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**ECONOMIC PERFORMANCE OF MANUFACTURING
INDUSTRY OF PILSEN AGGLOMERATION****Ekonomická výkonnost zpracovatelského
průmyslu v Plzeňské aglomeraci****PAVEL KRAJÍČEK****VÁCLAV NOVÁK****ŠÁRKA PALCROVÁ**

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Annotation

The aim of the article is to evaluate the economic performance of manufacturing industry in the agglomeration, which is presented by a strong industrial tradition. The Pilsen agglomeration is a relatively significant territorial unit for the population of the Czech Republic. The question is whether the importance of the Pilsen agglomeration is also expressed by its economic performance. Method of delimitation of agglomeration has been based on using of commuting to work data. Through a data base on reciprocal commuting flows, the correlation of the core of the agglomeration will be determined, i.e. Pilsen, with surrounding municipalities. Kovanda has already tried to define the Pilsen agglomeration. The thesis will, therefore, offer a comparison of the delimitation of agglomerations through two different methods. The performance of the manufacturing industry will be based on the aggregation of business accounting, especially the indicator of labor productivity, i.e. the ratio between value added and number of employees. The main findings include the fact that the Pilsen agglomeration showed very good results in the sector, which are most represented in the employment of manufacturing. The main drivers of the economy in the Pilsen agglomeration are beverage industry, transport, and general engineering.

Key words

manufacturing industry, Pilsen agglomeration, economic performance

Anotace

Cílem článku je zhodnocení ekonomické výkonnosti zpracovatelského průmyslu v aglomeraci, která se prezentuje výraznou průmyslovou tradicí. Plzeňská aglomerace je v měřítku České republiky populačně poměrně významnou územní jednotkou. Otázka zní, zda je význam Plzeňské aglomerace vyjádřen i její ekonomickou výkonností. K vymezení aglomerací byla užita data o dojížděcí do zaměstnání. Prostřednictvím datové základny o recipročních dojížděčkových prouděch bude zjištěna vzájemná provázanost jádra aglomerace, tzn. Plzně, s okolními obcemi. Plzeňskou aglomeraci se již pokusil vymezit Kovanda. Práce tedy nabídne porovnání vymezení aglomerací prostřednictvím dvou různých metod. Výkonnost zpracovatelského průmyslu bude založena na agregaci dat podnikového účetnictví, především pak indikátorem týkajícím se produktivity práce, tzn. poměrovým indikátorem přidaná hodnota na zaměstnance. K hlavním zjištěním patří skutečnost, že Plzeňská aglomerace vykázala velmi dobré výsledky u odvětví, která jsou zde zastoupena na zaměstnanosti ve zpracovatelském průmyslu nejvýrazněji. Hlavními tahouny ekonomiky jsou v Plzeňské aglomeraci odvětví výroby nápojů, dopravního i všeobecného strojírenství.

Klíčová slova

zpracovatelský průmysl, Plzeňská aglomerace, ekonomická výkonnost

JEL classification: R12

1. Introduction

Geographical thesis frequently tend to be extensive and multidisciplinary. However, purely geographical research activities include the identification and delimitation of different types of territory. The most important areas of settlement systems are agglomerations (Hampl, 2005). The agglomeration includes mainly the core of the city, where most services are directed. The non-core zone of the agglomerations is formed by municipalities with a narrower core background, where there is not only a very strong link to the core city, but there are also opposite trends. This means that core residents have a reason to travel to agglomerated municipalities in great intensity. Commuting both for work and for services. High proportion of interconnection of each of the spatial units in agglomeration is also given by high intensity of mutual commuting structures. (Halás et al., 2012).

Agglomerations arise due to the spatial growth of the most important centers (Hampl, 2005) and also because the municipalities neighboring to the important center make a profit, which means a population supply. In both cases, the suburbanisation processes associated with the residential and occupational function of agglomerated communities play an irreplaceable role (Novák, 2017). Since the 90s, and also in other post-communist countries, agglomerated areas experience dynamic economic changes, Krzysztofik (2016) for example, dedicated himself to the processes of reindustrialization and deindustrialization in Upper-Silesian Conurbation. The authors of this article are also devoted to the area with strong industrial tradition.

The economic performance of regions is observed worldwide. Porter (2003) observed regional economics in the USA, whereas registered that industrial sectors are reporting higher average wages and higher rate of innovations than other sectors of national economy. In the Czech Republic, the economic performance of small city-regions (Ženka et al., 2013) was examined, using the financial indicators. Financial indicators involved in the final accounts of companies were used by the authors of this article as well.

2. Delimitation of Pilsen agglomeration

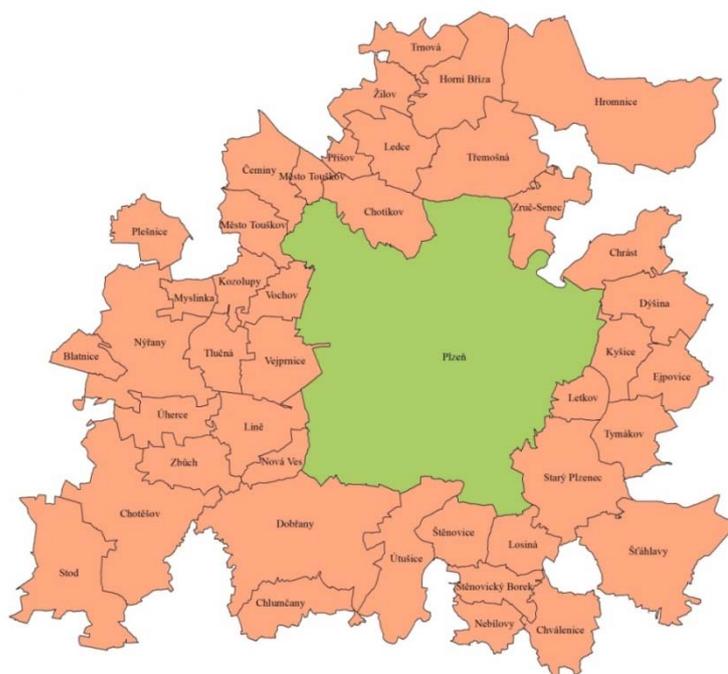
Kraft with Marada and Popiakova (2014) are pointing out the non-existence of standard methods for delimitation of city agglomerations. The delimitation of agglomeration can be performed through more complicated quantitative methods and with the use of geographic information systems (Liu, Dong, Chi, 2010). In the environment of south-eastern Asia, where by population and area a large scale metropolitan areas are situated, are these methods very suitable. The delimitation of the Pilsen agglomeration, will be carried out using a method based on data on commuting and commuting to work, previously defined by Novák (2017). The reason for choosing this method is the ever-increasing role of suburbanization - especially residential suburbanization - this includes the construction of new housing in the city's background and the gradual outflow of people from the core city to new family houses (Ouředníček, 2002). No less commercial suburbanization affects the growth of agglomerations. Population and jobs are also being moved beyond city borders (eg. the construction of new businesses). The result is higher commuting to work in the agglomerated communities from the core.

Novák (2017) followed the mutual interaction between the agglomeration center and its background by means of daily commute data to which a so-called merge parameter was built. *“The combining parameter has, in light of commuting to work, bi-directional character and forms a sum of two shared values:*

- *share of commuting out to work from the municipality daily to agglomeration, on total number of daily commuting out to work from the municipality (%);*
- *share of commuters to work to the municipality from the agglomeration on total number of commuters to work to municipality daily (%)., (Novák, 2017).*

The result of using the Novak method was a delimitation an agglomerated area of 42 municipalities including the core. It is one of the largest agglomerations in the Czech Republic. January 1, 2018, the population of the agglomeration was almost 250 thousand residents when approximately 2/3 of the total population (170 thousand) lived in Pilsen.

Kovanda (2006) has already tried to define the Pilsen agglomeration. Kovanda's method included six basic criteria, including commuting to work. Among other parameters were, for example, bus availability. Kovanda issued an opinion that at least 33% of employees had to go to the core of the agglomeration to be considered as agglomerated. To the delimitation did not include reciprocal commuting flows from the core. The agglomeration defined by Kovanda includes 89 municipalities and more than 270 thousand residents.

Fig. 1: Delimitation of the Pilsen agglomeration from March 26, 2011

Source: Czech Statistical Office (2011), author's elaboration

3. Economic performance

The importance of monitoring the economic performance of the industry is also confirmed by the authors Schwab and Hulten (1984), who in their work analyzed the economic performance of two distinct areas of departures dating back to the mid-20th century. Their analysis consisted of regional disparities at different levels of aggregation with access to the production sector. The performance of the manufacturing industry has also been explored since 1971 by Hussain and Bernard (2017). They have examined the two most primary industries in their country. The comparison took place in 4 of the world's "players" in the paper and pulp industry in countries with the best conditions for this type of industry: Canada, USA, Sweden, and Finland.

It is not possible to evaluate economic performance at a lower territorial level than the state level in the Czech Republic, that is mentioned by Novák and Drdová (2013). Data on the economic performance of industries are not available either for the regions of the Czech Republic or for smaller administrative units. Therefore, the author of the article has set up a database based on financial statements, where the companies of the processing industry were divided according to the CZ-NACE classification into sub-sectors:

- Manufacture of food products
- Manufacture of beverages
- Manufacture of wood and of products of wood and cork except furniture; manufacture of articles of straw and plaiting materials
- Manufacture of paper and paper products
- Printing and reproduction of recorded media
- Chemical industry - Manufacture of chemicals, chemical products + Manufacture of basic pharmaceutical products and pharmaceutical preparations
- Manufacture of other non-metallic mineral products
- Manufacture of fabricated metal products, except machinery and equipment
- Electrotechnical industry - Manufacture of computer, electronic and optical products + Manufacture of electrical equipment
- Manufacture of machinery and equipment n.e.c.
- Manufacture of motor vehicles, trailers, and semi-trailers
- Manufacture of other transport equipment
- Manufacture of furniture
- Other manufacturing (including Manufacture of textiles)
- Repair and installation of machinery and equipment

The 194 largest companies have been compared. There were companies operating in these branches of the manufacturing industry in the Pilsen agglomeration, who published their financial statements.

Some sectors of manufacturing were not included in the analysis, because of the low or no representation in the Pilsen agglomeration.

The comparison is based on several basic indicators of economic performance from companies. Labor productivity from added value will be evaluated primary. It is calculated as the ratio between added value and human capital (Truneček, 2004). The added value is per employee. To the other indicators that have been worked out are the average monthly wage, the number of employees and the economic result.

Tab. 1: Number of subjects in the core, non-core zone and in the Pilsen agglomeration according to the manufacturing industry in 2016

Manufacture of	Core	Non-core zone	Total
Food products	1	4	5
Beverages	2	1	3
Wood and products of wood	7	3	10
Paper and paper products	2	1	3
Printing and reproduction	5	0	5
Chemical industry	10	10	20
Other non – metallic mineral products	3	5	8
Fabricated metal products	34	7	41
Electrotechnical industry	16	10	26
Machinery and equipment n. e. c.	18	11	29
Motor vehicles, trailers	10	2	12
Other transport equipment	4	1	5
Furniture	4	4	8
Other manufacturing	6	2	8
Repair and installation	11	0	11
Total	133	61	194

Data source: Author's elaboration

There are less than 200 manufacturing companies in the Pilsen agglomeration. These are spread out identically to the population, thus 2/3 of the agglomeration core and the remaining third of the core. Most of the agglomeration has the largest enterprises in the metalworking industry (roughly 1/5), the vast majority are in the core. More than twenty enterprises are in chemical, electrical and engineering industries. The lowest number (3) is represented by businesses in the beverage and paper industries. The most significant difference in the number of enterprises (when the core prevails over the hinterland) is observed in the automotive industry and Repair and installation. The opposite situation is recorded by the food industry. The same number of enterprises have chemical, glass and furniture industries.

It is noteworthy that the total chemical industry operates in a total of 20 companies, including 19 companies which producing rubber and plastic products.

Compared to the number of companies in the Czech Republic, we can classify the Pilsen agglomeration as below average in the sector: Manufacture of wood and products of wood (roughly 10 percentage points), Printing and reproduction of recorded media (twice as low) and Electrotechnical industry (almost 12 percentage points). On the other hand, to the above-average sectors in the Pilsen agglomeration: Manufacture of machinery and equipment n.e.c. (by 12 percentage points higher), Manufacture of motor vehicles, trailers, and semi-trailers, which is represent more than 10 times higher than the Czech Republic. Other industries are represented in the Pilsen agglomeration by the same amount as in the Czech Republic on average.

Tab. 3: Number of employees in the core, non-core zone and in the Pilsen agglomeration by the manufacturing industry in 2016

Manufacture of	Core	Non-core zone	Total
Food products	25	209	234
Beverages	2 141	279	2 420
Wood and products of wood	119	74	193
Paper and paper products	456	145	601
Printing and reproduction	528	0	528
Chemical industry	1 093	832	1 925
Other non – metallic mineral products	280	2 027	2 307
Fabricated metal products	3 031	440	3 471
Electrotechnical industry	3 480	4 076	7 556
Machinery and equipment n. e. c.	4 069	1 326	5 395
Motor vehicles, trailers	6 227	1 227	7 454
Other transport equipment	3 309	15	3 324
Furniture	114	232	346
Other manufacturing	443	62	505
Repair and installation	507	0	507
Total	25 822	10 944	36 766

Data source: Author's elaboration

The number of employees in the Pilsen agglomeration is roughly the same compared to the number of companies. In the entire Pilsen agglomeration, almost 37 thousand people work in the manufacturing sector, which is roughly 40% of the total number of persons working in the manufacturing industry in the entire Pilsen Region. The average size of the company is approximately 190 employees.

“Two of the greatest giants of Czech engineering are the cities of Brno and Pilsen, where the engineering industry had not only a high number of workers but also a high share in total employment”(Bařtová, Toušek, 2005, p. 15). The table confirms the words of Bařtová and Toušek. The core of the Pilsen agglomeration continues to be the giant of Czech engineering.

Most employees are working in the electrotechnical and automotive industries. This phenomenon corresponds to the fact that in these sectors of the Pilsen agglomeration are large companies. However, for example, there are about 15 more companies within the Manufacture of fabricated metal products in the Pilsen agglomeration, but the number of employees in this sector is twice as high as in the Electrotechnical industry and Manufacture of motor vehicles, trailers. The Manufacture of motor vehicles, trailers has the largest number of employees in the core of the Pilsen agglomeration. In this sector is employed about a quarter of all employees from manufacturing industry in Pilsen. A significant proportion of people are also employed by the Manufacture of machinery and equipment n.e.c., Manufacture of fabricated metal products, except machinery and equipment and Manufacture of other transport equipment. The same number of employees in the core and in the hinterland is registered in the Electrotechnical industry. There is also a high number of employees in the Beverage industry, even in spite of the low number of companies. Especially important is the company Pilsner Urquell, which employs almost 2 thousand people. Compared to the Czech Republic, the proportion of people who are employed in transport engineering in the Pilsen agglomeration is almost 9 times a higher and the production of Beverage industry is a 6 times higher. Electrotechnical industry (10 percentage points) and Manufacture of motor vehicles, trailers, and semi-trailers (10 percentage points) have a higher representation in the Pilsen agglomeration than the whole Czech Republic.

Tab. 4: Value added per employee (in CZK thousands) in the core, non-core zone and in the Pilsen agglomeration according to the manufacturing industry in 2016

Manufacture of	Core	Non-core zone	Total	ČR
Food products	195	607	563	541
Beverages	3 786	2 440	3 630	1 321
Wood and products of wood	382	363	375	458
Paper and paper products	687	2 101	1 028	889
Printing and reproduction	564	0	564	544
Chemical industry	574	683	621	1 003
Other non – metallic mineral products	903	853	859	813
Fabricated metal products	918	946	921	662
Electrotechnical industry	989	566	761	753
Machinery and equipment n. e. c.	1 138	639	1 016	714
Motor vehicles, trailers	892	802	877	1 270
Other transport equipment	1 419	403	1 415	858
Furniture	570	511	530	472
Other manufacturing	253	398	271	457
Repair and installation	670	0	670	681
Total	1 162	943	1 175	953

Data source: Author's elaboration

“Basically, the value added per employee indicates how much money one worker can make for his employer. This does not include the cost of his wages and other income and expenses, which are not directly attributable to the manufacturing activity of the industrial enterprise“ (Novák, et al; 2012, p. 19).

Pilsen agglomeration shows a very above-average performance of employees. The employees of the Pilsen agglomeration will earn about 200 thousand CZK more than an average employee in the Czech Republic. We can see the difference when we compare added value inside the agglomeration. The difference between the core and the non-core zone is the same as the difference between the whole agglomeration and the average of the Czech Republic. The high performance is mainly due to the core city of Pilsen. Almost two-thirds of industrial sectors in the Pilsen agglomeration are above the Czech average. The beverage industry (mainly brewing) shows the highest performance, up to almost three times. Manufacture of other transport equipment also showed high values above the national average, when one employee in the Pilsen agglomeration earned his company about half a million CZK per year more than in the average of Czech republic.

Especially Škoda Transportation shows extremely above-average values, when one employee earns about CZK 1.5 million his company. Škoda Transportation has a long tradition in the Pilsen Region. Most of the production is focused on trams, suburban electric trains, locomotives, metro trains, trolleybuses or electric buses. It is the largest company in Central Europe (more than 5,000 employees) engaged in transport engineering (Aktuálně.cz, ČTK, 2018). The company has several subsidiaries and supplies vehicles worldwide. In 2018, PPF bought shares of the entire company (CZK 8.3 billion), the company is owned by the richest Czech, Petr Kellner. Škoda Transportation is still accompanied by financial scandals. The most important are eg. overpriced contract of the modern depot used to repair buses, when it was supposed to “drain” up to 160 million CZK (Karel Hrubeš, idnes.cz, 2018). Another example is the payment of dividends from previous shareholders for suspected tax fraud (Karel Hrubeš; Petr Kolář, MF DNES, 2018). Despite all the discrepancies, Škoda Transportation has a significant impact on the economy of the Pilsen agglomeration.

The performance of the Manufacture of machinery and equipment n.e.c. is set by Daikin (air conditioning) and Doosan Škoda Power is not lagging behind either. The traditional production of turbines in the Pilsen region dates back to 1904. Nowadays Pilsen turbines are delivered to very remote destinations (South America, Asia, Africa). Values for these industries exceeded the national average by about 300 thousand CZK per year.

Among the below-average performance sectors in the Pilsen agglomeration are the chemical and automotive industries (about CZK 400,000 per year less). The reason behind the below-average performance of the chemical industry is representation only from the plastics and rubber industries, which are not as powerful as chemical plants and factories. Such gigantic enterprises do not exist in the Pilsen agglomeration, so the performance is considerably below average.

The reason behind the under-performance of the automotive industry is the overwhelming specialization in interior components, which are not so highly valued as, for example, engines.

There is an above-average performance of the Manufacture of paper and paper products in the non-core zone, within individual sectors of agglomeration. This exceeds the performance of this branch more than twice in the core of the agglomeration. The hinterland also shows higher performance in the Manufacture of food products. Among the above-average manufacturing industries in the core are traditionally Beverage industry, Manufacture of other transport equipment, and Manufacture of machinery and equipment n.e.c.

4. Conclusion

The Pilsen agglomeration is the dominant economically strong settlement forming one of the largest Czech economic regional centers. Agglomeration has traditionally been strongly focused on the manufacturing industry. Its performance is crucial for the Pilsen agglomeration. The economic drivers include the local traditional sector. It concerns the production of beverages, general mechanical engineering, and transport engineering. The largest and most powerful enterprises are Pilsner Urquell and Škoda Transportation, which together employ more than 8 thousand persons and whose profit in 2016 amounted to more than CZK 6 billion. A surprising finding is also the fact that the agglomeration background also showed better results for the vast majority of the industry compared to the data for the whole Czech Republic.

There are more sectors behind the high economic performance. This fact can be perceived very positively, as several above-average performing industries give a stable and crises-resistant regional economy, where the effects of dependence on one dominant sector were significant (Blažek, 2010). It is certainly not possible to assume the current decline in demand for both beverages, especially beer, as well as for transport machinery (eg trams). The decrease in demand is certainly not expected in general engineering. The demand for turbines is primarily important. The turbines are also shipped around the world. The surprising conclusion is the uneven performance compared to the average wage of transport in Manufacture of other transport equipment. The difference of almost 600 thousand earned by one employee per year is not reflected in the average wage. By contrast, wages in general the manufacture of machinery and equipment n.e.c. (higher by CZK 9 thousand than in the Czech Republic) and the Beverage industry (higher by CZK 18 thousand than in the Czech Republic) correspond to the performance of these industries.

The Pilsen agglomeration shows highly above-average values in terms of economic performance and also low unemployment. It is independent on the Manufacture of motor vehicles, trailers, and semi-trailers. In conclusion, it is one of the most resistant Czech agglomerations in the Czech Republic.

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