

INOVAČNÉ AKTIVITY V PRIEMYSE NA SLOVENSKU V ROKOCH 2004 - 2008

INNOVATION ACTIVITIES IN INDUSTRY AT SLOVAKIA DURING 2004 – 2008

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Abstract This article discuss about the level of innovation activities in manufacturing industries between years 2004 – 2008. We present analysis of data gained from Community Innovation Surveys conducted in 2007, resp. 2009. Main goal of article is presenting level of innovation activities in industry and their changes between 2004 - 2008. In nowadays innovation is seen as entrepreneurship phenomenon and according lot of studies has important positive impact of competitiveness at micro level or firm level, but also at level of region or country.

Key words: Innovation. Innovation activities. Product innovation. Process innovation.

Introduction

There is broad agreement among economists that research and development is a major source of economic growth .Most of us have already heard about term competitiveness and also probably many economists agree that innovation and innovation activities have strong positive impact on competitiveness of company, sector, region or country (Porter 1998).

In most established markets competition among firms takes non-price forms: for real (e.g., longer service life) or imaginary (e.g., branding) reasons customers are willing to pay for a given good or service, although a less costly alternative could in principle fulfill the same need. As compared to cost competitiveness, competition over “desirability” in established markets (sometimes referred to as real competitiveness) is a multi-dimensional concept and cannot be readily compressed to a single measure. The picture is further complicated by the fact that many firms operate in a number of markets simultaneously, with the objective of maximizing overall discounted profits. A second complication is that firms do not only compete in established markets, they also compete for the introduction previously unavailable goods and/or services, spawning completely new markets. This may be referred to as innovative competitiveness.

Proposed article deals with results from Community Innovation Surveys which were conducted in 2007, resp. in 2009. Content of the survey was related to the reference period 2004 – 2006, resp. 2006 – 2008. Data are the results of the processing of the innovation survey Inov 1-99, which was carried out in 2007, resp. 2009. We put emphasis on industry data which we will try to analyze and evaluate the changes happened, and then we would like to take brief conclusion why did changes happen.

2 Methodology and Database

The methodology of these surveys was based on the statistical methodology of the EU member states and it was harmonized with the Fourth, resp. Fifth Community Innovation

Surveys (CIS 6, resp. CIS 8). There is a little change in defining innovation activities between years 2007 and 2009.

The innovation survey (CIS6) in 2007 was carried out in 3 712 reporting units, the sample corresponds to the 43,8 % of the target population which contents 8 035 units. Results from survey conducted in 2007 are based on 2 678 enterprises, i.e. the response rate was 83,5%. The innovation survey (CIS8) in 2009 was carried out in 3 239 reporting units, the sample corresponds to the 26,6 % of the target population which contents 11 761 units. Results from survey conducted in 2009 are based on 2 296 enterprises, i.e. the response rate was 70,9 % counted from filled in questionnaires.

By the term innovation we have described as both the act of invention and the activity required to bring the invention to the market. As a general statement, the incentive to innovate is the difference in profit that a firm can earn if it invests in R&D compared to what it would earn if it did not invest. These incentives depend on many factors, including: the characteristics of the invention, the strength of intellectual property protection, the extent of competition before and after innovation, barriers to entry in production and R&D, and the dynamics of R&D. There is a differentiation between methodology in 2007 and 2009. In 2007 there were four kinds of innovation – product innovation, process innovation, organizational innovation and marketing innovation. These four kind of innovation were grouped to two group – it means technological innovation (product and process innovation are included) and non-technological innovation (marketing and organizational innovation are included). Non-technological innovation was not included in the total innovation activity of enterprises.

3 Innovation activities in industry in Slovakia

Innovation activities include product innovations, process innovations, ongoing or abandoned innovation activities for product and process innovations, organizational innovations and marketing innovations.

Enterprises with innovation activity are those, which has introduced new or significantly improved products to the market or introduced a new or significantly improved process within the enterprise. Further abandoned or on-going innovation activities are also included to this group of enterprises.

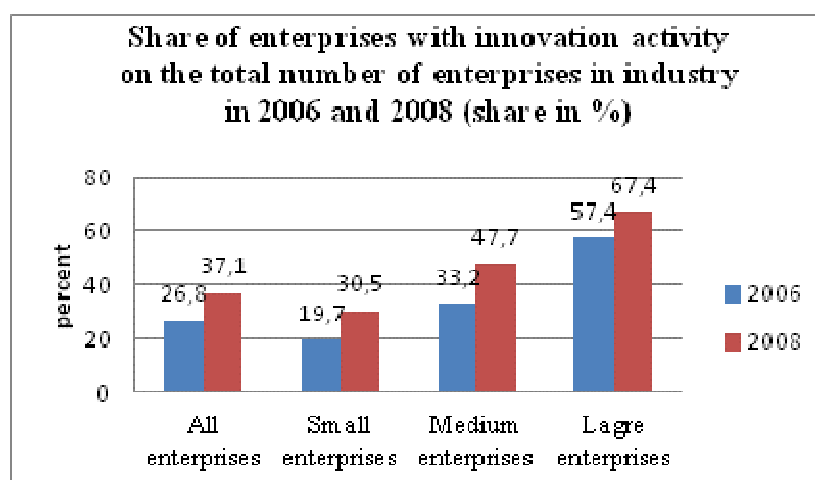
Enterprises that have had any kind of innovation activity:

- introduced new or significantly improved products
- introduced new or significantly improved process
- ongoing or abandoned innovation activities for product and process innovations
- Implemented new organizational method
- Implemented new marketing concept or strategy.

Ability to innovate in the industrial sector in 2008 had increased. In comparison with the CIS 2006 survey, share of innovation active enterprises is higher by more than one third, by 10,3 percentage points and it reach 37,1%. In figure 1 is shown share of enterprises with innovation activities on the total number of enterprises. When we take a look on presented data we could make the brief conclusion that innovation activities in all type of enterprises (small, medium and large) were higher. But it is necessary to say that growth of innovation activities is probably a result of including non-technological innovations in the total innovation activity of enterprises.

Successful innovators introduced or implemented product innovations, process innovations, or both products and process innovations. The following figure shows the share of enterprises with innovation activity in total number of enterprises in industry.

Figure 1 Share of enterprises with innovation activity on the total number of enterprises in industry in 2006 and 2008 (share in %)



Source: own processing based on documents of Statistical Office of the Slovak Republic (2010)

In 2008 similarly, as in the previous period, the innovation activity of enterprises was directly proportional to their size. Compared with the period of 2004-2006, the proportion of innovation activity increased in industry sector enterprises of all size categories. The most intensive growth of innovation activities between years 2006 and 2008 was recorded in medium size enterprises. The slightest growth was reported in large-sized industrial enterprises, as a result of higher innovation activity in this enterprise segment in the preceding period. When we take a look at data about large enterprises we find out that 2 from 3 enterprises introduce any kind of innovation in contrast with small enterprises where only 1 from 3 enterprises introduced any kind innovation.

The following table shows the numbers and shares of enterprises with any kind of innovation activity in total number of enterprises and in industry in 2006 and 2008.

Table 1 Numbers and shares of enterprises with any kind of innovation activity

Kind of innovation activity	Number of enterprises with innovation activity				Share in total number of enterprises in %			
	2006		2008		2006		2008	
	Total	Industry	Total	Industry	Total	Industry	Total	Industry
All kinds of innovation activity	1824	1037	3950	1866	22,7	26,8	33,6	37,1
Technological innovation	n/a	n/a	2339	1333	n/a	n/a	19,9	26,5
Successful innovations	1739	983	2221	1291	21,6	25,4	18,9	25,6
Product innovation only	395	244	442	269	4,9	6,3	3,8	5,3
Process innovation only	655	347	765	460	8,2	9	6,5	9,1
Product and process innovations	689	392	1014	562	8,6	10,1	8,6	11,2
On-going and/or abandoned innovation activities only	85	54	117	41	1,1	1,4	1	0,8
Non-Technological innovation	n/a	n/a	1611	533	n/a	n/a	13,7	10,6
Without innovation activity	6211	2828	7811	3171	77,3	73,2	66,4	62,9

Source: own processing based on documents of Statistical Office of the Slovak Republic

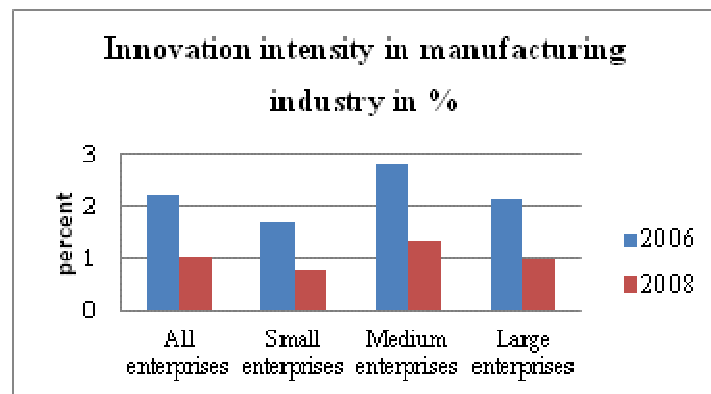
As we take closer look at data in table 1 we will find out that number and shares for industry are higher as in total number and shares for all enterprises. There is 26,8 % share for industry in 2006 vs. 22,7 % share for all enterprises, resp. 37,1 % vs. 33,6 % in 2008.

In period 2006 – 2008 determining share (95,3 %) of enterprises with technological innovation was constituted from successful innovators that introduced or implemented product or process innovation or both type of innovations. Only on-going or abandoned innovation activity were reported by 4,7 % of enterprises with innovation activity. Similar shares were reached in previous period – 95 % vs. 5 %.

4 Innovation intensity in manufacturing industry

Innovation intensity, expressed as a ratio between total spending on innovation in manufacturing industry over total turnover, represented 1,04 % in 2008. Medium enterprises had the highest innovation intensity (1,34 %), followed by large enterprises (1,0 %) and the lowest innovation intensity was in small enterprises (0,78 %). As we can see in comparison with 2006 for all types of enterprises innovation intensity has decreased. Innovation intensity for manufacturing felt down from 2,24 % in 2006 to 1,04 in 2008

Figure 2 Innovation intensity in manufacturing industry in %



Source: own processing based on documents of Statistical Office of the Slovak Republic

Innovation intensity according to the technological sector is shown in table 2. Definitions of technological sectors used in CIS are based on the OECD/Eurostat classification which takes into account the R&D intensity across different industries in manufacturing.

There are distinguished the following technological sectors, which include the listed activities in manufacturing sector by NACE:

High-tech - pharmaceuticals, office machinery and computers, radio, television and communication equipment, medical, precision and optical instruments, aircraft and spacecraft.

Medium-high-tech - chemicals and chemical products (less pharmaceuticals), nonelectrical machinery, electrical machinery, motor vehicles, railway and tramway locomotives and rolling stock.

Medium-low-tech - coke, refined petroleum products and nuclear fuel, rubber and plastic products, non-metallic mineral metals, basic metals, fabricated metal products, shipbuilding.

Low-tech - food, beverages and tobacco, textiles, fur and leather, wood, paper printing, publishing, furniture, other manufacturing, n.e.c., recycling

Table 2 Description of Technological sector

Technological sector	2006			2008		
	Share of enterprises (in %)		Innovation intensity in enterprises with technological innovations in %	Share of enterprises (in %)		Innovation intensity in enterprises with technological innovations in %
	classified into the sector in the total number of enterprises	with innovation activity in the total number of enterprises of sectors		classified into the sector in the total number of enterprises	with innovation activity in the total number of enterprises of sectors	
Manufacturing sector	100	27,4	3,1	100	37,3	1,6
of which						
High-tech	4,6	43,7	1,2	2,9	60,7	3,46
Medium-high-tech	19,5	34,9	3,9	18,2	45,1	1,51
Medium-low-tech	30	25,1	2,7	38,2	38	1
Low-tech	45,9	24	3,8	40,7	31,4	3,17

Source: own processing based on documents of Statistical Office of the Slovak Republic

As we can see at the table 2 we can say that almost 70 % of enterprises are from medium-low-tech or low tech sector, but only 1 from 4 companies (in 2006), resp. 1 from 3 companies (in 2008) declare any kind of innovation activities. When we take a look at the data from high-tech sector we find out big difference between low-tech and high-tech as almost 61% from high-tech declared any kind of innovation activity in comparison with 31,4 % in low tech sector.

5 Incentives for innovation and gains from innovation

As we have already mentioned term innovation describes as both the act of invention and the activity required to bring the invention to the market. As a general statement, the incentive to innovate is the difference in profit that a firm can earn if it invests in R&D compared to what it would earn if it did not invest. These incentives depend on many factors, including: the characteristics of the invention, the strength of intellectual property protection, the extent of competition before and after innovation, barriers to entry in production and R&D, and the dynamics of R&D.

It is more difficult to make general statements about incentives for innovations because a firm's profit before and after innovation occurs depends on fixed costs, price competition and the mix of other products in its portfolio. Even without investment in R&D, firms may supply too many or too few products from the perspective of total economic welfare. For example in the case of a process innovation, a monopolist's incentive to invest in R&D for a new product is the difference in the monopoly profits with and without the new product.

The dynamics of the innovation process affect incentives to invest in R&D. A firm may be able to pre-empt competitors in R&D if a head start in the innovation process gives the firm a discrete advantage in securing an exclusive right to the innovation. If that is not the case, firms can simultaneously engage in R&D, each with a reasonable expectation that its R&D expenditures will generate a significant return. For example a homogenous good is sold at price p and produced at constant marginal cost, c . Demand is $q(p)$ with $dq(p) / dp < 0$. Given the production technology, total economic welfare reaches a maximum when price is equal to marginal cost (GILBERT 2006). In the socially optimal allocation there are no profits and total welfare is equal to consumer surplus.

$$W(c) = \int_0^{\infty} q(x) dx$$

Note that $dW(c) / dc = -q(c)$. For an innovation that reduces the marginal production cost by a small amount, the welfare gain from the innovation is proportional to the amount consumed when the price is equal to the marginal production cost. This simple observation is key to understanding the value of innovation incentives under different market structures. The change in total welfare from a discrete investment in R&D that lowers the marginal cost of making the good to $c_1 < c_0$ is:

$$W(c_1) - W(c_0) \equiv \Delta W = \int_{c_0}^{c_1} \frac{dW(x)}{dx} dx = \int_{c_1}^{c_0} q(x) dx$$

This is the total achievable benefit from R&D that reduces marginal cost from c_0 to c_1 . It is the area c_1c_0bd in Figure 3.

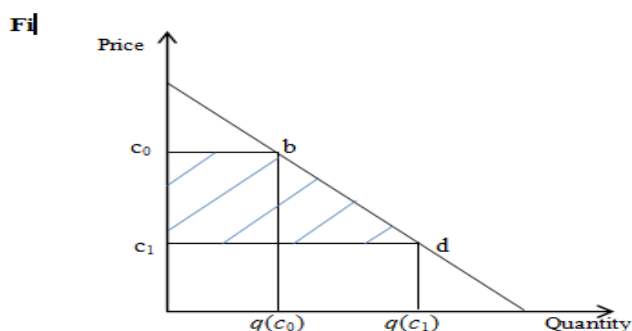


Figure 3 Benefit from R&D

Source: Own processing, according Gilbert 2006

Conclusion

In this article we had described level of innovation activities in manufacturing sector in Slovakia during 2004 – 2008. Methodology of CIS has been little changed, mainly due to distinguishing technological and non-technological innovation. Probably this changes are resulting in little bit higher shares of enterprises with innovation activity in 2008 than period before. On the other hand innovation intensity has decreased in 2008 in comparison with 2006. Also we have mentioned some incentives for realizing innovation activities and gains from innovation.

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