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# Opolskie Voivodship "Gazelle" Innovation Potential

**Aleksandra Zygmunt, Mirosława Szewczyk**
Opole University of Technology, Poland

**Abstract**

*The necessity for enterprises to adapt to constantly changing surrounding requires innovation activities, which impact regional development. In that area the essential meaning for a particular region's innovation potential is driven by enterprises, which are characterized by more than proportional growth. The conducted studies are based on the assumption that the fundamental role in a region is played by enterprises which very rapidly increase in value — known as "gazelles." The main purposes of the study is the examination of gazelles in Opolskie Voivodship. The paper consists of two parts. The first part contains considerations of issues connected with innovations of regions, their innovation potential and the significance of gazelles in improving the level of a region's innovations. The second part is concentrated on the analysis of gazelles in Opolskie Voivodship. Analysis was made of the activities structure of Opolskie Voivodship's gazelles, their segmentation based on technological intensity (manufacturing) and knowledge-intensive activities (services). The research also contains a structure similarity comparison. The essential data source used was Forbes' rating "Forbes Diamonds." The period under analysis is 2009–2013.*

**Keywords:** region's innovation potential, gazelles, Opolskie Voivodship

## Introduction

Dynamic development of the world economy forces the necessity of a region's competitive improvement. This highlights the role of innovation processes which are connected with a particular region. Innovation potential here holds a special position, which implies increase of a region's socio-economic potential, especially in the area connected with knowledge transfer and innovations. It is important to emphasize that a region's innovation potential is impacted above all by the companies which most increase their value — the gazelles.

Gazelles are an important element of success for an economy. The location of gazelles varies between regions and localities. Some regions are more receptive to certain types of gazelles than others. The main aim of this article is the examination of enterprises in Opolskie Voivodship[1] which are identified as gazelles. The studies are concentrated on the activities structure of Opolskie Voivodship's gazelles and their segmentation, as to which rely on technological intensity (for manufacturing) and knowledge-intensive activities (for services). Moreover, the examinations include a comparison of the structures similarity. The research is based mainly on data from "Forbes Diamonds".[2] The studies cover the period of 2009–2013.

1. It should be emphasized that economic processes which occur in Opolskie Voivodship have constituted for several years a theoretical and practical research subject in regional development and finance. The examinations are concentrated mainly on issues connected with investments in Opolskie Voivodship, possibilities of selected branch development, processes of concentration and changes in the share of branches (more in: Adamska 2012; Szewczyk and Tłuczak 2012; Szewczyk, Tłuczak, and Ruszczak 2011a, 2011b; A. Zygmunt 2013; A. Zygmunt and Szewczyk 2011; J. Zygmunt 2012a, 2012b; J. Zygmunt 2013a, 2013b).

2. See: https://www.hbi.pl/.

## 1 The essence of region's innovation potential

Analysis of European Union strategic documents lead to the conclusion that regional competitiveness constitutes a principle aim of the strategy "Horizon 2020" (*HORIZON 2020 in Brief…* 2014). In its essence, regional competitiveness provides sustainable growth in social, economic, environmental and institutional-political areas. In that aspect, it is important to emphasize that competitiveness is strictly connected with innovation processes and the potential of a region. That is why a region should put particular attention on its innovation abilities which are defined as internal conditions and attributes configuration, which enable innovation processes formation (Nowakowska 2011, 43). There are several determinants of a region's innovation process ability. J. Chądzyński, A. Nowakowska and Z. Przygodzki the most significant specify a region's R&D potential, innovation of enterprises which conduct their activity in the region as well as innovation and entrepreneurship of the region's public authorities, and the region's social and human capital potential (2012, 144–145). Z. Makieła emphasizes also the importance of technical infrastructure and access to capital (2013, 16). Innovation potential of a region is provided by a large number of entities such as universities, R&D institutions, social associations, and local government. The most significant should also be highlighted: the enterprises which establish their activity in the region.

## 2 The importance of gazelles in a region's innovation potential

A specific in creation of the innovation potential of a region should be attributed to the enterprises which have most increased their value. Those companies are recognized as gazelles. The literature analysis indicates that gazelles are mainly represented as enterprises which distinguish a considerable value increase or substantial employment increase in the defining period (Ahmad 2006; Birch, Haggerty, and Parsons 1995, 46). Nevertheless, a lack of configural invariance and criteria concerning the identification of gazelles' criterions should be emphasized. The research conducted by F. Delmar, P. Davidsson and W.B. Gartner (2003) lead to the conclusion that gazelles are most often companies characterized by essential growth in employment, market value, income value or revenues on sales. Moreover, difficulties connected a definition of gazelles deepens the multidimensional approaches to companies' value growth indicators and their measures (Delmar, Davidsson, and Gartner 2003). Despite this definitional discrepancy it should be emphasized that gazelles have a special position in a region's innovation potential creation. D.L. Birch (1981) emphasizes that the concept of "gazelles" means enterprises which constantly distinguish themselves on average for a conducted activity's branch as a result of their role as innovators. In consequence, gazelles contribute to new job growth. Their connection with a high level of their innovation impacts the improvement f the innovation potential of a region. Therefore, gazelles should be treated as a contributing factor to a region's economy and a substantial creator of jobs (Acs and Mueller 2008).

It is important to emphasize that gazelles appear in all branches of the economy. This is confirmed by studied by Z.J. Acs, W. Parsons and S. Tracy (2008). According to E. Autio, P. Arenius and H. Wallenius (2000), and G. de Wit and N.G.L. Timmermans (2008, 21) the majority of gazelles perform in branches connected with trade and services.

## 3 Data and method

Getting to know the branch structure of the gazelles plays a vital diagnostic role. In this place one needs to take into account the fact that the structures are not stable over time. There arises a necessity then of successive analyses of the structure and "the measures of similarity of results with respect to classification of sets of objects over time which allows in this case for assessing the degree of changes." (Walesiak 2011, 68). The analysis of the structures of the gazelles (corresponding to the "Diamonds" as referred to by Forbes) in the years 2009–2013 was carried out for Opolskie Voivodship, with the inclusion of Polish Classification of Activities 2007 [PKD 2007][3].

3. [Polish: Polska Klasyfikacja Działalności 2007—Ed.]

The PKD 2007 was established for each subject of the ranking on the basis of HBI Poland. The ranking project called "Forbes Diamonds" included companies which obtained the highest annual accretion of the value (amounting to at least 15%) and which, at the same time, satisfied the following criteria: they submitted their reports at the National Court Register on time, were profitable (on the basis of EBIT index and ROA), had a high current liquidity and were not in arrears, showed a positive financial result and worth of their own capitals, obtained incomes from sales at the amount of at least PLN 5 million.

At the first stage, the data relating to the gazelles located in Opolskie Voivodship were presented in a division into three economic sectors: agriculture (including forestry and fishery products), industry (including mining, manufacturing, construction), and services. At the second stage, the degree of technological intensity of the industrial companies was analyzed with the use of the Eurostat classification: high-technology, medium-high-technology, medium-low-technology and low-technology. At the third stage, the structure of the subjects in the service sector was analyzed with reference to the degree of intensity of knowledge (knowledge-intensive services) and services requiring lower intensity of knowledge (less-knowledge-intensive services).[4] The degree of enterprises' technological intensity is connected with the intensity of R&D activity (the second analyzed division) and — in compliance with the Eurostat classification — the above-mentioned four categories (high-technology, medium-high-technology, medium-low-technology and low-technology) were also differentiated.

The authors analyzed the number and the structure of subjects in the service sector due to the degree of intensity of knowledge.[5] Consequently, the last of the analyzed sectors was divided into services based on knowledge: those of the knowledge-intensive character are characterized, among other features, by a high rate of employees holding the necessary higher education or indispensable specialist knowledge.

Descriptions of examination of the dynamics of the structures are contained, among others aspects, in the works by Chomątowski and Sokołowski (1978), Kukuła (2000), and Walesiak (2011). One of the measures of the similarity of two structures is the percentage similarity index (or Renkonen index) (Wasilewska and Dudziński 2009). The percentage similarity index ranges from 0 (no similarity) to 1 (complete similarity). In the case of comparing structures at two moments the percentage similarity index takes the following form:

$$p_{ij} = \sum_{k=1}^{r} \min(w_{ik}, w_{jk}), \tag{1}$$

where:

$p_{ij}$ — measure of similarity of structures (percentage similarity) at two moments in time: $i$ and $j$, $(i, j = 1,2,\ldots,n)$,

$w_{ik}$ — share of the $k$-th component in the structure at time $i$, $(k = 1,2,\ldots,r)$,

$w_{jk}$ — share of the $k$-th component in the structure at time $j$, $(k = 1,2,\ldots,r)$.

There are two main hypotheses for explanation:

- $H_1$: "High-Tech" gazelles in Opolskie Voivodship represent a small share of the total gazelle population (gazelles are not overrepresented in high-tech industries)
- $H_2$: "Knowledge-Intensive" gazelles in Opolskie Voivodship represent a small share of the total gazelle population (gazelles are not overrepresented in knowledge-intensive services)

## 4 Results and discussion

As far as the economy of Opolskie Voivodship is concerned, a significant role is played by industry. Within the examined period the share of this sector oscillated, according to the "Forbes Diamonds" ranking list, in the range of 35,0–54,5%. The entities in the service sector made from 40,2% up to

4. See: Eurostat indicators of high-tech industry and knowledge — intensive services. Annex 3 – High-tech aggregation by NACE Rev. 2, page 1, [@:] http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf, (accessed: 2014.05.20).

5. Ibid.

57,5%.[6] No clear-cut trends were observed (tab. 3). According to the ranking of 2013, 20 subjects functioned in the service sector (40,8% of all the subjects), while 19 (38,8%) in the industrial sector. Opolskie Voivodship is in the lead as regards the results of agricultural production. Favorable natural conditions (soils, agro-climate, the water network) are very convenient for development of farming in the voivodship. In the "Forbes Diamonds" ranking of 2013, there were as many as 10 entities in the agricultural sector (20,4% of all the entities (tab. 1). When it comes to the industrial sector, attention has to be paid to the considerable share of entities representing the construction industry.

What is surprising is the relatively small number of entities representing the food industry or chemical industry, which are featured in the Forbes ranking throughout the entire analyzed period (i.e., in the years 2009–2013). Indeed, one should expect that the considerable concentration of businesses of these type in the voivodship ought to secure a valuable source of transfer of technologies, and organizational skills, as well as workers' specialist qualifications. This, in turn, should lead to a more numerous representation of entities in the food industry or chemical industry in the ranking.

In the years 2009–2013, there were noticeable small changes in the economic structure (tab. 2). The percentage similarity index oscillated (in the analysis) between 0,758 (for the years 2011 and 2013) and 0,902 (for the years 2009 and 2011). Therefore, the economic structure should be acknowledged to be fairly stable in the analyzed period.

**Tab. 1.** Number and structure of the "gazelles" according to economic sectors

| Specification | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | – | (0,0%) | 4 | (4,9%) | – | (0,0%) | 1 | (2,3%) | 10 | (20,4%) |
| Industry | 30 | (44,8%) | 44 | (53,7%) | 14 | (35,0%) | 24 | (54,5%) | 19 | (38,8%) |
| Services | 35 | (52,2%) | 33 | (40,2%) | 23 | (57,5%) | 19 | (43,2%) | 20 | (40,8%) |
| Not established | 2 | (3,0%) | 1 | (1,2%) | 3 | (0,0%) | – | (0,0%) | – | (0,0%) |
| Total | 67 | (100,0%) | 82 | (100,0%) | 40 | (100,0%) | 44 | (100,0%) | 49 | (100,0%) |

*Source:* own calculations based on data published at diamenty.forbes.pl and www.hbi.pl

**Tab. 2.** Percentage similarity index for the sectoral structure (the three-sector model)

| Year | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| **2009** | 1 | 0,862 | 0,902 | 0,880 | 0,796 |
| **2010** | 0,862 | 1 | 0,764 | 0,962 | 0,839 |
| **2011** | 0,902 | 0,764 | 1 | 0,782 | 0,758 |
| **2012** | 0,880 | 0,962 | 0,782 | 1 | 0,819 |
| **2013** | 0,796 | 0,839 | 0,758 | 0,819 | 1 |

At the next stage of the study, an analysis of the number of entities in manufacturing in the sectors of high, medium-high, medium-low and low technology was carried out (tab. 3). The gazelles of Opolskie Voivodship are characterized by a high share of enterprises of low and medium-low technology (53–87% in the analyzed period). Companies representing the sectors of high and medium-high technology deal with, among other activities, manufacturing of popular electronic equipment, production of synthetic rubber, production of dyes and pigments, production of electrical household appliances, production of pumps and compressors, production of machines and production of rolling stock.

Throughout the analyzed period entities in the following sections were relatively numerous among the gazelles: manufacture of fabricated metal products (PKD division 25, medium-low technology), manufacture of electrical equipment (PKD division 27, medium-high technology), manufacture of machinery and equipment n.e.c. (PKD division 28, medium-high technology).

6. [In the journal (in both Polish and English texts) European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). Furthermore in the International System of Units (SI units), fixed spaces rather than commas are used to mark off groups of three digits, both to the left and to the right of the decimal point. — Ed.]

**Tab. 3.** Number and structure of the "gazelles" according to technological intensity

| Specification | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| High technology | – (0,0%) | – (0,0%) | – (0,0%) | – (0,0%) | 1 (6,7%) |
| Medium-high technology | 7 (31,8%) | 5 (27,8%) | 1 (12,5%) | 8 (40,0%) | 6 (40,0%) |
| Medium-low technology | 10 (45,5%) | 9 (50,0%) | 3 (37,5%) | 7 (35,0%) | 6 (40,0%) |
| Low technology | 5 (22,7%) | 4 (22,2%) | 4 (50,0%) | 5 (25,0%) | 2 (13,3%) |
| Total | 22 (100,0%) | 18 (100,0%) | 8 (100,0%) | 18 (100,0%) | 15 (100,0%) |

*Source:* own calculations based on data published at diamenty.forbes.pl and www.hbi.pl

**Tab. 4.** Percentage similarity index for the manufacturing industry according to technological intensity

| Year | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| **2009** | 1 | 0,955 | 0,727 | 0,895 | 0,851 |
| **2010** | 0,955 | 1 | 0,722 | 0,850 | 0,811 |
| **2011** | 0,727 | 0,722 | 1 | 0,725 | 0,633 |
| **2012** | 0,895 | 0,850 | 0,725 | 1 | 0,883 |
| **2013** | 0,851 | 0,811 | 0,633 | 0,883 | 1 |

The evolution of the similarity index for the manufacturing industry according to technological intensity (high-technology, medium high-technology, medium low-technology and low-technology) is summarized in table 4. In the individual years, there were noticed relatively small changes in the structure of the manufacturing industry. In the study, the similarity index oscillated, in the examined years, between 0,633 (comparison of the years 2011 and 2013) and 0,955 (comparison of the years 2009 and 2010).

Gazelles are found in all industries in Opolskie Voivodship, and high-tech is not overrepresented. The first proposed hypothesis was supported. This result is consistent with (Holzl 2009).

The PKD codes indicate a generally low level of the development of services based on knowledge in Opolskie Voivodship (tab. 5). The share of the gazelles in the sections of services based on knowledge, in the analyzed period, oscillated between 5% and 21%. In the rankings for the years 2009–2013, decisively, the most numerous group consisted of entities representing less knowledge-intensive services: wholesale trading, with the exclusion of trading in vehicles, retail trade, with the exclusion of retail trading in vehicles.

In the individual years, there were observed relatively small changes in the structure (tab. 6). The least close structures were those of the years 2012 and 2013 (percentage similarity index = 0,839). In the examined years, the similarity index oscillated between 0,839 (for the years 2012 and 2013) and 0,993 (for the years 2009 and 2010).

**Tab. 5.** Number and structure of the "gazelles" as regards the degree of intensity of knowledge

| Specification | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| Knowledge-intensive services | 4 (11,4%) | 4 (12,1%) | 2 (8,7%) | 4 (21,1%) | 1 (5,0%) |
| Less-knowledge-intensive services | 31 (88,6%) | 29 (87,9%) | 21 (91,3%) | 15 (78,9%) | 19 (95,0%) |
| Total | 35 (100,0%) | 33 (100,0%) | 23 (100,0%) | 19 (100,0%) | 20 (100,0%) |

*Source:* own calculations based on data published at diamenty.forbes.pl and www.hbi.pl

**Tab. 6.** Percentage similarity index for the services structure

| Year | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| **2009** | 1 | 0,993 | 0,973 | 0,903 | 0,936 |
| **2010** | 0,993 | 1 | 0,966 | 0,910 | 0,929 |
| **2011** | 0,973 | 0,966 | 1 | 0,876 | 0,963 |
| **2012** | 0,903 | 0,910 | 0,876 | 1 | 0,839 |
| **2013** | 0,936 | 0,929 | 0,963 | 0,839 | 1 |

Gazelles are found in all services in Opolskie Voivodship, and knowledge-intensive services are not overrepresented. The second proposed hypothesis was supported. In contrast, Bos and Stam (2011) find that knowledge intensive branches generate an above-average number of gazelles.

## Conclusions

The economic structure of the gazelles (due to the division into the sectors: agriculture, industry and service) should be considered to be relatively stable in the years 2009–2013. A similar conclusion can be drawn with respect to the structure of manufacturing due to the degree of the technological intensity (high, medium-high, medium-low and low), as well as the structure of the entities in the service sector due to the degree of intensity of knowledge (knowledge-intensive services, less knowledge-intensive services). The observed structural changes were relatively small. The results point to a poor participation of dynamically developing entities representing knowledge-intensive services and to a lack of dynamically developing entities representing the high-tech sector in Opolskie Voivodship. Assessing the similarity between the structures of the gazelles of Opolskie Voivodship and those from other voivodships requires conducting further research.

Supporting the innovative activity of the enterprises of Opolskie Voivodship which have achieved success seems more important than attempts at attracting new investment from outside the region. It is worth supporting, first of all, these branches within whose ranges there exist technological and organizational competences in the voivodship. It appears that there is great potential in introducing innovations into the branches that have traditionally been present in the region (agriculture, construction industry), as well as into the sectors of medium-low and medium-high technology of manufacturing (manufacture of fabricated metal products, manufacture of electrical equipment, manufacture of machinery and equipment n.e.c.), numerously represented in the "Forbes Diamonds" ranking.

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