Competitive Regions, Competitive Firms? A Case Study on Hungary

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1 Introduction

Reducing regional inequalities and enhancing local competitiveness is one of the key focus points of not only national development policies but also included in the main EU-targets. The website of EU (2017) states that "regional policy targets EU regions and cities, boosting economic growth and improving quality of life through strategic investment." To serve this aim, the European Commission developed a regional competitiveness index (European Commission 2017) to measure the performance of sub-national regions within the EU. The RCI index value is calculated based on three sub-indices that integrate eleven pillars (Table 1). These pillars are calculated based on altogether 78 individual measures (Annoni et al. 2017). The index values are available for 2010, 2013, and 2016.

Once such a sophisticated measure of regional competitiveness is available, the question raises whether it is enough for the economic policymakers to aim at maximising RCI index to get closer to the EU development targets and boost economic growth. This paper analyses whether RCI scores and its elements have a direct link to the competitiveness of firms operating in the given area. As a case study, Hungary and its seven regions were picked.

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Table 1 Factors of the EU regional competitiveness index

Sub-index	Pillars
Basic sub-index	Institutions, macroeconomic stability, infrastructure, health, basic education
Efficiency sub-index	Higher education and lifelong learning, labor market efficiency, market size
Innovation sub-index	Technological readiness, business sophistication, innovation

Source: European Commission (2017)

2 Differences in Regional Competitiveness in Hungary

Why are there economic differences across regions? There are various recent papers investigating the question and coming up with different relevant causes.

Some link existence of these differences mainly to the level of economic development of the given country (Chan et al. 2010) assuming these disparities would disappear with advancements. However, various papers found poof of sub-national differences even in developed countries [Germany: Blume (2006), Wagner (2008), Italy: Basile et al. (2014), UK: Webber et al. (2007), US: Chan et al. (2010), and the EU: Bosma and Schutjens (2011)]. At the same not all developing countries suffer for such inequalities: Demchuk and Zelenyuk (2009) found no difference between eastern (mostly Russian speaking) and western (mostly Ukrainian speaking) regions of Ukraine.

Though, many additional explanatory factors were recommended in the last decade. Among others predominance of agriculture, a high proportion of the rural population, weak transport and telecommunication infrastructure (Raluca et al. 2010); quality of human workforce (Neagu 2011); development of trade, industrial development and the quality transportation infrastructure (Jovanović et al. 2012) were listed to have significant effect. Others identified as explanatory factors cultural differences (Bardy 2010); public administration quality (Di Liberto and Sideri 2015); local economic policy, social welfare spending, general income level of the population (Blume 2006); historical economic path (Wagner 2008); level of urbanisation and geographical location (Kourtit et al. 2012); local networking opportunities (Gellynck and Vermeire 2009); local capability to generate new knowledge and start-up firms (González-Pernía et al. 2012); peripherality, transport infrastructure, e-mobility (internet access, computer literacy) (Webber et al. 2007); geographical proximity to more developed markets, firm size-structure of the local economy (Braun and Cullmann 2011); proximity to knowledge assets (e.g. biotech firms, universities) and the funding venture capital firms (Kolympiris et al. 2015); ethnic differences (Chan et al. 2010); business-government connection, and local tax regulation (Remington 2016).

Juhász (2017) offers a summary of those factors (Table 2). It seems that most but not all of these are integrated into RCI. Particularly proximity effects of more developed areas are missing.

Table 2 Factors behind regional differences in competitiveness

Factors	Major elements
Infrastructure	Transportation, telecommunication, utilities, e-mobility, level of urbanisation
Proximity to more developed areas	Competitive pressure, distance to markets, spillover effects, cultural similarities/differences
Regional public administration	Institutions, regulations, development policy, taxation, incentives, criminality, support to local networks
Workforce	Level of training, availability, wage level, culture, ethnic characteristics, entrepreneurial attitude, labour mobility
Local demand	Population trends, income level, size of shadow economy, residential mobility
Stimulating business environment	Concentration of large firms, existence of large enterprises with developed technology relying on local suppliers, vivid start-up activity, nearby venture capital companies and knowledge sources (universities, R&D centres), well-operating business networks

Source: Juhász (2017)

Fig. 1 Regions of Hungary. Source: KSH (2018)

Together with several countries in the CEE region, Hungary (Fig. 1) also suffers from regional economic differences. Katona (2014) underlines that Central Hungary region including the capital (Budapest) was above 160% of the national average GDP per capita in 2012 (Budapest alone showed a remarkable 217% value) while three of the other six regions did not even reach 70% of the Hungarian average.

Table 3 Competitiveness of the Hungarian regions

Region	Basic sub-index		Efficiency sub-index		Innovation sub-index		RCI 2016	
Central Hungary (Közép-Magyarország)	34.44	125%	60.85	129%	56.63	197%	49.09	174%
Central Transdanubia (Közép-Dunántúl)	29.81	108%	51.05	108%	27.62	96%	30.90	109%
Western Transdanubia (Nyugat-Dunántúl)	31.88	115%	49.56	105%	28.12	98%	30.58	108%
Southern Transdanubia (Dél-Dunántúl)	24.31	88%	43.31	91%	24.93	87%	22.89	81%
Northern Hungary (Észak-Magyarország)	23.06	83%	40.78	86%	21.91	76%	20.07	71%
Northern Great Plain (Észak-Alföld)	25.75	93%	39.71	84%	19.68	69%	19.77	70%
Southern Great Plain (Dél-Alföld)	24.19	88%	46.08	97%	22.18	77%	24.30	86%
National average	27.63	100%	47.33	100%	28.72	100%	28.23	100%
EU average	61.75	223%	61.27	129%	49.30	172%	53.38	189%

Source: European Commission (2017)

These significant differences are well reflected in the RCI (Table 3). Central Hungary (Közép-Magyarország) ranks first regarding all (sub-) indices, Central Transdanubia and Western Transdanubia always come second or third. The other four regions lag far behind.

With a more in-depth investigation of the factors, we may learn that Institutions are weakest in Central Hungary (EU-wide standardised score: 28.16), but the difference to the best regions, the whole Transdanubia area (32.22) is relatively small. At the same time, Infrastructure score of the laggard Southern Transdanubia (11.59) is just a third of that of the neighbouring leader, Western Transdanubia (31.44). The minimum Health score (25.60) registered belongs to Northern Hungary, the top performer in this regard was Central Hungary (51.46). We have the same regions at the bottom and the top also for Higher Education and Lifelong Learning (scores: 43.96 and 65.09), Technological Readiness (40.48/56.84), Business Sophistication (10.40/44.38), and Innovation (18.64/60.10). Central Hungary also scored best (28.40) in Market Size, where the lowest value (8.82) belonged to Southern Transdanubia. In Labor Market Efficiency the leader was Central Transdanubia (62.96), the weakest performance was registered in Northern Great Plain (44.87).

Based on the RCI data, we can expect to experience significant gaps in firm-level average competitiveness across these regions. Before starting investigating those, we have to note that two of the eleven pillars have the same value for all regions within Hungary: Macroeconomic Stability and Basic Education help only to explain disparities between regions are located in different countries, but are not expected to be useful for to analyse one single country.

3   Sample and Methodology

To measure the strength of the link between the regional competitiveness factors and the business performance of the local companies, a sample of firms was set up using data from the official financial reports supplemented with information on headquarter location and employment data for the period 2010–2014 (database received from Bisnode Hungary). Firms were linked to a region based on the site of their headquarters. The analysis used the EU regions as categorisation variable.

The sample includes all non-financial private business entities employing at least 20 people in 2010, which provided precise ownership information (no offshore firms) and published full annual reports according to Hungarian Accounting Standards. Only companies with ongoing operations and positive equity book value throughout the whole period were considered. Businesses that went through legal transformation (e.g. due to mergers and acquisitions) were excluded. Due to all these restrictions, the sample is very likely to significantly over-perform the average of the corporate sector.

After the above exclusions, 1522 companies remained in the sample, of which 717 were foreign-owned. In 2010, 17.6 (total Hungarian economy above 20 employees: 6.2) percent of the firms in the sample had more than 250 employees, while 57.4 (32.9) percent employed 50–249 people. Table 4 presents the overall economic importance of the sample, while Table 5 offers an overview of the sample structure.

Table 4 The share of the sample in the total Hungarian manufacturing industry in 2011 (percent)

	Number of firms		Number of employees		Added value	
Firm size (employees)	1–249[a]	250+	1–249[a]	250+	1–249[a]	250+
Central Hungary	2.06	71.43	27.87	42.15	34.31	36.70
Southern Transdanubia	2.12	75.56	30.67	57.62	47.34	40.77
Northern Great Plain	2.38	65.79	28.93	85.92	43.87	67.93
Southern Great Plain	2.61	66.67	31.20	65.39	46.13	64.89
Northern Hungary	2.82	77.92	37.31	70.53	48.42	71.90
Central Transdanubia	3.05	56.82	36.06	81.16	49.52	99.03
Western Transdanubia	3.15	73.44	36.84	78.70	51.28	85.74

Source of national data: KSH (2013)
[a]The sample includes only firms of at least 20 employees

Table 5 Sample structure (number of firms)

Employment (2010)	Foreign-owned	Locally owned	Total
20–49	121	260	381
50–249	393	480	873
250+	203	65	268
Total	717	805	1522

Source: Author's results

Table 6 Competitiveness measures used

Factor	Measure
Growth	Annual percentage change in employment, sales, EBIT[a], and profit after tax[a]
Export performance	Export/sales, growth of export income
Level of technology	Wage/employee
Productivity	Sales/employee, EBIT/employee, Added value/employee
Profitability	EBIT/sales, Added value/sales
Efficiency	EBITDA/invested capital (ROIC)[a], Profit after tax/equity (ROE)[a]

Source: Author

[a]To remove extraordinary effects values outside the range −100%–+100% were not considered

For to assure a multidimensional approach, competitiveness was measured using various yearly ratios listed in Table 6. Rates were calculated for each year from 2010 to 2014.

For to identify connections among firm-level and regional competitiveness measures, the standardised factor data of the EU index for both 2013 and 2016 were added to the database. The fact that 2013 index values mainly build on information from the years 2010–2012 while 2016 index was calculated based on 2013–2015 data explains this decision. Including EU index data from two different measurement period also allows for identifying existing connection even if factor values for specific regions changed over time.

To control for connections, first regional average of all performance measures were calculated. Then Spearman's bivariate rank correlation was calculated for all possible pairs of regional and firm-level ratios. As the paper examines only the seven regions of Hungary, Pearson correlation coefficient seemed not to be adequate as that assumes normally distributed data across the sample and that assumption was refused at all levels of significance.

Zero hypotheses state no connection between the ranks established based on a given pair of measures. When summarising results, the analysis considered only relationships (refused zero hypothesis) significant at least 5%.

Based on the literature, differences among firms may arise not only due to regional effects but also because of internal factors (e.g. culture, technology, size) and industry characteristics. For to evade distortions in the results caused by these other factors, the analysis controlled for the type of shareholders (foreign/Hungarian, a proxy for management culture), size (based on employment) and in one case even for sub-industry influence. A step-by-step analysis was performed in order to remove the possible distortions possibly caused by these factors.

As theoretically a regional effect should last for several years, only significant connections that appeared in at least three of the 5 years examined were identified to have a regional source. At the same time, it is essential to see, that regional effects may be defined in at least two ways. (1) We may look at all effects that are caused by

regions as regional (harder to separate statistically) (e.g. bigger firms or companies of a given industry prefer one region over the other). On other option is (2) to limit the definition to differences across regions that are to explain only by spatial variables (less exact) (e.g. firm of the same size, ownership, industry perform differently in one area).

The latter definition would neglect all regional factors that influence business behaviour by affecting the control variables. Former papers identified several regional characteristics changing the distribution of size, ownership or sub-sectors of the firms (e.g. preference of FDI, the concentration of large enterprises, sector-specific regulations). Thus, this paper reviews regional differences both with and without the control variables.

4 Primary Results

When considering the total sample of manufacturing firms, we can only find three firm-level performance measures with significant rank correlation with any of the regional factors. Average wage over a number of employees, added value per employee and return on invested capital (ROI) all seem to be linked to regional competitiveness (Table 7 lists all the significant connections).

Beside of a limited number of firm-level variables connected to regional competitiveness, it is surprising when checking results that only negative relationships were to measure. In other words, counterintuitively firms in regions that are more competitive from one point or the other seem to be underperforming those companies active in less competitive regions. It is tough to reason why better health tends to decrease average wage or better technological conditions and a higher level of innovation decrease labour efficiency (added value/employee).

One possible explanation is that there are too many factors influencing the competitiveness of firms, for example, there was some restructuring within the manufacturing industry blurring the real connections. Therefore as a next step, the database was separated into two sub-samples based on the majority ownership. This variable should help us to see more clearly how different management culture was supported by regional factors.

For foreign-owned entities, four business performance ratios had significant connections with regional measures (Table 8). ROI does not appear here anymore, but two more efficiency measures appeared on the list: sales/employee and added value per sales.

As for wage per employee and added value per employee the same regional factors showed a connection with the same negative direction. Sales/employee ratio was negatively linked to labour market efficiency in 2016, but the added value content of sales showed positive link with the same regional measure.

When considering locally owned firms only, we receive a slightly different picture (Table 9). There are three firm-level competitiveness measures with significant connections: export intensity (Export/Sales), wage/employee, and Sales/

Table 7 Significant links for the total of the sample

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Wage/ employee	Health 2013	−0.821*	−0.821*	−0.821*	−0.821*	−0.964**
	Labour market efficiency 2013	−0.821*	−0.821*	−0.821*	−0.821*	−0.893**
	Labour market efficiency 2016	−0.929**	−0.929**	−0.929**	−0.929**	−0.857*
	Technological readiness 2013	−0.893**	−0.893**	−0.893**	−0.893**	−0.964**
	Technological readiness 2016	−0.893**	−0.893**	−0.893**	−0.893**	−0.964**
	Efficiency sub-index 2016	−0.857*	−0.857*	−0.857*	−0.857*	−0.929**
	Innovation sub-index 2016	−0.857*	−0.857*	−0.857*	−0.857*	−1.000**
	RCI 2016	−0.857*	−0.857*	−0.857*	−0.857*	−0.929**
Added value/ employee	Labour market efficiency 2013		−0.821*		−0.857*	−0.821*
	Labour market efficiency 2016	−0.857*	−0.929**	−0.857*	−0.893**	−0.929**
	Technological readiness 2013	−0.893**	−0.929**	−0.893**	−0.857*	−0.929**
	Technological readiness 2016	−0.893**	−0.929**	−0.893**	−0.857*	−0.929**
	Efficiency sub-index 2016	−0.821*	−0.893**	−0.821*	−0.821*	−0.893**
	Innovation sub-index 2016	−0.786*	−0.857*	−0.786*	−0.821*	−0.857*
	RCI 2016	−0.821*	−0.893**	−0.821*	−0.821*	−0.893**
	Health 2016	−0.786*	−0.857*	−0.786*	−0.821*	−0.857*
ROI	Innovation 2013	−0.893**	−0.821*	−0.786*		

Source: Author's results
*Correlation is significant at the 0.05 level (two-tailed)
**Correlation is significant at the 0.01 level (two-tailed)

employee. Wage/employee ratio has significant negative relationship to nearly all regional factors, thus it seems that people working in less competitive regions earn more. Export intensity appears to be negatively connected to the quality of regional infrastructure indicating accessibility of motorway, railways and airports. Sales/employee appears to be adversely linked to institutions (government effectiveness, low level of crime and corruption, ease of doing business) while the quality of the latter proved in earlier research to be a booster a competitiveness in other countries. Thus, it is doubtful that these connections would be casual and may signal that other factors not yet included in the investigation play a significant role in the competitiveness of the locally owned enterprises.

Table 8 Significant links for foreign-owned companies

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Wage/ employee	Health 2013		−0.786*	−0.786*	−0.857*	
	Labour market efficiency 2016	−0.893**	−1.000**	−0.893**	−0.964**	
	Technological readiness 2013	−0.821*	−0.929**	−0.929**	−0.964**	
	Technological readiness 2016	−0.821*	−0.929**	−0.929**	−0.964**	
	Efficiency sub-index 2016	−0.857*	−0.964**	−0.857*	−0.929**	
	Innovation sub-index 2016		−0.857*	−0.821*	−0.893**	
	RCI 2016	−0.857*	−0.964**	−0.857*	−0.929**	
Added value/ employee	Labour market efficiency 2016	−0.857*		−0.821*	−0.857*	−0.821*
	Technological readiness 2013	−0.857*		−0.821*	−0.786*	−0.821*
	Technological readiness 2016	−0.857*		−0.821*	−0.786*	−0.821*
	Efficiency sub-index 2016	−0.821*		−0.786*	−0.821*	−0.786*
	RCI 2016	−0.821*		−0.786*	−0.821*	−0.786*
Sales/ employee	Labour market efficiency 2016	−0.893**	−0.893**	−0.821*	−0.821*	−0.821*
Added value/sales	Labour market efficiency 2016	0.929**	0.929**	0.821*		

Source: Author's results
*Correlation is significant at the 0.05 level (two-tailed)
**Correlation is significant at the 0.01 level (two-tailed)

As presented in Table 5 it is the middle size (50–249 employees) category that has the highest number of firms. That is why as a next step mid-sized foreign and locally owned companies were separately analysed (Tables 10 and 11).

For foreign enterprises wage/employee and sales/employee showed significant connections once again, but for this sub-sample also the growth of employment and Export/Sales appeared to be linked to regional competitiveness. At this step, we first receive positive connections in line with theoretical expectations. Mid-sized foreign manufacturers in more competitive, innovative and efficient regions increased employment faster, while export intensity was higher in areas with more efficient labour market and employees also received a higher wage there. Sales/employee correlations are even at this level counterintuitive.

In case of the locally owned mid-sized firms, unfortunately, it still looks like the regional indices would measure precisely the opposite of what the companies

Table 9 Significant links for locally owned companies

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Wage/employee	Basic sub-index 2013	−0.821*	−0.786*	−0.821*		−0.786*
	Efficiency sub-index 2013	−0.857*	−0.857*	−0.857*	−0.786*	−0.857*
	Efficiency sub-index 2016	−0.857*	−0.857*	−0.857*	−0.821*	−0.857*
	RCI 2013	−0.857*		−0.857*	−0.786*	
	RCI 2016	−0.857*	−0.857*	−0.857*	−0.821*	−0.857*
	Health 2013	−0.929**	−0.786*	−0.929**	−0.857*	−0.786*
	Health 2016	−0.857*		−0.857*	−0.786*	
	Labour market efficiency 2013	−0.929**	−0.929**	−0.929**	−0.893**	−0.929**
	Labour market efficiency 2016	−0.821*	−0.893**	−0.821*	−0.857*	−0.893**
	Technological readiness 2013	−0.893**	−0.821*	−0.893**	−0.857*	−0.821*
	Technological readiness 2016	−0.893**	−0.821*	−0.893**	−0.857*	−0.821*
	Innovation sub-index 2016	−0.964**	−0.857*	−0.964**	−0.893**	−0.857*
Sales/employee	Institutions 2013		−0.810*	−0.926**	−0.926**	−0.810*
	Institutions 2016		−0.810*	−0.926**	−0.926**	−0.810*
Export/sales	Infrastructure 2016			−0.929**	−0.857*	−0.857*

Source: Author's results
*Correlation is significant at the 0.05 level (two-tailed)
**Correlation is significant at the 0.01 level (two-tailed)

experience. At the same time, it becomes evident that competitiveness of the locally owned businesses is influenced by different regional forces than that of the foreign-owned firms. It seems that local entities operate separately from the foreign counterparts, a signal for the existence of the dual-economy phenomenon. This finding is in line with results of several earlier investigations (Lengyel and Szakálné Kanó 2014; Gál and Juhász 2016; Juhász and Reszegi 2017; Lux et al. 2017).

When focusing on big (250+ employees) foreign-owned firms only, Export/Sales showed strong positive connections among others with RCI, Efficiency sub-index, Health, Technological Readiness, and Labor Market Efficiency for both 2013 and 2016. Both the Basic sub-index and Infrastructure from 2013 had a significant positive connection with ROE for the period 2010–2012. Though, all the numerous significant relationships of Wage/Employee ratio had a negative sign. As for big locally owned companies, Export/Sales showed significant positive link to Institutions from both 2013 and 2016 for the years 2012–2014.

Table 10 Significant links for mid-sized foreign-owned companies

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Wage/ employee	Labour market efficiency 2016	−0.857*		−0.857*	−0.964**	−0.893**
Sales/ employee	Market size 2016	−0.786*	−0.821*	−0.786*		
	Innovation 2016	−0.821*	−0.786*	−0.821*		
Change in employment	Basic sub-index 2013		0.786*	0.893**		0.929**
	RCI 2013		0.857*	0.821*		0.857*
	RCI 2016	0.786*	0.857*			0.857*
	Efficiency sub-index 2016	0.786*	0.857*			0.857*
	Innovation 2016		0.857*	0.786*		0.857*
Export/sales	Labour market efficiency 2016			0.786*	0.821*	0.786*

Source: Author's results

*Correlation is significant at the 0.05 level (two-tailed)

**Correlation is significant at the 0.01 level (two-tailed)

We may conclude based on these results that size and ownership need both to be controlled for first before any economically reasonable connections could be identified. Still, the links that were not only statistically but also theoretically acceptable show that the same firm-level variables are connected to different regional measures in case of the various sub-samples. Due to this, economic policy should focus on developing different fields to boost the business performance of a specific group of firms. For example, the export intensity of big locally owned firms needs well-functioning institutions to grow, while for big and mid-sized foreign-owned companies we should enhance the efficiency of the labour market to support the same measure.

The fact that even after controlling for size and ownership, we found no significant positive links for mid-sized locally owned entities may be the result of both the heterogeneity of the manufacturing industry and that of the business trends and effects that have a massive influence on these firms but were not involved in the analysis yet. Thus, as the last step, the industry was further narrowed to limit distortions due to foreign and local manufacturing firms having different sub-sectoral structure. For to keep sample size at maximum, the sub-sector "Manufacturing of Fabricated Metal Products" was chosen. There were 78 foreign and 82 locally owned mid-sized entities form this sub-sector in the sample. Due to this, the number of foreign or locally owned companies from a given region ranged from 6 to 19, what raises a severe limitation to the correct estimation of regional averages of the firm-level competitiveness measures.

For foreign-owned companies within the chosen sub-industry, there were no connections between firm-level and regional variables statistically significant for at

Table 11 Significant links for mid-sized locally owned companies

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Wage/employee	Basic sub-index 2013	−0.893**	−0.929**	−0.786*	−0.786*	−0.786*
	Basic sub-index 2016			−0.857*	−0.857*	−0.857*
	Efficiency sub-index 2013	−0.964**	−0.964**	−0.893**	−0.893**	−0.893**
	Efficiency sub-index 2016	−0.964**	−0.857*	−0.929**	−0.929**	−0.929**
	RCI 2016	−0.964**	−0.857*	−0.929**	−0.929**	−0.929**
	Health 2013	−0.893**		−0.821*	−0.821*	−0.821*
	Health 2016	−0.821*		−0.893**	−0.893**	−0.893**
	Labour market efficiency 2013	−0.929**	−0.821*	−0.964**	−0.964**	−0.964**
	Labour market efficiency 2016	−0.893**	−0.786*	−0.857*	−0.857*	−0.857*
	Technological readiness 2013	−0.929**	−0.750	−0.893**	−0.893**	−0.893**
	Technological readiness 2016	−0.929**	−0.750	−0.893**	−0.893**	−0.893**
	Higher education and lifelong learning 2016	−0.857*	−0.750	−0.893**	−0.893**	−0.893**
Added value/ employee	Basic sub-index 2016	−0.857*	−0.786*	−0.857*		
	Efficiency sub-index 2013	−0.821*		−0.821*		
	Efficiency sub-index 2016	−0.893**		−0.786*		−0.821*
	RCI 2013	−0.929**	−0.893**	−0.929**	−0.821*	
	RCI 2016	−0.893**		−0.786*		
	Health 2013	−0.964**	−0.929**	−0.964**	−0.857*	−0.857*
	Health 2016	−0.821*	−0.857*	−0.821*	−0.786*	−0.929**
	Higher education and lifelong learning 2013	−0.893**	−0.929**	−0.893**	−0.857*	
	Technological readiness 2013	−0.964**	−0.786*	−0.857*		−0.857*
	Technological readiness 2016	−0.964**	−0.786*	−0.857*		−0.857*
	Innovation sub-index 2016	−0.929**	−0.857*	−0.929**	−0.786*	−0.929**
	Business sophistication 2016	−0.821*		−0.786*		
Export/sales	Higher education and lifelong learning 2016		−0.786*	−0.786*	−0.786*	−0.786*

Source: Author's results

*Correlation is significant at the 0.05 level (two-tailed)

**Correlation is significant at the 0.01 level (two-tailed)

Table 12 Significant links for mid-sized locally owned companies in the sub-sector sub-sector of "Manufacturing of Fabricated Metal Products"

Firm-level ratio	Regional measure	2010	2011	2012	2013	2014
Added value/ employee	Basic sub-index 2013		−0.929**	−0.929**	−0.893**	
	Efficiency sub-index 2013		−0.857*	−0.857*	−0.857*	
	RCI 2013		−0.893**	−0.893**	−0.857*	
	Infrastructure 2013		−0.893**	−0.893**	−0.857*	
	Health 2013		−0.786*	−0.786*	−0.786*	
	Higher education and lifelong learning 2013		−0.821*	−0.821*	−0.786*	
	Market size 2016		−0.786*	−0.786*	−0.821*	
	Innovation 2016		−0.821*	−0.821*	−0.857*	
Change in profit after tax	RCI 2013	−0.929**	−0.821*	0.857*		
	Higher education and lifelong learning 2013	−0.964**	−0.857*	0.821*		

Source: Author's results
*Correlation is significant at the 0.05 level (two-tailed)
**Correlation is significant at the 0.01 level (two-tailed)

least 3 years of the 5-year period investigated. Results for locally owned firms are summarised in Table 12. Once again we see no positive connections except in case of the change in profit after tax for which signs of correlation coefficients change in 2012. This phenomenon could also be caused by noise coming from the estimation error of regional average for firm-level performance measures due to the low number of companies in this subsample.

5 Summary and Conclusion

This paper investigated the connection between regional competitiveness measures of the EU Commission and the firm-level competitiveness measures used in the literature. Ratios were calculated using a company database that covers 28–99% of people employed and added value created in the Hungarian manufacturing sector in the seven regions of the country respectively. To identify significant links Spearman's rank correlation coefficient was used at a minimum of 5% significance. Results are often counterintuitive, but support earlier research results on the structure of the Hungarian economy. The key conclusion could be summed as follows.

1. While regional competitiveness is measured in a very sophisticated way (11 factors, three sub-indexes, and an overall main index) none of the significant connections had the expected positive sign when considering the manufacturing industry in general. This result implies that an economic policy that does

only concentrate on boosting the regional competitiveness factors cannot be successful.

2. Controlling for the potential influence of ownership type and size, the list of the significant connections between regional factors and firm-level competitiveness measures changes radically. This means that to enhance the competitiveness of firms of different ownership and/or size economic policy has to use tailor-made tools, as there is no "one-size-fits-all" target to follow.

3. Connections with a sign in line with the theoretical expectations were only to find in case of big locally owned companies and foreign-owned entities when also controlled for size. This result suggests that the EU competitiveness factors have either very different or no effect at most of the locally owned firms. This phenomenon could be a sign of the existence of dual economy where the success of some players depends on another factor than that of the rest of the economy.

4. We could not identify any significant connections with a sign in line with the theory in case of locally owned mid-sized entities, not even when controlled for belonging to a specific sub-sector. Thus, we may suggest, that success of these firms is weakly connected to the factors that were controlled for, and other omitted variables (e.g. management style, personal connections, innovation) are more important. This result is particularly important as the Hungarian economic policy targets mainly the strengthening of SMEs.

Due to these findings, economic policymakers have to be more careful when selecting target variables to focus on, and should not just automatically aim at scoring better at the EU-wide regional competitiveness index. It seems that analysing why a country or a region is less competitive based on a specific measure will not necessarily offer a mean to figure out how to boost the business performance of the companies in the given area.

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