Journal of Geography and Regional Planning Vol. 5(4), pp. 115-121, 18 February, 2012
Available online at http://www.academicjournals.org/JGRP
DOI: 10.5897/JGRP11.117
ISSN 2070-1845 ©2012 Academic Journals

Full Length Research Paper

Spatial effects of localization and urbanization economies on urban employment growth in Iran

Shekoofeh Farahmand, Nematollah Akbari and Mina Abootalebi*

Department of Economics, Faculty of Administrative Sciences and Economics, University of Isfahan, Hezar-Jerib St., Isfahan, Iran.

Accepted 14 December, 2011

The emergence and growth of cities is affected through different factors. Urban economists have a broad consensus about the role of agglomeration externalities in the emergence and growth of cities. Urbanization agglomeration that is named Jacobs externalities, refers to the role of economic diversification in urban growth and leads to knowledge spillovers among different types of firms. Localization agglomeration is related to the concentration of firms activated in a special industry within a specified place. Following this concept, economic specialization is considered as a key factor to urban growth. The purpose of this research is to explore the impact of different types of agglomeration economies and their spatial lag effects on urban employment growth in 171 counties of Iran from 1996 to 2006. The indices are computed by the employment data in 3-digit industrial classification. Aggregate indices of specialization and diversification are calculated for all considered counties. Then, their effects are examined on the growth of urban employment. For considering the spatial impact of agglomeration economies, the spatial lags of indices are entered into the model. Results demonstrate an inverse U-shaped relationship between diversification and urban growth. Furthermore, findings for spatial Jacobs's effects show positive relationships among counties of Iran. Specialization economies have a negative impact on employment growth. We do not find any evidence for the impact of spatial lag on localization of economies. Meanwhile, unlike the negative effect which the population has on its populated neighbors, employment growth increases, since the market potential expands.

Key words: Localization, urbanizations, Jacobs's externalities, Marshall-Arrow-Romer (MAR) externalities, urban employment growth, spatial effects.

INTRODUCTION

In urban economics literature, the geographic concentration of economic activities is named agglomeration. By locating close to one another, firms can produce at a lower cost (O'Sullivan, 2003). It implied that agglomeration creates some capabilities more than acting as an isolated firm (Rabellotti, 1997). Cities are the most obvious example of agglomeration. Today, cities and urban areas are mostly regarded as the main scope of the economic activities for benefiting from opportunities of innovation, production and employment.

It is difficult to study how cities are created and grown because of various effective factors and the complexity of the relationships among them. However, there is a consensus that agglomeration economies have an important impact on the creation and growth of cities (Sabbagh, 2001).

There are two types of factors affecting the growth of cities: exogenous and endogenous factors. Exogenous factors such as access to natural resources or the geographic condition can explain the historical distribution of establishments, but these factors are not able to explain the further growth of already geographically concentrated industries (Douth, 2010). Endogenous factors are agglomeration economies that lead to further

*Corresponding author. E-mail:abootalebi.mi@gmail.com. Tel: +98 311 6680646. Fax: +98 311 6683116.

agglomeration growth. As remarked by Henderson (1997), there are two types of agglomerative economies: urbanization economies externalities (after Jacobs, 1969) and localization economies externalities (after Marshall, 1920; Arrow, 1962; Romer, 1986). Both externalities explain how agglomeration causes positive effects on productivity and employment growth. They differ in the specific form of agglomeration that has to exist for them to become effective (Douth, 2010).

In the existing literature, there is a vast theoretical and empirical discussion about the importance of agglomeration economies. But up to now, studies on this field in developing countries including Iran are still a minimal and it requires much more study and attention than what has so far been paid to it. More knowledge about agglomeration economies would be important to orient and reform economic policies, particularly employment policies and effective management of financial resources related to it. As a result, this study examines if and how the Jacobs and Marshall-Arrow-Romer (MAR) externalities increase regional employment growth in Iran. The sample is main counties of Iran from 1996 to 2006. In addition, it suggested that spatial effects of agglomeration economies are important to urban growth. Thus, study analyzes spatial effects of two categories of agglomeration economies on employment growth.

LITERATURES REVIEW

As stated earlier, the agglomeration is divided into two main categories. Each category causes a specific type of external economies. The first is related to economies resulting from localization. It occurs if firms in a particular industry are located close to one another, so that intra-industry linkages can allow the creation of positive externalities. Since the idea that industrial localization can increase productivity goes back to Marshall (1920), Arrow (1962) and Romer (1986), it is also called MAR externalities. Marshall (1920) who presented this hypothesis for the first time believed that, when an industry has thus chosen a locality for itself, it is likely to stay there for a long time; so the advantages which people get from their neighborhood following the same skilled trade are enormous. The mysteries of the trade become no mysteries; but as it were in the air, children learn many of them unconsciously… Employers are apt to resort to any place where they are likely to find a good choice of workers with the special skill which they require...The advantages of variety of employment are combined with those of localized industries in some of our manufacturing towns, and this is a chief cause of their continued economic growth.

Localization is also called clustering. Clusters are “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions (for example, universities, standards agencies and trade associations) in a particular field which compete but also cooperate” (Porter, 2003).

Localization economies can be created and increased by economic specialization in a region. Thus, specialization indices have been used for measuring localization economies in different studies. Beaudry and Schiffauerova (2008) have listed the most important measures used in the studies including the location quotient, own-industry employment, number of industry plants, several indices based on technological closeness of sectors and measures indicating the share of own industry in a region (measured either by output, R&D investment or industry value added).

The second category is related to economies resulting from urbanization which is called urbanization economies. Locating diversified economic activities in short time distances allows them to exchange knowledge in different fields. As described by Jacobs (1969), relevant sources of knowledge are not often necessarily found within, but rather beyond the own industrial environment. Consequently, Jacobs’s hypothesis refers to diversity of the local economy. Accordingly, it can be expected that urbanization economies increase urban employment growth in a region.

Measures of Jacob’s externalities that are often used in the studies are: Hirschman–Herfindahl index (the most common), other industry employment, Gini index, total local population, total local employment and others. The Hirschman–Herfindahl index is a diversity-based measure and in all of its forms, it is the most commonly used indicator (Beaudry and Schiffauerova, 2008).

There are three broad classes of mechanism to explain the reasons of agglomeration economies:

(1) Scale economies in intermediate inputs*:* an agglomeration allows for a more efficient sharing of local infrastructure and facilities, a variety of intermediate input suppliers or a pool of workers with similar skills.
(2) Labor-market pooling*:* an agglomeration allows for a better matching between employers and employees, buyers and suppliers, or business partners. This better matching can take the form of improved chances of finding a suitable match, a higher quality of matches, or a combination of both.
3) Knowledge spillovers*:* an agglomeration can also facilitate learning, for instance, by promoting the development and widespread adoption of new techno-logies and business practices (O’Sullivan, 2003; Puga, 2009).

“Localization economies differ from urbanization economies in two ways. First, urbanization economies result from the scale of the entire urban economy, and not the scale of a particular industry. Second, urbanization economies generate benefits for firms through the city, and not just firms in a particular industry” (O’Sullivan, 2003).

There is a huge body of empirical studies respecting

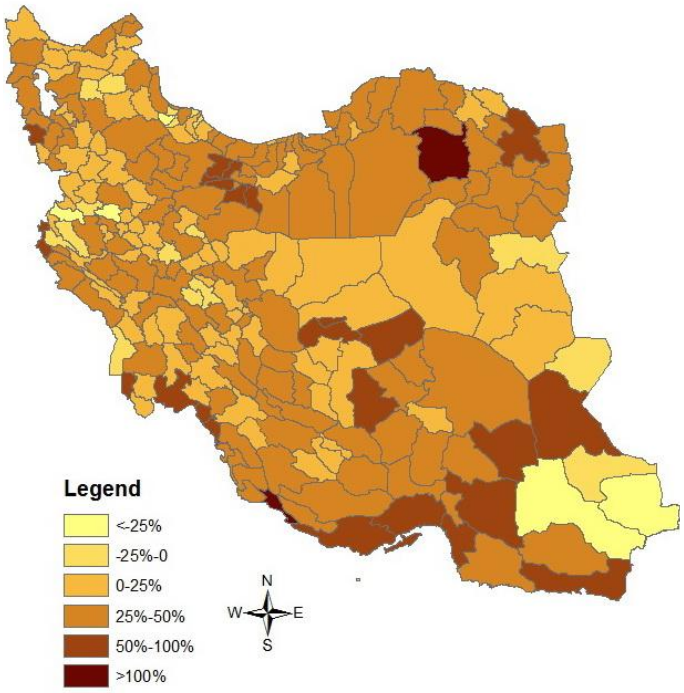

Figure 1. Employment growth in counties of Iran, 1996 to 2006. Source: Authors' computation.

how important are localization economies and urbanization economies. Lasagni (2011) used local labor market area (LLMA) data to investigate the dynamics of employment in the information technology (IT) sector in Italy between 2001 and 2005. The ordinary least squares (OLS) results are broadly consistent with Jacob's externalities. At the same time, LLMAs with higher IT concentrations are associated with lower employment growth rates. Also, an additional set of results revealed that the role of agglomeration forces is different across IT growth levels. Illy et al. (2009) have shown a U-shaped relationship between specialization and urban growth in German cities from 2003 to 2007. However, they have not found evidence for the impact of Jacob's externalities. City size shows a positive (but decreasing) effect on urban growth. Similarly, using a 30-year data on the evolution of Swedish labor-market regions, Neffke et al. (2008) have shown that industries can benefit from their local environment. These benefits are strongly associated with their stage in the industry life cycle. Their results indicate that whereas MAR externalities increase with the maturity of industries; Jacob's externalities decline when industries are more mature. Ejermo (2004) presented empirical evidence which strongly supports Jacob's externality hypothesis. Henderson (1988) measured the localization economies as the elasticity of output per worker with respect to industry output. His results have indicated that an increase in city size, by itself, does not increase productivity. He has concluded that larger cities are more productive because they have large concentration of specific industries (localization economies). In a seminal paper, Glaeser et al. (1992) found evidence of positive Jacob's externalities impact on industry employment growth in 170 U.S. cities. On the contrary, intra-industry technological spillovers have had no significant impact.

In a whole review, Beaudry and Schiffauerova (2008) summarized the results of the 67 articles. They stated that, around 70% of these studies claim to have found some proof of existence of Marshall externalities and their positive impact on economic growth or innovative output, while a comparable proportion of the studies (75%) confirm Jacob's thesis of a favorable influence of diversification of economic activities in a region. Although positive evidence for both types of externalities is measured, many of these studies have also detected negative impacts. The specialized regions tend to become more specialized with time, and thus experience increasingly less external relations than the diversified regions (Beaudry and Schiffauerova, 2008).

DATA AND VARIABLES

The used employment data are retrieved from the statistical center of Iran in the period of 1996 to 2006[1].

The analysis will be carried out for Iranian counties whose population has been over 100,000 in 1996. The used data has been justified in accordance to the formal boundaries of counties in 1996. The indices have been computed using the number of employees for each county at 3-digit industrial classification. In accordance to such studies as Illy et al. (2009), agriculture, fishing and mining as well as exterritorial organizations are excluded since employment of these industries is not influenced by agglomeration economies. In other word, these activities have no significant impacts on growth in cities.

Similar to the mentioned studies, the present paper tried to examine the effects of localization and urbanization economies on urban growth. Here, the employment growth rate of counties is considered as a proxy for urban growth. Thus, in the considered model, the dependent variable, $\hat{L}_c$, is as follow:

$$\hat{L}_c = \frac{L_c^{06} / L^{06}}{L_c^{96} / L^{96}} \quad (1)$$

where L_c is the employment of each county, and c= 1, 2…, 171 is an index for the county. Superscripts of L (06 and 96) are related to the years (that is, 2006 and 1996, respectively). The growth rate, $\hat{L}_c$, is normalized by the total employment to ensure comparability across counties. Figure 1 provides an initial vision of employment growth of Iranian counties from 1996 to 2006.

18.5 million employees in 2006, employment growth of the

[1] 2006 is the last year for which there are real census data in Iran.

Table 1. The most and the least specialized counties of Iran (1996).

The most specialized county		The least specialized county	
County	**KSI**	**County**	**KSI**
Nikshahr	1.557	Hamadan	0.215
Dolfan	0.985	Shiraz	0.239
Lordegan	0.962	Gonbadekaboos	0.261

Source: Authors' computation.

Table 2. The most and the least diversified counties of Iran (1996).

The most diversified county		The least diversified county	
County	**Inverse of HHI**	**County**	**Inverse of HHI**
Tehran	13.05	Hashtrood	2.366956
Mashhad	10.42	Chenaran	2.531047
Isfahan	9.93	Nikshahr	2.755027

Source: Authors' computation.

sample increases to 42%. Overall, total employment increases with about 40% for all counties. Employment in services and industry sectors increases with about 59% in the 10-year considered period. While, 23 counties have not been able to provide new jobs, the employment opportunities in 148 counties have increased. The most striking positive growth is found in Sabzevar (Khorasan) and Kangan (Boushehr) with an increase in each case of more than 100%. The most distinctive shrinkage has taken place in javanrood (Kermanshah, -64%) and sonqor (Kermanshah, -37%).

The main independent variables of the model are economic specialization and diversification as proxies for localization and urbanization economies. To compute these potentials in the level of a county, specialization and diversification are aggregated for all industries. We apply the Krugman specialization Index (KSI) to measure the overall degree of economic specialization:

$$KSI_c = \sum_{i=I}^{I} \left| \frac{L_{ic}}{L_c} - \frac{L_i}{L} \right| \quad (2)$$

where, L_{ic} is employment in a specific industry (i=1,…,142), in a given county (c=1,…,171). L_c is total employment of the county. L_i is employment of industry i and L is total employment of Iran.

The KSI ranges from 0 to 2. A high KSI indicates a strong deviation from the overall economic structure. A KSI of zero corresponds to an identical industry structure of the region and county (Krugman, 1991). Table 1 shows a view of the most and the least specialized counties of Iran in 1996.

Almost the same as most other studies (Beaudry and Schiffauerova, 2008), Jacob's externalities have been operationalized by an inverse relative Hirschman-Herfindahl index [HHI] (Equation 3). HHI of a county arises from the sum of the squared shares of employment of the several industries in the specific county ($L_{i,c}$ / L_c), (Illy et al., 2009). A high inverse-HHI indicates a strong diversification of the region`s economic structure.

$$HHI_c = \sum_{i=1}^{I} \left(L_{ic} / L_c \right)^2 \quad (3)$$

The variables are as previously defined. Table 2 shows the counties of Iran with the highest and the lowest economic diversification.

It is worthwhile to note that Tehran is the capital and primate city of Iran. Mashhad and Isfahan are the next larger cities of Iran. Meanwhile, a comparison of obtained specialization and diversification indices shows that those cities with a high economic specialization are often also the least diversified cities. Actually, while this relationship can be seen for most counties, this is not true for all. As mentioned by Beaudry and Schiffauerova (2008), localization and urbanization economies are not mutually exclusive. Especially in large cities, they can be present simultaneously.

County size and human capital have been considered as control variables in model. The county size have examined by the ratio of employment in each county relative to total employment of Iran. Meanwhile, in accordance to new growth theories, it is expected that human capital can influence urban growth. Human capital is measured by literacy rate. Finally, since the Tehran is the capital and primate city of Iran, a dummy variable is considered for it.

Besides the mentioned variables, spatial effects of two categories of agglomerations are also considered. Since we have used location data; it seems that growth in a county can be influenced not only by these agglomerations in that county, but by the agglomeration effects of other counties especially neighbor counties.

Correspondingly, to examine the spatial effects of diversification and specialization, the spatial lag of them are also considered in the model (Anselin and Hudak, 1992; Anselin, 1988). Variable's spatial lag in a county is a weighted average of amount of variable in county's neighbors, with the weights being obtained from the simple contiguity matrix. More explanations about the spatial matrix and model are discussed. There are spatial effects. In other word, it is suggested that urban

$$y = X\beta + u \quad (4)$$

With the error term *u* classical. As previously discussed, to examine the spatial effects of two categories of agglomerations on urban employment growth, the spatial lag of them are also entered in the model. Thus, the model is a spatial Durbin model (SDM). The SDM is:

$$y = X\beta + WX\theta + u \quad (5)$$

W is row-standardized spatial weights matrix (Viton, 2010). The dimensions of weight matrix will be the number of regions. An element of matrix equals 1 if regions i and j are neighbors of one another (Queen Contiguity) and zero otherwise. By convention, the diagonal elements of this spatial neighbors' matrix are set to zero. To row-standardize this, we divide each element in a row by the sum of the elements in the row (Viton, 2010; Anselin and Hudak, 1992). Thus, this model adds average-neighbor values of the independent variables (*X*) to the linear-in-parameters cross sectional model.

Therefore, the model used to estimate can be specified as:

$$\hat{L}_c = \alpha + \beta_1 HHI_c + \beta_2 HHI_c \text{^}2 + \beta_3 KSI_c + \beta_4 L_c + \beta_5 SHHI_c + \beta_6 SKSI_c + \beta_7 SL_c + \beta_8 EDU_c + \beta_9 dummy_c + u_c \quad (6)$$

where, $\hat{L}_c$ is the employment growth rate of county c in the period of 1996 to 2006. HHI is an accumulative index for diversification in the base year, 1996. According to Jacob's hypothesis, its coefficient was expected to be positive. To test for positive but decreasing effects of Jacob's externalities, the square of the HHI is also included in the model. SHHI is the spatial lag of HHI. KSI is a measure of overall degree of economic specialization of the counties in 1996 and SKSI is its spatial lag. L and SL are, respectively county size and its spatial lag. EDU is human capital in 1996. All variables are used in logs (except the dummy variable).

THE EMPIRICAL RESULTS

Before estimating the models, we trace the Multivariate Moran's I graph for having an initial view of spatial dependence between economic specialization and diversification as well as county size of considered counties in 1996 and the employment growth rate from 1996 to 2006. The multivariate Moran's I is a measure of spatial correlation between one variable and spatial lag of other variable. The graph on left side of Figure 2 indicates a positive correlation between economic diversification and spatial lag of employment growth. The result for city size is the same (right-side graph). The graph at the middle of Figure 2 shows the link between the KSI of the Iran counties and urban growth rates of their neighbors. A negative relation is shown for the impact of localization economies in a given counties' neighbors on urban growth of county.

THE MODEL

We start with a linear-in-parameters cross sectional model:

Table 3 shows the estimated results of Equation 3. Since the model suffers from inherent heteroskedastisity[1], thus, it has been estimated using weighted least squares (WLS) and two stage least square (TSLS). The similarity of the obtained results of WLS and TSLS methods could show the efficiency of estimators.

Specialization had a significant negative effect on employment growth. The second type of agglomeration economies which is urbanization economies was found to influence employment growth positively. However, the squared term indicates that at high levels of diversify-cation, the effect becomes negative. In fact, there is an inverse U-shaped relationship between employment growth and Jacob's externalities. The estimated co-efficient of SKSI is not significant. Therefore, the spatial effects of specialization were found to be insignificant. In other words, specification of neighboring counties had no significant effect on county's employment growth. Estimated coefficient for spatial lag of diversification is statistically significant. It would imply that locating near counties with higher degree of diversification can increase employment growth of a county.

The estimated coefficient of county size is negative and statistically significant. Similarly, the estimated coefficient of its spatial lag is significant and positive. Consequently, it can be remarked that having more diversified neighbors can influence employment growth positively. Also, it means that similar to Jacob's externalities, spatial Jacob's externalities can be important for urban growth.

Of the other control variables growth as expected, employment growth depends positively on human capital with a high significantly rate. The impact of dummy variable is also positive and significant.

CONCLUSIONS

In this study, we have examined the effects of agglomeration economies as well as their spatial lags on urban employment growth. The model was estimated for counties of Iran from 1996 to 2006. The empirical findings on urbanization theory show an inverse U-shaped relationship between diversification and urban growth. This result supports the Jacob's view of the benefits resulting from urban agglomerations but not in very high or very low levels of diversification. In fact, it has an optimal level. Therefore, Jacobs's hypothesis was only partially confirmed. Furthermore, findings for spatial Jacobs's effects show a positive spatial relationship among counties of Iran. A given county with a more diversified economy indicates extent and density of that county in general and therefore shows the importance of the county size. Large urban areas provide large-scale markets with a high number of potential customers and

[1] The F-statistic of the white heteroskedastisity test is 5.96 (prob. 0.00).

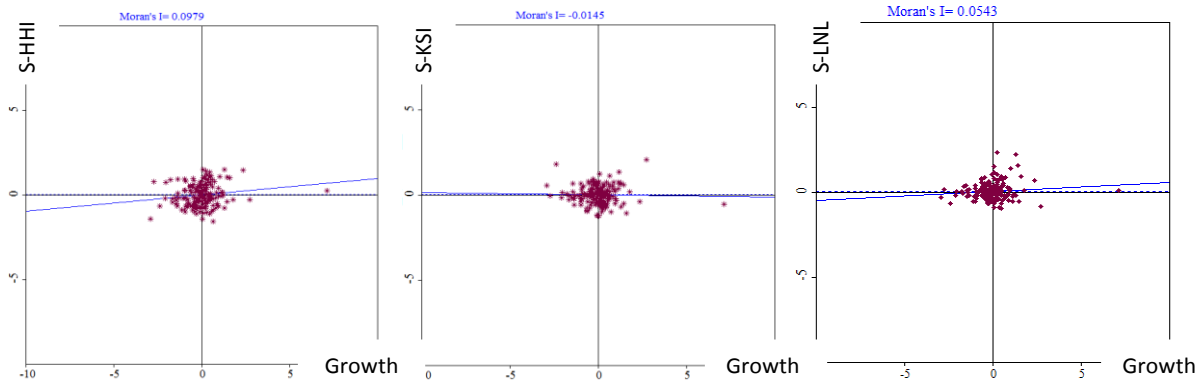

Figure 2. Multivariate Moran's I scatter plot for HHI, KSI and county size.
Source: Authors' computation.

Table 3. Estimation results of OLS, WLS and TSLS models.

Variable	OLS model	WLS model	TSLS model
α	-0.987** (0.01)	-2.024*** (0.00)	-2.031*** (0.00)
HHI	-0.092 (0.66)	0.467* (0.08)	0.478* (0.08)
HHI^2	0.019 (0.68)	-0.107** (0.036)	-0.11** (0.032)
KSI	-0.116* (0.08)	-0.107** (0.02)	-0.112** (0.017)
L	-0.699*** (0.00)	-0.912*** (0.00)	-0.914*** (0.00)
SHHI	0.119 (0.12)	0.33*** (0.00)	0.328*** (0.00)
SKSI	0.053 (0.67)	0.134 (0.31)	0.146 (0.27)
SL	0.045 (0.71)	0.247*** (0.00)	0.253*** (0.00)
EDU	1.349*** (0.00)	1.263*** (0.00)	1.22*** (0.00)
Dummy	-0.038 (0.83)	-0.074*** (0.00)	-0.066** (0.01)
R-squared	0.43	0.71	0.71
Adjusted R-squared	0.40	0.69	0.69
N	171	171	171

Numbers in parentheses are p-values.*, ** and*** denote significance at the 10, 5 and 1% levels.,Source: Authors' computation.

suppliers for neighbors' area as well as to provide advanced transportation and communication infra-structure for connection with them. Also, the estimated coefficient for spatial lag of county size confirms this result.

We have found to have no consistently for expected localization effects. The results show the negative specialization impact on urban growth.

Other explanatory variable, which is typically thought to be of importance for the urban growth is city size. Our results indicate that city size have affected negatively urban growth that could support the economic con-vergence theory. However, contiguity and neighboring effects of county size have had important role in urban growth in Iran.

REFERENCES

Arrow KJ (1962). The economic implications of learning by doing. The review of economic studies. p. 29.

Anselin L (1988). Spatial econometrics: Methods and models, Boston: Kluwer Academic Publishers.

Anselin L, Hudak S (1992). Spatial econometrics in practice: A review of software options. Regional science and urban economics. 22: 506-539.

Beaudry C, Schiffauerova A (2008). Who's right, Marshall or Jacobs? The localization versus urbanization debate. Research Policy, 38: 318-337.

Douth W (2010). Agglomeration and regional employment growth. IAB Discussion Paper, pp. 4-14.

Ejermo O (2004). Technological Diversity and Jacobs' Externality Hypothesis Revisited. The Royal Institute of technology Centre of Excellence for studies in Science and Innovation (CESIS), p. 16.

Glaeser E L, Kallal HD, Scheinkman JA, Shleifer A (1992). Growth in cities. J. political Econ., p. 100.

Henderson JV (1988). Urban development: Theory, Fact, and Illusion. New York: Oxford University. pp. 1-242.

Henderson JV (1997). Externalities and Industrial Development. J. Urban Econ., 42(3): 449-470.

Illy A, Hornych C, Schwartz M, Rosenfeld MTW (2009). Urban growth in Germany –The impact of localization and urbanization economies. Halle Institute for Economic Research – IWH, p. 19.

Jacobs J (1969). The economy of cities. New York: Random House. pp. 1-268.

Krugman P (1991). Geography and Trade. Cambridge: MIT Press, pp. 1-85.

Lasagni A (2011). Agglomeration Economies and Employment Growth: New Evidence from the Information Technology Sector in Italy, Growth Change, 42(2): 159-178.

Marshall A (1920). Principles of economics. London: McMillan, 8nd ed reprinted 1962, pp. 270-275.

Neffke F, Henning MS, Boschma R, Lundquist KJ, Olander LO (2008). Who needs agglomeration? Varying agglomeration externalities and the industry life cycle. Papers in Evolutionary Geography, Utrecht University 08/08, pp. 1-34.

O'Sullivan A (2003). Urban economics, Boston, Mass: McGraw-Hill/Irwin, 4nd ed, pp. 38-100.

Porter ME (2003). The Competitive Advantage of Nations. MacMillan, London. 37: 549–578.

Puga D (2009). The magnitude and causes of agglomeration economies. J. Regional Sci. 50th Anniversary Symposium. pp. 203–219.

Rabellotti R (1997). External Economies and Cooperation in Industrial Districts: A Comparison of Italy and Mexico [Hardcover]. St. Martin's Press. pp. 30-100.

Romer PM (1986). Increasing returns and long run growth. J. Political Econ., p. 94.

Sabbagh kM (2001). Regional Economics: Theory and Models. Tehran: samt, pp. 1-30.

Viton PA (2010). Notes on Spatial Econometric Models. City and regional planning, 870(03): 9-10.