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Sectoral Variety in Innovations

Tomáš Volek, Martina Novotná, Martina Kaňková

Abstract: *Innovations is the driver for growth of long-term business competitiveness. The paper was focused on identify the main differences in innovation activities in sectors of the Czech Republic. It was found that the innovation activity in Czech Republic is below the EU average. The number of innovating enterprises has been decreasing over the years. The most innovative sector is manufacturing (automotive, petrochemical, pharmaceutical industry). In the service sector, the most innovation activity have sectors of information and communication technologies and banking sector. In the future, we can expect increase of innovations activity due to the growing economy, the state's innovation policy or the integration ideas Industry 4.0. (robotization and digitization).*

Key words: Sector · Innovation · Manufacturing · Czech Republic

JEL Classification: O31 · O11 · O33

1 Introduction

The product and service market is constantly changing and customer needs are changing at the same time. If companies want to maintain their competitiveness on the global market, it is necessary to continually adapt. Innovation is today driver of growth of long-term sectors competitiveness. The aim of this article is to identify the main sectoral differences in innovations.

OECD define innovation as implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm (Oslo Manual, 2005).

Innovation can be divided into technical innovation and non-technical innovation. Innovation can also be divided by intensity of change into incremental and radical innovation. Radical innovations are fundamental changes that represent revolutionary changes in technology. Incremental innovations are minor improvements or simple adjustments in current technology. The major difference captured by the labels radical and incremental is the degree of novel technological process content embodied in the innovation and hence, the degree of new knowledge embedded in the innovation (Dewar, & Dutton, 1986).

What are the main factors that affect innovation activity? Factors can be divided into internal factors and external factors. The present review identifies about 27 internal determinants, with the variables categorised into five groups namely, firms' general characteristics, functional assets, firms' culture, organisational strategies, and firms' structure. The external determinants can be sub-categorised into supply, demand and business environment-related factors. The supply factors include tracking down the technological information from competitors (Kolluru & Mukhopadhaya, 2017). Another significant factor is the size of the enterprise whether it is a large, small or medium enterprise (Forsman 2011, Vrchota & Rehoř 2017, Mura & Buleca 2012). Aboal and Garda (2016) reached the similar conclusion. These authors found that the main determinants of technological and non-technological innovations are the level of investment in innovation activities and the size of the firm. An important factor influencing innovation and absorption capacity of innovation is the sector (Ettlie & Rosenthal, 2011) or even branches of sectors (Keupp & Gassmann, 2013). An important role has a region (Hajek, Henriques, & Hajkova, 2014, Dušek, 2013), in which sector operates and human capital (Šetek, & Petrách, 2016).

2 Methods

The paper is focused on identify major differences in the use of innovation in the sectors. The analysis concentrate on innovations in sectors of Czech Republic (NACE-CZ). The first part of analysis deals with total innovation activity of enterprises in the Czech Republic and EU countries. The following part deals with innovation activities in individual

Ing. Tomáš Volek, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech republic, e-mail: volek@ef.jcu.cz

Ing.Martina Novotná, Ph.D. University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech republic, e-mail: novotna@ef.jcu.cz

Martina Kaňková, University of South Bohemia, Faculty of Economics (student).

sectors. The data source was Eurostat (National accounts), Czech Statistical Office, and analysis of investment activities of companies in the Czech Republic. The observed data were from the period (2012-2014). The article uses division into technical and non-technical innovations. Technical innovations contain product innovations and process innovations. Product innovations involve significant changes in the capabilities of goods or services. Process innovations represent significant changes in production and delivery methods. Non-technical innovations can be divided into marketing and organizational innovations. Organisational innovations refer to the implementation of new organisational methods - new communication mix. Marketing innovations involve the implementation of new marketing methods. These can include changes in product design and packaging.

3 Research results

3.1 Innovation and the Czech Republic

In the Czech Republic, 42% of companies innovated their products, processes, marketing or organizational methods in the period 2012-2014. The total innovation activity of enterprises in the Czech Republic declines over time. This situation is described in the following table 1. The number of innovating enterprises has fallen from 56% (2006) to 42% (2014). In terms of the type of innovation, only the share of enterprises with product innovation increased. On the contrary, the number of enterprises with organizational innovation declined sizeable. In terms of size, the large companies innovate the most (more than 77% of enterprises). On the other hand, small businesses (35%) are the least innovating. The largest decline in the number of innovating enterprises was recorded in small enterprises in followed period. Technical innovation prevails in all groups of enterprises..

Table 1 Basic indicators of innovation activities of enterprises in the Czech Republic

	2006–2008		**2008–2010**		**2010–2012**		**2012–2014**	
	number	%	number	%	number	%	number	%
Innovative enterprises total	**13 196**	**56.0%**	**10 623**	**51.7%**	**9 765**	**43.9%**	**9 063**	**42.0%**
Enterprises with technical innovation	**9 256**	**39.3%**	**7 145**	**34.8%**	**7 919**	**35.6%**	**7 686**	**35.7%**
Enterprises with product innovation only	1 366	5.8%	1 944	9.5%	1 963	8.8%	2 257	10.5%
Enterprises with process innovation only	2 851	12.1%	1 688	8.2%	1 670	7.5%	1 671	7.7%
Enterprises with product and process innovation	4 398	18.7%	3 016	14.7%	3 664	16.5%	3 153	14.6%
Enterprises with non-technical innovation	**11 085**	**47.0%**	**8 720**	**42.4%**	**ther**	**31.6%**	**5 878**	**27.3%**
Enterprises with marketing innovation	3 076	13.1%	2 366	11.5%	2 484	11.2%	2 185	10.1%
Enterprises with organizational innovation only	2 686	11.4%	2 629	12.8%	2 053	9.2%	1 460	6.8%
Enterprises with marketing and organizational innovation	5 323	22.6%	3 726	18.1%	2 502	11.2%	2 234	10.4%

Source: Own calculations based on the data Czech statistical office

In the international comparison, enterprises in Germany and Belgium are the most innovate companies, see table 2. On the contrary, the smallest share of innovating firms are mostly newly acceding EU countries. The Czech Republic is well below the EU27 average (49.1%). This negative situation in the new EU member states is due to the large concentration of innovation in large enterprises. In the new Member States, they primarily invest in large companies that generate a significant share of the total revenue of the sector. On the other hand, small businesses in the new EU Member States innovate below the average of the old EU members.

Table 2 Innovation activity in EU countries

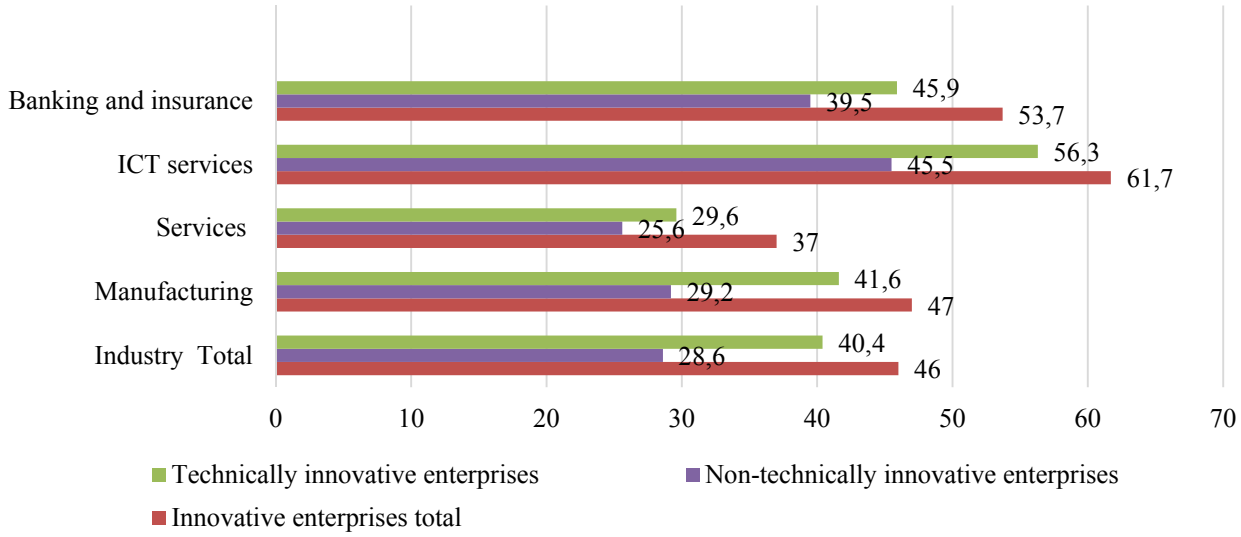
Country	Share of enterprises in the population in 2014	Country	Share of enterprises in the population in 2014
Germany	67.0	European Union (28 countries)	49.1
Luxembourg	65.1	Lithuania	43.3
Belgium	64.2	Czech Republic	42.0
Ireland	61.0	Croatia	39.7
United Kingdom	60.2	Spain	36.4
Austria	59.5	Slovakia	31.8
France	56.4	Estonia	26.5
Netherlands	55.3	Hungary	25.6
Finland	55.3	Latvia	25.5
Sweden	54.2	Poland	21.0
Portugal	54.0	Romania	12.8
Greece	51.0	Italy	48.7
Denmark	49.5	Slovenia	45.9

Source: Own calculations based on the data EUROSTAT

3.2 Innovation in sectors

Innovative business activity is different in sectors. The manufacturing has the highest innovation activity about 47% (Figure 1). On the contrary, agriculture has the lowest innovation activity. In manufacturing, the most innovative activity have production of other transport machine, petrochemical and pharmaceutical industry. In the service sector, the most important innovation activity have information and communication technologies sector and banking with insurance. The innovation activity in the Czech Republic is lower than EU average. Technical innovations have the greatest importance in the sectors.

Figure 1 Innovations in sectors of the Czech Republic



Source: Own calculations based on the data EUROSTAT

The following Table 3 shows us the international comparison of innovation activities in industry (EU states). The most innovate manufacturing firms are in Germany, Belgium and Italy. On the contrary, the least innovate firms are mostly in the new EU member states. The share of expenditure on innovation from total expenditure varies from country to country to the structure of individual economies. The largest share have countries with a high share manufacturing on GDP, such as the Czech Republic, Germany or Slovakia. On the other hand in countries with a lower industrial importance (Greece, Great Britain), the share of innovation expenditure to industry does not exceed 50%.

Table 3 Innovation activity in Manufacturing of EU countries

	Innovation activity in manufacturing (%)	Share of expenditure to innovation of manufacturing from total	Share of GDP (%)
Germany	72.6	77.4	22.9
Belgium	70.5	62.3	14.1
Italy	68	67.6	15.5
Austria	64.1	59.3	18.6
United Kingdom	64.1	28.6	10.2
Finland	60.5	70	16.9
France	59.8	50.5	11.3
Poland	59.1	46.6	18.9
Sweden	57	73.3	16.5
Greece	55.1	43.1	9.5
Romania	53.5	51.4	23.7
Latvia	50.8	40.1	12.3
Denmark	48	57.4	13.6
Czech Republic	47	74	26.8
Netherlands	43.7	58.4	11.4
Spain	39.3	50	13.7
Slovenia	32.9	70.3	22.9
Lithuania	28.9	32.2	19.2
Estonia	26.9	25	16.2
Hungary	25.7	68.8	23.1
Portugal	22.3	52.4	13.5
Slovakia	13.1	70.5	21.7

Source: Own calculations based on the data EUROSTAT

What is the assumption of innovation activities of Czech enterprises in the future? In the future, we can expect small increase of innovations activity. This assumption is based on three main factors that can increase innovation activity in enterprises. The first of these factors is the high growth of the Czech economy, which allows companies to invest in innovative activities. The second factor is the state's innovation policy orientated to supporting research and development in the form of tax relief or in the form of subsidies EU funds. The third factor is the fourth industrial revolution, ie. Industry 4.0, the growth of robotization and digitization (Gerlitz, 2016), not only in industry, but also in services (Services 4.0) and agriculture (Farming 4.0).

4 Conclusions

Enterprises competitiveness is determined in a present globalized world by many external and internal factors. Innovation is today the driving force to growth of long-term business competitiveness. The paper was focused on identifying the main differences in the use of innovations in various industries in the Czech Republic. The number of innovating enterprises has been decreasing over the years. The most innovative industry is manufacturing of other transport vehicles, petrochemical and pharmaceutical industry. In the area of services, Information and Communication Technologies and innovations are the most innovative. The innovation activity in Czech Republic is below the EU average. In the future, we can expect small increase of innovations activity due to the growing economy, the state's innovation policy or the integration ideas Industry 4.0. (robotization and digitization).

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