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## ESTIMATING MULTIPLIER EFFECTS ON THE LOCAL SCALE

**Abstract.** Academic studies of local multiplier effects generated by industries or large enterprises seem to be a 'rara avis' of contemporary research. This scarcity stems from a different research procedure implemented on a local scale. The lack of primary data necessary to conduct classical input-output analysis for the local level (Polish municipalities and counties) leads to the need of carrying out the company questionnaire. The survey usually entails the issue of identifying main contractors and spatial pattern of commuting practices. Moreover, in order to obtain the data about the place where employees pay taxes the employee survey is necessary.

Spatial problems of estimating multiplier effects have been described based on empirical data in Krakow's business service centers (Micek et al. 2010) and companies functioning in Special Economic Zone in Mielec (Domański et al. 2005). Multiplier effects are a form of impact effects and they may be presented as an increased employment in local companies or increased revenues of local government from corporate or personal income taxes. Employment multiplier effects are generated in cooperating companies (indirect effects) and firms which provide services for employees of the analyzed business sector (induced effects).

There are two problems that arise while estimating local multiplier effects described in the paper. The first issue is the 'leakage effect' measured in a number of jobs being generated outside the local area (community or county). The general rules concerning the lower leakage estimated for some industries (e.g. trade in comparison to market research services) are known, but attributing the value of supplies to a particular sector is possible only after obtaining specific data from enterprises and critical assessment of their quality.

The second issue is related to the low quality of official statistics in the fiscal system. Almost 90% of employees of Krakow business services centers live in the city, but about 50% of them pay taxes in their former place of residence. If the employees had paid taxes in their actual place of residence, the city would have benefited from additional 9.8 m PLN in 2009 (twice as much than it was in fact collected). On the other hand, this change would lead to the decrease of revenues of local governments outside Malopolska region that would have lost 8-10 mln PLN each year.

### 1. INTRODUCTION

Research on the multiplier effects has hitherto been a *rara avis* on the map of studies dealing with the impact of economic activities on a local milieu. The limited number of local investigations of this type results from the absence of generally available statistical data and the difficulties in obtaining indispensable information via other channels. A particularly significant problem is the lack of an input-output matrix at the local and sublocal levels (communes and poviats).

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The need of narrow definition of the analyzed economic activities (which frequently develop rapidly) prevents the use of matrices. For example, an analysis of business service centres would require data about flows to be collected at least at the level of classes or sub-classes of the Polish Classification of Activities (4-digit in NACE at the minimum). These difficulties imply the necessity of conducting research involving the qualitative methods, i.e. of obtaining data directly from companies and employees. However, the methods give rise to the problem with obtaining data that some enterprises treat as confidential. The data primarily enable the identification of the main suppliers of products and services and the employees' places of residence. Some information cannot be obtained from companies, but it can be provided by their employees in the distributed questionnaires. This information concerns the place where the employees settle their income taxes. All things considered, reliable methods for analyzing the multiplier effects are a rarity in our country, as noted by Domański and Gwosdz [2008].

Multiplier effects are one of the many forms of impact that enterprises exert on the local milieu. Meant more narrowly, they describe changes in the volume of income or employment in a local or regional economy, which are produced by activity conducted in a given location. In very general terms, an activity expanding (or shrinking) in a given area makes the demand for goods and services grow (or decrease), thus influencing the development of other types of activities in a given region or city. When a new activity starts or an existing one develops, we are dealing with positive multiplier effects, i.e. with an increase in income<sup>1</sup> and employment. Otherwise (an activity is terminated or its scope decreases), a decline occurs. Therefore, a direct effect brought about by the commencement of an activity in a given place (employment in an enterprise – direct effects) is accompanied by additional multiplier effects, i.e. indirect and induced ones. The former arise from additional demand for products and services generated by the enterprise, while the latter stem from the increased purchasing power of the enterprise's employees. In the case of enterprises, the most frequent measure of the multiplier effects is the number of new jobs created by the enterprise's suppliers and the services aimed to satisfy consumer demand<sup>2</sup>. The volume of multiplier effects in a given place or region also depends on the degree to which companies based in a given area are able to satisfy the needs of a new enterprise or its em-

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<sup>1</sup> Apart from additional employment, some multiplier effects are represented by local and regional governments' revenues growing due to their shares in the personal income tax, corporate income tax and real estate tax.

<sup>2</sup> The second basic measure of multiplier effects (in addition to the number of employees) is the income of enterprises. There are also attempts at calculating the effects within the added value category, e.g. using gross domestic product, gross regional product, as well as population's incomes.

ployees. If products and services are delivered from outside the region (because of their unavailability in the given location or unfavourable prices or quality), we face a leakage of multiplier effects.

A wider approach to the term ‘multiplier effects’ also involves an analysis of local and regional governments’ revenues from new investments or expansion of the existing plants. Calculations that are interesting from a practical point of view include comparisons of the value of public expenditures (necessary to provide infrastructure as well as utilities for plots, local tax abatements and exemptions, exemptions applying to activities conducted in a special economic zone) and the value of enterprises’ investment outlays. A leverage ratio calculated in this way indicates the efficiency of public expenditures, especially if it is connected with an assessment of the stability (durability) of a given investment.

This paper aims to present selected methodological problems related to the estimation of the multiplier effects’ value on a local scale. Special emphasis is put on these difficulties and dilemmas which have a spatial dimension. The paper also describes the non-spatial problems, traps and methodological weaknesses of analysis of multiplier effects.

## **2. RESEARCH ON MULTIPLIER EFFECTS ON LOCAL AND REGIONAL SCALE**

A local impact analysis may encompass various types of entities. Most frequently encountered (especially in the United States) are analyses of the impact of universities on local or regional development (Armstrong et al. [1997], Siegfried et al. [2007], Beck et al. [1995], Blackwell et al. [2002], Brown, Heaney [1997]). With a multiplier effect analysis, the contribution of tourist traffic or major cultural events (e.g. concerts and festivals) to local development is examined (Vaughan et al. [2000], Pacaud et al. [2007]). To estimate the volume of local budgets’ revenues, primary data usually collected by asking the visitors about the amounts of their expenditures and data on sales gathered through business surveys are used (Hjerpe, Kim, [2007], Saayman, Saayman, [2006]). It is frequently indispensable to analyze the local economic impacts before a decision is made about large investments, e.g. nuclear power plants, which may affect the natural environment, (Glasson [2005], Peerenboom et al. [1997]). In recent years, the studies of negative multiplier effects resulting from the closure of industrial plants have become popular, with the most famous case of MG Rover closed in Birmingham (Chapain, Murie, [2008]).

The analyses of multiplier effects that have been frequently conducted in Poland so far have been made from the perspective of large foreign investments’ impacts on local and regional development. Strykiewicz [2004] and his team

examined the impact exerted by foreign investors on local and regional development using the case of GlaxoSmithKline Pharmaceuticals in Poznań. The impact of the companies based in the Special Economic Zone in Mielec on their milieu (including the multiplier effects) was analyzed in a book edited by Domański and Gwosdz [2005]. The relationships between foreign enterprises and the multiplier effects they generated in the local milieu in rural areas were examined by Micek et al. [2009].

Multiplier effects were also analyzed in terms of individual sectors of the economy. This approach is exemplified by Wiedermann's study [2006] on the regional impact of the automotive industry in the Silesian region, as well as papers dealing with the impacts of business process outsourcing, shared services and research and development centres on the local milieu in Krakow (Micek et al. [2010]) and with the impact of transportation companies on the economic development in the Krakow Metropolitan Area (Micek [2010]).

In Poland, the effects are estimated for investments in special economic zones. Regarding the case of commercial enterprises funded under state aid for investments carried out in the special economic zones, it is necessary to prepare an evaluation of the results of a regulation containing, *inter alia*, the size of employment generated in the milieu and the local governments' revenues from PIT and CIT. For new investments in the Krakow Special Economic Zone, it was assumed that every 1,000 new jobs generated in the zone would generate approx. 250 new jobs in the milieu (*Regulation...* [2009])<sup>3</sup>.

### 3. METHODS

The estimation of indirect multiplier effects is basically divided into two stages. The first and easiest step is the identification of companies supplying raw materials, parts and services to enterprises generating the multiplier effects. Secondly, it is necessary to determine the share of the suppliers' activity that depends on the customer's organization.

A multi-task procedure is applied to estimate the induced multiplier effects. It requires the knowledge of employees' net incomes, of the rate of savings and of the structure of household consumer spending. Identification of the places where consumer needs are satisfied is more difficult. Further, the information about the percentage of people living in the area among all employed persons is required. Last but not least, it is necessary to obtain knowledge about the relation between the number of employees and the revenues generated by services.

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<sup>3</sup> It is worth noting that this type of volume estimates has some shortcomings. Which spatial milieu (local, sub-regional, regional) is considered is not indicated here. The brown-field and green-field types of investments were assigned the same index of employment effects.

The net incomes of the employees living in the area less the savings represent funds allocated to consumption i.e. a potential income of retailers and service providers. Knowing the structure of households' expenditures, we can calculate the income of a given branch. A multiplier effect expressed in monetary terms is thus obtained. Several further steps are necessary to calculate the induced multiplier effects as the number of jobs. First of all, the total labour costs have to be determined using the share of payroll and employment-related benefits in the revenues earned by the consumption branch. Once the cost of one job in a given branch is known (the data of the Central Statistical Office), the number of the full time jobs can be calculated. Using the proportion of employees having jobs in individual branches, it is also possible to allow for the owners and helping family members, thus arriving at the total number of jobs.

In this manner, the first round multiplier effects are generated. The induced effects are also generated by the suppliers' employees, i.e. the jobs that were created following the indirect effects. Moreover, people who work to satisfy consumer demand also generate this demand. In this way, the induced effects of the second, third and subsequent rounds are created until they expire.

Apart from indirect and induced effects, there are also multiplier effects specific to a given industry. In the case of the service centres, this is employment generated by the visits of the centres' guests in Krakow (Micek et al. [2010]). The estimates were produced using information obtained from the companies about the frequency and length of the guests' visits in Krakow and the knowledge of the prices of the most popular services that the guests use. As for passenger transportation, employment created by the purchases made by passengers in harbours, at stations and at stops (both mechanisms created approx. 400 jobs in total) is of certain – however not great – significance. In the business service centres, jobs are created by guests visiting the centres (customers, employees of other foreign centres, etc.).

The tools applied to measure multiplier effects include RIMS II, IMPLAN and REMI models. All these models make use of the analysis of an input-output matrix, more specifically the Leontief inverse matrix. For example, the eclectic simulation model REMI (Regional Economic Model) uses a combination of an output-result matrix with the Cobb-Douglas econometric model and allows accounting for the forecasted changes in costs, payroll and productivity of labour (Lynch [2000]). On the other hand, the IMPLAN (IMpact Analysis for PLANNing) allows measuring the multiplier effects at various spatial levels: from the local (county) level to the level representing the entire economy of the United States (Propst [2000] quoted by: Domański, Gwosdz [2008]).

The above models need a proper level of public statistics. Therefore, they can only be used in certain countries. They utilize the input-output matrix and assume that the dependencies ascertained on a general scale can be transferred

onto dependencies at the enterprise level in a given area. In Poland, because those data on the local level are not available, this analysis is not feasible. Therefore, research has use information about the actual linkages between companies in the examined territory collected by means of questionnaires.

An argument in favour of applying the questionnaire method to examine multiplier effects is offered by a comparison of its results with those provided by the models. The tests comparing the results of RIMS II (Regional Input-Output Multiplier System) with the calculations based on data derived directly from companies (questionnaire research) show that the models slightly (5-10%) overestimate the multiplier effects (Lynch [2000]).

The methods applied by the abovementioned Polish authors combine information obtained in the course of own research and data published by statistical offices and other institutions. Their basic shortcoming is that they are very laborious and that many economic entities willing to cooperate must be available in a given area. Without the support of local stakeholders, conducting this type of research is very difficult.

#### 4. DATA

Data obtained from interviews should be treated with a high degree of caution. The best verification method possible is to obtain data from an alternative source and then to compare the two sets. For example, indirect multiplier effects are usually estimated using several separate data sources, i.e. those provided by the companies and by their suppliers, which allows testing the results. In the case of any discrepancies, the lower values are usually adopted. If no information is available, the final solution is to apply the data that were obtained for a comparable investment in a different location. An analysis of the indirect multiplier effects produced by the central government or local governments can be made more reliable by using generally available data about the number and value of public procurement posted on the websites of the Public Information Bulletin (Micek [2010]).

Apart from the statistical data obtained via interviews, information about average wages in companies can also be derived from the annual financial statements that the organizations publish in "Monitor Polski B." In this case, the problem involves converting wages presented by employment structure into individual jobs. The payroll reports prepared by commercial companies may be of some assistance in this respect<sup>4</sup>.

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<sup>4</sup> For example, for the business service centres in Krakow the reports of the Advisory Group TEST Human Resources available on the website [www.raportplacowy.pl](http://www.raportplacowy.pl) were used.

The structure of households' expenditures is based on the calculations made by the Central Statistical Office (*Sytuacja gospodarstw domowych...* [2004], *Budżety...* [2008]). In the above-mentioned research, the consumption model as presented by a wage-earner's family or a structure of expenditures typical of households in cities with population in excess of 500,000 was adopted. The 'closure index' is estimated for each activity taking into account the place of residence of the inhabitants (data made available by individual companies or collected via questionnaire surveys of employees), the type of activity and the spatial range of services. As justly noted by Domański and Gwosdz [2008], the most appropriate solution would be to base 'the closure index' on a questionnaire aimed to determine the places where people inhabiting a given area satisfy individual types of their consumption needs.

The amount of local governments' share in CIT can be identified using data published in Monitor Polski on the profits of individual companies. The revenues from the personal income tax are simulated in order to grant permits for doing business in the special economic zone (*Regulation...* [2009]). The calculations made then for new investments understate those revenues, as they consider only average wages in the region, although wages in many of the examined sectors are usually higher than average. Additionally, the calculations pay attention only to the global revenues from PIT, whereas local research aims to find out about the benefits of these local governments that strive to attract new investors<sup>5</sup>.

In the calculations made for every year, the deductions from the tax were also considered, following the data made available by the Ministry of Finances on the last tax year (*Informacja dotycząca rozliczenia podatku dochodowego...* [2008]). Therefore, the value of the local governments' revenues from PIT depends on the size of employment in the sector, the wages, the tax rates being in force in the year and the taxpayer's place of residence declared for the sake of the annual settlement with the tax office. The problem is that many people register for tax payment in places which are not their place of residence.

## 5. RESULTS

According to analyses, the value of the multiplier effects is affected the most strongly by employment in suppliers working for a given industry (Table No. 1). The induced multiplier effects exceed indirect effects only in the case of business service centres.

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<sup>5</sup> If this relatively simplified methodology provided by the above resolution were applied, then the local governments' revenues would amount to PLN 28.2 million in 2009.

**Tab. 1. Multiplier effects of selected types of activity – local and regional scale**

SECTOR/ ZONE	LOCATION	SOURCE	INDUCED EFFECTS	INDIRECT EFFECTS	EFFECTS SPECIFIC FOR A GIVEN INDUSTRY	TOTAL EFFECTS
Special Economic Zone	Special Economic Zone Euro- Park Mielec	Domański et al. [2005]	1.13	1.22	X	1.35
Automotive industry	Silesian region	Wiedermann [2006]	1.13	1.17	X	1.30
Business service centres	Krakow (including Zabierzów)	Micek et al. [2010]	1.15	1.11	1.01	1.27
Passenger transportation	Krakow Metropolitan Area	Micek [2010]	1.11	1.32	1.03	1.46

*Source: developed by the author based on the sources indicated above.*

Various industries generate the strongest indirect multiplier effects depending on the type of activity. Owing to the investments in the Mielec Special Economic Zone, most jobs were created in the transportation industry (30% of all jobs generated as a result of multiplier effects) and then in the construction industry (20%) (Domański et al. [2005]). The business service centres generate the greatest demand for training services (Micek et al. [2010]). The providers of transportation services (40%) and organizations providing facility cleaning and equipment maintenance services (almost 20%) (Wiedermann [2006]) recorded the best results regarding the supplies of parts and services to automotive enterprises in the Silesian region.

The induced effects create jobs mostly in trade (from 41% to 48% depending on the research and the adopted structure of households expenditures). The smallest number of new jobs in trade is created by the spending of the business service centres' employees, who also spend a lot on the transportation and communications services (Micek et al. [2010]).

In the Poviát of Mielec, 63% of the effects generated in the country are accumulated, whereas the degree of closure is different for individual types of multiplier effects (Domański et al. [2005]). It is the highest for the induced effects. Closure is much stronger with respect to basic services (protection, cleaning and transportation services) and weaker for specialist services. The closure of the indirect production effects is approx.  $\frac{1}{3}$  (along with the energy and water supply that makes this value higher).

The final value of the multiplier effects on a local or regional scale calculated during the research and presented in Table No. 1 ranges from 1.3 to 1.5. The multipliers have higher values on a national scale. For the sake of compari-

son, the total multipliers calculated with IMPLAN range for the entire US area of the USA from 1.5 to 2.5 (Mulkey, Hodges [2003], quoted by: Domański, Gwosdz [2008]).

The effects produced by large investments or branches of the economy can be expressed not only in terms of employment, but also via the local or regional governments' revenues derived from either a starting (or continued) investment. Most of the revenues come from the local governments' shares in corporate and personal income taxes and from the real estate tax. They can be presented in terms of absolute values, converted per employee or assigned to public institutions' outlays on the implementation of a given investment (e.g. infrastructure outlays or amounts lost due to tax discounts).

As regards the Krakow business centres, local and regional revenues from CIT are small, amounting to at least PLN 5.5 million in 2007 (Micek et al. [2010]). In percentage terms, most funds are contributed by service centres to the budget of the Zabierzów commune near Krakow. The corporate income tax that the service centres paid in 2007 accounted for one-third of total revenues from this source. This value exceeds by over 20 percentage points the service centres' share in employment in the commune in 2007. In value terms, the revenues of the regional budget (PLN 3.7 million) are very significant, as they constitute approx. 1.2% of total revenues from CIT – the centres' contribution to employment in the region was similar in 2007. Because the corporate income tax represents a very significant portion of the region's revenues, the CIT amounts paid by the service centres amounted to 0.5% of total incomes in the regional budget. The budget of the city of Krakow received over PLN 1 million in CIT paid by the service centres, which accounted for 1.2% of total CIT receipts. This value is low compared with the percentage of people employed in companies with more than nine employees that in 2007 exceeded 2.5% (Micek et al. [2010]).

In 2008, local governments received PLN 28.5 million in taxes paid by the employees of the Krakow service centres; approx.  $\frac{2}{3}$  of this amount came from the BPO/ SSC employees and  $\frac{1}{3}$  from the employees of the software development centres and R&D centres (Table No. 18). The first group's share in the revenues provided by this tax is slightly lower than its share in employment, as the employees are paid less than in the R&D centres. The next year, the local governments' budgets are likely to receive PLN 26.5 million, despite rising wages and growing employment; the amount will be smaller because of tax reductions in this year. If the tax law is not changed, in 2010 the local governments can expect to receive PLN 31.5 million (Micek et al. [2010]).

The greatest beneficiary is the city of Krakow that should receive almost half of the revenues each year, i.e. PLN 13.5 million for 2008. The budgets of the other communes in the Małopolska region can expect approx. PLN 3-3.6

million each year, whereas other poviats in the region from PLN 850,000 to PLN 1 million. The budget of the Małopolska region should receive approx. PLN 600,000. However, substantial amounts will be credited to the budgets of communes, poviats and regions situated in other parts of the country. On average, the amounts account for approx.  $\frac{1}{3}$  of all taxes generated by employees in a given sector. In 2008 it was PLN 10.2 million. The employees of the R&D centres who usually come from other parts of the country and frequently pay their taxes at home, thus contributing to the outflow of the personal income tax payments outside the borders of the region, represent a relatively large proportion of personal income taxes being paid outside (Micek et al. [2010]).

The above amounts of taxes can be augmented with the revenues derived from the personal income tax paid by people whose jobs were created in the local milieu following the indirect and induced multiplier effects. It seems that the decline in PIT revenues in 2009, caused by the reduced tax burden, may be partially compensated for by increased consumer demand. The economy is receiving a stronger flow of cash, new jobs are generated and PIT revenues are growing. The calculations indicate that because of the jobs of suppliers and service providers of centres and the jobs created owing to the demand for goods and consumption services from the centres' employees, local governments at various levels may count on their budgets receiving additional financial support amounting to PLN 3 million for 2008 (Micek et al. [2010]).

The leverage ratios concerning investments in various plants and industries are more diversified than the values of the multiplier effects expressed in terms of employment. If the national and/or local governments support inefficient activities, public outlays may then exceed the companies' investment outlays. For example, the revenues that the local governments in the Małopolska region received due to local taxes and their shares in PIT and CIT paid by the passenger transportation companies in the Krakow Metropolitan Area were approx. PLN 35 million (Micek [2010]). However, in 2008, the Małopolska region made extra payments to fund the operations of PKP Przewozy Regionalne amounted to PLN 43.1 million.

As regards the business service centres, the value of the leverage is not uniform. The expenditures made by the Krakow City Office were estimated at approx. PLN 6 million a year, in which around 90% were local income tax reductions offered under state aid granted to the special economic zone due to labour costs (Micek et al. [2010]). Assuming that the minimum revenues that the centres contributed to the municipal budget stood at PLN 17 million, the leverage ratio amounted to approx.  $\frac{1}{3}$ . This points to the definite advantage of the revenues, indicating profitability of operation of business service centres from the city's point of view.

## 6. DISCUSSION: NON-SPATIAL WEAKNESSES AND TRAPS WITH RESPECT TO THE ESTIMATION OF MULTIPLIER EFFECTS

Estimates of the multiplier effects of various economic activities are sometimes “contaminated” by being overestimated. This particularly refers to the analyses performed by commercial companies, media reports and communications by local government authorities. An example can be found in the joint report by NASSCOM and Deloitte (*Indian IT Industry...* [2008]), whose authors claim that for one job in the IT and BPO/ SSC sector, there are four jobs in the local milieu. According to *Kondycja polskiej motoryzacji* [2005] quoted by Domański and Gwosdz [2008], even more jobs (from five to seven new jobs in companies supplying the automotive industry) correspond to one job at the final manufacturer's. The foreign BPO/ SSC and IT sector in Krakow is estimated to contribute EUR 640 million to the local economy (Hallam, Kaim-Kerth [2008]). This substantial amount of funds was calculated by multiplying the total costs of one job (EUR 40,000) and the overestimated number of 16,000 employees in the sector<sup>6</sup>. Such overestimations sometimes result from all jobs created by suppliers being assigned to the analyzed company or sector, while many service providers usually have other customers too.

Because of the method adopted, the multiplier effects generated by large investments may, in fact, slightly exceed the values calculated following the questionnaire research. Obtaining data from companies is not always possible. Besides, some studies disregard the indirect effects of companies providing services for employees. These calculations usually treat the number of jobs as full time positions, which means that employees having part-time jobs will increase the number of employees (Domański, Gwosdz [2008]).

A key element influencing the obtained value of the multiplier effects is the selection of enterprises or sectors to be analyzed. An overly narrow definition of the sector being described may lead to high multiplier values. This happened when the multiplier effects of the companies operating in the sector of passenger transportation in Krakow were analyzed (Micek [2010]); the main activity was limited then solely to the companies providing transportation services and the effects of their operation were assumed to affect only companies delivering maintenance services for the necessary infrastructure.

Some believe that the purposefulness of examining multiplier effects is discredited by their variability in time that results, *inter alia*, from the dynamics of the intercompany linkages. The input-output models, as well as the data obtained from questionnaires or interviews, naturally build on linkages that were ascer-

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<sup>6</sup> Employment in Arcelor Mittal Steel (steelworks in Krakow) and the Philip Morris tobacco factory was included in the pool of 16,000 employees of the BPO/ SSC sector (Hallam, Kaim-Kerth [2008]).

tained in the past, assuming their relative durability. As a result, it is sometimes considered that the analysis of multiplier effects sometimes offers knowledge about short-term effects.

Another weakness of the analysis of multiplier effects is the tacit assumption described by Domański and Gwosdz [2008], according to which a new or expanded activity does not compete with other organizations in the local market. Consequently, the negative multiplier effects (consisting in the displacement of competitive activities) are disregarded. This is especially noticeable in retail. This calls for creating a balance of multiplier effects as a difference between the demand or additional employment created by the new company and the declining receipts or employment in other companies.

## **7. DISCUSSION: SPATIAL PROBLEMS REGARDING ESTIMATES OF MULTIPLIER EFFECTS**

In addition to the above methodological weaknesses of the analyses of multiplier effects, several spatial problems exist. First of all, it is difficult to determine the actual borders of a local milieu. The smaller the adopted local milieu, the smaller the local closure of multiplier effects will be. For the small and medium-sized cities the area of a powiat is usually adopted and for the largest urban agglomerations the local milieu is delimited by the borders of the metropolitan area.

Further, the scope of the local milieu must be determined consistently and understood in the same way by the researchers and respondents (enterprises and/or their employees). Unfortunately, the author's experience shows that there are problems with the term being correctly understood and with providing a clear definition of the term local milieu in a questionnaire or during an interview. Companies are frequently misclassified with respect to the local milieu. For example, a company having its head office in Warsaw is believed to be a Krakow-based company, even though only one its representative operates in Krakow and no branch is located in the capital of Małopolska.

Secondly, the issue of the location where multiplier effects are generated is important from a geographical point of view. The range of spatial impacts consists of the development of both local enterprises and suppliers of goods and services located in distant cities, even outside the country. The greater is the closure of multiplier effects within the area of a city or a region, the stronger is their positive effect on local or regional development. On the other hand, a leakage of multiplier effects, for instance purchases of goods and services outside a city or a region, brings about positive effects in other areas, becoming a development-spreading factor. Some types of economic activities are characterised by a low level of local closure of multiplier effects. A case in point is the location of

investments outside Warsaw and a frequent use of advanced business services rendered outside a given city or a region. Apart from the differences arising from the characteristics of a given activity or company, the city's position in the settlement and economic hierarchy exert a significant influence on the scale of washing out of the multiplier effect. The leakage of multiplier effects beyond a city or a region is inversely proportional to its size.

Thirdly, Domański and Gwosdz [2008] point to the variability of the positive and negative multiplier effects depending on the geographical scale. For example, special economic zones may influence the development of suppliers' activity in one city instead of limiting it in another city of the region, which will be treated as a positive effect in the first city, but not necessarily on the scale of the entire region.

Fourthly, an important – though quite a detailed problem – is the difference between the place where taxes are paid and the actual place of taxpayers' residence. The results of the questionnaire research involving the employees of service centres (Micek et al. [2010]) revealed that a significant number of the employees pay their taxes outside the Małopolska region. This concerns approx.  $\frac{1}{3}$  of employees in the outsourcing service centres and shared service centres and 40% of the software development and R&D centres. In the latter case, the rate is due to the fact that the centres usually attract employees from outside the region. Relatively many people, approx.  $\frac{1}{6}$  of the respondents, filed their 2008 PIT declarations in the Małopolska tax offices, but outside Krakow. Therefore, with nine out of ten employees in the sector living permanently in Krakow, slightly more than a half of them filled out their tax declarations accordingly.

As regards the Krakow business service centres, we can form some expectations of what the situation of the local governments' budgets in Małopolska could be, if the employees of the centres settled their taxes where they actually live. A simulated distribution of this tax is very advantageous for the regional capital. For the year 2008, PLN 10.6 million in excess of the actual payment would have been credited to the city budget. This means that the revenues would have been twice larger than they are now. On the other hand, the change would have made other communes and poviats in the Małopolska region suffer. The largest losses would have been sustained by local governments outside Małopolska, as their budgets would be have been lessened by amounts ranging from PLN 8 to 10 million every year.

## 8. CONCLUSION

The above results demonstrate that media releases and consulting companies' statements about the scale of employment multiplier effects are highly overestimated. The research methods for assessing the multiplier effects for

various industries and locations should become a valuable source of information for local governments. It is especially useful for making location decision and for calculating the potential employment and financial effects for the local milieu.

This research indicates that the values of multiplier effects as expressed by the number of jobs are slightly at variance. This results from the industry-specific, small differences in the induced effects. The differences in the indirect effects are greater and depend on the types of economic activity examined: training services for the business service centres and transportation services for the automotive companies. Among the main non-spatial weaknesses and methodological problems there are:

- shortcomings of the questionnaire method (it is practically impossible to obtain information from all companies);
- an overly narrow definition of the analyzed activities/ companies;
- differences occurring in time, resulting from the dynamics of the linkages between companies;
- a failure to account in the balance of effects for the displacement of small and medium-sized companies by large companies.

Four major spatial problems were identified in estimating the multiplier effects:

- the determination of the local milieu borders (usually the area of a poviát in the case of small and medium cities or metropolitan area borders when the largest municipal centres are considered);
- the estimation of the scale of local leakage of multiplier effects beyond a city or a region;
- multiplier effects estimated differently depending on the geographical scale;
- differences between the place where taxes are paid and the actual place of taxpayers' residence leading to lower PIT revenues of large municipal agglomerations.

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#### PRZESTRZENNE PROBLEMY SZACOWANIA EFEKTÓW MNOŻNIKOWYCH W SKALI LOKALNEJ

Badania nad efektami mnożnikowymi powstającymi w otoczeniu lokalnym dużych przedsiębiorstw i specjalnych stref ekonomicznych nie są częste. Brak tego typu analiz wynika z konieczności zastosowania odmiennej od wykorzystywanej dla regionu czy kraju metody analizy. Brak danych niezbędnych do przeprowadzenia analizy przepływów międzygałęziowych na poziomie lokalnym i ponadlokalnym prowadzi do prób wykorzystania metody kwestionariuszowej.

Celem niniejszego artykułu jest przedstawienie wybranych problemów metodycznych związanych z szacowaniem wielkości efektów mnożnikowych w skali lokalnej. Szczególny nacisk położono tu na te trudności i dylematy, które mają swój wymiar przestrzenny. Analizę przeprowadzono na podstawie wyników badań przeprowadzonych w krakowskich centrach usług biznesowych i firmach transportu pasażerskiego, Mieleckiej Specjalnej Strefie Ekonomicznej i firmach przemysłu samochodowego w województwie śląskim. Badania wskazują na niewielkie zróżnicowanie wielkości sumarycznych efektów mnożnikowych wyrażonych liczbą miejsc pracy. Wynika ona z niewielkiego zróżnicowania efektów dochodowych w zależności od branży. Większe jest zróżnicowanie efektów zaopatrzeniowych, w ramach których występują różnice wśród branż dominujących w zależności od badanych działalności gospodarczych: w centrach usług biznesowych są to usługi szkoleniowe, a w przypadku firm samochodowych – usługi transportowe.

W artykule omówiono cztery główne przestrzenne problemy szacowania efektów mnożnikowych, tj. kwestię wyznaczenia granicy lokalnego otoczenia, szacowania skali lokalnego wyciekania efektów mnożnikowych poza miasto lub region, zróżnicowania oceny efektów mnożnikowych w zależności od skali geograficznej i różnic pomiędzy miejscem płacenia podatków a faktycznym miejscem zamieszkania.