

INNOVATIONS IN HIGH-TECH SECTORS DURING THE RECESSION AND RECOVERY CONDITIONS - COMPARISON CZECH AND SLOVAK REPUBLIC

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Successful transformation of quantitative competitive advantage into qualitative form depends on the use of technology and it can be assumed that the rate of change is determined by the development of high tech companies in the manufacture processing branch. Aim of this article is to analyze the position and development in the high tech sector in the manufacturing industry in the Czech Republic and the Slovak Republic. Input data for the analysis are the data collected by Czech Statistical Office and Slovak Statistical Office. Analysis and comparison of development in both countries will be the basis for the formulation of recommendations for the support of the further desirable development. HT MI is a small country an important source of competitiveness of the economy as it is the driver of innovation. Czech Republic and Slovakia know about it and trying to promote this area of different programs. The analysis can also show how the support programs should be targeted, probably because they bring the highest effects for the future.

Key words: innovation, high-tech sector, innovation ratio

JEL Code: O11, O30, O38

Introduction

In the economic literature in general there are two traditional theories on relationship between size of the firm and the ability to generate innovation which have different implications for the expected relationship: Schumpeterian theory claims that monopoly profit extracted from the dominant position creates enough financial resources to innovate, which in turn leads to more efficient production and better performance and thus large firms are the main source main engines to innovation. On the other hand, the firm in a competitive industry has a greater incentive to invest in research and development than a monopolist. However, there are studies which have found a negative or an inverted-U shaped relationship between R&D intensity and the firm's size (Zemplinerova, 2010). Křístková (2012) evaluates the macroeconomic importance of the order of expenditure as follows: The importance of knowledge inclusion does not necessarily lay in the dynamics of economic growth but rather in its effect on the

structure of the economy. Křístková (2012) also mentions the negative nature of the involvement of companies of high-tech manufacturing (production-intensive imports and rather lower value added).

1 The position high-tech manufacturing industry in the Czech Republic and in the Slovakia

To redirect our economy competitive advantages from cost-orientation to qualitative competitive advantage, innovation performance of firms is a key prerequisite in the high-tech sector. High-tech sector in the Czech Republic is defined through Classification of Economic Activities (CZ-NACE) and is divided into two main categories: high-tech manufacturing and high tech services. This article will focus on the analysis of the high-tech manufacturing (the HT MI).

The first reference period for data processing with the new CZ-NACE and SK-NACE was 2008 (Slovak Statistical Office only publishes data since 2008). During the analysis period (2008-2010) the position of the high-tech manufacturing industries in the manufacturing industry (MI) is stable. Employees of high-tech manufacturing industry accounted for approximately 5% of the CR staff throughout the manufacturing industry, the share of high-tech MI in sales of MI (sales of own products and services) did not significantly change even in 2009 and has an average of 12% in the period. Even in the case of Slovakia, this result can be regarded as a manifestation of a greater adaptability to crisis conditions. It is also possible to say that the adoption of the Euro had a positive effect on the sales of high-tech MI in the Slovak Republic.

Tab. 1: The position of high-tech manufacturing industries in the manufacturing sector (the share of high-tech MI to MI)

| Indicator | CR | | | SR | | |
|-------------------------------------|------|------|------|------|------|------|
| Year | 2008 | 2009 | 2010 | 2008 | 2009 | 2010 |
| Labour productivity (from revenues) | 2,01 | 2,24 | 2,39 | 2,38 | 2,47 | 3,17 |
| Staff | 6% | 6% | 5% | 5 % | 5% | 5% |

Source: Based on data from Czech Statistical Office and Slovak Statistical Office, own processing. (Revenues from own production and sale of goods in current prices in CZK and EUR.)

Table 1 shows that the position of HT MI in employment in the MI in both countries is stable. Due to the fact that in both countries the number of employed in MI and HT MI decreases, the

absolute decline in the number of employees in the MI and HT MI is uniform. Labour productivity (measured as a share of sales of own products and services and the average registered number of employees) in the HT MI more than doubled in both countries. The cause of significant differences in labour productivity is mainly the difference between firms with domestic and foreign owners. Immediately after the introduction of investment incentives, this difference was associated with the effects of foreign direct investment for both economies (the rate of technological flow is conditioned by the ability of domestic firms to absorb these new technologies). In times of crisis it is possible to associate this difference with the fact that the foreign owner due to its position in the value chain and the supplier-customer relations achieves higher market prices than firms with domestic owner. This view is supported by the following Table 2.

Tab. 2: : The position of foreign affiliates in the HT MI (share in %)

| Indicator | CR | | | SR | | |
|---------------------------------|------|------|------|------|------|------|
| Year | 2008 | 2009 | 2010 | 2008 | 2009 | 2010 |
| Staff | 68,3 | 70,0 | 61,3 | 73,9 | 79,8 | 80,9 |
| Value added | 73,6 | 70,8 | 59,0 | 89,9 | 82,3 | 92,0 |
| Sales of own products and goods | 84,7 | 90,8 | 87,4 | 95,8 | 97,3 | 96,8 |
| R&D expenditures | 72,9 | 67,3 | 33,3 | 84,0 | 89,4 | 72,1 |

Source: Based on data from Czech Statistical Office and Slovak Statistical Office, own processing. (The value added and sales in bc in CZK and EUR.)

Table 2 confirms the above mentioned argument about the position of foreign affiliates in the value chain and the supplier - customer relationships. The share of foreign affiliates in value added in the crisis year of 2009 decreased (in the Czech Republic it also fell the following year - in connection with a decline in the number of large foreign-owned companies in the sector), their share of sales increased. It may mean maintaining access to markets, but at the cost of less effective pricing policy. Another reason may be the more effective management of operating costs.

The higher share of foreign affiliates on the Slovak high-tech manufacturing industry can be explained by the different phases of the life cycle of investments in connection with subsequent massive influx of Foreign Direct Investment (FDI) and the influence of the common currency, which deprives the investor's risk of changes in the exchange rate.

The share of foreign affiliates on the number of employees and value added decreased in the Czech Republic by about 10 percentage points. The decline in the share of R & D expenditure was much stronger – 34 p.p., down expenses decreased to less than half the value. The share of foreign affiliates on the number of employees and value added of the Slovak on the other hand increased. The decline in sales in the conditions of crisis is evident from the decline in the share of firms with foreign ownership on value added. The increase in the share of foreign affiliates in R & D expenditure in 2009 (despite an absolute decline in spending) is a result of austerity measures in SMEs with a home owner (decrease R & D spending by 39%). The decline in the share of spending in the next year is due to a substantial increase in R & D spending by SMEs with home owner. The greater importance of foreign affiliates in the Slovak HT MI is evident from all the studied characteristics.

Table 3 shows the annual change in labour productivity and the number of employees in high-tech manufacturing industry and manufacturing industry and describes the impact of the economic crisis on the environment and high-tech manufacturing industry in both countries.

Tab. 3: Annual change in the labor productivity and the number of employees in the MI and HT MI (in %)

| Indicator | CR | | SR | |
|----------------------------|-----------|-----------|-----------|-----------|
| | 2008/2009 | 2009/2010 | 2008/2009 | 2009/2010 |
| Labor productivity (MI) | - 10,2 | + 25,5 | -8,4 | +14,7 |
| Labor productivity (HT MI) | + 1,8 | +22,3 | +5,3 | +15,4 |
| Staff (MI) | -12,5 | -2,4 | -16,0 | -13,8 |
| Staff (HT MI) | -13,4 | -8,7 | -3,0 | -7,8 |

Source: Based on data from Czech Statistical Office and Slovak Statistical Office, own processing. (Labor productivity = revenues from sales of own products and merchandise to employees at current prices in CZK and EUR.)

Better adaptability of HT MI companies to crisis conditions is evident from the annual changes in labour productivity. In manufacturing, labour productivity declined, HT MI had a positive impact on the performance of both economies in 2009.

The increase of productivity in high-tech industries in the Czech Republic was supported by a larger decrease in employees than the decline in sales.

In Slovakia sales increased, although there was a drop of the number of employees (we remind again of the positive effect of EUR - in the form of elimination of transaction costs and exchange rate risks). Recovery, which both economies showed in 2010, led to an increase

in sales in both countries with further decline in employment. The result is quite significant annual increase in the productivity of labour.

2 The difference between innovation in companies with the domestic and foreign owner

There is a difference between the innovative behaviour of companies with domestic owner and with foreign owner. (Nečadová, 2010) draws particular attention to differences in goals innovation. Companies with domestic owners behave more strategically and lead to innovation of higher orders. Firms with a domestic owner during evaluating impacts of innovative activities stressed above all growth of sales and subsequent increase in labour productivity. Firms with a foreign owner regarded as the most important consequence of innovations decrease in material and energetic intensity which enables economy of costs and then increase in labour productivity and market share (Nečadová & Breňová, 2010).

3 The Innovation Ratio in HT MI – comparison the CR and SR

To compare the results of HT ZP development in both countries was defined indicator Innovation Ratio (IR).

$$IR = \frac{RDE}{VAP}, \quad (1)$$

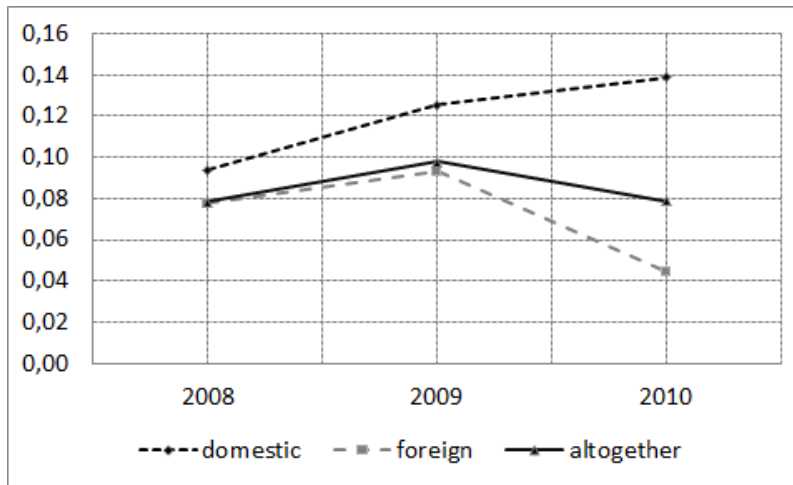
where RDE are research and development expenditures,

VAP – value added of production.

The following graphs in Figures 1 - 4 show the development of IR from different perspectives.

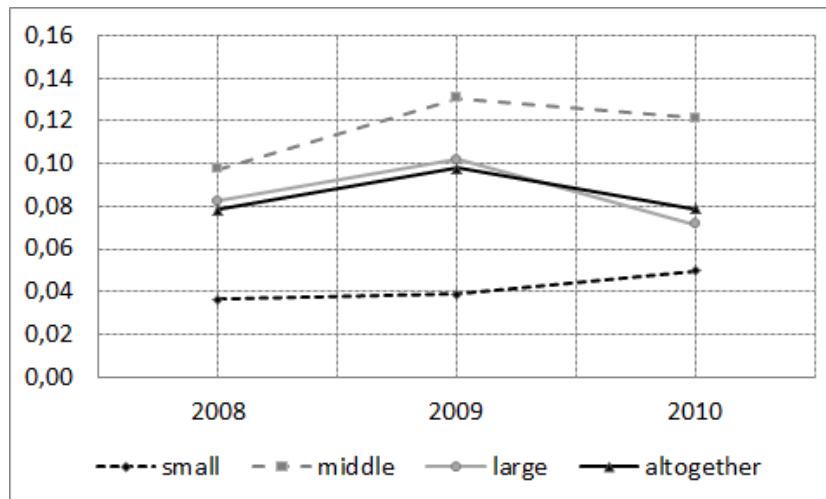
In the Czech and Slovak HT MI in 2009 R & D expenditure decreased, but increased IR. The reason may be higher inertia and the associated lower customization crisis conditions. This should, however, particularly on large innovative companies. On fig. 2 we see that the innovativeness of small firms grow more. In 2010, the Czech Republic continued to decline in the absolute R & D spending - especially in large companies with foreign owners. In the Slovak Republic, the year's expenditures increased in all types of companies - the size and the owner (see fig. 1- 4, compare fig. 1 with fig. 3 and fig. 2 with fig. 4).

Fig. 1: Innovation in the Czech HT MI by owner (measured by IR)



Source: Own processing from data of Czech Statistical Office 2013.

Fig. 2: Innovation in the Czech HT MI by company size (measured by IR)

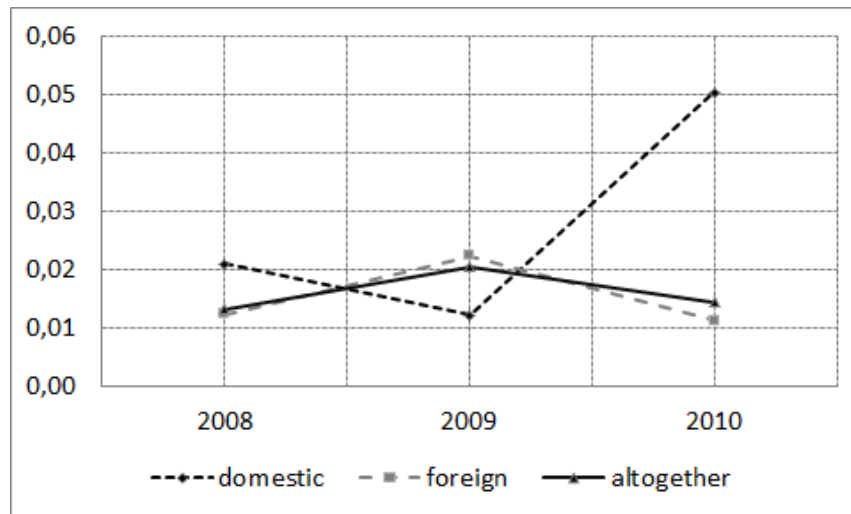


Source: Own processing from data of Czech Statistical Office 2013.

The growth of Innovation Ratio in HT MI in the Czech Republic in 2009, this is unfortunately not a positive signal. The reason is the uneven decline in both input indicators - while R & D expenditures in the Czech Republic declined by 5% yoy decline in value added was significantly higher (24%). Added value this year fell the most in large companies with foreign owners. The decline in innovation in 2010 is both a manifestation of austerity firms (R & D expenditures generally declined year on year by 5%) and increase in value added (overall increase of 17%). The sharp decline in R & D expenditure of foreign affiliates (53%) is

associated with the change of ownership and size structure of firms. This decrease was offset by almost doubling the R & D expenditure in domestic firms and SMEs. Increase in the rate of innovation in small businesses is a result of the aforementioned change in ownership and size structure in high-tech ZP - R & D spending in 2010 grew more (40%) than value added (about 9%). For leaders of innovation (in terms of our indicators of the rate of innovation) can be considered medium-sized businesses that have the highest share of R & D expenditure in value added. Positive impact on the development of R & D expenditure in 2010 was just the innovative behaviour of medium-sized businesses that expenditure on research and development increased absolutely. The annual decrease in value added in 2009, subsequent austerity measures (and also change the size structure) but would result in a level of innovation - an increase of R & D expenditure in 2010 was lower than the increase in value added.

Fig. 3: Innovation in the Slovak HT MI by owner (measured by IR)

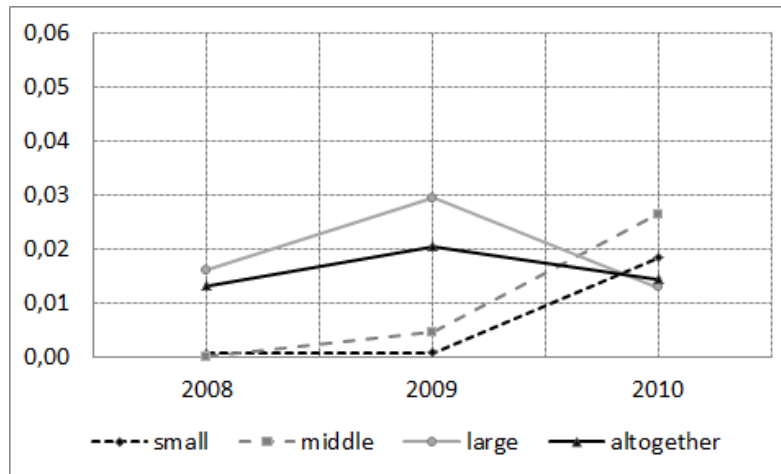


Source: Own processing from data of Slovak Statistical Office 2013.

Reason for the increase in the level of innovation Slovak HT MI in 2009 is the same as in the case of the Czech Republic (both initial decline indicators, and value added declined by about 40%, while R & D spending by 7%). A significant proportion of large firms with foreign ownership in high-tech ZP to Slovak is evident from both graphs.

The evolution of the IR indicator in Slovak HT replicates the degree of innovativeness of foreign affiliates. However, changes in the size structure of companies (growing importance of SMEs) are reflected in the large difference between the overall rate of innovation and the degree of innovation in large enterprises.

Fig. 4: Innovation in the Slovak HT MI by company size (measured by IR)



Source: Own processing from data of Slovak Statistical Office 2013.

The decline in this ratio indicator in 2009 of domestic firms is given by the negative change in expenditure on research and development (down 39%) at the same time annual growth in value added. The reason can be seen in a more flexible response management firms, SMEs in crisis conditions.

Conclusion

The comparison of changes in the indicator Innovation ratio implies that in the Czech Republic are the most innovative medium-sized companies with home owner. On the Slovak are still the most important innovators in HT MI large companies with foreign ownership, although their importance is declining, which should have a positive impact on the effectiveness of R & D expenditure (see Zemplerová & Hromádková, 2012). For the positive sign for the future competitiveness of HT MI in the Czech Republic and Slovakia consider IR growth in SMEs with home ownership, which could be a source of increased competitiveness of the country.

It's good that we can see both the stability of small and medium-sized domestic companies, but also flexibility in responding to changing circumstances. When possible support for building competitive advantages Czech economy should be given to support (whether direct or indirect) of domestic companies, particularly medium-sized, they have the potential to create product innovation and development of skilled labor.

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