

**Does crisis influence the number of innovation-active enterprises? Evidence from demography of innovative companies in Poland**

**Abstract:** The article provides an overview of the subject-matter associated with business demography, focusing on the analysis of problems concerning innovativeness of Polish companies in years 2006–2016. By making use of the tools of business demography and the publications of the Polish Central Statistical Office (GUS) and EUROSTAT, the author wants to determine the dynamics of changes in the demography of innovation-active companies in Poland and – in particular – the impact of cyclical changes on creating innovation. On the basis of the provided data, the author sets the thesis that the economic recession has a negative impact on the amount of innovation-active enterprises, and that the companies are not able to recover their innovativeness from before the crisis and even the end of the crisis does not bring back firms to the same level of innovations as before the downturn. The article analyzes the dependencies between the decrease in innovation in the Polish economy and the geographical location of companies, their size of employment and branch of the industry.

**Keywords:** business demography, innovations, innovativeness, crisis, companies, business cycles

**Introduction**

At the beginning of the 20th century, Joseph Schumpeter introduced the concept of creative destruction, which is a driving force for economic growth (Schumpeter, 1960). The idea behind this concept involves a force triggering the process of changes in the form of introducing new companies to the market and the disintegration of other companies, which has been a common phenomenon since the beginning of capitalism. Schumpeterian creative destruction works just like the mechanism of selection that eliminates economically inefficient units and awards companies which can successfully identify market incentives. Nevertheless, the situation on the market changes dynamically, depending on the condition in which the economy is - boom or bust. In this article, we will look at the second situation. The Chinese word 危機 for "crisis" (in Chinese "wēijī") consists of two characters; the first one characterizes danger or danger, the second one a chance. The question arises whether the economic crisis affects innovation and whether it favors or hinders innovative activities? This question forms conceptual framework, which includes statistical analysis of companies' decisions, known as business demography.

Business demography is a research discipline that relates to the collection of data and the analysis of the dynamics of changes in the population of enterprises. The empirical side of the processes of launch and decline of organizations has been described in vast literature (Mansfield, 1962; Geroski, 1995; Audretsch, 1995; Caves, 1998). The research on the causes of company formation from the end of the 19th century has long traditions, as it combines different characteristics and profiles of company founders (Kopczynski, 2009; Prokurat, 2015) with macroeconomic data and available technologies (Mansfield, 1962; Mansfield, 1974; Pol & Thomas, 1997). In the theoretical aspect, the most significant are the works of Richard R. Nelson, which concern formation of companies with the concept of functioning in a specific technological environment, and S. Klepper models that refer to the entry and exit of the product life cycle (Klepper, 1996), heterogeneity of companies entering the market and the

concepts of selection and learning (Jovanovic, 1982; Hopenhayn, 1992; Pakes, Ericsson, 1998; Baptista & Mendonça, 2007). However, the emergence of business demography as a separate knowledge domain among sciences is fairly recent. In Europe, the Lisbon conclusions made by the European Council in 2000 constituted the basis of the development of the statistical approach to data collection in the framework of applied demography. Murdock and Swanson (2008) note that applied demography evolved on the verge of the 20th and 21st centuries. Databases, terminology issues and methodological approaches became uniform standards in this field just a few years ago. Foundations of business demography has been described in publications by Murdock & Ellis (1991), Pol & Thomas (1997), Siegel (2002), Murdock & Swanson (2008), Swanson & Morrison (2010) and Ottens (2014). Polish demographic indicators can be found in articles by Dominiak (2005), Markowicz (2008) or Ptak-Chmielowska (2009; 2010).

### **Business demography– definitions and source of the data of this study**

Demography generally deals with phenomena related to people, creating a complete statistical picture of phenomena that have an impact on the size and structure of the population, the business demography describes statistically the population of enterprises and its corresponding processes. Business demography is analyzed with the use of the following measurement tools and indicators: number of companies entering the market (birth), number of companies exiting the market (death), birth rate, death rate and survival rate. A company may enter or exit the market as a result of various events. The term “birth” was determined uniformly by the European Commission (European Commission, Regulation No. 2700/98) and excludes acquisitions and mergers. A market entry involves legalization of business in the state register of companies, while a market exit is identical with removing a company from the register (Schmiemann, 2006, p. 11). The birth and death rates are calculated as a percentage of entering and exiting a market by companies in the year referring to the number of active enterprises in the reference year (in percent). The difference between these two indicators demonstrates real dynamics in the population of enterprises in a given year.

Business demography also deals with the analysis of the companies’ structure broken down into the size of business measured by the number of employees; type of business activity, geographical location, sectors of business activity, ratio of the number of enterprises to the number of households, operating period of liquidated companies (descriptive parameters: average, median, mode, quartiles, measures of diversity and asymmetry), statistics of business life-cycle, including the number of companies existing in the market for at least 5 years and numerous models for calculating the probability of business decline, survival (in a specific period); and the average operating period of organizations. Indicators which characterize the studied area (table 1) is composed of the following: Total number of companies in Poland (Population of Enterprises), Number of businesses entering the market (Birth of Enterprises), Number of businesses exiting the market (Death of Enterprises), Birth rate, Death rate, Number of enterprises exiting the market (Death of Enterprises) with the employment of 1–4 people, Number of enterprises exiting the market (Death of Enterprises) with the employment of 5–9 people, Number of enterprises exiting the market (Death of Enterprises) with the employment of 10 people and more, Survival rate: number of companies existing for at least 5 years .

Analyses of the processes of formation, functioning and collapses of companies is carried out in many countries of the world, including in member states of the

European Union (EU). In 2000, the European Statistical Office (EUROSTAT) launched systematic actions aimed at determining common principles and methodologies for conducting such research. The creation and normalization of methodologies of data collection gave rise to the Regulation of the European Parliament and of the Council (EC) No. 295/2008 of 11 March 2008, which introduced the obligation for all member states to collect information and submit it to EUROSTAT cyclically, year after year. Reports prepared on the basis of EUROSTAT databases – which help analyze global relationships between highly developed countries – are compiled by the OECD, with emphasis put on different challenges, concerning primarily the methodological challenges concerning the collection of data at different territorial levels, and secondly – the transformation of the collected data into specific conclusions useful for regional development (OECD, 2017). The rigor of the methodology developed jointly by EUROSTAT and the OECD (2007) gives comparable results, not only at a regional and national level, but also at an international level (OECD / Eurostat, 2008 and 2009).

**Table 1. Indicator values concerning the business demography of companies in Poland in 2008–2016**

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total number of companies in Poland (Population of Enterprises)	1,834,960	1,910,364	1,957,113	1,983,731	1,989,879	2,015,249	2,025,270	2,059,967	2,015,506
Number of businesses entering the market (Birth of Enterprises)	241,288	245,331	270,271	247,161	229,174	250,051	253,061	249,815	248,389
Number of businesses exiting the market (Death of Enterprises)	165,216	206,614	207,003	224,670	222,878	233,236	215,065	213,619	
Birth rate	0.1315	0.1284	0.1381	0.1246	0.1152	0.1241	0.125	0.1213	0.1232
Death rate	0.09	0.1082	0.1058	0.1133	0.112	0.1157	0.1062	0.1037	
Number of businesses exiting the market (Death of Enterprises) with the employment of 1–4 people	29059	36672	30344	33104	30853	36371	31065	41849	
Number of businesses exiting the market (Death of Enterprises) with the employment of 5–9 people	2852	4024	3131	3449	2784	2945	2454	3848	
Number of businesses exiting the market (Death of Enterprises) with the employment of 10	1608	1614	1184	1454	1296	1349	1198	2052	

people and more									
Survival rate – number of companies existing for at least 5 years	71.08 %	74.51 %	71.55 %	69.85 %	70.15 %	67.93 %	68.40 %	67.30 %	63.93 %

Source: EUROSTAT database, 2018

### **Innovativeness– definitions and source of the data**

Innovativeness of an economy is a key determinant. Notwithstanding, referring business demography to innovation is a newly undertaken problem. The examination of the impact of market changes in 2009–2013 on enterprise innovation with the use of business demography analysis may help understand the dynamics of changes in enterprise innovation in times of economic downturn and answer the following questions: Are there more innovations launched in times of crisis or in times of prosperity? Do business cycles have an impact on innovation?

The analysis of this problem creates the need to define concepts such as innovation and innovative company. Originally, the concept of innovation was introduced by Schumpeter in 1911 in order to aptly portray changes in a dynamically operating company subject to the process of creative destruction. He identified five types of entrepreneurial activity: (1) innovation of a new product or introduction of new services, (2) new process of innovation or new methods of production, (3) innovation of a market or opening new markets, (4) fishing for or acquiring a new source of raw materials (5) and organizational improvement (Schumpeter 1960, p. 104). Over one hundred years numerous publications and definitions dedicated to innovation appeared (Masfield, 1968; Freeman, 1982; Porter, 1990; Drucker, 1992), as well as research confirming the positive impact of innovation on economic success of enterprises (Bozeman & Link, 1983; Thurow, 1999; Link & Siegel, 2007) and – at a macroeconomic level – on correlations of innovation with the economic growth of countries and the increase in the wealth of societies (Baumol, 2002). It is therefore important to determine the framework and definitions of innovation which we will use in this analysis. For this study The Oslo Manual and its framework for innovation will be used. First edition of Oslo Manual was published in 1992, and since then constitutes an international standard for statistical research on innovation in the industrial and market services sectors. This methodology was developed under the direction of the OECD and Eurostat by a team of experts from thirty countries. The improved edition of the Oslo Manual created in 2005 is containing a new, standardized typology of innovation, which is currently a standard for understanding, defining and developing innovative activity. The concept of innovation, according to the Oslo Manual is defined as an implementation of a new or significantly improved product (good or service), a new or significantly improved process or an introduction of a new or significantly improved production method; a new marketing method, which includes significant changes in the business strategy and market-influencing instruments, or a new organization method consisting in the application of new methods of business organization in terms of business practice, workplace organization, new methods of cooperation with suppliers, new procedures and regulations (Oslo Manual, 2005). According to the so-agreed methodology, the definition of an innovative company assumes that it is an enterprise which – over the analyzed period of time – has implemented at least one technical (concerning a product or a process) or non-technical (organizational or marketing-oriented) innovation. This way, the Oslo Manual gives a rather broad definition of innovation, which

includes global innovations, market innovations (the company operates in) and innovations being innovations from the company's sole perspective. This standard is also clarified by the definition of an innovation-active enterprise, which includes innovative companies and companies which in the analyzed period of time conducted innovation-oriented activity that did not result in innovation implementation by the end of that period, but which conducted an ongoing innovation activity; and companies, which in the analyzed period of time conducted innovation-oriented activity that was interrupted or abandoned. Data is collected by surveys. In the 1990s, the European Commission launched the SPRINT programme (European Innovation Monitoring System, EIMS), aimed at conducting statistical research called CIS (Community Innovation Survey)<sup>1</sup>, performed with the use of methodology developed by Eurostat and the OECD, described in the Oslo Manual. Responsibility for the collection of data in individual countries participating in the CIS programme is borne by national authorities, statistical institutes or relevant ministries (Arundel & Smith 2013). The EU is represented by the Statistical Office of the European Union, i.e. EUROSTAT. Indicators of innovation, which have been determined in the research, are used for the establishment of other indicators, such as the European Innovation Scoreboard, which as a tool helps evaluate different initiatives, such as the European Research Area (ERA) in the context of the "Europe 2020" strategy. This study on innovation activity of enterprises in Poland before is aggregated by EUROSAT it is developed by the Central Statistical Office (GUS) under the cyclically conducted research program called "Innovation activity of enterprises", and their scope refers to the periods of report compilation. Although data available on the website date back to 2001 – and on paper even to 1998 – only from 2005 analysis comprises statistical data conforming to the Oslo Manual. As innovation is not bound to short 1 year period, methodology of collecting data through surveying of firms stick to 3 years and it's publish every year. Therefore the data is as follows: 2006-2008 (compiled in 2009), 2006-2009 (compiled in 2010), 2008-2010 (compiled in 2011), 2009-2011 (compiled in 2012), 2010-2012 (compiled in 2013), 2011-2013 (compiled in 2014), 2014 (compiled in 2015), 2013-2015 (compiled in 2016), 2014-2016 (compiled in 2017). The studies referred to above classify companies with the employment of 10 people and more, operating in industry and separately – in services (table 2).

**Table 2.**

	<b>2006-2008</b>	<b>2006-2009*</b>	<b>2008-2010</b>	<b>2009-2011</b>	<b>2010-2012</b>	<b>2011-2013</b>	<b>2012-2014</b>	<b>2013-2015</b>	<b>2014-2016</b>
Participation of innovation-active enterprises in the total number of industrial enterprises with the employment of 10 people and more	21.4 %	18,1 %	17,1 %	16,1 %	16,5 %	17,1 %	17,5 %	17,6 %	18,7 %

<sup>1</sup> The legal basis for the collection of these statistical data is the Commission Implementing Regulation (EU) No. 995/2012 on the implementation of the Decision of the European Parliament and Council No. 1608/2003/E of 22 July 2003.

Participation of innovation-active enterprises in the total number of service-providing enterprises with the employment of 10 people and more	16.1 %	14,0%	12,8 %	11,6 %	12,4 %	11,4 %	11,4 %	9,8 %	13,6 %
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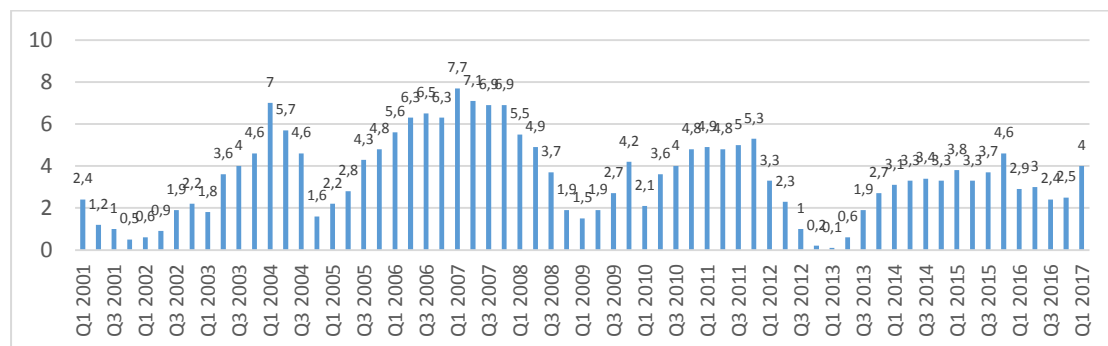
Source: compilation of reports of Polish Central Statistical Office (GUS) “Innovation activity of enterprises”, 2006-2016.

\* Due to different span this is non-conforming to other years, thus will not be taken into account.

### Recession– timeline definition and source of the data

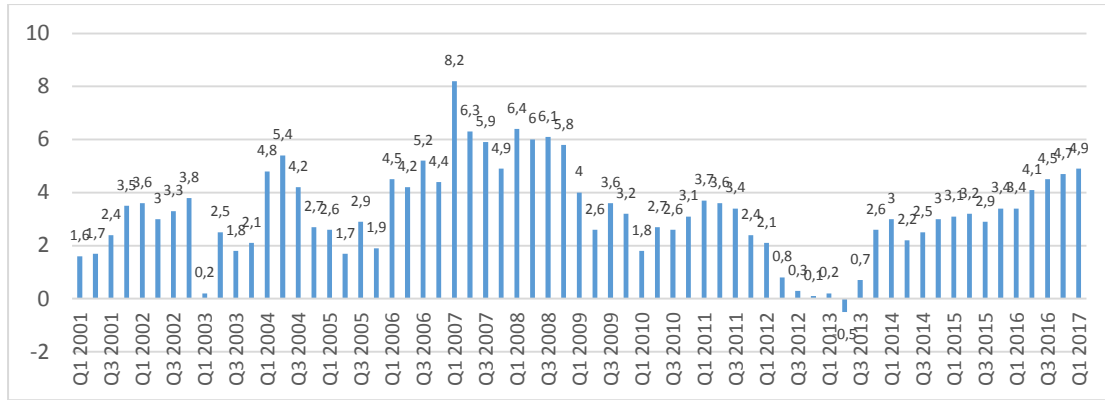
Market changes occur cyclically and their cause, course and effects are the subject of discussion documented extensively in literature (including Schumpeter, 1939; Lee, 1955; Mankiw, 1989; Hall, 1990; Glasner, 1997; Ruhm, 2000; Tvende, 2001; Altug, 2010; Süssmuth, 2012). Within the framework of market changes, in this elaboration, the concept of an economic crisis is defined as a deep collapse of economic indicators. In the analyzed period, the sources of the recession date back to 2007, but it reached its peak in 2008–2009 when Lehman Brothers went bankrupt in the US, Fannie Mae and Freddie Mac were nationalized and the AIG Group needed assistance of the state. The aftermath of it was the spillover effect, when the crisis spread all over the world, including Europe. The economic slowdown reached Poland in the fourth quarter of 2008. Period of crisis came in two waves, is considered to have occurred in 2009–2013. Poland was then affected by the period of global recession, so GDP dynamics was lower compared to prior periods (Chart 1) and, most of all, the dynamics of consumption has decreased (Chart 2). To compare statistically data related to economic downturn with business demography data, economic performance of Poland was been presented as 3 year average (Table 1).

**Chart 1. Annual GDP dynamics in Poland in 2001-2017 (in % annual change of the previous year)**



Source: GUS database, 2018

**Chart 2. Annual dynamics of consumption in 2003-2017 (in %, fixed annual average prices of the previous year)**



Source: GUS database, 2018

**Table 3. Aggregated average 3-year GDP dynamics and 3-year dynamics of consumption in Poland between 2006-2017 (in %)**

	2006-2008	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016
Annual GDP dynamics in Poland in 2001-2017	5.775	3.4	3.733333	3.441667	2.675	2.1	2.816667	3.275
Annual dynamics of consumption in 2006-2017	5.658333333	3.991666667	3.058333333	2.216666667	1.616666667	1.416666667	2.191666667	3.333333333

GUS studies “Innovation activity of enterprises” carried out in 2006–2016

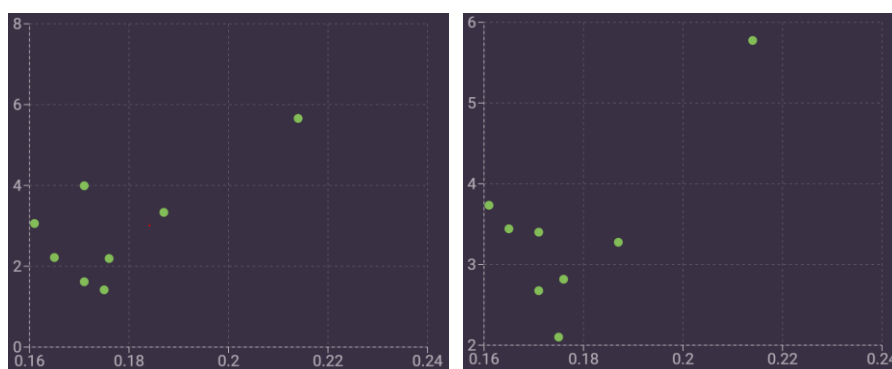
### Statistical analysis

The following preliminary conclusions can be drawn from the quoted business demography variables. The number of enterprises on the market was constantly growing from 2008 to 2015, despite the economic crisis, however, the dynamics of setting up new enterprises varied. There are significantly fewer new companies in 2011 and 2012 compared to previous years, then the situation is normalizing. It is especially important that the market conditions, at the time of launching a company also determine its ability to survive (López-García and Puente, 2006). The number of companies exiting the market (Death of Enterprises) is growing significantly in 2011 and in 2011–2013 remains at a higher level than in 2008–2010 and 2014–2015, which reflects the clearly higher death rate in the years of the crisis (2011–2013). In particular, the indicators of the number of companies exiting the market (Death of Enterprises) with less than 10 employees indicate that it was microenterprises that suffered most from the recession. Significant is the fact that the size of business affects the survival rate also during the crisis, which is largely proved in literature (Jovanovic, 1982, Audretsch and Mahmood, 1994; Mata, 1995; López-García, Puente, 2006).

There are several reasons for this phenomenon, the most important of which is the need for large companies to have a certain scale that guarantees effective operational capacity, greater capital intensity and less financing problems over a difficult period in the financial markets. Larger companies also diversify their activities more efficiently, which contributes to a reduced dependence on a limited number of suppliers or individual products, which results in less market risk. Newly established companies have a better chance of survival if they find themselves in dynamically growing industries or sectors or are subject to a relatively lower level of competition (Mata et al., 1995).

The share of innovation-active enterprises in the total number of industrial enterprises employing 10 and more people, along with the recession, is decreasing, reaching the lowest values: 16.1% in 2011 and 16.5% in 2012, during the economic crisis of 2009–2013. Similarly, the share of innovation-active enterprises in the total number of service-providing enterprises employing 10 and more people starts to decrease from 2008, from 16.1% in 2008 to 12.8% in 2010, then further in 2011–2014 it continues to decrease and stabilize at the level of 11.6–11.4% (except for 2012, when there was a temporary increase, i.e. a break before the second wave of the economic crisis). Interestingly, this indicator in 2015 continues to decline to 9.8% and returns to the level from the beginning of the crisis (13.6%) only in 2016. However, the share of innovation-active enterprises in the total number of enterprises does not reach the level from before the crisis, even after its end. This indicates suggests that the period of recession might has a long-lasting negative impact on generating innovation (in companies employing 10 people and more) in the Polish economy and innovation-active enterprises have long-term problems with recovering to the level from before the crisis. Pearson's product-moment correlation was run to assess the relationship between aggregated average 3-year GDP dynamics as well a 3-year dynamics of consumption in Poland between 2006-2017 (in %) and share of innovation-active enterprises. Results are presented in Chart 3.

**Chart 3.1 Innovation-active enterprises in industry**



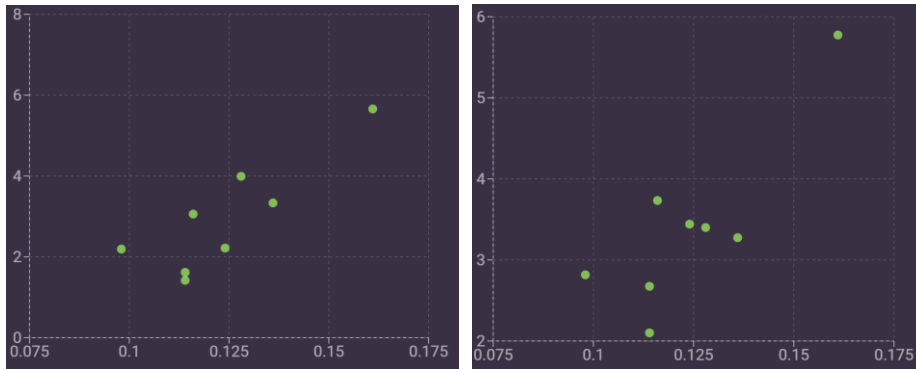
Pearson correlation coefficient results:

consumption dynamics:  $r = 0.7123$ ;  $p\text{-value} = 0.0474$

GDP dynamics:  $r = 0.6942$ ;  $p\text{-value} = 0.0561$

**Chart 3.2 Innovation-active enterprises in services**





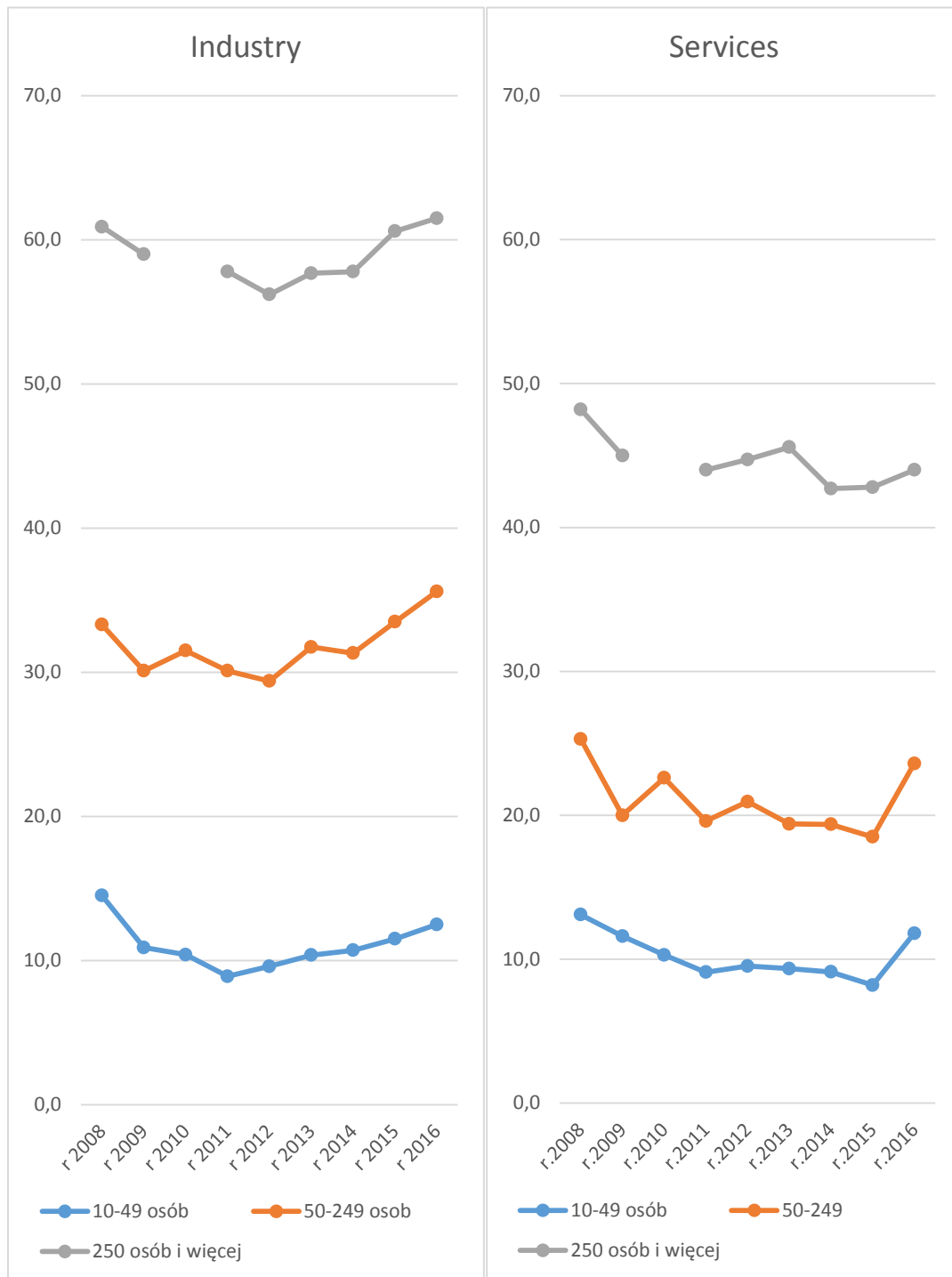
Pearson correlation coefficient results:

consumption dynamics:  $r = 0.8472$ ;  $p\text{-value} = 0.0079$

GDP dynamics:  $r = 0.8309$ ;  $p\text{-value} = 0.0106$

Results suggest that economic recession results with lower share of innovation-active enterprises both in industry and service. There was a positive correlation between variables, thus, in terms of Polish economy less innovations appear during the crisis. Notwithstanding that the analysis of innovation-active enterprises by size/employment (Chart 4) reveals also other an interesting relationship. More innovations, as declared by respondents, appear in industry than in services, but what is worth emphasizing, the difference is visible only for companies employing 50–249 people and 250 or more people. In the case of enterprises employing from 10 to 49 people, innovation between industry and services among the surveyed companies is at a comparable level. There is also a distinction between returning to an upward trend. Industrial innovation-active enterprises employing 10–49 people, 50–249 people and 250 or more people, returned to an upward trend faster – already in 2013; while similar service-providing enterprises achieved an upward trend only in 2016.

**Chart 3. Innovation-active enterprises according to size/employment in 2008–2016.**



Source: GUS studies “Innovation activity of enterprises” carried out in 2006–2016

Detailed analysis of demographic data of innovative companies allows to look more closely at the division into voivodeships with the breakdown into industry (Table 2) and services (Table 3). For greater transparency, we have adopted the division into the East of Poland (voivodeships: Lubelskie, Łódzkie, Małopolskie, Mazowieckie, Podkarpackie, Podlaskie, Świętokrzyskie and Warmińsko-mazurskie), to which we refer in the table as “East average” and the West of Poland (voivodeships: Dolnośląskie, Kujawsko-pomorskie,

Lubuskie, Opolskie, Pomorskie, Śląskie, Wielkopolskie and Zachodniopomorskie), which has been described in the table as “West average”.

**Table 2. Share of innovation-active enterprises in the total number of industrial enterprises with the employment of 10 people and more with the division into voivodeships in Poland in the years 2008–2016 (in percent)**

Voivodeship	2008	2009	2010	2011	2012	2013	2014	2015	2016
East average	21.4	18.0	18.2	17.3	17.4	18.6	17.5	18.7	20.2
West average	20.8	18.2	18.0	16.9	17.2	16.9	17.6	18.8	19.6
Dolnośląskie	24.7	20.9	17.7	16.1	20.7	19.0	22.1	19.1	20.5
Kujawsko-pomorskie	20.6	17.5	18.8	19.1	17.5	13.6	14.9	16.9	18.7
Lubelskie	21.1	18.1	19.1	20.1	15.9	15.9	21.2	18.7	22.6
Lubuskie	14.7	15.8	16	12.5	16.4	19.2	15.5	16.3	20.8
Łódzkie	15	14.1	14.2	11.5	13.7	15.6	15.2	17.5	18.1
Małopolskie	22.8	19.3	17.3	20.2	17.4	18.1	15.6	21.2	23.7
Mazowieckie	25.8	16.2	18.4	15	15.3	18.5	19.1	18.8	22.4
Opolskie	22.9	17.6	20.3	20.6	22.3	20.0	19.5	23.1	21.1
Podkarpackie	22.6	23.3	21.8	22.2	17.9	19.9	18.4	18.9	23.3
Podlaskie	25	19	18.2	17.1	22.0	23.4	18.7	21.6	20.6
Pomorskie	25.1	19.9	16.4	16.5	11.0	15.3	16.5	16.6	18.0
Śląskie	22.6	20.9	21.1	17	19.1	15.4	19.9	21.3	22.9
Świętokrzyskie	20.2	16.5	16.9	15.9	18.2	17.6	14.2	14.5	15.7
Warmińsko-mazurskie	18.3	17.8	19.4	16.1	18.6	20.1	17.4	18.4	14.8
Wielkopolskie	18.8	16.1	17.1	18.9	12.0	15.7	14.9	18.3	17.9
Zachodniopomorskie	17.2	16.7	16.4	14.1	18.2	16.7	17.4	18.6	17.2

Source: GUS studies “Innovation activity of enterprises” carried out in 2006–2016

**Table 3. Share of innovation-active enterprises in the total number of service-providing enterprises with the employment of 10 people and more with the division into voivodeships in western Poland in the years 2008–2016**

Voivodeship	2008	2009	2010	2011	2012	2013	2014	2015	2016
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East average	<b>13.4</b>	<b>11.3</b>	<b>12.2</b>	<b>10.7</b>	<b>10.8</b>	<b>10.6</b>	<b>11.2</b>	<b>10.5</b>	<b>13.0</b>
West average	<b>14.6</b>	<b>13.9</b>	<b>13.0</b>	<b>11.6</b>	<b>10.6</b>	<b>10.4</b>	<b>9.9</b>	<b>9.9</b>	<b>11.1</b>
Dolnośląskie	20.6	12.3	14	9.7	12.9	13.4	10.5	12.7	9.6
Kujawsko-pomorskie	14.6	13.9	10	11.9	10.8	8.4	10.0	9.1	11.1
Lubelskie	12.8	13	12.3	10.8	11.4	10.1	17.5	9.1	23.6
Lubuskie	17.2	8.4	11.7	11.2	12.2	9.5	5.5	8.3	7.4
Łódzkie	9	9	10.7	8.5	11.4	10.4	11.9	11.2	11.5
Małopolskie	14	13	13.1	12.1	13.0	11.8	11.5	11.0	13.8
Mazowieckie	22	18.1	16.3	14.4	16.9	15.2	15.1	12.6	19.9
Opolskie	9.6	19.9	15.2	10.3	5.7	10.1	15.7	8.6	7.2
Podkarpackie	17	9.6	14.9	12.5	11.6	9.5	10.8	12.3	17.6
Podlaskie	9.2	10	9.2	9.3	8.1	12.0	10.6	11.2	6.3
Pomorskie	16.7	10.8	14.2	15.3	10.7	9.6	8.1	10.0	20.9
Śląskie	17.3	15.5	13.3	15.1	8.9	10.8	11.4	7.7	11.1
Świętokrzyskie	12.7	5.2	11.6	7.9	8.4	6.7	8.1	9.8	6.4
Warmińsko-mazurskie	10.7	12.4	9.2	9.7	5.3	9.1	4.4	6.6	4.9
Wielkopolskie	13.2	15.3	13.1	12.3	11.6	8.5	7.7	9.3	14.2
Zachodniopomorskie	7.8	14.9	12.1	6.6	11.7	12.5	10.7	13.6	7.1

Source: GUS studies “Innovation activity of enterprises” carried out in 2006–2016

The quoted data show large geographical diversity of demography of innovative companies in Poland. Before the crisis (2008–2009), the most innovation-active enterprises were present in the following voivodeships: Mazowieckie and Dolnośląskie. The downturn flattened the geographical structure of the demography of innovative companies. After 2010, there have been no such distinct leaders as Mazowieckie and Dolnośląskie. Ultimately however, the number of innovation-active enterprises in 2016 declined significantly in Warmińsko-mazurskie and Świętokrzyskie, compared to 2008. Interesting conclusions can be drawn from dividing Poland into the eastern and western parts. In industry, the eastern and western parts of Poland, affected by the downturn, behaved similarly in terms of the percentage of innovation-active enterprises that had long-term problems in getting back to their condition from before the crisis. For the entire period of 2008–2016, the maximum difference between the East and the West of Poland was 0.6 percentage points (except for

2013); on the other hand, in services, as the economic crisis became more intense, the innovative collapse was more crushing in the West than in the East. The research shows that in 2008–2009 companies located in western voivodeships had initially an advantage in generating innovation over their counterparts from the East. Even in the first years of the crisis, in 2010–2011, enterprises from western voivodeships maintained that advantage, then in 2012 and 2013 reached a similar level of innovation as companies based in eastern voivodeships, and finally in 2014–2016 recorded worse indicator results (Table 3). This may indicate a greater degree of globalization of western Poland and an economic unity with the European countries, which made long-term problems with returning to the level of innovation from before the crisis even more challenging for the surveyed companies.

## Summary

The role of innovation consisting in triggering economic growth has been re-emphasized in the last twenty years, when the extraordinary development of information and communication technologies (ICT) and other advanced technologies favored the creation of new thriving startups as well as a new approach to entrepreneurship. Innovation has become the key word that has engaged the attention of governments, which are more and more willing to care for the growth of innovation (OECD, 2010). Innovativeness of Poland calculated by *Global Innovation Index* (2016) positions Poland in the 39th place in the world (among 143 countries) and in the 27th place in Europe. *The European Innovation Scoreboard* (2018) situates Poland below the EU average, with the indication that its innovation slightly, marginally, improved in 2016 (54.8 pts) in relation to the EU average in times of recession in 2010 (52.8 pts). The above mentioned indicators suggest that innovation in Poland remains at a firmly stable low level, lower than in other EU countries. However this work, based on data provided by EUROSTAT and the Polish Central Statistical Office, draws attention to business cycles occurring in the market. Downturns, as it has been shown in this article on the example of Polish companies, constitutes the reason for temporary inhibition of innovation processes. Sometimes, as in the case of the 2009 crisis, it may contribute not only to a long-term decline in innovation, but also even when the recession ended, innovativeness might not necessary come back to the level from before the crisis.

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