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Regional disparities in the spillover effect

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Abstract: The aim is to identify differences in spillovers between regions within the economy of the Czech Republic. Based on the choice of spillover effect determinants and a shift-share analysis, a regional spillovers indicator has been constructed. It was discovered the differences in the sizes of spillovers between the regions are increasing over time, which indicates deepening economic disparities. The main contribution is the constructed indicator identifying the different effects of FDI in different regions in order to better identify the strengths and weaknesses of the regions and better model economic policies to set up more effective support for the FDI inflows.

JEL Classifications: E32, J63, J64

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1. Introduction

Foreign direct investment (FDI) is a term that is intoned worldwide. However, FDI is considered to be an economic phenomenon with an ambiguous interpretation by the professional public, as this type of foreign capital causes a whole range of effects on the host business environment, and the final impact of those effects is often ambiguous.

The effect of FDI flowing into the examined regions can be directly measured by its impact on macroeconomic indicators such as the employment rate or product development (gross domestic product, gross value added) in the region, as well as indirectly.

With the inflow of FDI into a region, there are also impacts aside from the economic growth of the region, impacts which spill over - for example, the experience and capabilities resulting from technology-level disparities between the investing company's country and the investment-receiving regions. The question is how to measure the spillover effect objectively.

Even through the effects of FDI are subject to extensive discussion in professional literature, there are only a few studies and approaches that quantify, comprehensively evaluate, and compare mainly the indirect effects of FDI on lower regional units, that is, regional levels NUTS 3 and lower. The reason is that it is difficult to measure the spillover effect of technology transfer and the determinants causing the effect. This is mainly due to the complications of collecting data from the annual reports of individual enterprises as well as the macroeconomic concept of the competitive ability of states which cannot be fully applied to lower regional levels.

Camagni (2009) states that some laws applied in international trade do not work at a lower level than the national one. In contrast to the country level, exchange rate changes as well as changes in price and wage ratio either do not work or do not exist at the regional level. On the other hand, the transfer of production factors (labour, capital) between regions can pose a real threat to the involved regions.

Despite the fact that current professional literature deals with both the economic aspects and effects of FDI and thus helps to better understand this issue from the microeconomic point of view, it is practically not concerned with quantifying individual effects or their determinants at lower regional levels.

The aim of this research paper is to construct a spillover effect indicator usable for evaluating the size of the spillover effect in regions within a single state. The constructed indicator of a regional spillover effect is used on the data of six regions of the Czech Republic in a time series of thirteen years (2002-2014), a period beginning when the Czech government began to support FDI.

2. Delimitation of spillover effects and their spreading

Positive spillover effects can be identified if the presence of FDI increases the productivity of domestic enterprises (Lesher & Miroudot, 2008). The technology available from FDI spills over into the host region's economy as a whole as well as into other businesses, increasing their productivity in what is known as a positive technological spillover effect (Pavlínek & Žížalová, 2016).

Positive spillover effects are considered to be a counterpoint to a dual economy, as they are identifiable through the growth of labour productivity of domestic companies in the host region. In cases where FDI positively affects domestic enterprises within the same industry, so-called horizontal spillover effects can be identified. Blomström & Kokko (1998) defined four ways that local businesses can increase their productivity using the presence of FDI: imitation effect, human capital, competition, and better export performance.

Technology transfer most often occurs through the acquisition of human capital. People who have originally worked in FDI can be hired by domestic business or they can start doing business themselves. The improvement of productivity is a result of labour mobility. Even though the investor's prime motive is the low cost of labour, multinational corporations spend money on various training programs and invest in human capital in many different ways (Čuhlová & Potužáková, 2017). No company is able to 100% protect its investment in employees; employees themselves are carriers of intangible capital (Zamrazilová, 2007).

Transfers of know-how, overall knowledge, and managerial practices are the impacts that are most strongly and consistently reflected in the economy of the host country. Employees who have been involved with the management of foreign-owned companies transfer sophisticated management and proven corporate culture into other businesses, afterward often becoming high-level managers in domestic companies or capable entrepreneurs (Pavlínek, 2004).

From the point of view of spillover effects, competition plays a key role. The presence of FDI disturbs the market equilibrium in the host region and causes local businesses to fight for their current market share. One of the possible ways to face new competition is to

imitate FDI. If the imitation effect does not occur, local businesses need to use their existing technology more efficiently to maintain their competitive position (Wang & Blomström, 1992). A more efficient use of technology leads to the growth of productivity, and at the same time, competition can also result in a change of speed in the implementation of new production processes (Kokko & Kravtsova, 2008).

The foreign investor tries to prevent the horizontal spillover effects from the moment of entering the foreign market, taking actions such as internationalising its activities, or establishing FDI instead of selling a license to a local business (Shaver & Flyer, 2000).

On the other hand, multinational corporations can also benefit from the existence of spillover effects. If they are able to use high-quality products from domestic suppliers, they have no reason to prevent the spread of the so-called vertical inter-industrial spillover effects (Gryczka, 2010). The basic difference from the horizontal spillover effect is that vertical spillover does not come from competition but from cooperation (Lesher & Miroudot, 2008).

Vertical spillover effects occur through so-called backward linkages and forward linkages. Backward linkages arise if FDI finds its suppliers among local businesses (Watanabe, 1983). The origin of spillover feedback effects is dependent on the voluntariness of multinational corporations to provide technology transfer and the willingness of domestic companies to adapt to the requirements of multinational corporations (Alam & Shah, 2013).

On the other hand, localisation of FDI in the host region can result in some negative effects. The entry of a foreign company could cause a reduction in the sales of domestic products. Domestic businesses can be pushed out of the domestic market by foreign investors; such a situation is the negative horizontal effect of FDI, also known as the crowding-out effect (Barrios, Görg, & Strobl, 2011). The negative vertical effects of FDI occur when domestic suppliers are replaced by foreign business partners. However, this replacement leads to an inflow of other FDI and an increase in the creation of new primary jobs (Kotíková, 2016).

3. Determinants of indirect FDI effects

Whether the overall indirect effect of FDI in the host region is positive or negative, and whether any indirect effects actually occur depends on a number of factors such as market size, infrastructure quality, working capital, and others (Alam & Shah, 2013). But the key factors are mainly those related to labour productivity, i.e. the size of the technology gap and the absorption capability of the foreign presence in the host business environment (Szent-Ivanyi & Vigvári, 2012).

The very first person to examine the secondary impact of FDI on the host economy was Finlay (1978), who found that spillover effects were determined by the so-called relative lagging, in other words the technology gap between the parent and host economy. He claims that the larger the technology gap, the greater the space for the spillover effect to occur. His argument is based on the basic condition that a foreign investor always comes from a more advanced economy than the area where FDI is located.

On the other hand, Bitzer, Geishecker, & Görg (2008), Barrios et al. (2011), Cantwell (2017), Cohen & Levinthal (1990, 2015) have modified views on the position of the technology gap factor and its influence on the spillover effect. It follows from their

conclusions that if the technology gap is too large, domestic enterprises are unable to transfer technology in either the horizontal (e.g. through the FDI imitation effect) or vertical directions. A large technology gap can lead to a crowding-out effect when local firms are unable to compete with FDI. However, a too-small technology gap does not provide enough space for learning and technology transfer. Finally, it is possible to say that the positive spillover effect is most likely to occur when the technology gap is moderate.

This is also confirmed by Falk (2015) who, on the basis of a sample of 38,000 companies from Central and Eastern Europe, found that the performance of local suppliers only benefited from the presence of foreign firms if the technology gap between these groups of companies was not too great.

The technology gap is closely related to the absorption capacity of domestic businesses. Szent-Ivanyi & Vigvári (2012) talk about the so-called technological competence of companies in the host market: whether and to what extent the local business environment is able to absorb foreign technology.

Absorption capacity is defined as the ability to acquire knowledge created by someone else and to modify it for own business needs (Pattnayak & Thangavelu, 2011). It is also considered to be a determinant of the occurrence of indirect FDI effects (Narula, 2017). Absorption capacity expresses the overall economic level of the given region (Xu, 2000). The level of human capital is considered to be a key attribute because the inflow of FDI creates the potential for technology transfer into the domestic business environment; on the other hand, the level of human capital in the local labour market also determines the amount and structure of foreign companies that can be attracted to the given region and logically to what extent domestic companies, and the larger domestic business environment, are able to absorb technology transfer.

However, the occurrence of the above-mentioned effects does not depend only on the foreign presence. The FDI localization itself is just a first step, the final effect is mainly dependent on the interaction between domestic and foreign enterprises (Blomström, 2002).

Researches focused on the effect of FDI work with a database containing corporate data and various macroeconomic indicators. Spillover effects are very difficult to measure. It is not possible to find out if a domestic business has increased its productivity or recruited new employees due to a supplier-customer relationship with FDI or because of the imitation effect of FDI. Since multinational corporations, on the one hand, prevent information leaks in order to eliminate the FDI imitation effect and the so-called horizontal spillover effect, and, on the other hand, try to support technology transfer within the supplier-customer relationship (via reverse and direct links), it is possible to suppose that a higher rate of spillover effects can be identified in the vertical direction (Rodrigez-Clare, 1996).

The creation of links between FDI and domestic enterprises is considered to be a key mechanism for creating indirect effects - the increase of labour productivity or the emergence of new domestic businesses. The level of FDI integration into the host region may vary considerably. A high level of FDI penetration may be a key element in the transformation of the local business environment; for example, the supply network may be restructured. On the other hand, FDI may develop no or only negligible links to local businesses. The level of FDI penetration into the host region is therefore considered an indicator of investment stability (Pavlínek & Žížalová, 2016).

Individual governments spend a lot of money on acquiring positive effects that are taken for granted, but in reality such effects are very difficult to measure. On the other hand, it can also happen that positivity is not manifest in the host region at all, and the granted investment support can cause the occurrence of the FDI crowding-out effect or the emergence of the so-called dual economy where, on the one hand, there are capital-intensive foreign companies with advanced technology, high-quality management, and efficient organization of production, and on the other hand there are domestic producers who are unable to compete with multinational corporations or cooperate within supply chains.

In practice, the conflict between these two owner sectors can be solved by the specialisation of domestic firms in qualitatively less-demanding products. In this case, a negative vertical differentiation of production occurs. This simultaneously weakens mutual competition between the two parties, each of which then operates on other parallel markets. The final impact of duality is reflected not only on price relations between them but also on the export area. The impact on the labour market is identifiable in terms of wage levels. Last but not least, duality is evident in the possibility or rather the impossibility of transferring and adopting new technologies (Benáček, 2006).

From the above-mentioned, it can be summarised that the final impact of FDI on the host region and its business environment is ambiguous. The effect of FDI and its interaction with other businesses in the region may take various forms, and the influence on the host business environment and regional competition can occur in both positive and negative ways. This article tries to identify the effects of FDI on the business environment at the regional level, that is, at a level that is directly affected by FDI.

4. Methodology

The baseline of measurement is the determination of the set of quantifiable factors which are influenced by FDI in the examined regions, so it is possible to measure their indirect impact (in the form of externalities).

Szent-Ivanyi & Vigvári (2012) state that the identification and measurement of spillover effects is meaningful in such business environments where there are intense vertical links between domestic firms and foreign affiliates. At the same time, these affiliates must represent major employers, meaning an environment with an identifiable foreign presence. The authors base these statements on the findings of Blomström & Kokko (1998) and Görg & Greenway (2004), the pioneers in the field of spillover effects.

On the basis of the findings currently available to achieve the goal of assessing the level of the spillover effect within the economy and determining regional disparities in the examined regions, the regional spillover effect indicator (RSPE) has been constructed. It is composed of the following indicators:

1. Gross value added (GVA) - It can be assumed that FDI has a direct impact on the development of GVA. For investments coming from the countries with advanced technologies making high value-added products, this impact should be highly positive. However, the dependence can also be the opposite: regions with high GVA attract investment from higher GVA, i.e. FDI from countries with advanced technology. Hence, the development of GVA is both the cause of increasing foreign investment and the consequence of the inflow of foreign investment. Therefore, the weight of this factor in RSPE will differ from the weight of other factors.

2. Investment in research & development (IR&D) - It can be expected that a higher level of FDI from countries with advanced technology brings new investment into research and development in the region for foreign companies to directly invest in this area. Furthermore, it is also logical to assume that areas with higher GVA will attract foreign investors with higher value-added production.
3. Proportion of the population with secondary or tertiary education (EDU) - It is possible to expect that high-tech businesses require highly qualified workers. This should, among other things, lead to cooperation between companies and schools in the region, which should consequently lead to an increase in the proportion of people with a higher level of education in the region. At the same time, this component is an indicator of human capital, which is an attribute of the absorption capability of the domestic business environment.
4. Inflow of foreign direct investment (FDII) - This is an indicator of the openness of the host business environment. It is significant that the spillover effect is directly dependent on the size of FDI in the region, which can greatly influence (above all in a positive way) the inflow of other FDI. This may happen for many reasons, including greater experience of the region with attracting new FDI, higher qualification of the population and thus higher absorption capacity of the business environment, or the investments of buyers or suppliers in the investing companies.
5. Regional technology gap (RTG) - This is the region's ability to use the foreign presence. It can be said that the greater the inflow of FDI into a region and the more technologically advanced countries this investment comes from, the greater the region's experience and the greater the ability to use opportunities from this investment.

Each of the above-mentioned factors is considered in a relative measure, which is determined by:

a. Ratio of the absolute amount of the indicator to the population of the region (per capita in the region). This will allow the relativisation of the differences in the size of the economic space of the regions.
b. Ratio to the benchmark. The benchmark will always be the simple arithmetic mean of the indicator of sums of values for individual regions.
c. Weight of the indicator of the relative GVA size will be half the weight in the RSPE, other factors will have the same weight. The constructed final pattern of RSPE (1) has the following form:

$$RSPEn = \frac{\frac{GVAr}{INr} * \frac{1}{\frac{GVABr}{INr}} + 2\left(\frac{IR\&Dr}{INr} * \frac{1}{\frac{IR\&DBr}{INr}}\right) + 2\left(\frac{EDUr}{EDUB}\right) + 2\left(\frac{FDIIr}{INr} * \frac{1}{\frac{FDIIB}{INr}}\right) + 2\left(\frac{RTGr}{RTGB}\right)}{9} \quad (1)$$

Where, $RSPEn$ is the spillover effect in year n; $GVAr$ is the relative gross value added that is ascertained from national statistics - in the case of the Czech Republic from the Czech Statistical Office (2018) - and calculated as the average level of gross value added per capita of region r measured to the benchmark of regions ($GVABr$); INr is number of inhabitants of region r; $IR\&Dr$ is the relative level of investment in research and

development that is ascertained from national statistics - in the case of the Czech Republic from the Czech Statistical Office (2018) - and calculated as the average level of investment in research and development per capita of region r measured to the benchmark of regions ($IR\&DBr$); $EDUr$ is the proportion of secondary- and university-educated inhabitants of the region that is ascertained from national statistics - in the case of the Czech Republic from the Czech Statistical Office (2018) - and measured to the benchmark of regions ($EDUB$); $FDIIr$ is the rate of the FDI inflow that is ascertained from national statistics - in the case of the Czech Republic from the Czech National Bank (2018) - and calculated as the FDI inflow into the region measured to the benchmark of regions ($FDIB$); $RTGr$ is the regional technology gap measured to the benchmark of regions ($RTGB$).

The size of the technology gap is one of the basic determinants of the spillover occurrence. Productivity of domestic and foreign companies is mutually determined. The level of productivity of foreign companies in the host market leads to the productivity increase of domestic enterprises which increases the technology transfer as well as the productivity increase of other companies. In professional literature, the size of the technology gap for identifying of spillover effects is measured by differences in labour productivity between the investor's country of origin and the host economy. However, to quantify the technology gap at the regional level, it is necessary to modify this approach and to come down from the monitoring of technology gap at the national level (from the perspective of the host country) to the regional level.

The constructed RTG monitors the difference between the productivity (level of technological advancement) of foreign companies and the host region. The total value of the indicator or the values of its single components also indicate the possible lagging of a region, particularly some selected groups of regions lagging behind the technological level of foreign enterprises.

The development of the technology gap using the shift-share analysis is calculated using the following pattern (2):

$$RTG_n = \frac{\sum_{i=1}^{r}\left(AP_{Li}^{FDI} - AAP_B^{reg}\right)\cdot FP_B^{reg}}{AAP_B^{reg}} + \frac{\sum_{i=1}^{r}\left(FP_i^{FDI} - FP_B^{reg}\right)\cdot AAP_B^{reg}}{AAP_B^{reg}} + \frac{\sum_{i=1}^{r}\left(AP_{Li}^{FDI} - AAP_B^{reg}\right)\cdot\left(FP_i^{FDI} - FP_B^{reg}\right)}{AAP_B^{reg}} \quad (2)$$

Where, AP_{Li}^{FDI} is the productivity of foreign companies of the given country in year n (OECD, 2018) which is expressed as the productivity of the investor's country of origin (reported by OECD in constant prices of 2010, where the rate of use of labour inputs is measured by the total number of hours worked); AAP_B^{reg} is the productivity of the benchmark in year n, which is expressed as the arithmetic average of the productivity of all the examined regions*; FP_i^{FDI} is the proportion of the employees of the companies in the given country to the total number of people employed in the region in year n; FP_B^{reg}

* Measured in USD; the exchange rate of the Czech National Bank: USD/CZK = 18.751 (31 December 2010).

is the benchmark of the proportion of employees in foreign companies in the examined regions, which is expressed as the arithmetic average of the proportion of employees in the examined regions in year n.

In order to increase its productivity and economic growth resulting from the FP, the examined region has to prove high foreign openness, i.e. to attract a sufficient number of high-tech productivity multinational corporations are able to create as many new jobs in the region as possible. The RTG indicator combines both assumptions. However, it cannot accurately and separately quantify to what extend the region has grown thanks to the large presence of multinational companies, and to what extend the region has been able to absorb as much technological potential offered by multinational companies as possible. Besides the RTG indicator, which reflects the question of how the presence of multinational companies has been shown in the productivity growth of the examined regions during the monitored period, it would be appropriate, in further research, to monitor the level, respectively the capability of the region to use FP. It would be interesting to deal with the question to what extent, ceteris paribus, the region is able to use the unit of FP for the productivity growth (Kotíková, 2018a).

The shift-share analysis, which is the method of the RTG indicator construction, is often used in professional literature to determine the dynamics of employment, labour productivity, or value added (Zdeněk & Střeleček, 2012). For example, Esteban (2000), though a shift-share analysis, evaluated the multisector structure of labour productivity with regional differences at the national level of EU states. The main advantage of the shift-share analysis is its use at any regional level.

Due to the facts considered above, it can be expected that the higher the values the region achieves, the higher the potential for the spillover effect. Furthermore, the higher the relative value of this indicator compared to other regions, the higher the potential for technological growth the region (compared to other regions) - abstracted from any growth constraints.

5. Interpretation of results. Identification of spillover effect for the examined set of regions

The above approach to determining the size (intensity) of the spillover effect has some essential features and benefits. According to the ascertained values, it is possible to determine the order of the examined regions in terms of spillover impact and to find out in which region the greatest spillover effect occurred. This approach also makes it possible to extend the set of the examined and monitored regions and add a virtually unlimited number of other regions. Subsequently, such a set of regions can be sorted again by the intensity of the spillover effect. The differences between the single regions can be expressed in percentage points. It is also quite easy to evaluate the trend of the RSPE indicator series for individual regions.

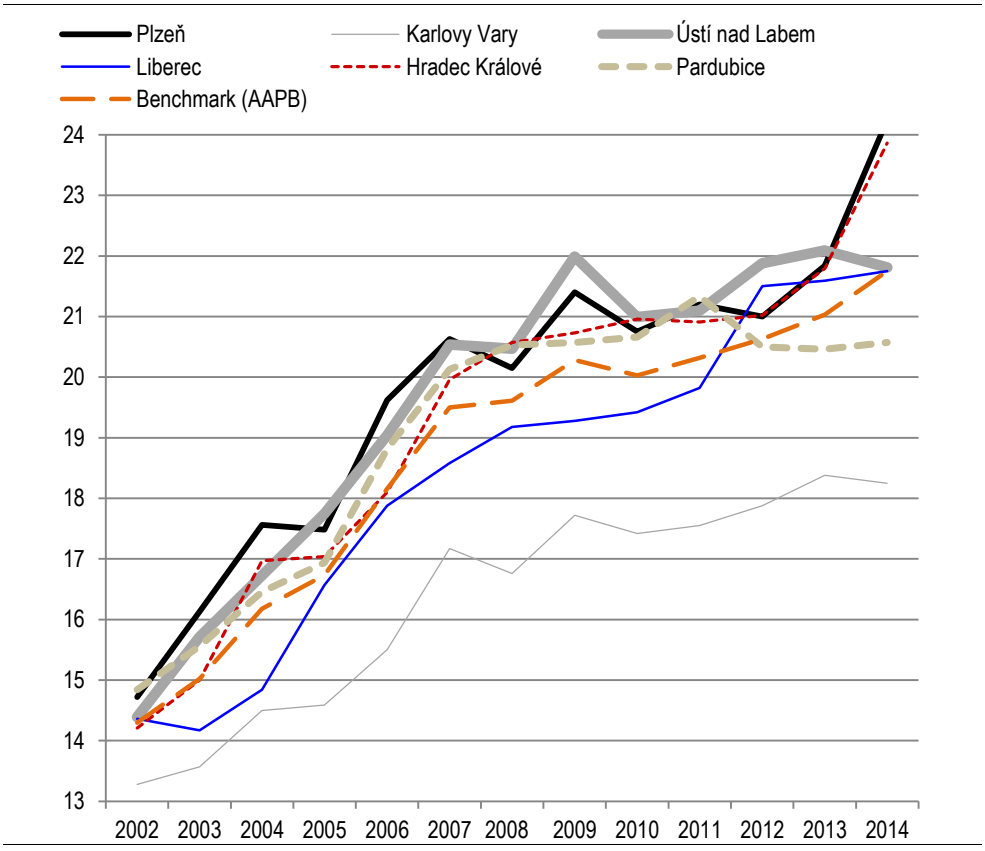
Since the value of each indicator component is relative to the benchmark of the given component, the average value of the RSPE indicator for all the examined regions will be equal to one. Regions with values greater than one show an above-average spillover effect, and those with a value less than one show below-average spillover.

Based on the above-mentioned methodology, the annual values of spillover effect have been calculated for the selected group of regions examined in the period from 2002 to 2014.

Regarding countries of origin, FDI investors in the surveyed regions are dominated by Germany and the United Kingdom (UK). FDI in the Plzeň region is located from: Austria, Belgium, France, Germany, Italy, Japan, Spain, Switzerland, UK, and the USA; in the Karlovy Vary region from: Germany, Japan, the Netherlands, Sweden, Switzerland, and the UK; in the Ústí nad Labem region from: Austria, France, Germany, China, Israel, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK, and the USA; in the Liberec region from: Belgium, Denmark, France, Germany, Japan, Spain, Switzerland, the UK, and the USA; in the Hradec Králové region from: Austria, Belgium, France, Germany, Luxembourg, the Netherlands, the UK, and the USA; in the Pardubice region from: Denmark, France, Germany, India, Italy, Japan, the Netherlands, Spain, Switzerland, and the UK (Kotíková, 2018b).

The development of productivity of labour during the monitored period is shown in Figure 1. The year 2002 was selected as the initial year of assessment because in that year the Czech Republic, on which the methodological procedure is demonstrated, changed the Act on Investment Incentives in order to intensify the support of foreign capital (MPO, 2008).

FIGURE 1. DEVELOPMENT OF LABOUR PRODUCTIVITY IN THE EXAMINED SET OF REGIONS



Source: Own construction based on data from Czech Statistical Office (2018).

Note: Measured in USD per one worked hour.

From the Table 1 it is clear that within the analysed period, the greatest rate of spillover increase was detected in the Plzeň region, while the Karlovy Vary region recorded the greatest rate of spillover decline. At the same time, from the perspective of the individual indicators (GVA, FDII, IR&D, RTG, EDU), the Plzeň region is a leader, and the Karlovy Vary region, on the contrary, falls behind the other regions in all the analysed values. This is not a situation where one component would significantly influence (e.g. decrease) the final value of the indicator. The highest value of the spillover indicator of all the examined regions, 2.22, was reached in the Plzeň region in 2013; the value of this indicator says that the Plzeň region was 2.22 times better in the spillover effect than the average of the regions.

TABLE 1. VALUES OF SPILLOVER EFFECT INDICATOR IN SIX SELECTED REGIONS OF THE CZECH REPUBLIC

YEAR	PLZEŇ	KARLOVY VARY	ÚSTÍ NAD LABEM	LIBEREC	HRADEC KRÁLOVÉ	PARDUBICE
2002	1.086	0.728	0.918	1.176	1.041	1.051
2003	1.124	0.945	0.636	1,060	1.228	1.008
2004	1.025	0.910	0.820	0.815	0.928	1.503
2005	1.072	0.847	1.087	1.061	0.848	1.086
2006	1.047	0.538	1.101	1.445	0.817	1.051
2007	1.168	0.526	0.908	0.981	1.067	1.349
2008	1.251	1.057	0.734	0.911	0.751	1.296
2009	1.655	0.364	0.785	1.420	0.839	0.937
2010	1.254	0.371	0.983	1.133	0.854	1.404
2011	1.457	0.379	1.705	0.788	0.740	0.930
2012	1.529	0.409	1.261	0.880	1.060	0.860
2013	2.220	0.385	0.782	0.844	0.706	1.064
2014	1.300	0.415	1.744	0.837	0.834	0.869
AVERAGE	1.332	0.606	1.036	1.027	0.901	1.108

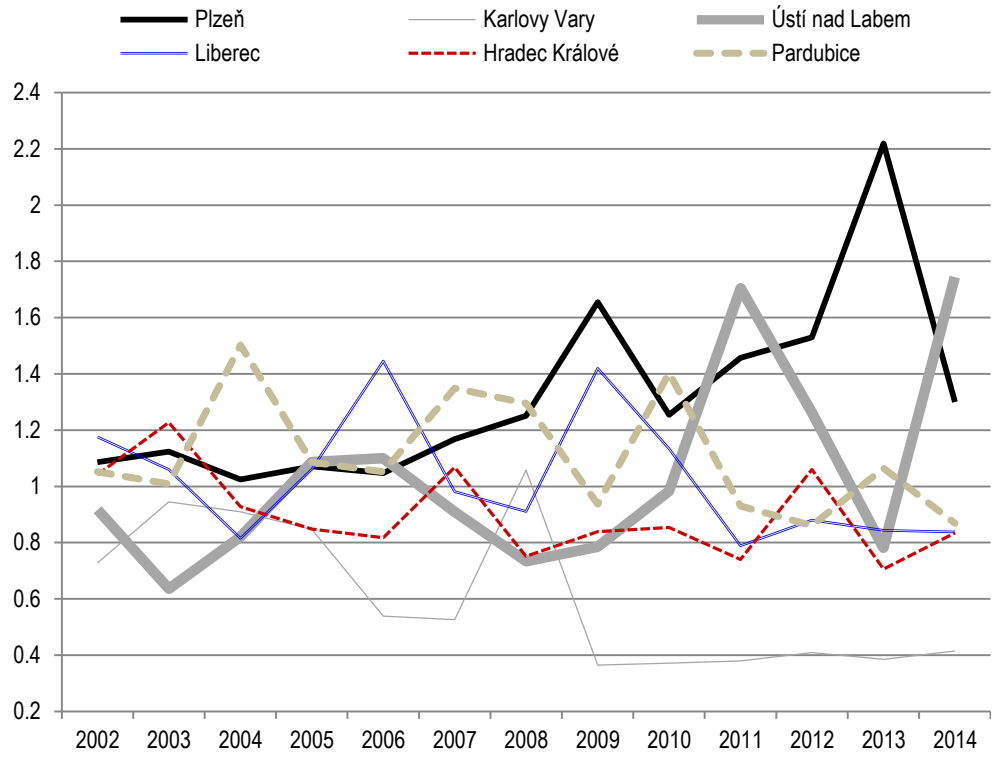
Source: Own calculations based on data from OECD (2018), Czech Statistical Office (2018) and annual reports of the examined FDI (Ministry of Justice, 2018).

On the other hand, the least successful, the Karlovy Vary region, reached the lowest value of the spillover indicator in 2009 (specifically 0.36). This value indicates that in the mentioned year the spillover effect in the region was almost three times smaller than the average of all the examined regions. A relatively stable to slightly volatile level of spillover effect can be seen in the Pardubice, Hradec Králové, and Liberec regions. The values of the spillover effect in these regions were mostly around the average level of one. Strongly volatile development during the analysed period was recorded in the Ústí nad Labem region, which proved to be below the average of almost 40 %, so it could later reach the average of nearly 75 %. The strong lagging behind of the Karlovy Vary region is a very negative reality. However, the volatile development in Ústí nad Labem can also be evaluated as a negative feature. Graphical comparison of the spillover effect development for individual regions is shown in Figure 2.

This graphical comparison also illustrates more clearly the increase in the difference of the size of the spillover effect between the examined regions in the analysed time series. This development can be assessed negatively because it indicates the deepening of socio-economic disparities between regions. At the beginning of the monitored period, between 2002 and 2005, there was a comparable size of spillover effect between all the individual

regions. In the period between 2009 and 2013, the values of spillover effect differed significantly between the regions. Given that in the first mentioned time period (2002-2005), the Czech economy had started to report strong economic growth culminating in 2006, and to the contrary, in the second period (2009-2013) the domestic economy was in a recession, it is possible to state that the development of any spillover effect is dependent of the economic development of the country.

FIGURE 2. SPILLOVER EFFECT - COMPARISON OF THE EXAMINED REGIONS



Source: Own construction based on original calculations and data from OECD (2018), Czech Statistical Office (2018), and annual reports of the examined FDI (Ministry of Justice, 2018).

The position of the Karlovy Vary region, which indicates a warning sign for economic policy makers, is worth mentioning - the Karlovy Vary region is the region with the lowest level of foreign presence and at the same time the region with the lowest labour productivity. Government policy should therefore focus on attracting FDI into this area with an effort to improve the position of this peripheral region. The Karlovy Vary region has not managed to get away from the crisis and the values since 2009 have been more than alarming: the existing institutional support obviously does not contribute to the elimination of regional disparities; on the contrary, it is possible to identify a significant regional grouping of the core-periphery. However, the absorption capacity of the region to receive and benefit from foreign presence, including creating spillover effects, is at a very low level.

6. Conclusions

Using an example of six regions of the Czech Republic, the spillover effect, derived from the foreign presence of FDI in the country, was quantified. On the basis of selected indicators determining the spillover effect (FDI inflow, gross value added, size of the technology gap between FDI and the host business environment, R&D investment, and the proportion of the population with higher education) a regional spillover effect indicator was constructed.

The described approach has to be taken in certain time and space with certain limitations, which reduce the indicator's quantification ability - but they cannot be fully included in the model and notes: the indicator abstracts from the interconnectedness of the regions (e.g. the transfer of acquired technological knowledge from FDI between regions). The approach does not consider the absolute contribution of multinational companies to the region. Thus, a region with a historically very high rate of foreign presence may, with the RTG indicator, stagnate or decrease due to the saturation of the region by foreign presence. Therefore, it would be advisable to monitor or, if necessary, construct a "saturation indicator" of the regional market and its capacities. Its values could then be a certain limitation on the use of the RTG indicator. Damijan, Rojec, Majcen, & Knell, (2013) point out the positive spillover effects actually concern only a certain group of companies. Positive horizontal impacts are evenly distributed among enterprise size groups, while negative horizontal impacts are likely to increase with smaller firms. Quantification of the spillover effect, to some degree, underestimates the true meaning of this effect.

Based on the calculations made from the data of the Czech Statistical Office (2018), Czech National Bank (2018), OECD (2018) and the annual reports of the analysed enterprises, it was found that regional disparities deepen over time (in terms of the spillover effect and the impact of multinational businesses in the host regions. Economically strong regions consolidate their position and benefit from the presence of multinational corporations, while weaker regions are still increasingly lagging behind stronger ones (see Figure 2). There is a deepening of disparities from the perspective of the regional relationship between the core and its periphery.

It is possible to assume that at times of economic growth, the spillover effect in individual regions should be of a similar value; in other words, branches of multinational companies bring positive effects to all the examined regions. The calculations proved that at times of recession, the spillover effect is focused on certain regions - mainly the economically strong ones which are attractive for FDI. This fact will be confirmed or disproved using data that will be monitored in the next few years, when the Czech economy has undergone a period of economic recovery and growth.

The research provides recommendations for economic policy makers, on which regions should focus in the field of investment support for foreign investment attraction, as well as which regions are able to benefit from, and to what extent, the presence of FDI in their business environment.

The main contribution of the presented approach to this scientific field is the proposed methodology of the effects identification, the construction of the indicator and the assessment of the monitored effect at the lower, regional level. A certain filling of the current gap in the existing economic research focused on the identification of the FDI effects at the lower regional level can also be considered a contribution to the scientific

field. This approach allows virtually unlimited expansion of the set of the examined and monitored regions. All the constructed indicators are applicable not only to the regions of the Czech Republic but also to other regional units in other countries.

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