubs; these cities are very important nodes in the communication network by air, road, railways or boat. Around these cities the most important banks and multinational companies devoted to new technologies and telecommunications have its headquarters. These cities are hence Global or World cities and generally are situated in high developed countries. In the second group of cities, corresponding with an intermediate steady state, there are a few number of them that have a strong economic power, such as Sao Paulo or Shanghai, but normally the effects of the globalization on these sub-group of cities is lower than in the first group. These cities belong to emerging countries and some of them can to become in World cities. In the third group, the cities belong to less developed countries, and no globalization effects have had. They are very populous cities, but there is not any economic power. This implies that they are not World or Global cities, but only Mega cities. However, as a result of our research, we can say that there is absolute convergence in real per capita

income among all 53 big cities analysed, although really in the group of cities there are at least three steady states. In reverse, among the countries they belong there is normally divergence. This implies that the relation among big cities is not the same than among countries whose cities belong. Globalization seems stronger in cities than in countries.

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