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The Impact of Innovation on Performance: Firm Level Analysis

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Both economics and management literature assumes that innovation has a positive impact on business performance. Our research is based on the Hungarian Competitiveness Research database of 2013 launched by the Competitiveness Research Centre, Institute of Business Economics of Corvinus University of Budapest. The final database consists of 300 firms, including 97 medium sized manufacturing companies, which our paper is focused on. Due to lack of data the ordinal and OLS regression equations have less firms. We have examined the impact of innovation on firm performance, which has been measured by export and profitability. We have found that the foreign owned firms show the best results regarding both of the performance measures. Contrary of the expectations those firms are more successful which have a high new-to-the-firm product innovation/sales ratio, rather than those of having a high new-to-the-world product innovation/sales ratio.

Introduction

This paper aims to investigate the relationships between innovation and firms' performance based on a Hungarian database. Majority of the studies dealing with these questions reported a positive relationship, but the overall picture is not clear. Beyond the product and process innovations our study takes into account the impact of organisational and marketing innovations. They can contribute to higher level exports and financial performance through reducing costs by more efficient organisational processes and increasing revenue and profit by attracting and reaching more customers. We have chosen the subsample of the medium sized manufacturing firms. Small- and medium sized firms contribute substantially to the growth, employment and competitiveness of nations. Unfortunately, in Hungary, compared with the most developed countries, they play a bit less important role in this respect. We suppose, that compared with the small firms, medium sized firms possess more knowledge assets and critical resources needed adequately manage the innovation process that will produce higher

economic performance. Manufacturing firms have been sorted out because service companies concentrate more on domestic markets.

The paper is organized as follows: Section 2 describes the methodological aspects of the empirical study, the data and the measures of the variables. Section 3 summarizes the literature about the firm level relationship between innovation and export and financial performance. Section 4 presents the results and section 5 offers some conclusions from the study.

Methodology, database and variables

The study has been based on data "In Global Competition 2013" survey, which was organised by Competitiveness Research Centre at Corvinus University of Budapest. The aim of the survey was to give a general view of the competitiveness of the Hungarian companies. The final database consists of 300 firms, including 97 medium sized manufacturing companies, which is 5.7% of the Hungarian medium sized manufacturing companies. Within the manufacturing industry the representativeness of the sample is acceptable (Table 1). In our sample 28 companies were foreign owned. The average number of employees is 108. The questions, I used, are similar to the questions of the Community Innovation Surveys (CIS).

Table 1. Sample and nation-wide distribution according to industries

Industries	Global Competition 2013 survey	Hungary
Food	25	21
Textile	20	17
Chemical	11	15
Machinery	37	39
Other	7	8
	100	100

We have measured financial performance by EBITDA/employee (mean value: 2100 HUF) in 2012. Export intensity, the share of exports in total sales for a particular firm in 2012, also an important metrics of business performance. According to export/sales ratio, we constructed a categorical variable: no export activity (24 firms); low export activity (24 firms, average export intensity: 10%); moderate export activity (22 firms, average export intensity: 55%); dominant export activity (26 firms, average export intensity: 90%).

We have measured the product, process, organisational and marketing innovations, which were introduced between 2010-2012, impacts on firm performance. Two product innovation variables are differentiated in terms of the level of novelty they incorporate. New-to-the-market innovations refer to new or significantly improved products introduced before competitors and new-to-the-firm innovations refer to new or significantly

improved products that were already available from competitors. These variables encompass the innovation performance of firms as they are measured by percentage share of sales due to new products. According to the Oslo Manual (2005) a process innovation is the implementation of a new or significantly improved production or delivery method. Process innovations can decrease unit costs of production and increase quality. Marketing innovations can detect customer needs better, can find new markets, or position newly a firm's product on the market. The marketing innovation variable is ordinal. Its value is 0, if the firm did not introduce any kind of marketing innovation during the given time period; 1 if it introduced either new design/packaging or new sales/distribution methods; and 2 if it introduced both of them. Organizational innovations can reduce administrative and transaction costs, and can allow more intense information and knowledge flow inside the firm and with outside partners, this way generating more new ideas. The organizational innovation variable is also ordinal: 0 in lack of any kind of organizational innovation; 1 if either new knowledge management methods or new organization of work was introduced; and 2 if both type of organizational innovations were introduced.

It has been also supposed that more competitive products (in terms of quality, cost, market advantage, and product and process uniqueness) contribute to better firm performance. Factor analysis has been used to construct the variable of product competitiveness using the 5 items mentioned above (KMO=0.763). Foreign ownership is a dummy variable. Foreign owned companies play a key role in the Hungarian economy and innovation system. In Eastern-Europe our economy can be described the most as a dual economy, the vast majority of our export come from foreign owned firms. Multinationals contribute to the Hungarian business enterprise's R&D expenditures more than 50 percent. In the sample the ratio of foreign owned companies (with higher than 50% foreign property) is 29%.

Literature review

The majority of the empirical researches, many of them based on the CIS samples (e.g., Mairesse & Mohnen, 2010; Raymond et al., 2013), have found innovation as one of the most important sources of sustainable competitive advantage. Kendall et al (2010) based on an American sample of 272 firms over 19 years found positive relationship between new product announcements and firm performance in terms of return on assets (ROA) and sales growth. Gurhan et al., (2011) found that innovations performed in manufacturing firms have positive and significant impacts on firm performance. Another Turkish study also found positive relationship between technological (product and process) innovations and firm performance in the automotive supplier industry, but no evidence was found for relationship with organizational and marketing innovation (Murat et al.,

2013). Nham et al., (2016) based on a sample from Vietnam found that except product innovations the other three types of innovations (process, organisational, marketing) have a positive impact on firm performance. Camison and Villar-López (2014) concluded a positive and direct relationship between organisational and product innovation and firm performance, while the impact of process innovation on firm performance is mediated by product innovation.

Innovation and internationalization are intrinsically related, causality couldn't be identified, and it is a two-way relationship. On the one hand, the challenges of foreign markets force them to innovate; on the other hand, more innovative companies are more likely to be successful in international markets. According to Filippetti et al. (2011) innovative firms are more competitive on export markets than non-innovative ones, and the higher expectations induce innovation. Altamomte et al. (2013) concluded that there is some support for the "learning by exporting" channel mainly for less developed countries. Damijan et al. (2014) have examined the innovation-exporting relationship using a sample from four waves of CIS. They found a highly positive relationship between export and product, process, marketing and organisational innovations. They also found that the effects of export status on firms' innovation performance are substantially lower in the new EU member states. Contrary to these findings, Silva and Leitao (2007) concluded that Portuguese export intensive industrial firms were less capable of innovating, because the majority of them were subcontractors from the clothing and footwear industry, pursuing a low-price strategy. Monreal-Perez et al., (2012) very robust to endogeneity results suggest that self-selection hypothesis is much more valid than learning-by-exporting hypothesis. "That is, innovation induces firms to increase their export activities. … firms do not experience any learning-by-exporting effects on the obtaining of product or process innovations" (Monreal-Perez et al., 2012. p. 862). Halpern and Muraközy (2010) also found, based on the Hungarian sample of CIS that both product and process innovations have a positive impact on export propensity and intensity. Using a big and representative sample (EU-EFIGE/Brugel Survey dataset), similar results were gained by Carbini and Medda, (2017), namely that higher proportion of sales due to innovative products is positively related with export intensity (export/sales ratio). Beside the six Western European countries Hungary was the seventh member of this team.

Results

Table 2 contains the bivariate correlations of the variables. Our models' dependent variables show high correlation justifying the assumption that exported products have higher profit margin. There is also a strong relationship between export intensity and new-to-the-firm product innovation intensity. Bivariate correlation between profitability and marketing innovation is significant at 10 percent level, although it is not the

case in the regression model (Table 3) showing that other variables' impact is stronger. High novelty products are more competitive, (corr: .22; p= .04), and marketing innovation can increase the competitiveness of new products (corr: .34; p= .00), as the high correlation coefficients imply it. The high correlation of new-to-the-firm product innovation with marketing and process innovation refers to it that product adaptation comes with the launching of new packaging or distribution methods as well as changes in production or product design. Production innovation also requires the introduction of new organization of work (corr: .24, p= .02).

Table 2 Correlations of variables

	1	2	3	4	5	6	7	8
Export intensity	-							
Profitability	.26**	-						
Foreign ownership	.39***	.24**	-					
New to the market	.00	-.01	-.14	-				
New to the firm	.21**	.12	-.01	.14	-			
Process innovation	-.02	.09	-.11	.12	.28***	-		
Organisational inn.	.00	.16	-.16	.14	.05	.24**	-	
Marketing inn.	.07	.18*	-.14	.08	.21**	.04	.24**	-
New product perf.	.10	.18*	.06	.21**	.03	.10	.06	.34***

Significance levels: *0.1 **0.05 ***0.01

Table 3 contains the results of the regression analyses. Both models are significant and explain high proportion of variability of the dependent variables. White's test showed that there has been heteroscedasticity in the OLS regression, so, in order to correct heteroscedasticity we used weighted least squares (WLS) regression.

Foreign owned companies' export intensity is the highest and they are more profitable than the Hungarian ones. This finding is in line with the well-known dual characteristic of the Hungarian economy. Contrary to the expectations, new-to-the-firm type of product innovations contribute more to the export and financial performance of firms than new-to-the-market ones. Having in mind that the relationship is not significant statistically, there is a tendency that those of the firms introducing process innovations are less likely to export. Exporting firms apply new organizational and marketing methods more likely, although the relationships are not significant statistically.

Process and marketing innovations do not play a significant role in the profitability of firms. At the same time, organizational innovation – we suppose that mainly the introduction of new organization of work – have

enhanced the profit per employee ratio. Firms, introducing competitive products are significantly more profitable.

Table 3. Ordinal and OLS regressions of the impact of innovation on export intensity and financial performance in the Hungarian medium-sized manufacturing firms

Independent variables	Export intensity Ordinal regression		Profitability WLS	
	Estimate	*Std. Err*	*Coefficient*	*Std. Err*
constant			658*	358
Foreign ownership	1.94***	0.48	1629**	649
New to the market product inn.	0.00	0.01	−7	28
New to the firm product inn.	0.05**	0.02	27	38
Process innovation	−0.24	0.43	-220	449
Organisational innovation	0.11	0.47	783**	322
Marketing innovation	0.12	0.32	5	361
New product performance	0.18	0.25	666**	291
Chi-square (8)	24.49***			
Nagelkerke Pseudo R-squared	0.24			
Adjusted R-squared			0.10	
F stat			2.36**	
Number of observations	95		88	

Significance levels: *0.1 **0.05 ***0.01

Conclusions

The main objective of this study was to investigate the relationships between innovation types and firm performance within the context of the Hungarian medium sized manufacturing companies. The most striking result to emerge from this study was that the highest economic performance has been achieved by those of the firms whose high proportion of sales came from new-to-the-firm product innovations. The reason why product adoption has a significant effect on firm performance may be explained by the fact that it is less risky and generates less development costs. On the other hand, large part of the exporting Hungarian firms are suppliers, working on an outsourcing basis. They focus more on quality and price of existing products rather than on new product development.

Our research corroborates the positive relationship between organizational innovations and profitability per employee. We can suppose, that changes in the work methods can contribute to cost reduction and/or quality enhancement thus increasing profit of the products.

It is significant statistically, that product performance (compared with the competitors) has a positive impact on profitability. We have examined that why it is not significant in the case of export and found that beside the non-exporting companies, the heavy exporters' level of product performance

was the lowest, due especially to the Hungarian owned companies. Very likely, they are mainly subcontractors delivering less profitable parts. The highest result in terms of product competitiveness has been achieved by the moderate exporters. Among the Hungarian owned firms, the moderate exporters' products were the most competitive and profitable. So, we can conclude in line with what Reszegi and Juhász (2014) found, that there exist a successful group of the Hungarian companies whose revenue's about 40-60 percent comes from exporting competitive products. At the same time, as almost all of the foreign owned firms in our sample is an exporter and their financial performance better than the Hungarian ones', our study does not contradict the allegation about the dual characteristics of the Hungarian economy.

These findings have an important implications for managers, namely that the follower strategy for innovation can be rewarding, especially if the firm is able to reduce cost and/or improve quality. Another noteworthy thing is that marketing and organisational innovations are worth more attention, as they can contribute to the firms' export capability and profitability.
Because of the relatively small and cross-sectional sample, the results must be viewed with caution.

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