The EU's Effect on the Urbanization Stages of the New Member and Accessing Countries

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-ABSTRACT-

This paper aims to reveal the eventual impacts of European Union (EU) membership process on city-size distribution of the New Members (NM) and Accessing Countries (AC) of the EU. In doing it I present three empirical results: (I) evolution of city-size distribution of these countries, calculated with Pareto and Hill estimator; (II) besides I establish a concrete linkage between development stage and city-size distribution stage in order to show urbanization stage of the EU-15 and the NM and AC; and (III) the impacts of the EU and linked factors on city-size distribution of these countries.

I can state main results as fallows: Direct and indirect effects of the EU are analyzed from different points of view. Agglomerating forces are dominant for the NM and AC. There is a clearly visible difference between the EU-15 and these countries in term of urbanization stage. The biggest impact of the EU comes from intern immigration that feed agglomeration process.

I. Introduction

One of the most remarkable aspects of the world economy is the uneven distribution of population and economic activity. However, the distribution of people and economic activity represents also regularities. There is a tendency in the economic literature, using basic equation, to reveal empirical regularities. Especially the Geographical Economics (GE) and the Urban Economics (URE) pioneer this kind of attempts. For example, **Krugman** (1995) described three particular empirical regularities: the equation underlying the rank-size distribution, the gravity model of trade, and the market potential analysis.

In both GE and URE, the size of cities matters and differences in city size must be the result of the fact that the balance between agglomerating forces (economies of scale, low transport cost, market potential, spillovers, externalities, high wage level etc.) and spreading forces (diseconomies, congestion, high land cost, cost of living, pollution etc.) differs between individual cities. Moreover one can add into the forces in question internal and external immigration and regional integration which have sufficiently powerful impact in the middle and long terms on the city-size distribution of countries.

In this paper I firstly handle theoretical back round of city-size distribution and analyze the eventual impacts of European Union (EU) membership process on city-size distribution of the New Members and Accessing Countries of the EU. The paper is organized as fallow: In the next section theoretical bases of city-size is dealt with previous literature; in the third section the Zip's Law is tackled with critics on its empirical side; and then I present a model that take account population dynamic and immigration behavior; in the fifth section city and data definitions take place; and finally empirical results are presented.

II. Economic Theories of City Size

In the economic literature, interaction between growth and cities occupies a large ground. Doubtless, cities play a crucial role in economic growth. This fact has been stressed on by many economic historians (see **Hohenberg and Lees**, 1985). As stated by **Fujita and Thisse** (1999, Ch. 11), “more precisely, cities are viewed as the main social institutions in which technological and social innovations are developed through market and non-market interaction. Furthermore, city specialization changes over time, thus creating a geographically diversified pattern of economic development. For all these reasons, cities are often considered the engines of growth”.

The requirements of competitiveness encourage the companies to privilege, in their choices of localization, the regions, best equipped in infrastructures, activities and services. The urbanization and the growth maintain the close links: as an economy develops the demand in manufactured goods and services increases. This reinforces the relative importance of these sectors in the economic structure, and consequently that of the city, which is the privileged place of their localization. Under the terms of the *economies* which emerge from the concentration of the activities and the people, the urban centre is desirable of an economic point of sight, even if negative externalities do not fail to appear within these human and economic regroupings.

If the search for external economies encourages the companies to cluster, the phenomenon takes sometimes such amplitude in the developing countries which it can become a source of major concern for the economists and for the politicians as well. The rise of these “giant” agglomerations (known as primate cities) justifies the growing interest for the interdependent questions of the urbanization, the growth and the regional inequalities in these countries. As the vast literature and the efforts made in order to comprehend the phenomena show the deep changes in a coherent theory over time (**Henderson**, 1974; **Krugman**, 1994a,b, 1988; **Krugman and Elinzondo**, 1996; **Puga**, 1998; **Fujita et** ***all***, 1999).

a. Agglomeration and growth

In fact the start of many theoretical works which attempted to explain the phenomena of agglomeration date back to Von **Thünen** (1826). In spite of the diversity of the approaches, there is a consensus to support that the agglomeration is an essential factor of growth. The reasons for which the people and the activities concentrate in the cities - external economies of scale and informational spillovers – make cities privileged in term of economic dynamism (**Alonso**, 1964;

Lucas, 1988; **Rivera-Batiz**, 1988). The concentration generates also diseconomies of scale and, with beyond certain size, the advantages are counterbalanced by these disadvantages (**Roback**, 1982; **Burnell and Galster**, 1992). According to certain economists, as soon as the cities reach this critical point, the rise in the land rents slows down their growth and in fact other spaces will attract the people and activities (**Henderson**, 1988; **Duranton**, 1997; **Brueckner and Zenou**, 1999). As long as new cities are formed and that the land markets are perfectly competing, the urban growth leads to an effective allocation of resources (**Henderson and Becker**, 2000).

With regard to the developing countries, the question is not solved and two points of view are opposed for a long time in the literature. On a side, **Bairoch** (1985, 1992) and **Torado** (1995) support that the less developed countries are over-urbanized and that the concentration of the urban populations in the "primates" cities can constitute a blocking to their development. Who defend a control of the urban growth stress that the decreasing returns are often underestimated in the literature and recommend interventionist policies in regional planning in order to limit the social and environmental harmful effects (**Tolley and Crihfield**, 1987) as much as to generate an important concentration (**Zheng**, 1998).

Contrary, **Whealton and Shishido** (1981) and **Moomaw and Shatter** (1993, 1996) advocate in favor of the large cities because they are necessary to carry out economies of scale which will allow a "takeoff". Following work of **Williamson** (1965), certain authors indeed could note that a strong degree of urban concentration was associated at the first stages of development[1] and that as the income of the countries increased, the *primacy* was increasingly less observed (**El-Shaks**, 1972; **Davis and Henderson**, 2003).

In the "new geographical economy", increasing returns, transport and accessibility to a vast market are key factors of concentration (**Krugman**, 1991a). The agglomeration results from the interaction enter increasing returns, transport cost and pecuniary externalities. The firms located in densely populated areas gain, in terms of fixed costs if they concentrate their production in only one site, and terms of transport cost while being located near vast markets (final and intermediary). The primacy will be as observable as the infrastructures of intern transport are poor (**Krugman,** 1994), as the access to the foreign markets is made difficult by restrictive

[1] I will deal with development stages more detailed in the next chapter.

marketing policies to importation (**Krugman and Livas-Elizondo**, 1996) as to export (**Gelan**, 2003), and as the level of development is low (**Catin and Ghio**, 2004).

The liberalization, by favoring the access to the external markets, has an impact on the localization of the activities. Certain studies provide a conceptual framework to understand how increasing returns to scale and opening-up of trade modify the space organization of production (**Henderson,** 1982; **Rauch**, 1993; **Krugman and Venables**, 1995; **Ottaviano and Thisse**, 2002). But this polarization, if it generates productivity gain, attracts also strong migratory movements: by accelerating the urbanization, it generates regional imbalances, from economic and social points of view.

The question is important because too centralized hierarchies can lead sometimes to disorder. It is the scenario, called “catastrophic” agglomeration developed in the model center-periphery (**Krugman**, 1991a; **Abdel-Rahman and Wang**, 1995; **Baldwin *et al,*** 2001). This phenomenon creates fear of a deficit of intermediate cities in the urban structure and the stressing of dualism between regional spaces. The city is not an element isolated in space, it falls under a system of cities in interrelationship which organize and serve a space. The city is “a system in a system of cities” (**Berry**, 1964).

b. The city in a system of cities

Very early, the cities seem to be organized in networks, sometimes extremely hierarchical: *Rome* establish its authority on an immense territory thanks to such an organization space (**Von Mises**, 1966, p. 806), in the Middle Ages, the cities of *League Hanseatic* or that of *Décapole* also provide examples of hierarchical space distributions. The concept of urban hierarchy rises consequently from the observation of the facts and gained a renewed interest thanks to work of **Christaller** (1933) and **Lösch** (1940). The geographers and the economists note that the urban issues appear to be organized according to strong regularities of sizes, number and spacing. Also they will seek to explain how this order can emerge from an visible chaos of individual behaviors.

The concepts of hierarchy and centrality are closely dependent: one often compares the cities to centers, economic, administrative, religious etc. By center one understands that the city carries on an activity of control on the territory which surrounds it (**Pumain**, 1994). It polarizes flows because it is at the same time a node of communication and a center of exchange. Once these centers located in space, the economists and the geographers tried to make understandable the territorial organization of these town suits. The concept of hierarchy tries to answer in the same time to several problems: one seeks to explain why and how towns of different sizes coexist in the same space and to understand the subjacent logic such urban networks. Their organization results in general from the frequency of use of a good or a service, from size of market of the cities, from thresholds of appearance of certain urban functions for example tendency to concentrate in the same centers. Geographical and urban economists seek to show that this hierarchy is more or less spontaneous and powerful.

The theory of the central-places currently knows a revival because the recent models of geographical economy take again the topic of the spontaneous organization of the urban systems in hierarchical networks, this time in a context of general spatial equilibrium (**Fujita and Mori**, 1997; **Fujita *et al***, 1999; **Fujita and Krugman**, 2000). The distance between the centers is taken into account thanks to the introduction of interurban transport costs. These models explain the diffusion of the urbanization by the growth of the population and the interaction between centrifugal and centripetal forces. The presence of farmers uniformly distributed on the space, constraints of routing of the industrial goods to these consumers and the agricultural goods at the urban markets, as well as competition resulting from the firms which located to the same place encourage the dispersion of the activities. Economies of agglomeration (forward and backward linkages) maintain the urban concentration. Space equilibrium, and the hierarchy, which rise from these interactions will depend on the relative values of the various parameters: consequently a great number of space configurations can be described by these models.

The models of urban systems show that the urban hierarchies emergent spontaneously because they make it possible to organize the production and distribution efficiently (**Henderson**, 1982; **Fujita *et al***, 1999). In the orthodox economics, the market forces naturally controls the urban systems, which are effective from the point of view of the sizes and the number of cities which compose them.

The hierarchical relations seem to be a historical and cultural invariant, at such point that one has searched a “law” reflecting this regularity. The observation reveals that the cities do have neither the same sizes, nor the same functions but that their distributions in the urban structure have certain regularity. However, the regularity of the urban size distribution poses a “real puzzle” (see **Fujita** ***et all***, 1999). The analysis and the description of the size-distribution of cities within an urban system attracted the attention of many researchers since work of **Auerbach** (1913) and **Zipf** (1949). We well look at the principal empirical works which have sought to test the regularity in the city distribution.

III. The Zipf's Law

One of powerful regularities observed in rank-size distribution of cities is the Zipf’s Law. The law expresses that there is a logarithmic proportional relationship between rank and size of cities in linear form. A linear regression of log-rank on log-size gives a very high R^2 and the coefficient of the log-size is generally found to be close to unity. When Zipf’s Law holds, the largest city in the sample is more than *b* times as large as the *b*th largest city. **Auerbach** (1913)[2] is considered as the first to observe this empirical regularity in the size of distribution of cities which was recognized “Zipf’s Law” due to **Zipf** (1949) who propagated this regularity. What Zipf did is that he had tried to approximate the distribution of city sizes with a Pareto distribution[3]. In empirical studies, when cities are ordered by population size, regressing the logarithm of their rank on the logarithm of their size yields a slope coefficient close to minus one in so instances that the phenomena has acquired the status of the eponymous Zipf’s law. Taking exponents, the relationship can be seen to be a special case of a power rule relating the size rank of a city to some power of its population size rendering the statistical distribution appropriate for the relationship a member of the family due to **Pareto** (1897) more commonly employed in modeling income distributions. More generally, the

[2] Like its empirical side, the theoretical side of the Zipf’s Law is open to discussion. Despite the early discovery, the quest for a robust theoretical model to explain such an empirical distribution of cities remains elusive. **Christaller** (1933) described Auerbach’s finding as “a most incredible law” which was “nothing more than just playing with numbers”. The criticism on the fact that the Zipf’s Law miss a theoretical foundation has carried on to the 1990’s. In this context, the theoretical side of the Zipf’s Law was tried to be challenged by **Mansury** and **Gulyas** (2006) with the agent-based approach, by **Krugman** (1996a) with the scale economy based model, by **Page** (1999) with the spatial computational model, and by **Brakman** ***et all*** (2001) with the congestion model.

[3] This is also known « power law ». This basically says that the Pareto exponent of the distribution of city sizes is equal to unity.

Pareto exponents generated from the rank size regression are not necessarily equal to unity, and this so-called rank size rule is believed to be applicable to almost all countries around world.

In the facts, much of authors could note that the number of cities of big size seems to decrease according to a rather regular geometric progression which depends on their rank in the urban hierarchy. Statistical a "law", inspired by **Zipf** (1949), gives the size of a city according to its rank in the hierarchy and of the population of the most important city of the considered space. On the theoretical level, this descriptive model seems quite founded (**Getz**, 1979).

However, this empirical report is completed by a functional specialization at the various levels of the urban hierarchy. Geographical regularity and economic logic appear inseparable. Also let us underline that the hierarchies of the urban networks are apparently very stable in time. Nevertheless, the hierarchy is not solidified; it does not necessarily correspond to equilibrium, but rather to the result of dynamic processes impelled in the past.

However, since **Christaller** (1933) and **Lösch** (1940), one knows that a balanced space must comprise various categories of agglomerations. The small cities are used as interface between the rural world and the urban world, the average cities between the small centers and the regional metropolises, and so on, the capitals offering a privileged connection with the rest of the world. The sizes of the centers are decreasing according to the rank which they occupy in the hierarchy but their number is multiplied. The urban population residing in the small cities must be more important than that of the intermediate cities, the cumulated manpower of the intermediate cities superior to that of the regional cities,… etc to the capital.

The "rank-size" distribution gives in fact a synthetic description of the spatial organization. It is in any case an inter-temporal referent and universal like one a long time wanted to believe it, but it has the advantage of allowing comparisons compared to a distribution which one could qualify "the ideal one" on the theoretical level.

According to **Parr** (1985), the mode the urban system is "young" and the more it can have imbalances but the populations tend to be redistributed towards the small and average cities because of the negative effects (pollution, congestion, increase in ground rents… etc) which touches the great agglomerations. Decentralization takes place at the final stages of development taking into account the fact that the urban congestion and the improvement of the infrastructures (in particular of transport and communication) lead to a delocalization of the activities towards periphery (**Henderson *et al*,** 1995).

Nevertheless, if the people and the activities tend to concentrate in an agglomeration, logic of center-periphery proposed by certain models of geographical economy (**Krugman**, 1991a; **Abdel-Rahman and Wang**, 1995) and of endogenous growth (**Waltz**, 1996; **Martin and Ottaviano**, 1999; **Baldwin**, 2001) will reveal. One can consider a spatial duality. In the long term, the problems involved in the thickening around the important cities are likely to threaten the economic performances like social and environmental balances.

In brief, the Zipf's Law posits that if one ranks cities in descending order according to their population size, and then estimates the following equation:

$$\log(R_j) = \alpha - \beta \log(M_j) \qquad (1)$$

where α is constant, M_j is the size of city j (measured by its population), and R_j is the rank of city j (rank 1 for the biggest city, rank 2 for the second biggest city, etc.). In empirical research β is the estimated coefficient, giving the slope of the log-linear relationship between city size and city rank. It means that if and only if β=1, the Zipf's Law holds. If β is smaller than unity, a more even distribution of city sizes results than the Zipf's Law predicted. That is to say, if $\beta = 0$ all cities are of the same size. If β is larger than unity, the large cities are larger than the Zipf's Law predics, implying more urban agglomeration (the larger city is more than *b* times as large as *b*th largest city. Empirically, if the rank-size distribution holds, the question to pose is whether β=1 or not.

a. **Empirical validations of the Zipf's Law**

The empirical validity of Zipf's Law is debated by many authors (See **Black and Handerson**, 1999, 2003; **Gabaix** and **Ionnides**, 2004; **Krugman**, 1996; **Soo**, 2005). And even if they have different points of view, they reach a consensus on two points: (I) Zipf's Law holds *proximately* but not *absolutely* (the coefficient's value varies round the unity), and (II) Zipf's Law changes over time. For example look at empirical studies on the USA, **Caroll** (1982) says that Zipf's Law does not always hold for the United States. **Rosen and Resnik** (1980) find that the Pareto coefficient is equal to 0.84 for the USA. **Black and Handerson** (1998) showed that the slope of the city-size distribution slowly increased in the USA over the course of the twentieth century[4].

Several empirical studies tried to test the validity of these models. Since 1936, Singer examines the results of the application of the rank-size distribution of cities of more than 2000 inhabitants of seven countries. **Allen** (1954) starts an identical step on a sample of 58 countries. **Rosen and Resnick** (1980) are pressed, them, on a sample of cities of more than 100000 inhabitants of 44 different countries of which coefficients of Pareto β are located in the interval [0,81; 1,96], with 75% of the country posting an absolute value of the exhibitor higher than 1 (the average of β is equal to 1,13).

On the methodological ground, these authors show that the slope of the distribution is extremely sensitive to the criteria of selection of the sample, which also confirms the study of **Brakman *et al*** (1999) which applies to a whole of 42 German cities (β=1,13). Obtaining contradictory results they put forth the assumption of a possible deviation with respect to the strict linearity between the logarithm of the size and the logarithm of the rank which characterizes the Pareto's Law. This deviation is studied by adding a quadratic term to the basic equation of the rank-size relation which transforms it in a following way:

$$\log(R_j) = \alpha - \beta \log(M_j) - \delta \log(M_j)^2 \qquad (2)$$

[4] See also **Dobkins and Ioannides** (2000) and **Eaton and Eckstein** (1997) who find for Japan and France that Zipf's Law nearly holds and the coefficient changed over time. I will explain in the next section from what the differences between the empirical studies realized with the same data result.

According to **Gabaix and Ioannides** (2003), when δ is significantly different from 0, one moves away from the Zipf's law. If δ>0, the curve of the rank-size distribution are strictly convex, which means that the number of intermediary cities is lower than that recommended by the Zipf's Law. If, on the contrary, δ<0, the curve of the distribution are strictly concave, which implies a significant number of intermediary cities whose demographic weight counterbalances that of the great agglomerations and the small cities.

Moriconi-Ebrard (1993) proposes an analysis of the distribution of the cities of more than 10000 inhabitants in 78 countries, from the industrialized countries to the developing countries. It finds an index of global hierarchization (β) equal to 1,05, with a relatively weak standard deviation (0,138), which confirms the validity of the Zipf's Law on a world scale. Nevertheless, the variation of β nationals, which range between 0,73 and 1,38, shows a certain differentiation of the countries according to their level of development and their political régime.

Fujita et al (1999), as well **Gabaix** (1999b) examine the urban hierarchies in the United States by using a sample of 130 cities and find a Pareto coefficient close to unit for the higher part of the distribution (1,004 for Fujita et al, 1,005 for Gabaix). **Guerin-Pace** (1995) studies the French case by applying the model to 1782 urban units of more than 2000 inhabitants (the coefficient is equal to 1.05).

Lastly, **Dobkins and Ioannides** (2000) try to study the evolution of the slope of the rank-size distribution of the American cities between 1900 and 1990. They show a systematic fall from β who passes from 1,044 in 1900 to 0,999 in 1950 and to 0,949 in 1990, which represents a demographic reinforcement of the great agglomerations during the twentieth century. However, while using a different sample which is based on a definition more complex of the agglomeration, **Black and Henderson** (2003) arrive at more contrasted results. The coefficient of Pareto is appreciably lower than that calculated by Dobkins and Ioannides and posts a less deterministic evolution: it increases slightly between 1900 (β =0,861) and 1950 (β =0,870) and drops thereafter (β=0,842 in 1990). Black and Henderson draw, by this bias, a strongly hierarchized American space where the tendencies to demographic concentration accelerate in second half of the twentieth century.

b. **The Pareto coefficient with the Hill estimator**

Estimation of the β values by many authors diverge according to whether they use the method of least squares ordinary (OLS) or the Hill estimator (1975). **Gabaix and Ioannides** (2004) show that the Hill estimator (who is that of the method of the maximum of probability, when the law of Zipf is checked), for a sample of n cities with sizes $M_1 \geq M_j \geq M_n$ is equal to:

$$\beta = \frac{n-1}{\sum_{j=1}^{n-1} (\ln M_j - \ln M_n)} \tag{3}$$

while the standard error for $\frac{1}{\beta}$ is given by the equation:

$$\sigma_n\left(\frac{1}{\hat{\beta}}\right) = \left(\frac{\sum_{j=1}^{n-1} j(\ln M_j - \ln M_{j+1})^2}{n-1} - \frac{1}{\hat{\beta}^2} \right)^{\frac{1}{2}} (n-1)^{-\frac{1}{2}} \tag{4}$$

If $\frac{1}{\hat{\beta}} > \sigma_n\left(\frac{1}{\hat{\beta}}\right)$, the standard error of the estimate of β is equal to:

$$\sigma_n(\hat{\beta}) = \hat{\beta}^2 \left(\frac{\sum_{j=1}^{n-1} j(\ln M_j - \ln M_{j+1})^2}{n-1} - \frac{1}{\hat{\beta}^2} \right)^{\frac{1}{2}} (n-1)^{-\frac{1}{2}} \tag{5}$$

According to **Gabaix and Ioannides** (2004), the Hill estimator, being more robust, corresponds better to the low part of the rank-size distribution of the cities that the estimator obtained by the method of least squares ordinary (OLS).

Into its study based on a sample of towns of 73 countries and by using the method of least squares, **Soo** (2005) rejects the empirical validity of the law of Zipf, for 73% of the cases, that is to say 53 countries. This consolidates the results of **Rosen and Resnick** (1980) which invalidated the assumption of a Pareto coefficient equal to unit in 82% of the countries of their sample. While using, on the other hand, the Hill estimator, the rate rejection drops to 40% of the cases (**Soo**, 2005).

With a better determination of the standards errors, the Hill method thus provides an estimation of the Pareto coefficient which leads to a more systematic checking of the Zipf's Law. However, this estimation method is subject to many criticisms, in particular as for its capacity to represent the lognormal distribution of the cities since their demographic growth is not independent of their size, which is a condition of rejection of the Zipf's Law (**Embrechts, Kluppelberg and Mikosch**, 1997; **Pumain and Moriconi-Ebrard**, 1997).

c. **Some conclusions of the empirical studies**

Table 1 recapitulates the results of principal empirical work which seeks to test the validity of the law of Zipf on the distribution row-size of the agglomerations within the various urban systems, areas or country.

The whole of this empirical work makes it possible to draw up a certain number of conclusions on the methodological level, as regards the distribution row-size of the cities:

- The value of the Pareto coefficient is very sensitive to the size of the sample, but also to the adopted definition of the city and/or the agglomeration;
- The value of the Pareto coefficient is variable according to the method of estimate; in a general way, the Hill method gives coefficients lower than the method of OLS, when the

weight of the large cities is oversize and vice versa; it allows, by elsewhere, a better estimate of the standards errors of the Pareto coefficient;

- In the whole of the studies, the value of the coefficient is relatively close to 1 when the sample size is relatively important, even if the confidence intervals are more or less spread out according to the country, the threshold of the urban population selected or the calculation method.

Taking account of these conclusions, study the evolution of the rank-size distribution of the cities for the new member and candidate countries[5] of the European Union (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia Bulgaria, Romania, Croatia, Turkey).

IV. The Model

As I explained above through former empirical studies, the rank-size rule which means a systematic order in distribution of cities does not hold always for all countries but changes over time. Thus one can say that the Pareto coefficient resulting from the estimation of the Zipf's Law is neither universal nor fixed. Nevertheless, there is a subjacent consensus of the empirical works in question about the fact that the over-time-change in city-size distribution follows a regular trajectory according to economic level of countries as a result of structural changes in the economy. Temporary variance in rank-size distribution of countries depends on certain conditions. For instance, **Gabaix** (1999a) shows that the Zipf's Law results if cities are characterized either by constant returns to scale or by external (increasing) returns to scale. According to this conclusion, a geographical economics model with centrifugal and centripetal forces gives rise to the Zipf's Law. "Indeed, the whole thrust of the [geographical economic] model[6] is to understand the forces that spread economic activity away from center

[5] Taking into consideration of the geographical closeness I included into analysis only the new and candidate countries around the Balkans Region. I excluded also Croatia that has yet applied for the EU.

[6] I have to precise that what Krugman means by "geographical economic model" is the model based central-place theory. In fact, historical economists who inclined on urban evolution use two points of view to analyze the linkages between cities. The firs one is the central-palace approach developed by **Christaller** (1933) following monocentric model of **von Thünen** (1826) and the second one urban-system approach based on industrial and commercial differentiation among cities, where systems imply close interurban linkages. Both of them stress on the regularity in size and other variables like distance of centers or population. So it is not surprising that both approach use the rank-size rule as a tool to reconstruct urban relation through its regularity.

(centrifugal forces)" and "the forces that pull economic activity together (centripetal forces)" (**Krugman**, 1995, p.53). Now it is useful to look at the linkage between development stages and urban evolution. This would lead us to better understand centripetal and centrifugal forces in formation and re-formation of urban structure.

a. Development Stages and Evolution of Urban Structure

However, since especially development economists (see **Rosenstein-Rodan**, 1943; **Hirschman**, 1958; **Myrdal,** 1957) looked at location issue in framework of why some countries are much poorer (or industrialized) than others, different authors have described "forces" or "effects" in order to determine development stages for realizing comparative studies. Indeed the work of listing *forces creating stages* dates back to **Weber** (1909) who emphasized "location triangle"[7]. Following Weber's "location triangle", Myrdal's "backwash and spread effects", Hirschman's "backwards-forwards linkage", **Krugman**(1993c) brought a progressive point of view with the instruments of the geographical economics. He described two "nature". In the "first nature, inter-industry specialization, comparative advantages, high transport cost, geographically distributed demand etc. matter. And in the "second nature", dominating factors change, for example, economies of scales, low transport cost, imperfect competition, differentiated goods etc. This approach is used also in empirical and theoretical works of international trade.

Catin and Ghio (2004) develop a geographical economic model with four development stages where they examine the spatial concentration of different kinds of activities. (I) pre-industrial regions: the initial agriculture-industry complementary relation extends; (II) regions with standardized industries: the location of a "standardized" industry extends with external and pecuniary economies of scale in a monopolistically competitive environment; (II) regions with technological industries: autonomous technological progress spread to other regions due to technological externalities; (II) metropolitan regions with superior services: industrial activity leads to the development of the sector of services. The

[7] Weber's approach, subsequently developed by Christaller, deals with historical dimension of the formation of cities. He defines three "strata", say stages according to the types of economic activity: the first stage concerns traditional activities, the second, small manufacturing activities which back the locations of first stage and the third stage means spreading of the second activities.

four development stages which set also a link between specialization pattern and trade structure are explained by Catin and Ghio as follow:

> "During each stage, the export pattern changes, due to the evolution of regional specialization. During the first stage as well as during the transition to the second one, regional specialization is based on factor proportions and their relative prices. In the second stage, the regional industry becomes specialized in the production and export of standardized but low-technological content goods- this specialization stems from the exploitation of scale economies and low-paid jobs. Economic development and geographic concentration have combined effects, which go through: i) supply and demand multiplier effects –this leads to a development of complementary and induced activities; ii) capacity investments and scale economies – which foster exports. In the third stage, the regional industry is oriented towards high-tech activities, based both on the exploitation of autonomous productivity gains and on a significantly skilled labor force. With a significant export basis, the usual internal multiplier will lag far behind foreign trade multipliers and non-price competitiveness effects. Technological interactions will boost innovating activities and investments through networks, whether organized or not, cross-sectoral spillovers will give way to 'backward and forward linkages', due to trade. In the fourth stage, the high-tech and rich region will experience worse performances for its exports of industrial commodities, as compared to regions in the second and third stage –mainly because its services exports increase. The technological potential and the metropolitan dimension of region, together with the concentration of research and development, decision and commercial activities, lead to the production of superior services" (Catin **and Ghio**, 2004).

Briefly, this analysis shows that industrial specialization in the first two stages is based on economies of scale and low-paid works, while specialization in the two last stages is based on the exploitation of autonomous productivity gains and skilled labor force. In this model the firs two stages correspond to Krugman's first and second natures in regional development.

Similarly **Kooij** (1988) assumes a sample description, close to that of Krugman, in framework of determining of development stages of cities. It is coherent with spreading and agglomerating forces. **Brakman et al** (2001) adapted Kooij's stages of urbanization to their rank-size distribution analysis for Netherlands. Kooij distinguishes three stages of urbanization: (I) Pre-industrialization, characterized by high transport costs, substitute produces and production being dominated by immobile farmers; (II) Industrialization, characterized by declining transport cost and the growing industrial production with increasing return to scale; and (III) Post-industrialization, characterized by the declining importance of industrial production, and increasing importance of negative externalities, like congestion. In the first stage, there is low level of integration due to high transport cost. In the second stage, decrease in transport cost pushes some cities to expand and to be bigger. Agglomeration forces dominate in this period. In the third stage, transport cost remains low but the manufacturing sector is characterized by differentiated products and increasing returns to scale. Nevertheless spreading forces, or so-called congestion effects, like diseconomies, traffic jams, pollution, criminality, raising land rents in larger cities etc. emerge in this period. For example, **Cullen and Levitt** (1999) have shown that on average, a 10 percent increase in crime rates subsequently leads to a one percent decline in population.

A combination of Catin and Ghio, Krugman and Kooij approaches can be possible when we want to focus on flows of goods, services, and people (immigration). This permits us to effectuate comparative studies with various variables which have impacts on rank-size distribution of countries. A basic correlation analysis can say to us a lot of things about the linkage between development level and city-size distribution.

Subsequently, following the estimation of the Pareto coefficient for the period between 1995 and 2005 first I will keep it as explained variable. And then I will run a multivariable regression in order to reveal the degree of influence of certain factors on the temporary change in the rank-size distribution of the countries in the sample. But before built estimation model I have to precise in the light of what I have stated up to now two dynamics: population dynamic and immigration behavior. Both of them constitute the vertebra of the core analysis.

b. Population dynamics

At any given time, location *j* can be either empty or populated by one or more agents. Let $M_j(t) \geq 0$ represent the population size of location *j* at time *t*, and $N(t) \equiv \sum_j M_j(t)$ the total number of agents in the entire system. At the beginning of time, we introduce $\bar{N}$ number of agents into the world. As in **Gibrat** (1931), we assume infinitely lived agents that bear no offspring, implying a fixed total population for all periods, $N(t) = \bar{N}, \forall t = 1,2,...T$. Each agent $a \ni A(1)$ is randomly assigned an initial location based on a uniform probability distribution function (PDF).

A city is defined as any location *j* hosting at least a single agent, $M_j(t) > 0$. With a fixed population size in the entire system, the population dynamics of cities in the model are fully determined by net migration flows. Formally, denoting $\eta_{ji}(t)$ as the number of agents migrating from location *j* to *i*, and $\eta_{ij}(t)$ from *i* to *j* at time *t* the size of a city formed in location *j* at time *t* can be computed as:

$$M_j(t) = M_j(t-1) + \sum_j \eta_{ij}(t-1) - \sum_j \eta_{ji}(t-1) \quad (6)$$

That is, the population size of a city changes if the previous flows of in-migration, $\sum_i \eta_{ij}(t-1)$, are not counterbalanced by the flows of out-migration, $\sum_i \eta_{ji}(t-1)$. Since the second term in the equation shows agglomerating effects and the third term congesting effects *j* represents agglomeration and *i* intermediary cities.

c. Immigration behavior

Urban systems are characterized not only by flows of goods and services but also by flows of people. It is possible to measure to what extent people migrates along the communication lines of the urban system and how strongly agglomerating/spreading forces pull/push people to/from centers. But in this paper, I consider congestion as one of the stages that distinguish degree of city growth in a region composed of different countries.

The Kooij's approach indicates that the first stage correspond to a more even city distribution ($\beta < 1$) whereas the second stage corresponds to more urban agglomeration ($\beta > 1$). In the third stage, β takes decreasing value (again smaller than unity) due to the congestion effects. Spreading forces are in action. A part of economic activity and people spread out in different location. This represents again a log-linear slope of city-size distribution. Thus, two immigration behaviors can be determined. The first is for the countries where congestion forces matter and the other is for the countries where agglomerating forces are dominant.

First of all, I begin by describing the first case. **Ellison and Glaeser** (1997) note that the location decisions of firms and people are heavily influenced by the presence of agglomeration economies. Given the set of locations that agent *a* can reach, I assume that $\eta_{ji}(t)$ and $\eta_{ij}(t)$ are divisible since they denote agents immigrating from *j* to *i* and from *i* to *j* respectively. Taking into account the population movement from *i* to *j* one could not conclude that all of migrants move in the big cities but a share of them immigrate towards foreign countries[8]. Thus this will have a negative effect on agglomeration in term of city size. (Im)migration from intermediary cities is not necessarily a factor that contribute to agglomerating forces. As well, as to congesting forces, they have also separable structure. Population movement from agglomerations to intermediary cities does not necessarily mean that it make the slope of distribution of city-size more regular. Because, some migrants spreads out into intermediary cities when another immigrates to abroad. If the first occurs β would have tendency to be under unity. But the second is a preventing factor of this tendency. In the light of givens I re-write the Eq. (6) as follows:

$$\begin{aligned}\ln M_{j,z}(t) &= \gamma_1 \ln M_{j,z}(t-1) + \gamma_2 \ln \mu_{ij,z}(t) - \gamma_3 \ln \mu_{ij,z\to k}(t)^2 - \gamma_4 \ln \mu_{ji,z}(t) \\ &- \gamma_5 \ln \mu_{ji,z\to k}(t)^2 + \varepsilon\end{aligned} \qquad (7)$$

where γ_3 and γ_5 represent the coefficients of population flows (in quadratic form) from intermediary cities to abroad and immigration from agglomerations to abroad respectively. In equation $M_{j,z}(t-1)$ indicates a magnitude when η_{ij} and η_{ji} indicate movement toward or

[8] In a sense that j denote also foreign countries' agglomerations.

from this magnitude. Eq. (7) shows agglomeration (and congestion) economies as a function of location *j*'s population weight. Here only γ_2 (out of γ_1) represents positive value when the other ones contribute to congestion. One can observe positive externalities (agglomerating) and the negative effect of population overcrowding (congesting).

The source of positive externalities as captured by the second term has been the subject of numerous theoretical endeavors. For example, **Murphy et al.** (1989) and **Krugman** (1991b) have argued that geographic concentration of firms brings about physical spillovers vis-a` -vis lower costs of infrastructure. On the other hand, **Glaeser et al.** (1992) suggest that agglomeration economies generate intangible spillovers of knowledge and ideas to the neighboring firms, which raise the average productivity of all firms within the geographic proximity and hence reinforce agglomeration further. Empirically, **Roback** (1982) shows that population density itself can directly represent a desirable amenity in the sense that it has a positive imputed price. **Henderson** (1986) presents the empirical evidence showing that firm productivity is higher in locations where there are neighboring firms from the same industries. In contrast, the negative terms in Eq. (7) represent the *dis-agglomerating* effect of highly populated regions. Specifically, a high-density industrial center is often associated with higher levels of crime rates, pollution, land costs and general costs of living. This kind of external diseconomies can lead to out-migration of residents that seek to avoid highly congested areas.

Now it is useful to tackle an important point: the variation of agglomeration (and congestion) levels among different countries. γ coefficient needs some interpretation. I expect that considering their development level, for the 15 EU countries congesting forces are more influential than agglomerating forces. Thus we must interpret the second term as agglomerating force based and say for the third, forth, and fifth terms in Eq. (7) that they result from spreading force based effects. Nevertheless taking into account the New Members and Accessing Countries of the EU one can expect that congesting forces are very limited but contrarily agglomerating forces are powerful. This expectation necessities that the values of γ_4, γ_5 remain very limited compared the EU-15. And the coefficient γ_3 is expected to be negative and sufficiently influential. Even if the speed of agglomeration is quit great in the NM and AC, the gravity of the agglomerations of the EU-15 may has negative impact on agglomerating forces in the NM and AC. The gravity that big agglomerations have in the EU-15 attracts a share of immigrating population from the NM and AC.

If we imagine the EU agglomerations as planets and (immigrating population of) intermediary cities as meteorites that move about among planets the situation will be more concrete. Meteorites that move about in the space fall down on the planet that they get caught by its gravity. And physically planet's gravity depends on its mass and the distance from meteorite. In this example the greatness of agglomerating forces of countries plays a crucial role in the immigration behavior. A share of immigrating population immigrates toward foreign agglomerations in foreign countries because agglomerating forces in these countries are more powerful than those in its home country[9]. In this point of view some immigrants prefer move toward home country's agglomerations because of the distance. The more the distance is long the more the gravity of foreign agglomeration is low. But really distance matters? Doubtless distance plays a role in immigration behavior. Moreover there is a social factor that influences it in term of preference of immigration location. I suppose that what makes a location attractive in the ayes of an immigrant is the "consanguinity"[10]. So I define immigration preference for the NM and AC with following function:

$$\psi_{a,ij}(t) = \delta + \eta_{a,ij}(t-1) + \tau(SIZE_j) - \lambda(DISTANCE_{ij}) + \varepsilon \qquad (8)$$

where $\psi_{a,ij}(t)$ denotes location preference of immigrants, say agent *a*, that depends on the population which have yet immigrated in *j* at time *(t-1)*. The second term on the right hand side shows consanguinity or acquaintanceship effect on location preference of agent *a*. I suppose that distance is a factor disfavoring out-immigration due to the fact that agglomerating forces take place in the NM and AC[11]. And I suppose also that the size of the agglomeration effects immigrant preference positively. The framework of the model confines

[9] On the one hand European biggest cities attempt to spread out, on the other hand out-immigration from abroad continue to feed agglomeration process. This phenomenon is worth examining. However in this paper I do not include the effect of the big European agglomeration in term of gravity on the immigration behavior of the NM and AC.

[10] Here the I use the term "consanguinity" in order to describe the behavior of an immigrant who immigrate into a location where there is a person with who he have very strong connection (familial or homeland based relationship).

[11] For example, in a China where there are not agglomerations like Shanghais, a Chinese may immigrate to the USA despite distance. But when there are large-size agglomerations in Chine, the probability that he remains in his county but in another location is very high *ceterus paribus*.

to national and international population movements from *i* to *j* for the NM and AC and both from *i* to *j* and from *j* to *i* for the EU-15.

d. The impact of population movement on β value

Above after talking about rank-size rule I said that β represented the impact of city size on rank of city. And I built a model with a very limited framework where change in city-size is determined only by itself at time (t-1) and by population variances. Finally, it was indicated that with respect to development levels, the coefficients in the model can be subject to different interpretations for the EU-15 and the NM and AC. The expectation that allow me to take account development factor is the one that congesting forces are dominants in the EU-15 countries when agglomerating forces are most powerful in the NM and AC.

Up to now all other factors that have impacts on the Pareto coefficient (β) have been kept out of the model. My goal in doing it is to analyze the real impacts of the EU accessing via population movements on the rank-size distribution of the NM and AC of the EU. Thus from Eq. (7) I develop a modified model as replacing β value by $\ln M_j(t)$:

$$\begin{aligned}\beta_z(t) &= \phi + \gamma_1 \ln M_{j,z}(t-1) + \gamma_2 \ln \mu_{ij,z}(t) - \gamma_3 \ln \mu_{ij,z\to k}(t)^2 - \gamma_4 \ln \mu_{ji,z}(t) \\ &- \gamma_5 \ln \mu_{ji,z\to k}(t)^2 + EU + \varepsilon\end{aligned} \tag{9}$$

Log-linear values of the stated variables are taken into model that is estimated by OLS method. In the model there are two kinds of country: the New Members (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia), the Accessing Countries which obtained an precise joining date by the EU (Bulgaria, Romania), and the AC which still continue negotiations Turkey). However, I used a dummy variable (**EU**) to indicate the NMC in question.

In sum, estimation process consists of three steps: (I) estimation of the Pareto coefficient (and the Hill estimator) separately for 11 countries and for every year between 1995 and 2005, (II) estimation of Eq. (7) for every year but for the group of countries together (cross-sectional time series), and (III) estimation of Eq. (9) for all of the countries and the years between 1995 and 2005 (cross-sectional time series).

V. City Definitions and Data Description

a. Choices of sampling

As it was predicted by **Brakman et al.** (2001, Ch. 7) like many others ones, "if the size of cities drops below a certain threshold level, there is hardly any negative correlation between size and rank left for the group of very small cities. Inclusion of very small cities makes it therefore more likely that one finds that $\beta < 1$". Thus the choice of the sample is important. There are various points of view in this subject. For example according to **Chesire** (1999), the various international comparisons of rank-size distribution, alternate three criteria of city selection for a sample: the number of cities per country, size of cities or finally a threshold of agglomeration to the top of which the sample represents a fixed proportion of the population of the country. The first criterion is problematic because, in the small countries, a city rank *n* can represent a simple village, while in the largest countries; it is an agglomeration. The third criterion is also contestable because it is strongly biased by the degree of urbanization of each country. Lastly, the second criterion presents the disadvantage of leading to the constitution of samples with different size according to countries. However this seems conformable with reality because the large countries have, in a general way, a greater number of cities than the small countries. The problem of the definition of the agglomeration, which is not the same one for all the countries, remains (**Soo**, 2002), this as well from the statistical point of view as from the social or cultural point of view.

On the other hand, **Brakman et al** (2001) describe two ways in term of the definition of a city. The firs one is to limit the city to its legal boundaries, the so-called city proper (like in **Rosen and Resnick**, 1980). The second one is to define the city as the agglomeration (like in **Black and Handerson**, 1998) that is thought to constitute an economic unit and to put out official city definitions. "Studies that confirm the Zipf's Law are mostly based on the urban agglomeration definition of cities" (**Brakman et al**, 2001).

Taking into account the population levels and the urbanization structures of the New Members and candidate countries, I use the city proper definition and the agglomeration definition with the threshold of more than 100.000 inhabitants.

b. **Data**

All data were collected from the Eurostat website. This website lists city size (measured by number of inhabitants) for the countries being subject to my analysis. Both city proper and urban agglomeration data cab be calculated for all city in the sample at least 100.000 inhabitants. The rank-size distribution is estimated for all of the countries above the threshold value. Depending on data availability, I estimated the Pareto coefficient in two methods about which I talked above (equation 1 and the Hill estimator). And the coefficients are estimated for the two urban definitions. Taking the ranks and sizes of the cities into the regression I estimated the Pareto coefficients for the period between 1995 and 2005.

c. **Estimation Method (Econometric Methodology)**

The success of any econometric analysis ultimately depends on the availability of the appropriate data. It is therefore essential that we spend some time discussing the nature, sources, and limitations of the data that one may encounter in empirical analysis. Three types of data may be available for empirical analysis: time series, cross-section, and cross-sectional-time-series (CSTS) data. A time series is a set of observation on the values that a variable takes at different times and cross-section data are data on one or more variables collected at the same point in time. Although time-series and cross-section are used heavily in econometric analysis they present special problems: For time-series, the problem comes from the assumption of *stationarity* and for cross-section, the problem comes from *heterogeneity* (for more information about stationarity and heterogeneity (see **Beck**, 2001; **Gujarati,** 2003). A variant of the extraneous and a priori data technique is the combination of cross-section and time-series data, known as pooled data. We deal with data that follows a given sample of units (individual, countries, etc.), $i = 1,2,...,N$, over time, $t = 1,2,...,T$, so that we have multiple observations ($N * T$) on each unit over time.

CSTS technique has recently seen a tremendous increase in their applicability. The convention is to refer to this data as either pooled or CSTS data. However, there are considerations where the CSTS data look more like panel data. **Beck** (2001) lines up principal differences between them as fallow:

- Panel data are repeated cross-section data, but the units are sampled (usually they are survey respondents obtained in some random sampling scheme), and they are typically observed only a few times. CSTS units are fixed; there is no sampling scheme for the units, and any "resampling" experiments must keep the units fixed and only resample complete units (**Freedman and Peters,** 1984).
- In panel data, the people observed are of no interest; all inferences of interest concern the underlying population that was sampled, rather than being conditional on the observed sample. CSTS data are exactly the opposite; all inferences of interest are conditional on the observed units.
- The difference between CSTS and panel data has both theoretical and practical consequences, which go hand in hand. Theoretically, all asymptotics for CSTS data are in *T*; the number of units is fixed and even an asymptotic argument must be based on the *N* observed units. We can, however, contemplate what might happen as $T \rightarrow \infty$, and methods can be theoretically justified based on their large-*T* behavior.
- Panel data have the opposite characteristic. However many waves a panel has, that number is fixed by the design, and there can be no justification of methods by an appeal to asymptotics in *T*. There are, however, reasonable asymptotics in *N*, as sample sizes can be thought of as getting larger and larger.
- We also use standard time-series methods to model the dynamics of CSTS data; this is possible only when *T* is not tiny. Panel data methods, conversely, are constructed to deal with small *T*s; one would not attempt to use a lagged dependent variable when one has only three repeated observations per unit! Thus, CSTS methods are justified by asymptotics in *T* and typically require a reasonably large *T* to be useful. Again, there is no hard and fast minimum *T* for CSTS methods to work, but one ought to be suspicious of CSTS methods used for, say, $T<10$. On the other hand, CSTS methods do not require a large *N*, although a large *N* is typically not harmful. In contrast, panel methods are designed for and work well with very small *T*s (three, or perhaps even

two) but require a large *N* for the theoretical properties of the estimators to have any practical consequences.

- Panel estimators are also designed to avoid practical issues that arise from the large (and asymptotically infinitely large) *N* that characterizes panel data. Because much of the econometric literature conflates the analysis of panel data with the analysis of CSTS data, it is critical to keep in mind the distinction between the two types of data.

Why use CSTS data? We are often interested in explicit comparisons. For example how are countries different? Examining these differences over time allow for dynamic comparisons. Moreover CSTS permit us to solidify our theoretical prediction on a question. It can be more appropriate to generalize a model according to a population by pooling units over time. But certain author stressed on the *interpretation* problem: "Although it is an appealing technique, pooling the time series and cross-sectional data in the manner just suggested may create problems of interpretation[12] […] the technique has been used in many application and is worthy of consideration" (**Gujarati**, 2003, p. 365).

In my model, the dependent variable is continuous. Given the nature of typical CSTS data, I often refer to the units as countries and the time periods as years. And 11 countries constitute $N = 11$ unities when the time period between 1995 and 2005 constitute $T = 10$ (asymptotics). Thus, that is to say, the model that is subject to the estimation fills the basic conditions.

VI. Empirical Results

a. City-size Distribution

As in the way that I explained above, I calculated β value for 11 countries and for the period between 1995 and 2005 and therefore put them in graphical form for a better representation. In Graphic 1 we see β values, estimated through OLS. And in Graphic 2 β values are estimated through Hill estimator. Even if values obtained from two methods are not

[12] He talk about the problem coming from the implicit assumption that that the cross-sectional estimation is the same thing as that which would be obtained from time series analysis.

the same, the fact that I estimated β values for every country in the sample in two manners is important from the point of view of revealing of the major evaluative tendency of the city-size distribution over time. It can be said that in most of cases, Pareto and Hill estimations give approximate numbers. With a global regard, all of the countries recorded upward variances in their city-size distribution. Especially, relatively small countries, in term of surface and population, have faster evaluating β values than others. The reason for this differentiation is that relatively small countries have little number of big cities whereas relatively large countries have more pioneering urban areas. Nevertheless one cannot generalize this idea as excluding other factors. In this sense, Bulgaria, the Czech Republic, Estonia, the Slovak Republic are the countries, among them, which experienced the most rapid changes in their city-size distribution.

It is expected that EU accessing processes of the NM and AC had a significant effect on the evolution of city-size distribution. Especially one can say that the period, after beginning of accessing negotiations, marked by increase in FDI, use of EU structural funds, and radical transformation of legal system play a crucial role in this evolution. Subsequently, this will be analyzed with details. But for instance this consists, just, of an expectation.

Another remarkable observation is that the variance of β value (according to both Pareto and Hill estimators) for Hungary, Lithuania, and Turkey get more and more stabilized compared with other countries. The slope of logarithmic rank-size evolution over time for these countries has recently started to follow horizontal motion. This is particularly more evident for Turkey. From 1995 to 2000 the big cities grew faster than intermediary cities and so distribution of cities progressively became more irregular. That is a sign for more urban agglomeration. Nevertheless, since 2000 increase in β value has stabilized. Considering the fact that distinguishes Turkey from Hungary and Lithuania which passed a transition period, we can think that the reason for stabilization of city-size distribution variance can not be the same for these countries.

It is possible that upward variance of β value for Turkey could result from its joining to the Customs Union in 1996 when those for Hungary and Lithuania could come from their transitions. Already it is a well-known reality that privatization, tightening-belt policy, economic and political reform process during transition period (from the beginning of 1990's to the end of 1990's) provoked urban-rural population structure (see **Blanchard**, 1997; **Blanchard *et al*.** 1994). It is worthy of tasting. As to Turkey again, accessing to the Custom Union could stimulate foreign trade and so competitive sectors. It is expected that raise in exporting sector, grouped frequently in agglomerations, could lead centripetal forces to be excited. This is coherent with previous studies (see **Fujita and Thisse**, 2002; Fujita et al., 1999). But in all case we need to work with longer-time data in order to arrive to a more coherent idea.

b. City-size Distribution and Development Stages

The differences in rank-size distribution among different countries must results from the balance between agglomerating forces and spreading forces which depend mostly on the economic development stages in which countries are found. That is to say, change in β value over time depends on the economic parameter changes. Fallowing a progressive pattern, economic development begins with β well below unity. As economy develops, β value increases. And when the economy reaches a certain maturity level, then β value starts to decrease. In section IV a, I explained, as revising some influential authors' very similar points of view, the linkage between development stages and evolution of city-size distribution. Now in order to concretize this theoretical prediction, I plot a scatter graphic, for the EU-15, the NM and AC, representing the correlation between countries' β values and their GDP per head as an indicator of development stage. In deed when development stages matter, that must be to say, necessarily, larger time period. Looking on 10-year period variance of the countries' β values is just like taking a photo of the actual situation that will give us a general outlook. It is important also to observe the general pattern (tendency) that countries pass according to their development stages.

In graphics 3 and 4, we see the correlation distribution of average β values and GDP per head of the 15 EU countries and 11 NM and AC. I plotted the same graphic with β values obtained both from the Pareto and Hill estimator. Even if the Hill estimator gives more strict values, this does not prevent the general tendency from emerging. In graphic 3, Latvia, Denmark, Austria constitute outliers. In graphic 4 Denmark and Austria continue to remain outlier. But we can observe a tendency curve for most of countries in the sample ($R^2 = 0.88$). This supports theoretical prediction about the linkage between development stages and evolution in city-size distribution.

When we take GDP per head at $ 20.000 and β value at one as the thresholds of the scatter plot, we see 26 countries be devised in two: the 15 EU members and the NM and AC. Countries in the zone I are the ones which are found at the beginning of the agglomeration pattern; countries in the zone II are the ones which are found at high-level of the agglomeration pattern; and countries in the zone IV are the ones which are found at congestion stage. The latter is mostly the EU-15 where spreading forces are more dominant then agglomerating forces. We observe that all of every NM is not at the same level whereas all EU-15 countries take close position each others. Considering development stages, positions where 26 countries are found very globally indicates *things being equal elsewhere* the patterns that they will pass in the future.

c. City-size and Population Dynamics

After explaining theoretical bases I defined Eq. (7) that is based on population dynamics and immigration behavior. I assume that in the middle term the factors which determine city-size are the city-size at time $t-1$ and population movements between intermediary cities and big ones. Once model (7) is based on this assumption we dropped any other factors having impacts on city-size. Thus Eq. (7) does not comprise constant term.

In estimation of the model, one problem is coming from given data regarding population changes. I separated population movement from intermediary cities in two (to big cities and to abroad) and also that from big cities in two (to intermediary cities and to abroad). In order to reveal power degrees of influence of the devised population movements I added two second-degree polynomials, so called quadratic term. In doing so, I can capture various powers of the variables on explanatory variable.

Eq. (7) was estimated according to city proper and agglomeration definitions for different time periods: 1995-2000, 2000-2005, and 1995-2005 respectively. As predicted in the previous empirical studies (**Black and Handerson**, 1998; **Brakman et al**, 2001) Agglomeration based city-size definition reflects more general cases then city proper-based definition. The former's R^2 is bigger than the latter.

As predicted above, the more influential variable on the city-size is the population of the city at time $t-1$. We clearly observe that population movements which feeds agglomeration in the urban zones show to what extent agglomerating forces are in action in the NM and AC. This is coherent with the previous analysis (Graphics 3 and 4). This justifies also the prediction that spreading forces are more powerful in the EU-15 when agglomeration forces are more powerful in the NM and AC. looking at $\eta_{ji}(t)$ that capture congestion effect which is much more influential in the EU-15 than in the NM and AC, we see one more time spreading forces are very weak.

As for immigration to abroad from intermediary and big cities, captured by quadratic terms, one can say that immigration from intermediary cities is bigger than big cities. I explained it with location preference function in immigration behavior. I assume that location preference, $\psi_{a,ij}(t)$, of immigrant a depends on his acquaintance that immigrated at time $t-1$. Thus agent a prefers immigrating to a country or region in which there are intensively a group of people close to him. On the other hand his location preference relies on the distance between his home-country and the country or region into which he is intended to immigrate. So the second term on the right hand in Eq. (8) has a positive impact and the third term has a negative impact on immigration. Another thing going out from Eq. (8) is the polarization affect of urban agglomerations. That is to say, immigration from intermediary cities to urban agglomeration depends on; positively the size of agglomeration or agglomerating forces as well, negatively congestion or spreading forces and distance. This constitutes a kind of "gravity equation". One can expect that despite growing spreading forces in the EU-15, magnetic fields of the EU-15's urban agglomerations for immigrants are more powerful than the NM and AC. On the one hand this feeds the expectation that joining process to the EU provokes an increase in number of immigrants towards the EU-15's urban agglomerations and contributes to agglomerating forces in the EU-15. On the other hand, with increasing FDI as well other factors, membership process of the EU stimulates agglomerating forces in the NM and AC. And immigration from them to abroad remains weak over time with the negative effect of the distance. So, urban agglomerations in the NM and AC will continue to grow up to a certain point before and after the EU membership. All of expectations are worthy of testing in another paper. But now without going out of the framework of this paper now I must be focus on the impacts of the EU membership process on city-size distribution of the NM and AC.

d. Change in City-size Distribution

Results obtained from the estimation of Eq. (9) with two β value definitions and two city definitions are presented in Table 4. Again Eq. (9) was estimated with OLS. As predicted in **Brakman et al** (2001) urban agglomeration definition confirms better the Zip's Law. With Pareto and Hill estimator for urban agglomeration definition the estimation's R^2 is about 0.89 and 0.64 respectively while according to city proper definition this is 0.88 and 0.61 respectively. These results confirm also Brakman and al.'s prediction. Four cases matter and all of them are significant at 0.1 level. I put expected signs (+/-) near every variable in light of what I explained above and the values that I obtained correspond to expected signs (impact). If one compares the four estimations each others it can be observed that there is not extremely large differences between values obtained for every case. It is important for significance of the estimations.

As for the population movements, city-size distribution largely depends on city population at time $(t-1)$. Its effect varies in ln-term between 0.26 and 0.37 (taking exponent of them: 0.29 and 0.59). In the analysis $\mu_{ij,z}(t)$ represents population movement from intermediary city to big city at time t (as a sign of agglomerating forces) and $\mu_{ji,z}(t)$ represents population movement from big city to intermediary city at time t (as a sign of congesting force). Nevertheless the sign of congesting force is interpreted here as a factor which prevent agglomerating force for the NM and AC. For this reason it is useful to call it "resistant factor". As stated in the last section, intern immigration towards agglomerations is a very determinant factor in city-size distribution. Its impact on β value varies between 0.18 and 0.28. And considering development stage of the NM and AC I have predicted above that the impact of "congesting forces", $\mu_{ji,z}(t)$, will remain very limited. However, the estimations confirm this prediction.

Using quadratic terms I took into account also extern immigration from or towards abroad. We can clearly say that immigration from abroad is limited while immigration to abroad is bigger. This results from immigration behavior that I defined in Eq. (8). Because, with opening-up process and progress in agglomeration forces the NM and AC give some immigrants to the EU-15 that represents a kind of gravity effect for the NM and AC. In a moment where immigrants are found under gravity effect of foreign and national agglomerations, two factors positive factors and one negative factor play a crucial role: acquaintance, size of agglomeration, and distance respectively. We see clearly the impacts of agglomerating forces, $\mu_{ij,z}(t)$, are superior to that of three resistant forces. This indicates that in for the NM and AC agglomeration process will continue.

In order to capture the direct effect of membership of the EU I added "EU" dummy variable for the years from 2003 for the NM. And its impact is found very weak because of the limited time period. But either accessing process or membership have direct and indirect effects. Even if its direct effect look small accessing to the EU activates agglomerating forces.

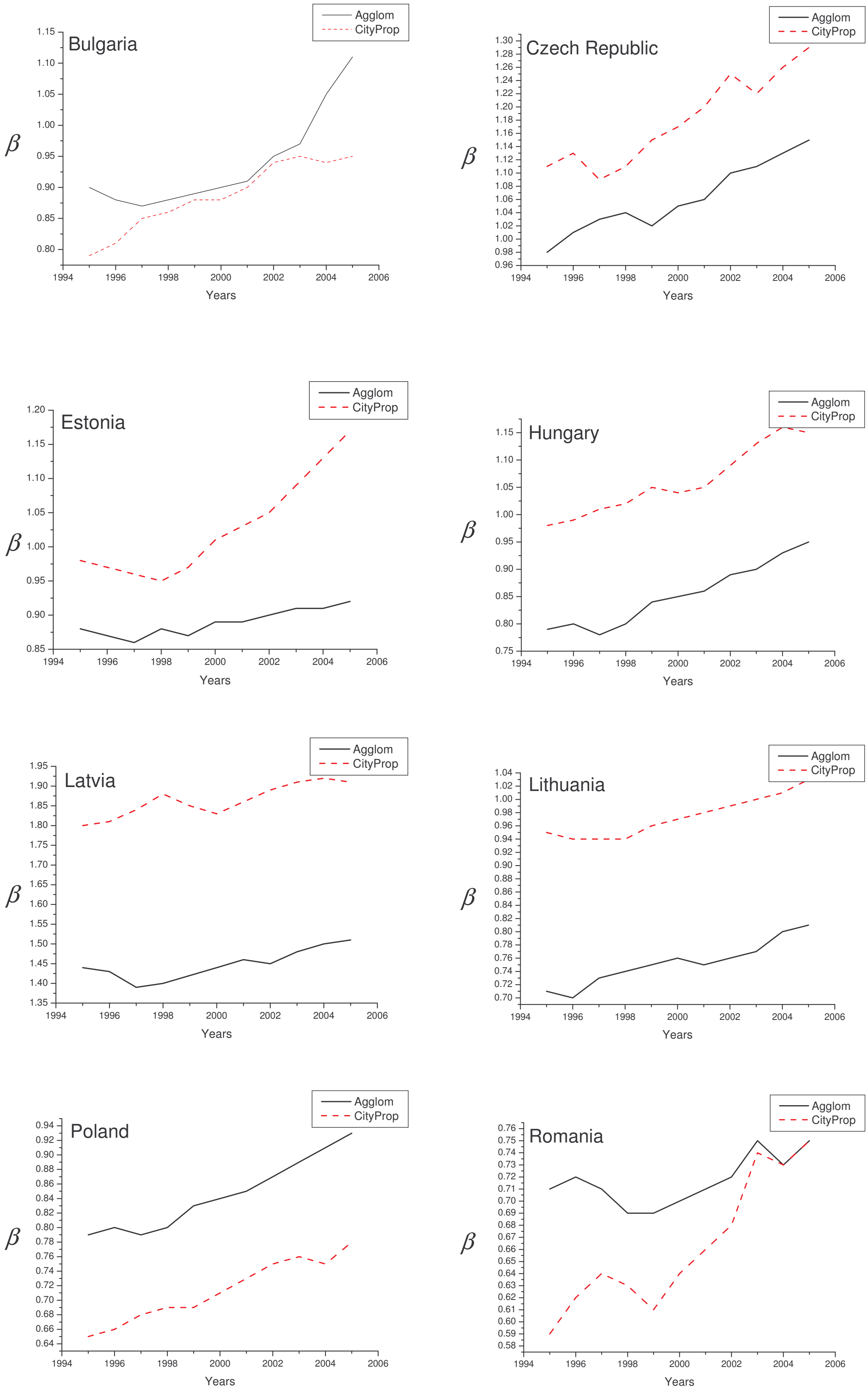
VII. Conclusion

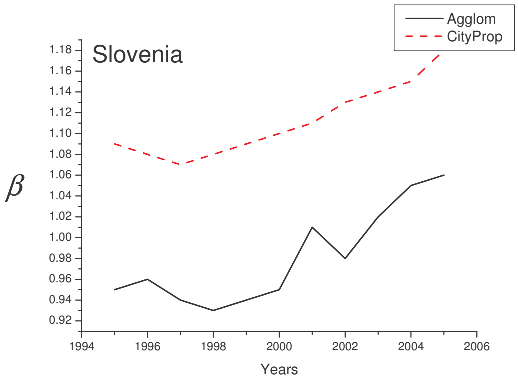
Main results resulting from my analysis can be given as fallows: Direct and indirect effects of the EU are analyzed from different points of view. Agglomerating forces are dominant for the NM and AC. There is a clearly visible difference between the EU-15 and these countries in term of urbanization stage. The biggest impact of the EU comes from intern immigration that feed agglomeration process.

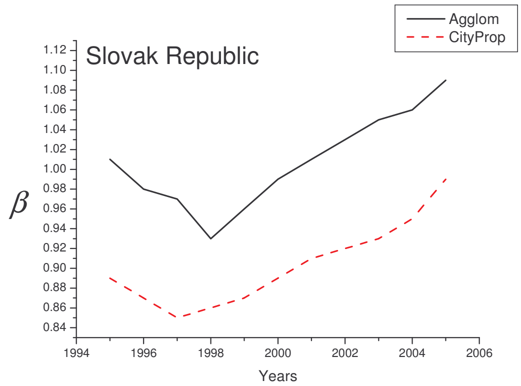
Table 1: Former Empirical Studies Testing the Zipf's Law

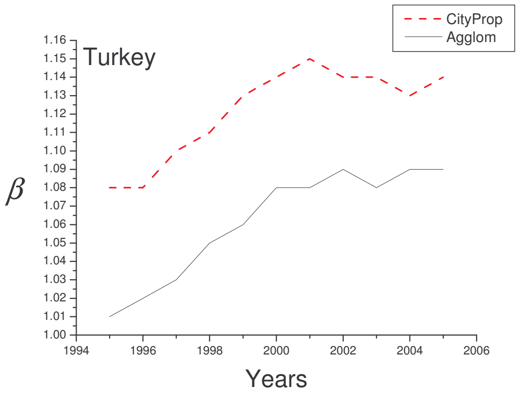
Auteur	Number of country	Date	Pareto Coefficient β (Absolute Value)
Singer (1936)	7 countries (with cities of mode than 2000 inhabitants)	XIXth and begin of XXth century	1,15
Rosen & Resnick (1980)	44 countries (with the 50 biggest cities of every country)	1970	1,13
Moriconi-Ebrard (1993)	78 countries (with minimum 30 cities per country)	1950 to 1980	1,06
Guérin-Pace (1995)	France (1780/675 cities of more than 2000 inhabitants en 1982/1871)	1831 and 1982	in 1982, 1,05 in 1831, 0,72
Brakman et all (1999)	Germany (42 cities)	1990	1,13
Fujita, Krugman & Venables (1999)	USA (130 cities)	1990	1,004 (increasing part of the slope)
Gabaix (1999b)	USA (135 cities)	1990	1,005 (increasing part of the slope)
Dobkins & Ioannides (2000)	USA 112/162/392 cities according to date	1900 1950 1990	1,044 0,999 0,949
Black & Henderson (2003)	USA 194/247/282 cities according to date	1900 1950 1990	0,861 0,870 0,842
Soo (2005)	73 country of more than 15000 inhabitants	Last year available	1,179 (OLS) 1,117 (Hill)

Graphic 1 : Pareto Coefficients between 1995 and 2005

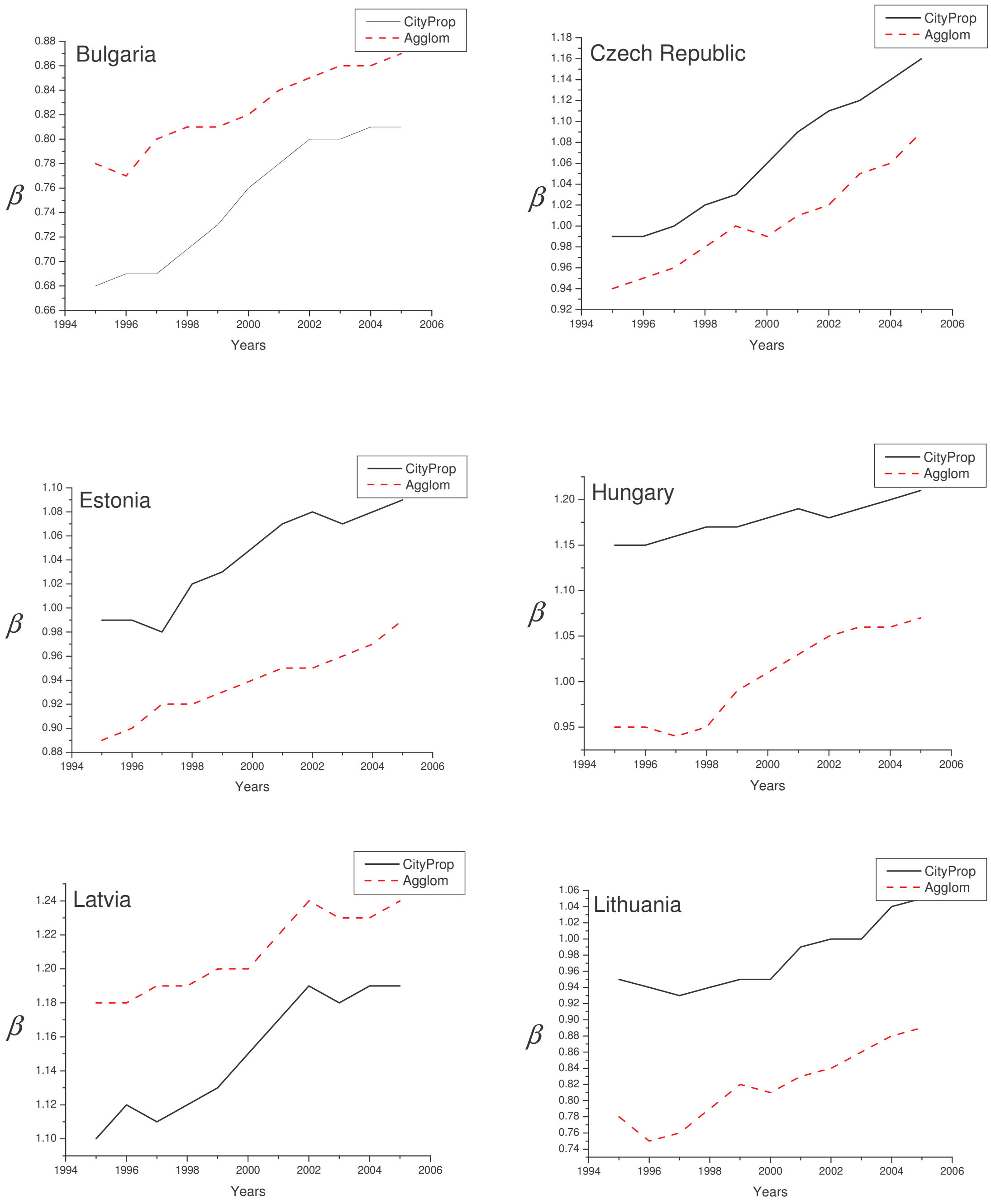


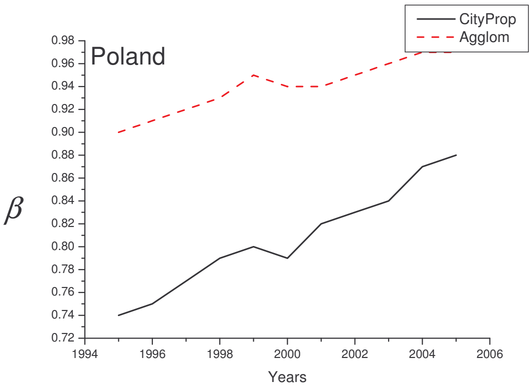

Slovenia
Agglom
CityProp
β
Years

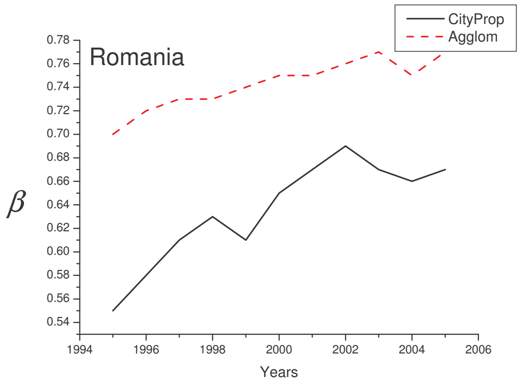

Slovak Republic
Agglom
CityProp
β
Years

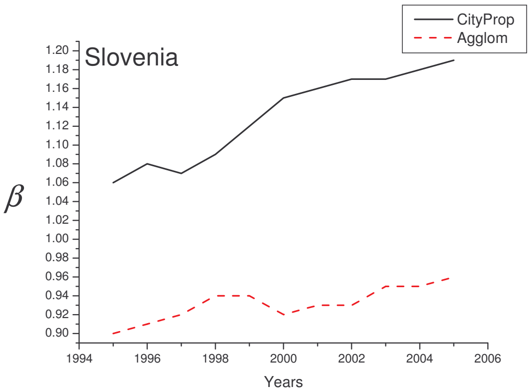

Turkey
CityProp
Agglom
β
Years

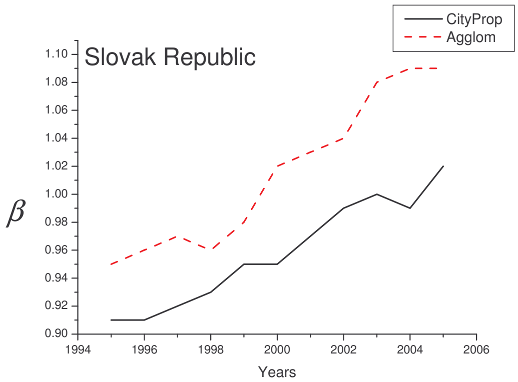
Graphic 2 : Hill Estimators between 1995 and 2005

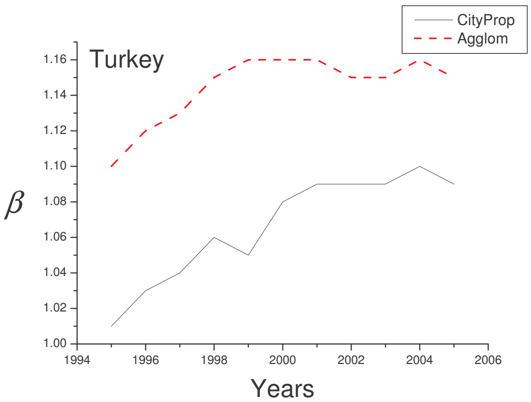



Poland
CityProp
Agglom
β
0.98
0.96
0.94
0.92
0.90
0.88
0.86
0.84
0.82
0.80
0.78
0.76
0.74
0.72
1994
1996
1998
2000
2002
2004
2006
Years

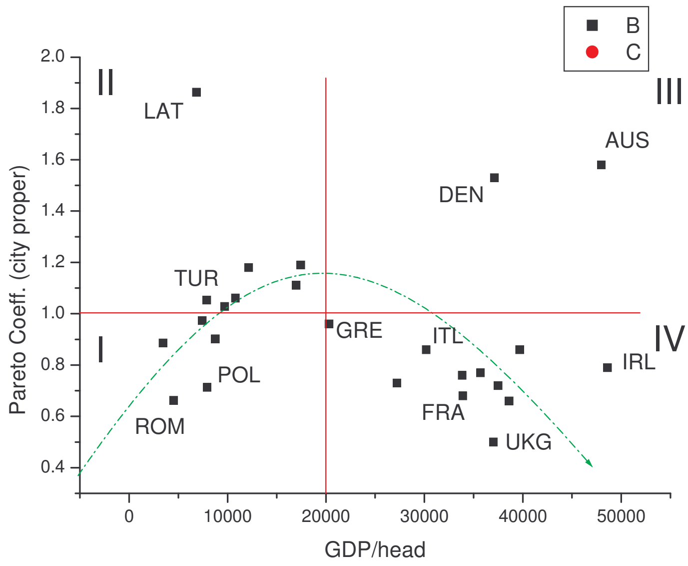

Romania
CityProp
Agglom
β
0.78
0.76
0.74
0.72
0.70
0.68
0.66
0.64
0.62
0.60
0.58
0.56
0.54
1994
1996
1998
2000
2002
2004
2006
Years


Slovenia
CityProp
Agglom
β
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
0.90
1994
1996
1998
2000
2002
2004
2006
Years


Slovak Republic
CityProp
Agglom
β
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
0.90
1994
1996
1998
2000
2002
2004
2006
Years


Turkey
CityProp
Agglom
β
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
1994
1996
1998
2000
2002
2004
2006
Years

Graphic 3 : Scatter plot of β -value and personal income of the EU-15, new member and accessing countries



Graphic 4 : Scatter plot of β -value (with Hill estimator) and personal income of the EU-15, new member and accessing countries

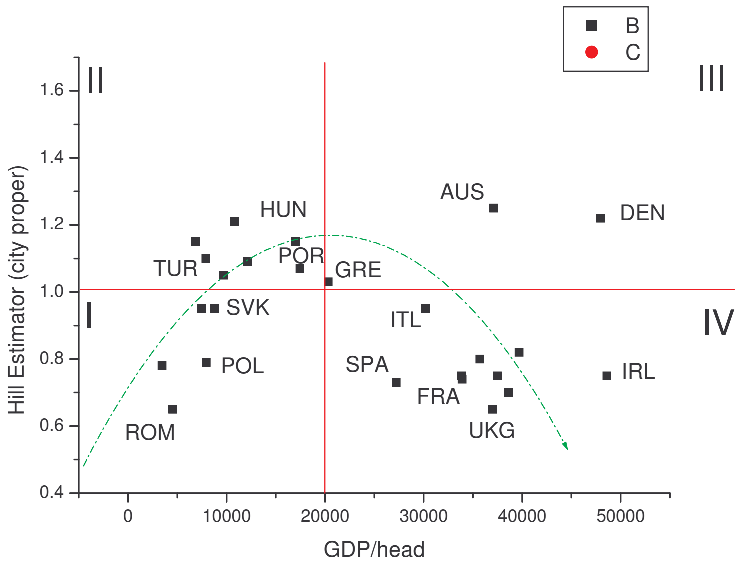


Table 2 : The impacts of population movements on city-size with city proper definition

Variables/Years	1995-2000	2000-2005	1995-2000
$\ln M_{j,z}(t-1)$	1.231314 (1.190321)	1.242110 (1.241646)	1.248916 (1.151600)
$\ln \mu_{ij,z}(t)$	0.460012 (2.198747)	0.520114 (2.336478)	-0.458794 (-1.984793)
$\ln \mu_{ij,z\rightarrow k}(t)^2$	-0.211611 (-2.445454)	-0.244407 (-2.564671)	-0.230491 (-2.510007)
$\ln \mu_{ji,z}(t)$	-0.071973 (-3.698747)	-0.051782 (-3.784575)	-0.078456 (-3.664701)
$\ln \mu_{ji,z\rightarrow k}(t)^2$	-0.008459 (-5.167984)	-0.006688 (-5.241478)	-0.007155 (-5.131647)
R^2	0.85	0.86	0.92

All values are significant at 0.1. t values are in parenthesis.

Table 3 : The impacts of population movements on city-size with urban agglomeration definition

Variables/Years	1995-2000	2000-2005	1995-2005
$\ln M_{j,z}(t-1)$	0.881425 (2.135871)	0.872987 (2.154781)	0.861478 (2.136669)
$\ln \mu_{ij,z}(t)$	0.421478 (2.698725)	0.491278 (2.771648)	0.467898 (2.551478)
$\ln \mu_{ij,z\rightarrow k}(t)^2$	-0.177643 (-2.454781)	-0.216000 (-2.551478)	-0.200612 (-2.001478)
$\ln \mu_{ji,z}(t)$	-0.050555 (-1.898747)	-0.048901 (-1.125547)	-0.047615 (-1.995800)
$\ln \mu_{ji,z\rightarrow k}(t)^2$	-0.002555 (-1.990254)	-0.002391 (-2.121478)	-0.002265 (-2.012478)
R^2	0.93	0.92	0.94

All values are significant at 0.1. t values are in parenthesis.

Table 4 : The impacts of the population movement on the city-size distribution in the NM and AC of the EU

Variables		β with Pareto		β with Hill estimator	
		City Proper I	**Urban Agglomeration II**	**City Proper III**	**Urban Agglomeration IV**
ϕ		1.293512	1.385469	1.331004	1.487979
		(2.113691)	(1.235879)	(2.134678)	(1.773316)
$\ln M_{j,z}(t-1)$	(+)	0.450015	0.471236	0.260014	0.302249
		(1.269874)	(2.874674)	(2.551478)	(1.898840)
$\ln \mu_{ij,z}(t)$	(+)	0.234519	0.251647	0.171454	0.1794522
		(3.164782)	(3.217747)	(2.013335)	(3.332648)
$\ln \mu_{ij,z}(t)^2$	(-)	-0.091314	-0.131478	-0.081247	-0.092365
		(-1.555154)	(-2.221774)	(-3.447876)	(-2.225460)
$\ln \mu_{ji,z}(t)$	(-)	-0.051646	-0.077478	-0.064879	-0.070366
		(-2.998471)	(-2.147894)	(-3.111400)	(-4.790010)
$\ln \mu_{ji,z}(t)^2$	(-)	-0.041687	-0.021447	-0.061454	-0.020131
		(-3.333145)	(-3.001478)	(-4.444500)	(-3.695841)
EU	(+)	0.0312225	0.031248	0.012020	0.020214
		(2.501147)	(4.140001)	(4.121470)	(5.151460)
R^2		0.88	0.89	0.61	0.64

All values are significant at 0.1. t values are in parenthesis.

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