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ECONOMIC RESILIENCE OF THE COMMAND AND CONTROL FUNCTION OF CITIES IN CENTRAL AND EASTERN EUROPE

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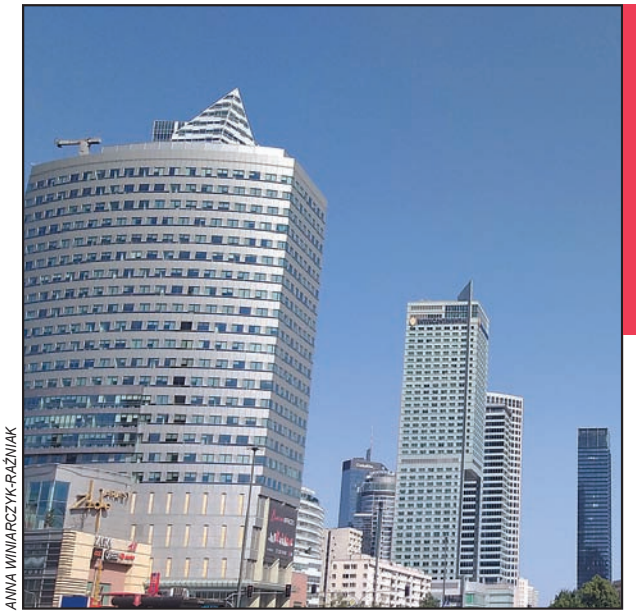

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Economic resilience of the command and control function of cities in Central and Eastern Europe

ABSTRACT: The authors propose a new approach to the analysis of cities in a time of potential major crisis in a dominant sector consisting of the largest firms generating the command and control function of a city. This purpose is served by the creation of the Central and Eastern European Economic Centre Index (CEEECI), which reflects the potential of each studied city and its development and/or fields of economic specialisation of its largest companies capable of generating regional command and control (C&C) functions of cities. Research has shown that the C&C functions of cities such as Warsaw, Prague, and Budapest are the most resistant to economic crisis of the dominant sector. More than half of the analysed cities are economically dominated by the consumer business and transportation and manufacturing sectors.

KEY WORDS: cities, economic resilience, headquarters, regional command and control function, Central and Eastern Europe

Ekonomska odpornost funkcije vodenja in upravljanja srednje- in vzhodnoevropskih mest

POVZETEK: Avtorji v članku predlagajo nov pristop k analizi mest med morebitno veliko gospodarsko krizo vodilnega sektorja, v katerem največje gospodarske družbe opravljajo funkcijo vodenja in upravljanja mesta. V ta namen avtorji oblikujejo indeks srednje- in vzhodnoevropskih gospodarskih središč, ki izraža potencial posameznega proučevanega mesta in njegov razvoj in/ali področja gospodarske specializacije njegovih največjih gospodarskih družb, ki lahko opravljajo regionalno funkcijo vodenja in upravljanja mest. Raziskava je pokazala, da so funkcije vodenja in upravljanja mest, kot so Varšava, Praga in Budimpešta, najbolj odporne na gospodarsko krizo vodilnega sektorja. Glavni gospodarski sektorji v več kot polovici analiziranih mest so sektor izdelkov za široko rabo, prevozništvo in proizvodni sektor.

KLJUČNE BESEDE: mesta, ekonomska odpornost, sedež, regionalna funkcija vodenja in upravljanja, Srednja in Vzhodna Evropa

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1 Introduction

The concept of a command and control function appears in many research publications and descriptions of the economic strength of cities and their international connectivities. One seminal paper on this subject is that of Hall (1966) who created the *world city* concept. Friedmann (1986, 70–77) argues that one measure of a world city is its control function in the global economy: »…*The global control functions of world cities are directly reflected in the structure and dynamics of their production sectors and employment*…«. He also notes that *world cities* invite foreign capital (Friedmann 1986, 73) by functioning as open systems, thus attracting investment and yielding additional command and control functions in the world economy. Sassen (1991) describes New York, London, and Tokyo as the most critical cities in the world economy due to their accumulation of world economic control functions. Beaverstock, Smith and Taylor (1999) analysed the international connectivities of cities via the largest companies in the services sector, accounting sector, advertising sector, banking sector, and the field of law, but connectivities may also be examined for other sectors including global media firms, maritime-producer services, and non-governmental organisations (Derudder and Taylor 2018). It appears at this point in time that New York and London are the most highly linked cities via what is known as the NY-LON city-dyad concept (Taylor et al. 2014). Command and Control Function (C&C) is determined on the basis of location of the headquarters of the main multinational companies. The C&C functions in city research are strongly linked to the notion of cities as command and control centres of the world economy (Csomós 2013; Csomós and Derudder 2014). The command and control (C&C) function may also contribute to the prestige of a city (Alderson and Beckfield 2004). It seems that research on the corporate headquarters of the largest firms shows a particular strength of cities in terms of their command and control role in the global economy; however, this is not the only measure of the global rank of a city (Taylor 2004).

Other studies on the number of corporate headquarters per city and corporate financial results as factors in the economic strength of cities as well as their impact on other parts of the world include the following: Heenan (1977), Friedmann and Wolff (1982), Taylor et al. (2009), Huang, Leung and Shen (2013), Raźniak, Dorocki and Winiarczyk-Raźniak (2018b), Csomós (2017), Derudder et al. (2018), Śleszyński (2018), Raźniak, Dorocki and Winiarczyk-Raźniak (2019). Since the 1970s transnational corporations have become increasingly important in the world economy and many have relocated their principal office or corporate headquarters to new locations in Asia (Csomós and Derudder 2014). This may be due to the fact that geographical diversification of investments is one of the key issues considered by investors eager to reduce their level of risk (Bacsosz 2019). It is noteworthy that companies located in Central and Eastern Europe are starting to play an increasingly significant role in the world economy (Raźniak and Winiarczyk-Raźniak 2015).

Existing conceptualisations of the city, e.g. world city (Internet 3), global city (Sassen 1991), city command and control function (Csomós 2013) do not assess the resilience of these functions to periodic crises in the world economy. While cities may be very important in the world, they may not be ready to counter economic recession events that may strongly affect a given key function of their economy. It may be argued that a city characterised by a strong command and control function is not necessarily prepared for a major crisis event. The command and control function of cities dominated by a single sector or company is prone to economic collapse in the event that the dominant sector or company faces problems. On the other hand, the C&C function of cities basing their growth on multiple successful companies or sectors is better able to offset losses at selected companies or structural problems in some sectors by the successful performance of other companies or entire sectors of the command and control function (Raźniak, Dorocki and Winiarczyk-Raźniak 2017).

Cities are complex, adaptive systems of people, economics, and the natural environment driven by key processes sustaining them and determining their ability to resist crisis events (Hooling 2001). This means that a city's resistability may be defined in terms of the flexibility of its communities and economies, which are able to predict, prepare for, and respond to disruptions in their functioning (Barnett 2001; Foster 2007).

We argue that a given city's command and control function stability can be measured in terms of its ability to resist economic crisis of the dominant sector represented by leading corporations (Raźniak, Dorocki and Winiarczyk-Raźniak 2017). This paper assesses this level of resistance to crisis for key economic sectors and key corporate employers in the studied cities. Crisis is defined by the authors in this case as a decline in the financial performance of firms in a given sector, which causes them to become excluded from the

list of the 500 largest firms in Central and Eastern Europe. This type of decline forces a sector to lose its dominant economic position and effectively its ability to play a regional command and control role in its parent city.

In current world economy the increasingly important question is the following: »How will these cities change when/if these principal functions are lost (Raźniak, Dorocki and Winiarczyk-Raźniak 2017)?« It is not only important for a city to rank high in a good economic situation, but also in an economic crisis that may affect its main functions. This prompts the following question: »What will happen to the city command and control functions in case of economic recession?« The authors use the concept of the city command and control function to determine the resilience of the cities to possible future economic crises that can affect a city's overall rank in the world economy.

2 Research data and methods

The study analyses the largest companies in Eastern Europe and compares their performance over the period 2008–2015 based on data obtained from the *Deloitte* company (Internet 1), which has been compiling sales revenue data on the top 500 companies headquartered in Central and Eastern Europe since 2008.

According to Anh, Thuy and Khanh (2018) an economic crisis may be triggered by a budget deficit, international currency reserves or increases in national debt. In a purely financial sense, a crisis may be defined by a depreciation of local currency against the U.S. dollar of at least 30%, and this decline is higher than 10 percentage points relative to previous years (Delbianco, Fioriti and Tohmé 2019). Corporate performance suffers over the course of a financial crisis, as does corporate management quality, with executives attempting to maximise their own compensation packages at the expense of company financial performance (Cornett et. al. 2009).

In this research crisis is defined as a decline in financial performance among companies in the most profitable sector present in a city, which results in a substantial loss of market status of the sector's companies that generate the command and control function of a city. This type of analysis is served by the creation of an World Economic Center Index that illustrates the rank of a city in terms of the value of the largest corporate headquarters by sector as well as the stability of this rank upon sudden removal of the most important sector. This index is calculated using basic statistics including standardisation via the standard deviation value and the weighted average. These methods represent the basis for descriptive statistics and are used in the calculation of most statistical indices employed in socioeconomic studies (Benos, Karagiannis amd Karkalakos 2015). This method is designed to produce information on the command and control potential of a city, but also on its path of economic development or economic specialisation of the companies creating this function. In addition, it may be assumed that strong company resistance to economic crisis is linked with a city's high degree of international connectivity, as financial losses generated by a company at one location may be offset by profits generated an another location in the globalised world (Raźniak, Dorocki and Winiarczyk-Raźniak 2017).

Deloitte's Central Europe Top 500 List + 50 banking and 50 insurance companies (banking and insurance companies are in the same reports but not in the main Top 500 list) (Raźniak, Dorocki and Winiarczyk-Raźniak 2018a) is not representative of the studied region, as it could be affected by a potential overrepresentation of the banking and insurance sectors. In addition, sales revenue is not the only factor that describes the rank of a company. In light of this issue, Deloitte Central Europe Top 500 Reports were used to create a customised list of the most important 500 companies in Central and Eastern Europe. Deloitte Central Europe Top 500 Report (Internet 2) is based on standardised financial data, and it was used to create a New Eastern Europe Top 500 list of major companies. Sales revenue was standardised along with net profit for all 600 Deloitte companies by calculating the share for each individual company where the maximum relative value is 100. Next, an average value (Equation 1) was calculated for this set of revenue and profit values (x_{top}) (Shiller 1991).

$$x_{top} = \frac{\left(\frac{x}{x_{max}}100\right)+\left(\frac{y}{y_{max}}100\right)}{2} \quad (1),$$

where x is the sales revenue and y is the net profit.

The x_{top} value was used to assign a rank to each company on the list. The first 500 companies were then selected for further analysis. Further analysis focused on selecting only cities with corporate headquarters representing three or more sectors of the economy in any given year.

The studied companies were divided into nine sectors used by Deloitte in its research work (Internet 1): banking, consumer business and transportation, energy and resources, insurance, life sciences and health care, manufacturing, the public sector, real estate, technology media and telecommunications. The geographic location of each company was determined based on the location of its headquarters. Companies were assigned to specific major metropolitan areas.

Based on Raźniak, Dorocki and Winiarczyk-Raźniak (2018a) it is assumed that regional as well as local command and control functions are generated in Eastern European cities by companies on the New Eastern Europe Top 500 List created by the authors. The benefits of the presence of these companies presumably go to their parent cities. Based on New Eastern Europe Top 500 List Central and Eastern European Economic Center Index (CEEECI) was created, which assesses cities in terms of the value of corporate headquarters by sector and stability in cases where one or more sectors are excluded. This approach yields information not only on the potential of a given city, but also on its economic evolution and/or specialisation. Cities with at least three economic sectors were included in the analysis. Cities featuring only two sectors were excluded in light of the substantial decline of the command and control function in the event of crisis in one of the sectors.

The rank of the studied cities was compared by calculating standardised values based on mean normalised revenue and net profit (x) for each studied sector of the economy (z) in the calculation of the comprehensive potential index (CPI) for each studied city (Equations 2 and 3):

$$z = \frac{x - \frac{\sum_{i=1}^{N} x_i}{N}}{\sqrt{\frac{\sum_{i=1}^{N} (x_i - \overline{x_i})^2}{N}}} \tag{2}$$

$$CPI = \sum_{i=1}^{N} z_{s_i} \tag{3}$$

where x = revenue plus net profit for each sector of the economy, s – is the sectors of the economy and N – is the number of cities per sector of the economy.

One goal of the research was to verify which sector of the economy impacts a city's economic potential the most. This purpose was served by subtracting the value of individual sectors from the total standardised value calculated for 2009, 2012 and 2015. The objective was to observe how the sum of standardised values (z') changes for a given city, assuming that the initial value constitutes 100% (Equation 4). Cities characterised by a high range following sector subtraction tend to specialise in one area of the economy and tend to remain underdeveloped in other areas of the economy. On the other hand, cities with low range tend to have both, advanced and multifaceted economies. The paper analyses cities with three or more sectors.

$$z' = \frac{CPI - z_s}{CPI} \tag{4}$$

Then a stability index (SI; Equation 5) was constructed using standardised values CPI and variances in values resulting from the subtraction of the selected individual sectors of the economy (z') from all studied sectors. The value of the index was then divided by the standard deviation (SD) of values resulting from the subtraction of selected sectors (z') [4]. This index also illustrates how financial crisis in a city's main economic sector impacts the city's overall economy.

$$SI = \frac{CPI}{SD_z} \tag{5}$$

The final step consisted of the construction of a Comprehensive Development Index for cities based on sectors (CEEECI). The index includes the degree of stability, number of sectors, and the number of corporate headquarters (Equation 6). The weights of the variables used to construct the CEEECI were calculated using principal component analysis (PCA), which included the stability index (SI), number of sectors

of the economy (S) and the number of headquarters (HQ). Data for 2008, 2012 and 2015 were analysed separately and the value of the CEEECI was calculated only based on the first principal component.

$$CEEECI = \frac{SI * w_{(SI)} + S * w_{(S)} + HQ * w_{(HQ)}}{\sum w} \quad (6)$$

where HQ is the number of headquarters, S is the number of sectors of the economy and SI is the stability index.

Calculations cannot be performed for a mean sector value of zero. Normalisation was performed only in relation to a normal distribution without checking for data asymmetry and assuming that a normal distribution will suffice. This must be considered in data analysis and normalisation must not be used for data that is strongly skewed.

Similar methods of constructing economic indicators with the use of standardized values, weighted averages, principal component analysis, and mixed models were discussed by Morrison (1967), and Marino and Tebala (2016). However, the method used in this paper was created by its authors, and it is used also by the authors of other publications (Dorocki, Raźniak and Winiarczyk-Raźniak 2018 and 2019; Raźniak et al. 2019).

3 Ranking of Eastern European cities based on the CEEECI

A total of 500 companies had their headquarters in 125 cities in 2008, 124 in 2012, and 156 in 2015. The number of cities declined by one (–0.8%) during the global economic crisis in 2008. A significant diversification of headquarters locations was noted in the period 2012–2015, and the number of cities increased 25.8%. An opposite trend was observed in the case of the location of the largest world corporations (Internet 2).

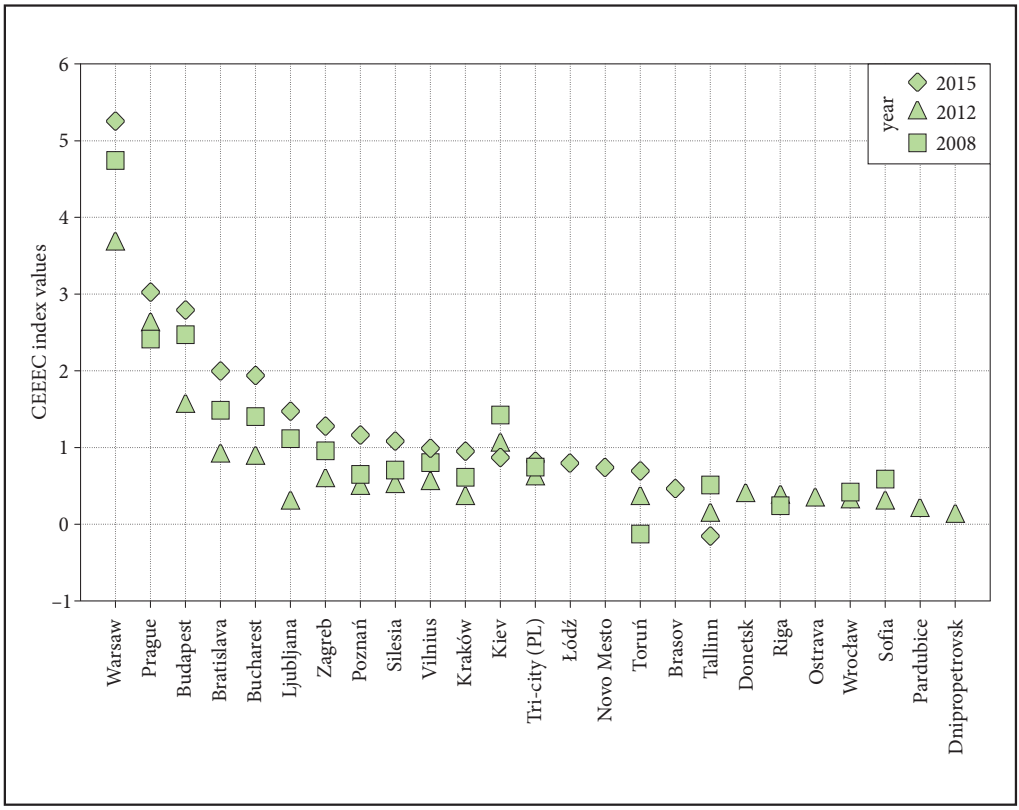

Figure 1: CEEECI values for 2008, 2012 and 2015 based on Deloitte's Central Europe Top 500 Reports.

The number of cities with the largest corporations increased 7.9% in the period 2008–2012 and then declined 5.4% in the period 2012–2015. Hence, a spatial deconcentration is observed for the largest corporations in Central and Eastern Europe, while a spatial concentration is observed on a world scale.

The highest CEEECI values in 2008 were noted for Warsaw (4.7 points), Budapest (2.5 points), and Prague (2.4 points; Figure 1). Warsaw had the highest CEEECI in subsequent years. Resistance to crisis in the main sector of Budapest's economy declined in 2012 and 2015 leading to a decline to third rank, behind Prague. Other capitals were also characterised by rather high CEEECI values in 2015: Bratislava (1.99), Bucharest (1.94), Ljubljana (1.46). On the other hand, Kiev's resistance to crisis significantly declined. The reason for this may be the current state of war between Russia and Ukraine, influencing the economy (Charap and Colton 2017; Feklyunina and Romanova 2017).

Its CEEECI in 2008 was 1.42, while in 2015 it was almost 40% less. The lowest values (less than 0.5) for CEEECI cities in the study period were those of Pardubice, Brasov, and Tallinn. The largest increases were observed for smaller cities such as Łódź (240%), Novo Mesto (189%), Poznań (176%), Pardubice (158%), and Kraków (153%). However, only Poznań exceeded a value of one in 2015. Several cities were classified as CEEECI cities in one or two years of the study period: Riga, Wrocław, Sofia in 2008 and 2012; Donetsk, Ostrava, Pardubice, Dnepropetrovsk in 2012. It may be argued that these cities were not affected by the global economic crisis of 2008, as they had lost their rank after 2012 (Figure 1).

In 2015 a total of 18 Central and Eastern European economic centres were identified and divided into four categories based on their ability to resist an economic crisis. Three cities were given the *top* CEEECI ranking. Six cities were ranked *major*. Seven cities were ranked *midsize*. Two cities were ranked *minor*. The Romania and Slovenia feature two cities each. Another seven countries in Eastern Europe feature only one top-ranked economic centre each. Finally, no ranked economic centres were noted in Albania, Bosnia

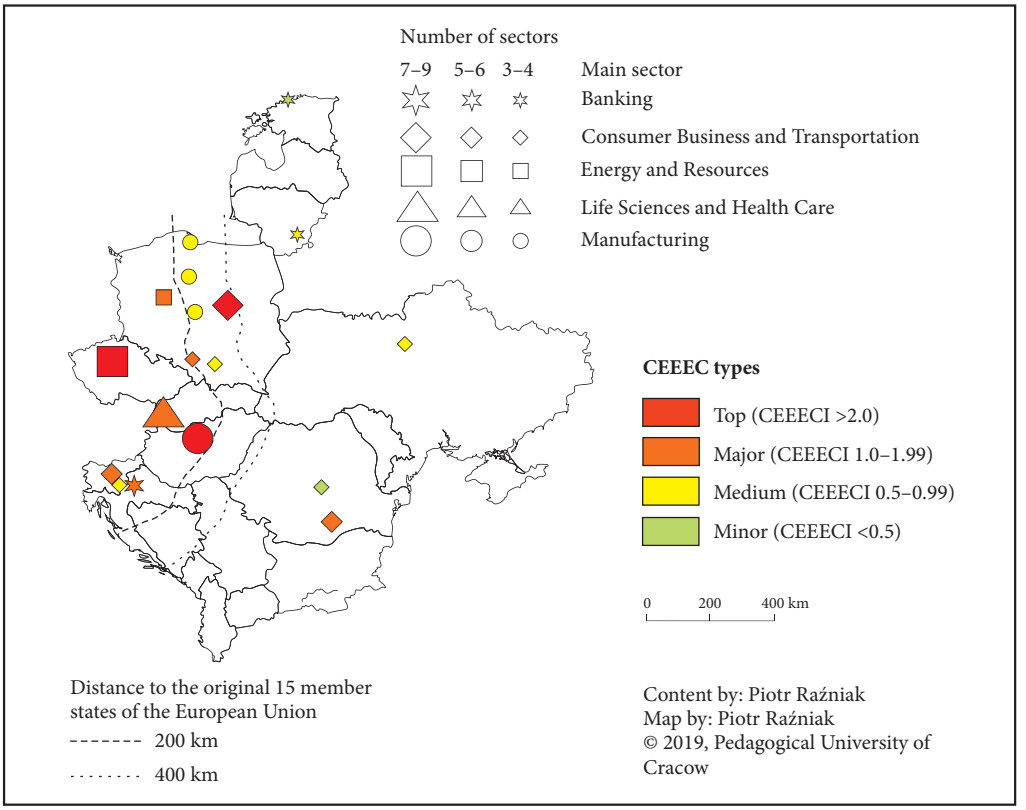

Figure 2: Central and Eastern European economic centres in 2015 based on Deloitte's Central Europe Top 500 Reports (author: Anna Winiarczyk-Raźniak).

and Herzegovina, Montenegro, Moldova, Northern Macedonia, and Serbia (Figure 2). All of the above six countries are characterised by small geographic area, small population, low total GDP, and low GDP per capita (Internet 2). Most of these countries became independent only in the 1990s following the dissolution of the much larger Socialist Federal Republic of Yugoslavia. Warsaw, Prague, and Budapest are now the three most significant Central and Eastern European Economic Centres, and are classified in the *top* category due to their economic dominance in the region and very strong resistance to economic crisis. At the same time, only Prague is home to all nine of the studied sectors (Warsaw and Budapest are home to eight). These three top CEEECI cities differ in terms of their dominant economic sector. In Warsaw, it is consumer business and transportation, while in Prague energy and resources, and lastly in Budapest it is manufacturing. Cities such as Bratislava, Bucharest, Ljubljana, Zagreb, Poznań and the Katowice were classified in the *major* category due to their strong ability to resist economic crisis (Figure 2). The only non-capitals in this group (Poznań and Katowice) are located in Poland, but they are »balanced« regional centres (Páthy 2017). The region continues to develop in an economic sense as well as in the sense of its residents' well-being (Egri and Tánczos 2018) and home to a number of robust foreign corporations (Nazarczuk and Umiński 2018).

However, each of the three cities is dominated by a different sector of the economy except Zagreb and Poznań (consumer business and transportation). Hence, it may be argued that the rank of these six cities may change in different directions in the event of crisis in a particular sector. The strength of Polish cities (7 cities) is apparent in this study, with 38.9% of CEEECI cities located in Poland. Polish cities are not strongly differentiated by main sector and are classified mostly as *major* and *medium* type. Three Polish cities are dominated by the life sciences and another three are dominated by consumer business and transportation. Cities described as *minor*-type usually feature three or four sectors. In the event of crisis in a dominant sector, *midsize*-type cities are likely to decline substantially in economic terms (Figure 2).

The most frequently encountered sector in Central and Eastern European economic centres is the consumer business and transportation sector – eight cities (44.4%). This is especially the case in countries that used to be part of the Soviet Union until the early 1990s including Lithuania, Latvia, Estonia, and Ukraine. Manufacturing is dominant (22.2%) in four key urban regions – usually old industrial regions such as the Tri-city (Gdańsk, Gdynia and Sopot) and Łódź in Poland. However, Eastern European companies in this sector are not important players on the global scene (Krätke 2014). In summary, Central and Eastern European Economic Centres are dominated by consumer business, transportation, and manufacturing (66,7%). The next key sector is banking (3 cities; Figure 2).

4 Discussion

The largest companies in Central and Eastern Europe became concentrated in a larger number of cities in the period 2008–2015 (Internet 1). This is the opposite trend to what is now observed in the world economy, with fewer cities hosting the largest corporations around the world (Internet 2). This may be the result of the opening of some offices of foreign corporations headquartered in Eastern Europe in order to limit operating costs and invest more profits in the home country. What is important is that this occurred several years after the global economic crisis of 2008.

Economic stability of the command and control function of cities in time of crisis was analysed in terms of the effects of structural change on the economy. The smallest differences in the level of economic development based on sector specialisation and corporate financial performance were noted in Prague, Warsaw, Ljubljana, Vilnius, Zagreb, and Poland's Tri-city. However, the latter four cities were characterised by low standardised values, which is why the difference in values triggered by the loss of a major sector of the economy was quite small. A high degree of specialisation and a close link with a single sector were observed in the case of Donetsk, Bucharest, Kiev, and Bratislava.

Two thirds of the analysed cities are economically dominated by consumer business and transportation and manufacturing. A crisis in any of these key sectors could trigger a decline in the city command and control function. Consequently, the cities of Warsaw, Prague, and Budapest may be called the leading Central and Eastern European Economic Centres. The three cities are highly resistant to crisis and have significant international connectivities. At the same time, these three cities possess an adequate amount

of potential to play a meaningful role in the world economy. However, Prague outpaced Budapest in 2012 and 2015 compared with 2008.

Given the political history of Central and Eastern Europe and its links to globalisation, it remains a unique region where many companies operating in this part of the world are in fact just regional offices of leading corporations. Śleszyński (2015) argues that strategic decisions regarding their key functions are made outside of Central and Eastern Europe, and argues that the largest companies, even those whose headquarters are located in a foreign country, may generate the command and control functions of a given country's economy.

Despite being listed in the Deloitte Central Europe Top 500 Report, many companies in the study area do not fully perform the command and control function in their home cities. However, regional offices located in the Central and Eastern Europe may have some decision power at the local and regional level. Regional managers thus may perform a limited regional or local command and control function, but not higher-level functions that remain reserved for main offices located outside of the study area. For example, the decision to close a plant or regional office made outside of the studied region may strongly affect the stability of a city's regional command and control function. Hence, it is important to study cities not only in terms of the financial results of key corporations, but also in terms of the ability of the command and control function to remain stable in times of economic crisis in a principal sector generating this function.

It may be argued that, for a city, important is not only the magnitude of the C&C function, but also its ability to weather a crisis. This is important, as the economy of a city and its C&C function are not only affected by economic processes, but also by historial problems and ongoing warfare in some cases.

5 Conclusion

In a global world, it appears that a city's global rank in a period of economic growth is not the only important issue. What is also important is its global rank in periods of economic recession, which may affect its primary functions. The methodology presented in the paper answers the following question: »What would happen if something goes wrong in the realm of a city's C&C function?« Similar research needs to be performed as part of other urban conceptual models such as the concept of the *world city*. Standard forecasts are not sufficient (Neal, Derudder and Taylor 2019); instead what is needed is analysis on what would happen to intercity connectivities in the event that the number of linkages between a given city and its main connectivity partner city would strongly decrease. Would it continue to be connected as well as before? Would it continue to be a world city?

Research has shown that cities can resist economic crisis in their command and control function better if they are home to a larger number of economic sectors and follow a more sustainable path of economic development. In order to increase the attractiveness of a city to global investors, it would be helpful to help streamline city management practices by reducing redundancies between local governments and the national government, and increasing the effectiveness of the local job market. These steps would reduce differences between cities (Wolman et al. 1992) and may also help cities weather any potential crisis that may occur. Alderson and Beckfield (2004) speak of a certain type of prestige associated with a city's command and control function. Cities in the studied region could attempt to build their brand as cities performing a regional command and control function resistant to economic crisis in a main sector of their local economy. A strong local or regional brand would then help them to trigger a virtuous cycle of brand recognition and continuous foreign direct investment.

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