

Kolvekova, Gabriela; Kolvekova, Gabriela

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**ASSOCIATIONS AMONG EMPLOYMENT AND
INDUSTRIES OF SLOVAK ECONOMY**

Gabriela Kolvekova, Daniela Palascakova

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Gabriela Kol'vecková - Daniela Palaščáková

Gabriela.Kolvekova@tuke.sk – Daniela.Palascakova@tuke.sk

Technical University of Košice, Faculty of Economics, B. Nemcovej 32, 040 01
Košice, Slovak Republic.

Associations among employment and industries of Slovak economy

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Abstract

Research background: Urban areas are as important as rural ones for regional development. This paper observes especially the position of cities, urban areas in the context of global value chains – GVC. Global value chains reflect specialization and labour division of companies, mostly multinational enterprises – MNEs. MNEs can be considered for flagships of some industries. Such flagship influence suppliers and purchasers. MNEs are a part of networks or do have got an access to such networks that combine dispersion of the value chain the boundaries of the firm and across national borders and.

Purpose of the article: The impetus of this humble work was to look at position of Slovak cities (Bratislava, Žilina) in order to look for sectors that can help to develop the city and its adjacent regions, particularly cross-border regions. The paper discussed how the attribute of the cross-border regions gives the cities more advantageous position in GVC.

Methodology/methods: Applying method of location quotient allowed to shed a light on GVC, which cities participate in. Some cities were in a position to take advantage of participation in GVC.

Findings& Value added: Examined cities are located in the western part of Slovak Republic. Discussion about the attribute of the cross-border regions can stimulate new ideas for finding causalities in city sprawl or in specialization patterns in industrial structure of the city. Discussion further fosters the comparison of two cities strengths and weakness of each of them that were summarized in terms of employment and industrial exploitation of GVC. It is the first finding and value added of

the paper. Second one, method of location quotient is simple, but provides clear evidence on the regional development or decline in particular industries and time of observation.

Introduction

Cities position in global world can either be embedded in the region or get disconnected from its own region. There exist particular sectors to urban economy such as services that observed rapid changes in a last few decades. The growth of these global cities is fed by location of transnational corporations, which does not have to apply to cities of smaller scale. Nonetheless, what applies is that “cities are key sites for the production of services for firms.”(Sassen, 2002, pp. 13-30). The overview of the dispersion in terms of various jobs in production in two Slovak cities by sectors was a motivation for writing this paper. Similarly, the motivation could be found in observation of strengths and weakness of two cities with significant position in Slovak economy and at the same time cities being specific for its location both as a part of bordering regions and in western part of Slovakia.

Paper is organized in two parts. Part one it briefly names numerous literature that gives a context for explanation of objectives and relevant theories, followed by a notes on methods applied. Part two is analysis itself, i.e. examination of location quotient throughout industries in the urban area of two major cities located in boarder regions. Analysis took into consideration the skewness of the location quotient that resulted in an additional point of view. Method of location quotient was applied with dataset of employment in these two cities only in one year. The analysis emphasizes employment and companies` particularities and peculiarities in regions in question. Following description of entrepreneurial activities specific recommendations could be derived. Discussion provides reader with limitation of this paper as well as plausible or problematic parts of the research. Nonetheless conclusions are both general and particular for the cities observed. In this paper, the focus of research was to identify one possible way of measurement of the outputs and inputs in all industries in two city-regions of Slovakia: Bratislava and Žilina city.

Theoretical impetus

Living in a city or in some rural area have pros and cons as it is generally known. Science has come up with additional negative side effects of living in a city, namely sprawl. Authors of this term reflect a reality, which is preferred option by employed people. The option is to work in city and at the

same time live very close to city, so to say half-way to rural area. To be accurate half-way to rural area means suburb of a city (Brueckner, 2000, pp. 160-171; Johnson, 2001, pp. 717-735; Jun, 2009, pp. 311-327). The sustainability of the city could be a future envisioned in the life of the regions, particularly the cross-border ones (Nevens, Frantzeskaki, Gorissen, & Loorbach, 2013, pp. 11-122). The methodology for multi-criterial assessment of city's development in perspective of sustainability was suggested by Yigitcanlar et al. (Yigitcanlar, Dur, & Dizdaroglu, 2015, pp. 36-46). For instance, they introduce Micro-level Urban-ecosystem Sustainability Index.

Urban growth (Baus, Kováč, Pauditšová, Kohutková, & Komorník, 2014, pp. 104-111) is distinguished from urban sprawl (Pazúr, Feranec, Štych, Kopecká, & Holman, 2017, pp. 135-146; Verbeek, Boussauw, & Pisman, 2014, pp. 48-59). While the urban growth has meaning in population growth and growth of economic activities, the notion of urban sprawl emphasis stretching the borders of city with some regard to economic activities as well to population. Urban sprawl is rather uncontrolled (Uhel, 2006), cities that are characterised by “non-sprawl” are also called “edge cities” or polycentric such as probably Manchester, Leeds (Pratt, 2009, pp. S109-S114). The need to travel might decrease due to an increase of jobs for “knowledge workers”, it is a picture of new worker and new human (Stallings, 2001, pp. 3-14). The more educated people live in the city the more they spend on local products and create a demand for further goods and services and vivid city life (Marlet & Van Woerkens, 2007, pp. 2605-2626). According to this study the presence of creative class in the city fosters urban development in terms of employment. Thus employing creative class distinction is valuable variable for explaining city growth in terms of employment and availability of jobs.

Exchange of routines or new managerial experience is fostered by labour market mobility, input-output linkages and reverse engineering (Fratesi & Senn, 2008). It is foreign direct investments – FDI that are noticeable at regional and national level as capital flows in the network of companies. As Zeleny correctly points out, the outsourcing process allowed that value added is being searched for more and thus the Shih's smile curve is broader and deeper (Zeleny, 2007). Explanation was that added value is the measure of human knowledge, which again is searched globally.

The Heckscher-Ohlin-Vanek model – HOV - gives a basis to understanding the impact of globalization on labour market. This theory can apply to cities located near borders (Leamer, 2000, pp. 17-49). For instance, the food processing firms, once they produce in a value chain, they benefit from some kind of spillovers that make productivity a less stringent requirement for export (Giovannetti & Marvasi, 2016, pp. 110-125). This is also why the study provides an insight to export jobs.

Based on this context the main objective is to find out sectors localized in the cities that have a relatively significant position regarding the proportion with Slovak national localization. As it is explained in details with methodology and later illustrated with brief description. Identifying and confirming of these sectors could be considered factors for sprawl, growth and other phenomena presented above.

Research Methodology

Location quotient (LQ) are the starting point of this humble research. As there exist several options on how to calculate location quotient as referred to book by Miller and Blair (Miller & Blair, 1985). In general, one can use location quotients to describe the situation of an area. In this paper the emphasis was given on cities. The basics of using location quotients can be found in the first formula, where x_i^r and x^r denote gross output of sector i in region r . Total output of all sectors at national level, denotes n , i.e. x_i^n and x^n . (Miller & Blair, 1985, p. 349).

$$LQ_i^r = \frac{x_i^r/x^r}{x_i^n/x^n} \quad (1)$$

This formula express how much each of the sectors contributes to the regional output in its numerator and to the national output in its denominator. As a consequence: the more the LQ exceeds 1, the more is the sector concentrated in the region compared with nation. Region in the following analysis it will be a city. The quotient refers to the most concentrated industry. The implementation of this LQ would be appropriate to support with the Wald test as suggested in explanation using dartboard test. This test provides valuable information on the substance of decision making to localization, i.e. independency and randomness (Capone & Boix, 2008, pp. 209-224; Guimaraes, Figueiredo, & Woodward, 2009, pp. 360-364). This test was mentioned here to provide a limitation of the study that can be an impetus for new and deeper research. Another test were recommended such as Kolmogorov-Smirnov (K-S) test for normality (O'Donoghue & Gleave, 2004, pp. 419-427). It is because LQ values shall approximate normality, otherwise the logarithmic transformation is recommended. This was done in respect to the fact that aggregation error is continuously of importance in regional input – output models. (Lahr & Stevens, 2002, pp. 477-507). Later on we use this quotients for broader analysis (Hsieh & Kung, 2013). The overall usefulness of using LQs can be underpinned by regional input coefficient that can be estimated (Anthony T. Flegg & Tohmo, 2013, pp. 703-721; A. T. Flegg & Webber, 1997, pp. 795-805). The data used for analysis was found in Statistical Office SR and World city report (Habitat, 2016).

Cities of border regions in Slovak republic: Bratislava and Žilina

Both Bratislava and Žilina are cities on the river stream, Dunaj and Váh river respectively. Comparing the urban area: Žilina covers 8 003 hectares and Bratislava 36 763 hectares. Despite this fact Žilina is the fourth largest city in Slovak republic and was selected for the study because of its geographic location. Further description of border regions gives details on region of Bratislava city, which is located about 55 kilometers from Vienna in Austria, which is noticeably hosting almost one third of total labour force in its quarters. While in Bratislava it is around half of this proportion, as seen in table 1. Next comparison is related to the city of Žilina, which can be reached from Polish cities: Katowice (177 km), Kraków (127 km) and Czech city Ostrava (76 km). Out of all cities Kraków can refer to the lowest unemployment, in the region of 3%.

Table 1 Comparing labour market characteristics of cities neighbouring slovak region

| Metropolitan areas | Labour force of the metropolitan area as a share of national value (%) | | | | Employment of the metropolitan area as a share of national value (%) | | | | Unemployment of the metropolitan area as a share of national value (%) | | | |
|--------------------|--|------|------|------|--|------|------|------|--|------|------|------|
| | 2000 | 2010 | 2013 | 2014 | 2000 | 2010 | 2013 | 2014 | 2000 | 2010 | 2013 | 2014 |
| Bratislava | 14,7 | 14,6 | 14,3 | 14,2 | 16,7 | 15,8 | 15,5 | 15,3 | 6,5 | 7 | 7,2 | 7,4 |
| Brno | 6,1 | 6,1 | 6,3 | ... | 6,2 | 6,1 | 6,3 | ... | 5,8 | 6,5 | 6,2 | ... |
| Katowice | 5,4 | 6,5 | 6,8 | 6,6 | 5,3 | 6,6 | 6,9 | 6,6 | 6,2 | 6,2 | 6,5 | 6,3 |
| Kraków | 3,6 | 3,3 | 3,5 | 3,4 | 3,8 | 3,4 | 3,5 | 3,4 | 2,6 | 3,2 | 3,7 | 3,5 |
| Ostrava | 5,5 | 5,2 | 5,1 | ... | 5,1 | 5 | 5 | ... | 8,9 | 7,2 | 7,3 | ... |
| Vienna | 31,8 | 32,2 | 32 | ... | 31,8 | 31,8 | 31,4 | ... | 32,4 | 40,2 | 42,2 | ... |

Source: based on data of World Cities Report 2016

In the following we have applied the simple location quotient (LQ) for employment in two towns thought all industries (see table 2, where NA stands for „not applicable”). Previously mentioned knowledge worker and their jobs are to be noticed in economic activities (J – Information and communication), Bratislava 2,87 whereas in Žilina less 1,53. This location points out that region of Bratislava provides output from Information and communication services from 13 811 job positions, similarly Žilina from 760 job positions.

Table 2 Employment in thousands of persons concerning the export jobs and location quotient (as of 2014)

| Of which: by economic activities of NACE Rev.2 (codes) | | Bratislava | | Žilina | |
|---|---------------------|------------|-------------|--------|-------------|
| | | LQ | Export jobs | LQ | Export jobs |
| Agriculture | A | 0,04 | NA | 0,21 | NA |
| Industry in total* | B,C,D,E | 0,42 | NA | 0,91 | NA |
| | B | 0,08 | NA | 1,06 | 17 |
| *Of which: | Manufacturing | 0,41 | NA | 0,84 | NA |
| | Electricity supply | 0,29 | NA | 1,95 | 701 |
| | Water supply, waste | 0,36 | NA | 1,16 | 144 |
| | F | 0,87 | NA | 2,04 | 2 424 |
| Construction | F | 0,87 | NA | 2,04 | 2 424 |
| Wholesale, retail trade | G | 1,19 | 7 832 | 1,22 | 1 758 |
| Transportation and storage | H | 1,05 | 995 | 1,26 | 1 032 |
| Accommodation, food services | I | 1,31 | 1 433 | 0,33 | NA |
| Information, communication | J | 2,87 | 13 811 | 1,53 | 760 |
| Financial, insurance activities | K | 2,97 | 12 015 | 0,67 | NA |
| Real estate activities | L | 1,49 | 1 769 | 0,87 | NA |
| Profession.,scient., techn. activit. | M | 2,84 | 20 042 | 0,71 | NA |
| Administrative services | N | 1,61 | 6 111 | 0,84 | NA |
| Public administration | O | 0,98 | NA | 0,74 | NA |
| Education | P | 0,72 | NA | 1,26 | 1 367 |
| Health | Q | 0,83 | NA | 0,63 | NA |
| Arts, entertainment, recreation | R | 1,52 | 2 121 | 1,07 | 57 |
| Other service activities | S | 1,50 | 1 356 | 0,75 | NA |

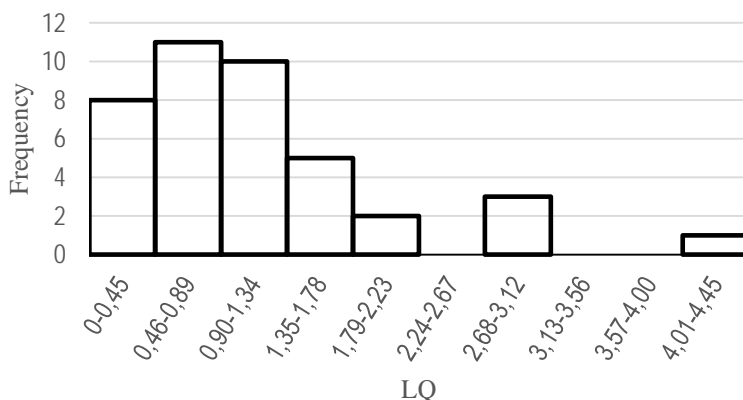
Source: Own elaboration, based on data of Statistical Office SR

A services providing financial, insurance activities (K) is favorable for Bratislava, where 6 108 people work to provide for local demand and 12 015 provide for other regions. It is possible that these workers provide serves for demand in Žilina, because the location quotient for this economic activity there is 0,67. The opposite is true for industry of construction (F), where Bratislava`s location quotient is 0,87 and Zilina`s is 2,04. In Žilina there is 2 424 export jobs. The most favorable activities in Bratislava can be summarized as: Wholesale, retail trade; Transportation and storage; Accommodation, food services, Information, communication; Financial, insurance activ-

ities; Real estate activities; Administrative services; Arts, entertainment, recreation and other services. In Žilina the most favorable economic activities would be: Electricity supply; Water supply, waste, Construction; Wholesale, retail trade; Transportation and storage; Information, communication; Education and Arts, entertainment, recreation.

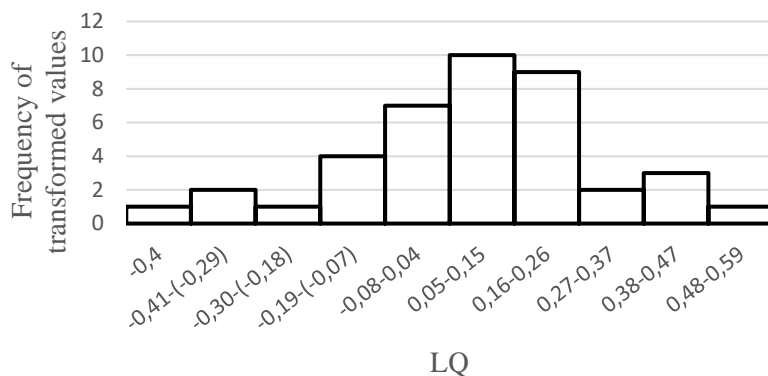
As seen in Figure 1 the skewness of location quotient is positive (1,7) and K-S test of normality approved that distribution is not normal ($D(39)=2,14$, $p>0,05$). Thus the Standardized Localization Quotient (SLQ) were obtained from logarithmic transformation (figure 2) using Box-Cox transformation (Freeman & Modarres, 2006, pp. 764-772), skewness of SLQ (-0,24). This way the outliers, statistically significant residuals could be identified. Statistically significant values of LQ were found in z-values (over 1,65) of the following activities and it is only in Bratislava for sectors: J (1,85), K (1,93), M (1,82). None sectors were identified in Žilina.

Figure 1 Measure of location quotient asymmetry of the probability distribution



Source: Own elaboration, based on data of Statistical Office SR

Figure 2 Standardized Location Quotient –after transformation of data



Source: Own elaboration, based on data of Statistical Office SR

Companies of border regions in Slovak republic: Bratislava and Žilina

The economic growth and improvement of competitiveness of national economy can be directly influenced either by small and medium enterprises (SME) in Slovakia within which were observed Bratislava and Žilina cities and its regions or by integration to network of companies and especially by integration to global value chains – GVC. These chains are coordinated by transnational corporations. The importance of this form of international labour division has risen significantly especially in the course of last two decades. This again is influencing economic position of national economy as well as competitiveness. In this context and upon the foreign experiences the paper took advantage of knowledge of the Slovak enterprises and large companies that were part of the GVC and global supply networks particularly in automobile industry. The automobile industry is a economic activity that had been using observably the international labour division since 90s of 20th century (Sturgeon & Van Biesebroeck, 2011). There were serious changes in intensity and architecture of such chains in reaction to global recession. At the same time the automobile industry is a flagship of the economic growth in Slovak Republic as noticeable from the presence of three large automobile companies in the country and two of them are situated in the regions in question, i.e.: Volkswagen SK, a.s. in Bratislava and Kia Motors Slovakia, s.r.o. in Teplica nad Váhom in Žilina region.

It is self-evident that automobile industry in Slovakia is not only the three large car producing companies, but also broad network of high quality suppliers that are both vertically included into global value chains and included to horizontal clusters.

According to data of Automotive Industry Association of the Slovak Republic (hereinafter „ZAP SR“) in 2016 there were 343 supplying companies to automobile industry. Out of this number it even 279 located in the western part of Slovakia, especially along the highway D1 from Bratislava (the capital) to Žilina and along the road R1 from Trnava to Banská Bystrica, 64 suppliers are located in eastern part of Slovakia. Among these are also large companies within foreign control. Such companies are suppliers of first haul (e.g. Continental, Johnson Controls, INA, Mobis, Magneti Marelli, Getrag Ford, Valeo, ZF, ArvinMeritor, Visteon, Faurecia, Lear, etc.) and suppliers of second haul (e.g. HBPO, Brose). This is true not only for automobile companies in Slovakia, i.e. they export its products. The most numerous group of the suppliers are suppliers of lower level, who supply components, parts of products, raw material such as metal parts, plastics, aluminum parts, textile and the like. This group also includes several foreign controlled companies together with domestic producers.

Business environment in Bratislava and Žilina region is relatively stable and friendly towards entrepreneurs. These regions were helped by FDI inflow, especially Volkswagen SK, Kia Motors Slovakia and subcontractors that are cooperating with local businesses. Direct consequence of FDIs and induced investments are reflected in statistics either employment ones or average wages. Employees praise opportunities of career promotions as well as educational opportunities, introducing newest technologies and social benefits.

The above description should illustrate the situation from qualitative point of view as an additional information to location quotient and employment data analysis.

Conclusions

Activities having higher value added could be fostered by the government policy focus especially on education, research and development and cooperation of universities (research institutions) with business sector. This policy in fostering cooperation shall bring about conditions for foreign investors to have an interest in establishing their economic activities with higher value added. This applies generally for joining of local enterprises to GVC. In praxis it is mostly SMEs, eventually also large companies that still are not included in GVC. SMEs need more attention in terms of information assistance (in order to provide knowledge on SMEs to foreign investors and vice versa in order to provide SMEs with information on opportunities of joining GVC available to them, as well as information on quality standards and other norms that such inclusion requires). Of key importance is also an financial support for SMEs.

There are main recommendations for government policies towards SMEs in GVC in the following theses:

- to provide information on market opportunities for subcontractors and potential foreign partners;
- to support expansion of domestic SMEs to abroad;
- by means of suitable tools support spreading of information among various chain parts of GVC, eventually motivate foreign investors to inform local companies on their intentions (while it is allowed or even required by their own global strategy)
- to support formation of companies' networks or clusters in local economy;
- to provide SMEs with workshops on the correct ways of the selection of the future cooperating partner; and so forth.

Given recommendation can contribute towards improvement in attractiveness (even taken into account by dartboard test) of local sector of SMEs to foreign investors. This also can in certain extent apply towards local business that they would achieve better position in the value chain. Still an unanswered question is how to secure financing such claims that are brought about with SMEs inclusion into GVC. Perhaps euro funds could be used here.

One can rephrase the result of tests that in Bratislava are outstanding the following sectors: Information, communication (J), Financial, insurance activities (K), Professional, scientific, technical activities (M). For Žilina the sector of Construction (F) can be mentioned. These sectors were influencing the growth and sprawl in its regions. As for the limitations: dartboard test suggested by Portuguese authors can contribute to better understanding of randomness of the localization process and at same time shed a light on urban sprawl.

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