Does the development level influence the relationship between economic growth and urban concentration? (Evidences from Mediterranean Countries and EU)

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Abstract

Urbanization and economic growth goes hand in hand in developing process. There is an extensive literature on urban development process and its relationship with economic growth. Urban concentration shows whether resources are over-concentrated in one or some large cities, or spread too evenly across different cities. There is a significant relationship between economic growth and the degree of urban concentration, as measured by different measures including urban primacy or the share of the largest city in an urban system. Based on the Williamson's Hypothesis, the optimum degree of urban concentration is dynamic and increases in the first level of economic development. Then, it starts to decline through more development.

The main question of the study is whether there is a significant relationship between economic growth and the degree of urban concentration, which measured by primacy in this paper. Meanwhile, it is tested that if there is such a relation, does it affected through the development, which specified by HDI. The case of the study is Mediterranean countries and EU which contain both developed and developing economies. The used model is the Solow growth model (1956) with urban primacy and its interaction by development as independent variables, in 2005.

The results show that in both Mediterranean countries and EU, primacy has had significant and negative effect on the growth in 2005, while the effect of the interaction of primacy and HDI has been significant and positive which shows that the development level affects the relationship between economic growth and primacy.

JEL code: F43, O18

Keywords: Urban Concentration, Economic Growth, HDI, Mediterranean Countries, EU.

1. Introduction

There is an extensive literature on urban development process and its relationship with economic growth. Urban development has two key aspects: one is urban development and urbanization itself which relates to the number and size growth of cities in an urban system. The other aspect of urban development is concern of urban development form or urban concentration. Indeed, urban concentration shows the degree to which urban resources are concentrated in one or two large cities, as opposed to spread over many cities.

At any point in time, given a country's level of urbanization, resources may be spread too evenly across cities with insufficient concentration in certain cities to exploit the economies of scale in production. Alternatively, resources may be over-concentrated in one or two excessively large cities, raising commuting, congestion, and living costs to excessive levels, raising costs of production of goods and lowering the quality of urban service provision. The implication is that there is an optimal degree of urban concentration, achieved by trading-off the social marginal benefits and costs of increasing urban concentration. Either over or under-concentration is very costly in terms of economic efficiency and national growth rates (Henderson, 2000). Founded on different studies, urban concentration affects economic growth and efficiency. Based on the Williamson's Hypothesis, the optimum degree of urban concentration is dynamic and increases in the first level of economic development. Then, it starts to decline through more development.

The main question of the study is whether the relationship between economic growth and the degree of urban concentration is affected by development level. It can be a test for the Williamson hypothesis. The case of the study is European Union (EU) and Mediterranean countries, both separately and all together. For this purpose, we first describe urban concentration and its measurement methods and then specify a model. The third section shows a brief about the urbanization and urban concentration in considered countries. In the next section the specified model is estimated in 2005 in a cross section

model and obtained results are illustrated. The last section of the paper summarizes the results of the paper.

2. Urban Concentration and its Effects on Economic Growth

2.1. Urban concentration and its measurement

According to the economic theory, the spatial concentration of activities generates a set of external effects and in particular a revitalization of territory. The agglomerating of persons and activities in a place not only causes an expansion of the market size, but also makes productivity gains. This relationship between space and economic activity is characterized by the urban phenomenon because cities are the cornerstones of space and play a key role in the development of a region, and this is more so as they form networks more or less effective.

The concentration of activities in a given location generates a set of positive externalities, largely described by the economic theory. First, if they belong to different sectors of activity, their concentration can be beneficial because the proximity of suppliers and/or customers can significantly reduce the transport costs and the costs of certain indivisible equipments (such as infrastructure, water supply or electricity). Subsequently, the firms that belong to the same industry may benefit from a pool employment specific, generated by the place of accumulation of human capital in cities and share the risks of the activity. In addition, it will promote creation of local markets for goods, specialized services, and networks information, which are other factors of productivity gains. Many studies have shown the importance of this spatial concentration of activities, because as it enhances the capacity for innovation and flexibility of firms, it is a potential response to the growing instability of the economic activity. A city plays an essential role in the development of a territory to the extent where dynamic emerging positive externalities on its sub-area or hinterland.

Economic development involves the transformation of a country from an agricultural based economy to an industrial-service based economy. Production of manufacturing and services is much more efficient when concentrated in dense business-

industrial districts in cities, because localized and urbanized economies of scale increases (Fujita and Ogawa, 1982; Helsley and Strange, 1990; Duranton and Puga, 2001; and Henderson, 1974, 2002). Close spatial proximity, or high density, promotes information spillovers amongst producers, more efficiently functioning labor market, and savings in the transport costs of parts and components exchange among producers and of sales to local residents (Henderson, 2000). On the other hand, supportive policies of governments for urban industries make it attractive to invest in cities and encourage migration from rural to urban areas (Renaud, 1981). The interaction of benefits and costs of agglomerating of people and firms determines an optimal degree for urban concentration.

There is also a dynamic component to this discussion of optimal urban concentration. Hansen (1990) used the Williamson's hypothesis of development in an urban context. It is argued that a high degree of urban concentration in the early stages of economic development is viewed as essential to efficiency. By spatially concentrating industrialization, often in coastal cities, the economy conserves on "economic infrastructure" –physical infrastructure capital (transport and telecommunications) and managerial resources. Such spatial concentration also enhances information spillovers at a time when the economy is "information deficient" and it may similarly enhance knowledge accumulation (Lucas, 1988; Black and Henderson, 1999; and Henderson, 2002).

Henderson (2000) explains that in the development process, eventually de-concentration becomes efficient for two reasons. The economy can afford to spread economic infrastructure and knowledge resources in hinterland areas. Second, the cities of initial high concentration become high cost, congested locations that are less efficient locations for producers and consumers. De-concentration occurs by manufacturing moving first from the core cities of large metro areas to nearby satellite cities, and then into hinterland cities, where wage and land costs are much lower. Wheaton and Shishido (1981) find the pattern of the first increasing and then decreasing urban concentration

across countries as income rises. This result is consistent with findings of regional convergence in regions over time.

Such studies as Renuad (1981), Henderson (1988, 2000, and 2002) and Ades and Glaeser (1995) have argued that often the political institutions in countries encourage over-concentration. As national governments choose to favor one (or more) cities- typically national capital such as Seoul, Jakarta, Tehran, etc- over others, there is a lack of a level playing field across cities in many countries. Such favoritism can involve the allocation of local public services in favor cities, where decision-makers live. The problem can be exacerbated if other cities do not have the power to determine their own public service levels, either because of a unitary national constitution or because local autonomy is weak. Migrants and firms flow to a favored city, until it becomes so congested and costly to live in, that these costs offset the advantages of the favoritism. Moreover, the excessive resources devoted to one or two favored cities detract from the quality of the life in the rest of the urban system.

A key question is how to measure urban concentration. Different studies have used diversified indices. Wheaton and Shishido (1981) used Hirschman-Herfindahl indicator for measuring the urban concentration, based on the proportion of each city in the national [1]

[1] It is the sum of squared shares of every city in a country in national urban population.

The Hirschman-Herfindahl index is most desirable, but such data as used for it is not available. Thus, what index is used is urban primacy . While this could be a crude measure, because sush shares are typically very large, primary measures tend to be closely correlated with Hirschman-Herfindahl indices (Henderson, 1999, 2000). This idea of close correlation is also supported by evidence on Zipf's Law (Gabaix, 1999). Also, by following the "Rank-size" law, Henderson believes that the size of the largest city can define in a way the size of all other cities and is an indicator of urban concentration.

2.2. The Model

Now, referred to the previous section, the question is how the effect of urban primacy on economic growth can be estimated. Henderson (2000) test is the relationship between economic growth and degree of urban concentration measured by the relative size of the urban primacy through the Solow-Swan growth model (1956). The solow-swan growth model focuses on a Cabb-Douglas production function in which output is related to capital, labor and technological progress. In this model, the growth of output per worker is:

$$Lny_t - Lny_{t-1} = (1-\alpha)\left[LnA_t - LnA_{t-1}\right] + \alpha\left[Lnk_t - Lnk_{t-1}\right] \qquad (1)$$

in where y_t is output per worker at time t (in empirical studies, income per capita is considered as a proxy for it), k_t is capital per worker, and A_t is technological progress. In this model, growth can result form either technological progress or capital accumulation. Thus, the model implies that determining the sources of growth is an empirical issue. The empirical-specified model for a country i over time, called β-convergence model, is:

$$Lny_{i,t} - Lny_{i,t-1} = \alpha + (1-e^{-\beta})Lny_{i,t-1} + X_{i,t}\gamma + \varepsilon_{i,t} \qquad (2)$$

in where Lny_t is log of income per capita at time t, and ε_t is error term. β is convergence coefficient and implies a long-run tendency towards the equalization of income per capita. Matrix X_t includes different variables affecting on technological progress including investment rate, fertility rate, government size, etc [for further details see Barro and Sala-i-Martin (1995) and Barro (1997)].

urban population. Rosen and Rosnick (1981) used the Pareto parameter of the distribution of city sizes which is the overall degree of disparity in the sized distribution. Mac Kellar and Vining (1995) were interested in the distribution of the total population and not just urban population. The index used is the difference between the rate of growth of the population in central region and total population growth rate. The other index is urban primacy which is measured by the share of the largest metro area in national urban population. Since the used data for this index is available over the years for many countries, it is used in more studies including Mutlu(1989), Ades and Glaeser (1995), Junius (1999), and Henderson (2000, 2002).

To modeling the effect of urban concentration on economic growth, urban primacy is entered to the model as an explanatory variable. However, the literature suggests that optimal primacy ought to also vary with the development level Under Williamson hypothesis, high spatial concentration at the earliest stages of development is important but as development proceeds de-concentration occurs (Henderson, 2002). Moomaw and Shatter (1996) considered comparing the determinants of three aspects of urbanization: the urbanization rate, the metropolitan concentration (the part of the urban population living in cities with over 100,000 inhabitants) and the primacy. It would therefore appear that generally during the early stages of development, the economic mechanisms caused the phenomenon of urban concentration to increase naturally, and then decline when the countries reach a certain level of industrialization. This pattern of evolutionary urban concentration, suggests the existence of an "optimum" degree of urban concentration, which varies depending on the stage of development considered. For Henderson (2000), the optimum degree of urban concentration corresponds to the degree of concentration that reaches the strongest growth.

For considering the impact of development on the relationship between economic growth and primacy, we add the interaction of them as an explanatory variable to the model. In this paper we use human development index (HDI) as a proxy for development. In comparison to the income per capita which is used by Henderson and other as a proxy of development, the advantage of HDI is that it considers education and health in addition to the income per capita. Therefore, in addition to considered variables, the following phrase is added to equation (2):

$$\ldots + Primacy_i\,(\delta_1 + \delta_2 HDI_i + \delta_3 HDI_i^2) + Primacy_i^2 \qquad (3)$$

The estimated δs answer the question of the paper.

3. A Review of Urban Concentration in EU and Mediterranean Countries

The cases of the study are Mediterranean countries and EU. Mediterranean zone consists of both developing and developed countries including Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya,

Malta, Montenegro, Morocco, Slovenia, Spain, Syrian Arab Republic, Tunisia, and Turkey. While the EU contains 27 countries, which most of them are developed.[2] All of these countries have high human development with HDI more than 0.8.

There are 39 mega-cities in the considered countries in which more the one million inhabitants reside. As figure (1) shows, most on these mega-cities are in Mediterranean zone in developing countries. Most developing countries around the world have faced to urban primacy phenomenon, so that the biggest city (or cities) of their urban system has (have) become very crowded during their urbanization. This has produced lots of costs for residents of these cities, as well as their governments. This phenomenon also decreases the economic growth.

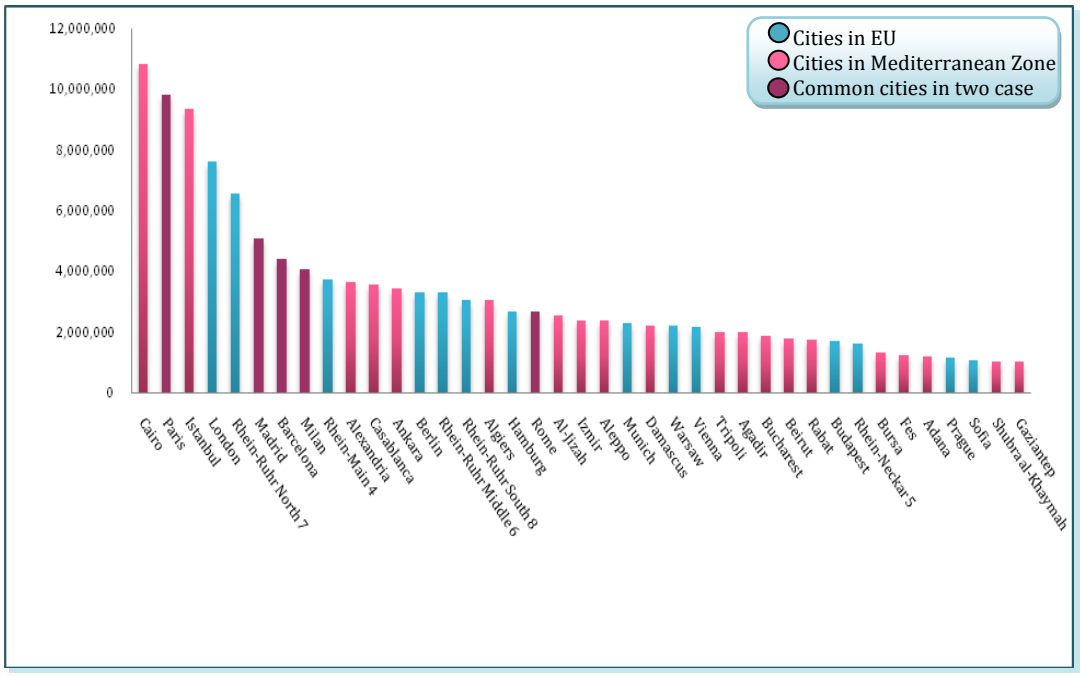

Figure (1): Mega-cities of the Mediterranean zone and EU.

[2] The EU contains Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherland, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

The averages of urban primacy, the share of the largest city in national urban population, are 8.75 and 13.20 for Mediterranean zone and EU, respectively. Luxembourg has the largest primate city relative to its urban population.

Figure (2) illustrate the relationship between economic growth and urban primacy. The trend line has a negative slope. This relationship estimated econometrically, at the next section.

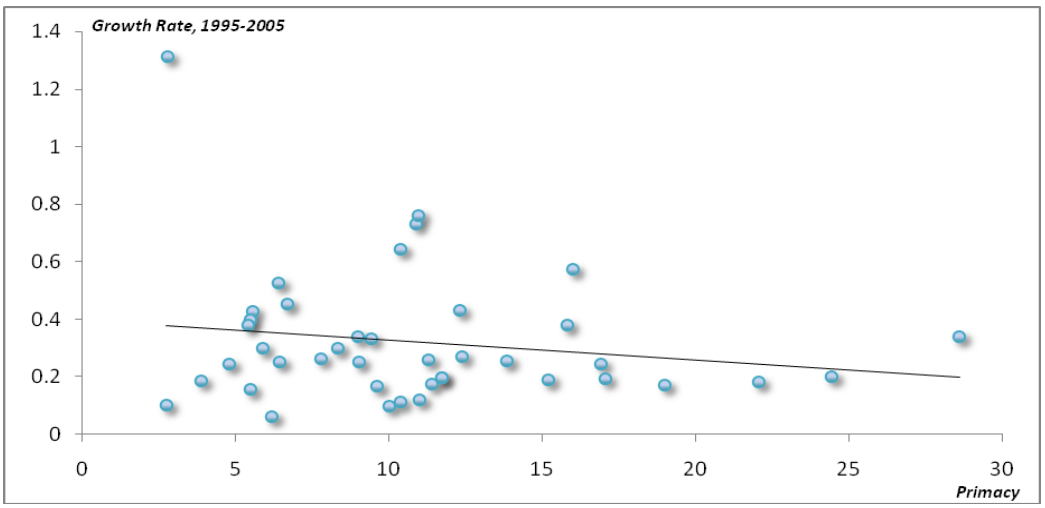

Figure (2): Economic growth and urban primacy in considered countries.

4. The Empirical Results

The specified growth model is as follows:

$$gy = \alpha - (1 - e^{-10\beta})Lny + X\gamma + \varepsilon \quad (4)$$

where, gy is economic growth rates in a 10-year interval (1995-2005). X contains such variables as HDI, GDI (gender development index), primacy and their interactions.

First, we estimate Eq. (4), for Mediterranean countries and the EU, separately. Then, we consider all together.[3]

[3] Models are estimated by STATA software.

Table1: Estimation results of the growth model without and with urban primacy effect for Mediterranean countries, 1995-2005.

Variable	*I*	*II*	*III*	*IV*
C	0.353 (0.35)	0.535 (0.33)	3.215*** (0.50)	3.150*** (0.49)
$L_n y_{95}$	-0.342*** (0.06)	-0.325*** (0.06)	-0.342*** (0.06)	-0.396*** (0.06)
HDI	3.336*** (0.78)			
GDI		2.975*** (0.71)		
Primacy			-0.424*** (0.09)	-0.396*** (0.09)
Primacy*HDI			0.482*** (0.10)	
Primacy*GDI				0.451** (0.09)
Adj. R^2	0.610	0.599	0.643	0.631
No.	20	20	20	20
F ***Prob.***	15.83 (0.0001)	15.19 (0.0002)	11.98 (0.0002)	11.58 (0.0002)

***Significant at 5% confidence level, **Significant at 5% confidence level, *Significant at 10% confidence level (Standard deviations are in parentheses).
(Source: Research computations).

The significant negative coefficient of the Lny_{-1} confirms conditional convergence hypothesis (i.e. the income per capita of each country converges to its steady-state level) and the speed of convergence (β) is 4.1 which is considerable. HDI and GDI both have significant and negative effects on growth, but the effect of HDI is stronger. 0.01 increasing in HDI raises economic growth by about 3.3 percent.

Columns 4 and 5 are estimation results of the growth model with urban primacy effects. Tables (1) and (2) demonstrate estimation results of equation (4) for the two cases by considering two development indices (HDI and GDI). In both tables, columns 2 and 3 show the growth model without the urban primacy effects.

All variables are significant. By inclusion of the urban primacy effects in the growth model coefficients of determination have improved. Primacy has negative effect on economic growth so that if population in primate city increases 1 percent, growth rate decrease by 0.4 percent. This result is consistent to urban economic theories. By concentrating infrastructures and possibilities in an area in a country, other urban areas face to lack of possibilities and it eliminates scale effects for them. On the other hand, if a primate city grows impoliticly, costs of life on it

including residence, transportation, health, and education costs increase, irregularly. All of these reduce efficiency and effectiveness and consequently economic growth.

But the coefficient of primacy times HDI is positive and significant which shows that with more development, more urban concentration helps to achieving to higher economic growth. Therefore, the main hypothesis of the study is accepted. In other words, the development level influences the relationship between economic growth and urban concentration and its effect is positive. More developed a country is, more urban primacy is useful. It is notable that two other variables, primacy squared and primacy times income per capita squared, are added to the model, but none of them are statistically significant. The reason could be that the model is cross sectional and dose not have time dimension.

The next table demonstrates the estimated models for EU.

Table2: Estimation results of the growth model without and with urban primacy effect for EU, 1995-2005.

Variable	*I*	*II*	*III*	*IV*
C	-0.544 (0.35)	-0.061 (1.14)	2.401*** (0.68)	2.103** (0.71)
$L_n y_{95}$	-0.262*** (0.10)	-0.216** (0.10)	-0.233*** (0.75)	-0.203** (0.08)
HDI	3.569* (2.10)			
GDI		2.599 (2.12)		
Primacy			-0.201 (0.11)	-0.143 (0.13)
Primacy*HDI			0.223* (0.13)	
Primacy*GDI				0.162 (0.14)
Adj. R^2	0.343	0.307	0.334	0.292
No.	27	27	27	27
F ***Prob.***	7.78 (0.0025)	6.75 (0.0047)	5.34 (0.0061)	4.57 (0.0119)

***Significant at 5% confidence level, **Significant at 5% confidence level, *Significant at 10% confidence level (Standard deviations are in parentheses).
(Source: Research computations).

As table (3) shows, the convergence hypothesis is accepted for the European Union, and the speed of convergence is higher. This result was predictable, because growth facilities are

more in EU. The estimated coefficient of HDI is positive but it has low confidence interval. The primacy effect is not statistically significant. It seems that the distribution of facilities is more regular in different area of European countries. The interaction of primacy and HDI has positive effect on the growth rate.

Table3: Estimation results of the growth model without and with urban primacy effect for Mediterranean countries and EU, 1995-2005.

Variable	*I*	*II*	*III*	*IV*
C	0.026 (0.30)	0.201 (0.28)	2.867*** (0.42)	2.871*** (0.42)
$L_n y_{95}$	-0.277*** (0.05)	-0.256*** (0.04)	-0.292*** (0.05)	-0.295*** (0.05)
HDI	3.097*** (0.65)			
GDI		2.705*** (0.60)		
Primacy			-0.343*** (0.08)	-0.333*** (0.08)
Primacy*HDI			0.381*** (0.08)	
Primacy*GDI				0.375*** (0.08)
Adj. R^2	0.479	0.456	0.473	0.470
No. of Obs.	41	41	41	41
F ***Prob.***	19.37 (0.0000)	17.76 (0.0000)	12.95 (0.0000)	12.81 (0.0000)

***Significant at 5% confidence level, **Significant at 5% confidence level, *Significant at 10% confidence level (Standard deviations are in parentheses).
(Source: Research computations).

Finally, we combine the two cases. By deleting the common countries, there are 41 observations. The statistically significant estimated coefficients of primacy variables show that primacy influences economic growth, although its effect is negative and changes through the development level (the estimated coefficient of its coincident effect with *HD*I is significant and positive). Results show that the relationship between economic growth and urban primacy exits and can be change through the development process. The model results are consistent to other studies like Henderson (2000, 2002) and Farahmand et al (2007), although income per capita is the index of development in these studies.

5. Conclusion

In this paper, the effect of urban concentration on economic growth is studied. Inclusion of urban primacy variables to the growth model increases the model's coefficient of determination. Urban primacy as an index for urban concentration influences economic growth negatively. That is larger primate cities have some costs on economic growth. Of course, this relation depends on the development level. In this study, HDI and GDI are considered as indices for development. Through more development, more primacy leads to more growth. In this paper only the first part of Williamson's hypothesis is confirmed, because we have used a cross section model and hence we could not examine the dynamic aspect of this relation. As a result of the paper, we can say that the main hypothesis of the paper is accepted i.e. development can influence the relationship between economic growth and urban primacy.

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