

# “A financial performance-based assessment of SMEs’ competitiveness – an analysis of Hungarian and US small businesses”

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## ARTICLE INFO

Vivien Csapi and Virgínia Balogh (2020). A financial performance-based assessment of SMEs’ competitiveness – an analysis of Hungarian and US small businesses. *Problems and Perspectives in Management*, 18(3), 452-464. doi:[10.21511/ppm.18\(3\).2020.37](https://doi.org/10.21511/ppm.18(3).2020.37)

## DOI

[http://dx.doi.org/10.21511/ppm.18\(3\).2020.37](http://dx.doi.org/10.21511/ppm.18(3).2020.37)

## RELEASED ON

Monday, 12 October 2020

## RECEIVED ON

Monday, 13 July 2020

## ACCEPTED ON

Tuesday, 29 September 2020

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## JOURNAL

"Problems and Perspectives in Management"

## ISSN PRINT

1727-7051

## ISSN ONLINE

1810-5467

## PUBLISHER

LLC “Consulting Publishing Company “Business Perspectives”

## FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

**50**



NUMBER OF FIGURES

**2**



NUMBER OF TABLES

**9**

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**BUSINESS PERSPECTIVES**



LLC "CPC "Business Perspectives"  
Hryhorii Skovoroda lane, 10,  
Sumy, 40022, Ukraine  
[www.businessperspectives.org](http://www.businessperspectives.org)

**Received on:** 13<sup>th</sup> of July, 2020  
**Accepted on:** 29<sup>th</sup> of September, 2020  
**Published on:** 12<sup>th</sup> of October, 2020

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**Conflict of interest statement:**  
Author(s) reported no conflict of interest

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# A FINANCIAL PERFORMANCE-BASED ASSESSMENT OF SMES' COMPETITIVENESS – AN ANALYSIS OF HUNGARIAN AND US SMALL BUSINESSES

## Abstract

The study aims to identify the financial performance measures used as a proxy of the firm-level competitiveness dimensions of small and medium-sized enterprises and their competitiveness. By investigating the factors that affect competitiveness in general, those areas will be introduced, related to an identified competitiveness dimension. Financial and non-financial performance indicators will assess these areas. The paper considers competitiveness as an outcome variable, suggests a relationship between financial performance and the identified areas, and searches for the financial performance measures drivers.

A panel data model was tested on Hungarian small and medium-sized enterprises (SMEs) and US SMEs. The collected data cover the period between 2013 and 2017. As a result of the applied panel regression, those variables were successfully identified that drive and could predict financial performance measures related to competitiveness. The research found a significant difference between the two-sample dataset results, which differences can be connected to country, industry, and, in general, to economic development characteristics.

The results provide decision-making support and hint about the managerial tools and techniques aiming to control the firm characteristics, performance, and, eventually, firm-level competitiveness. Based on the results, further research can be dedicated to the development characteristics of firm-level competitiveness and the analysis of the relationship between the competitiveness dimensions and competitiveness itself.

## Keywords

SMEs, firm-level competitiveness, financial performance, panel data, regression analysis, productivity, innovation

## JEL Classification

C33, G39, L25

## INTRODUCTION

Competitiveness is a complex, multidimensional phenomenon, a relative concept that combines economic, managerial, political, historical, and cultural aspects (Waheeduzzaman & Ryans, 1996; Chaudhuri & Ray, 1997). Competitiveness in general and competitiveness analyzed at different levels (firm-level, sector level, regional focus of economic activities, national level) of understanding is debated among the academic society and practitioners and policymakers. At the macro level, country-specific competitiveness reflects a country's ability to manage its resources and competencies to increase the aggregate wealth of its citizens (Deakins & Freel, 2012). At the intermediate level, regional competitiveness is based on firms' combined competitive advantage and the comparative advantage of a local economy (Budd & Hirmis, 2004; Szerb & Ulbert, 2009). The roots of competitiveness can be traced back to the micro-level, as firms' economic value sums up the competitiveness of industries and, ultimately, nations. Firm-level

competitiveness is the ability to deliver goods and services at the time and place, and in the form sought by buyers, while lowering the cost of production, providing superior value with superior returns on investment (Cook & Bredahl, 1991; Jiang, Jin, & Ren, 2017). From this research's point of view, the most appropriate definition for competitiveness comes from Basu (2011), who defines competitiveness as a multidimensional and complex concept that attempts to capture the process of fit between the firm and its dynamically evolving environment.

Small and medium-sized enterprises (SMEs) are rarely investigated through the lens of competitiveness. Depperu and Cerrato (2005) set out the economic and market performance indicators generally connected to competitiveness. The publicly available information about the frequently used performance measures, whether financial or non-financial, is limited and makes the research focus more larger-firm oriented. However, an SME is not a scaled-down version of large enterprises (Wisenthige & Guoping, 2016). Even though an increasing number of international studies focus on SMEs' competitiveness, there is still a lack of research focusing on Hungarian firm-level competitiveness. In contrast, neither Hungarian nor international focus aims to connect SMEs' competitiveness and financial or non-financial performance measures.

SMEs account for more than 25 million registered entities in the Old Continent and around 30 million in the United States, accounting for 99.8% and 99.4% of all enterprises. SMEs create the newest private-sector jobs and are responsible for 56.4% of the value-added generated by the business sector (EU Publication Office, 2020, p. 11). SMEs in Hungary are considered the central pillar of the economy, the primary source for jobs, and the economy's growth.

If an SME wants to become or remain competitive on the market, evaluating performance and effective resource utilization monitoring is inevitable. Competition is what requires SMEs to monitor their performance. Although performance measurement has potential benefits, it remains a too complex field for SMEs that requires too much effort from the firms, both in terms of human capital and financial resources.

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## 1. LITERATURE REVIEW

Even though competitiveness has gained widespread attention in the economics and business literature over the past decades, the debate about the actual meaning of the concept of firm-level competitiveness is not yet solved, nor the issues about its assessment and measurement (Blandinieres, 2017). The various definitions available could be classified as competency-based and resource-based approaches. Competency approaches focus on the firms' abilities and capacity to fulfill the needs of their customers more efficiently than the competitors do (Budd & Hirmis, 2004); to use technology, quality, and performance for profit and growth (OECD, 1992); to compensate employees and provide incremental returns to shareholders (Buckley, Pass, & Prescott, 1988); to compete in a given business environment (Porter, 1990). Later, incorporating more dynamic aspects, a resource-based approach arrived with empha-

sis on the specific characteristics of a given firm (Buckley et al., 1988). The competency approach identifies the crucial determinants of firms' competitiveness, such as strategy, structure, competencies, and capabilities, but now from an innovation, flexibility, adaptability, speed, and agility perspective (Hamel & Prahalad, 1989; Barney, 2001). Overall, firm-level competitiveness is usually related to the ability to fulfill firms' double purpose, make a profit through meeting your customer requirements, while continuously adapting, in short, to survive in the market (Chikán, 2008). The definitions mentioned above suggest that measuring a firm's competitiveness should incorporate quantitative measures and qualitative indicators.

From the above mentioned variable perspective derived (Chaudhuri & Ray, 1997), Depperu and Cerrato (2005) propose a classification, according to which competitiveness could either be considered as an input (driver) or output variable of firm

performance (Akben-Selcuk, 2016). Buckley, Pass, and Prescott (1988) introduced a mixed concept, considering competitiveness as the driver of performance and a result of that. They distinguished competitive performance to assess the past and current firm performance; competitive potential to define the current and future competitive performance of a firm based on internal factors; firm capabilities to be able to translate competitive potential into actual or prospective performance. Building on that, in this research, competitiveness is approached through the dimensions of competitive performance, competitive potential, and firm-related capabilities.

Resources, may they be assets or labor-based resources that the company currently has, and those that it lacks and what it needs to grow, were the bedrocks of our models. The productivity of these assets determines competitive performance, while the resource of research and development (R&D) is the key to translating competitive potential, innovation into future performance. The level of innovation plays an important role in SMEs' business performance (Rostek, 2012).

Measuring company competitiveness is more like assessing it. There is not an appropriate proxy for firm-level competitiveness. The existing literature suggests approximating company competitiveness with some profitability, productivity, market performance measures, or unique indexes (Bhawsar & Chattopadhyay, 2015; Oral, Cinar, & Chabchoub, 1999; Liargovas & Skandalis, 2010). The paper connects competitive performance to productivity measures based on that well-documented and proven practice and resource-based logic. Figure 1 contains the applied regression models' dependent (total asset turnover, labor productivity, R&D expenditure) and independent variables (gross margin, size, age, growth, liquidity, leverage). These variables are meant to explain and predict the financial performance measures that drive the competitiveness dimensions.

Some would think measuring performance and measuring financial performance is an easy job, but it is far from being solved, especially at the SME level. With it being easy to understand results, financial performance measurement is a commonly recognized process to assess and ana-

lyze firms; it provides essential information for investors, financial analysts, auditors, and management. Despite its advantages, as it was summed up by Katone (2016), SMEs rarely apply performance measurement systems due to the lack of capital and labor resources, and intense competition (Garengo et al., 2005); still, most SMEs focus more on financial indicators (Massalla, 1994; Monkhouse, 1995), relying mainly on accounting information and financial measurements (Carpinetti, Galdámez, & Gerolamo, 2008).

This paper aims to give a clear picture of firm-level competitiveness and how SMEs should assess it from a financial performance-based perspective. It compares SMEs from a less developed country (Hungary) to SMEs from a developed country (USA) based on their financial performance-based competitiveness determinants.

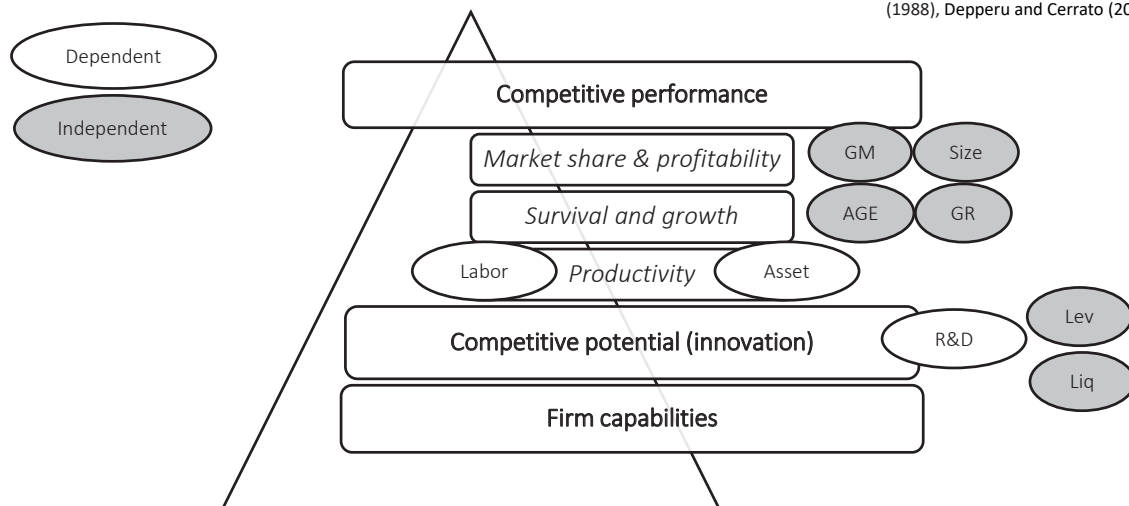
## 2. METHOD

The following financial performance measures were picked for the research after breaking down competitiveness into competitive performance, competitive potential, and firm capability (see Figure 1):

1. Competitive performance dimension:
  - Total asset turnover, which ratio evaluates the efficiency of managing all the company's assets.
  - Labor productivity corresponds to the total earnings before interest and taxes created by the company's labor.
2. Competitive potential dimension:
  - R&D expenditure is the key indicator of the inputs into innovation, measured by the research and development costs related to net sales.

Mixed expectations can be connected to the explanatory variables. Since competitive performance is determined by market share, profitability, survival, growth, and productivity (see Figure 1), the most commonly used financial ratios were

Source: Own construction based on Buckley et al. (1988), Depperu and Cerrato (2005).



**Figure 1.** Competitiveness dimensions and the way to assess them

picked to express potential effects and predict power on the chosen measures in the financial analysis practice.

Market share's proxy was the firm size, which is frequently involved in the financial performance-based competitiveness analyses since it is one of the first and most influential decisions of a company. Führer and Michael (2004) argue that firm size affects a company's financial performance significantly and will increase more. Based on the traditional neoclassical view, one would anticipate a positive relationship between firm size and financial performance. Recent evidence shows firm size has positive and harmful effects on financial performance and, thus, overall competitiveness. Firms with larger size measured by their net sales, usually benefit from economies of scale, specialization, and diversification. They access capital and qualified human capital better and have higher negotiation power with stakeholders (Hall & Weiss, 1967; Damoah, 2013; Hirsch, Schiefer, Gschwandtner, & Hartmann, 2014; Yang & Chen, 2009). Larger size could be a burden since corporate inertia, bureaucracy, operational rigidity, higher transaction costs, and communications or exposure to public scrutiny could backlash to performance (Greve, 2011; Loderer & Waelchli, 2010; Park, 2003; Tripsas & Gavetti, 2000). On the other hand, evidence indicates that a smaller firm size can come with greater innovativeness, flexibility, and creativity (Nieto & Santamaría, 2010).

Profitability is a useful indicator of financial performance with a positive effect on competitiveness but is usually considered the financial performance itself. No evidence is available about profitability's effect on competitiveness as a value driver of other financial performance indicators.

Company age was chosen as a measure to assess the survival and experience possessed by a company. Previous studies documented the positive effect of learning, experience, and reputation on production processes, costs, sales, and quality (Hannan & Freeman, 1989; Loderer & Waelchli, 2010). Less flexible and to the dynamically changing environment, hardly adaptable older firms could end up with organizational rigidities, slow growth, and a lag in the market development (Sørensen & Stuart, 2000; Hirsch et al., 2014).

Growth is expected to positively affect financial performance; thus, competitiveness (Abor, 2005).

Regarding leverage, a positive relationship was documented by Ghosh (2000), Roden (1995), and Taub (1975), but according to Gleason, L. Mathur, and I. Mathur (2000) and Simerly-Li (2000), using more debt in the capital structures of the firm could lead to lower financial performance also.

The same mixed expectations could be defined regarding liquidity. Profitability and liquidity can complement each other, but excessive investments in current assets could end up in adverse effects



(Goswami-Sarkar, 2011). Table 1 summarizes the expected impact of the financial areas on financial performance, thus on competitiveness.

**Table 1.** Expected impact of financial areas on competitiveness

Source: Own construction.

Financial performance measures	Expected impact on financial performance/ competitiveness
Market share	+/-
Profitability	+
Growth	+
Survival	+/-
Liquidity	+/-
Leverage	+/-

Two sample countries were chosen to determine the effect, the explanatory power, and the predicting power of financial metrics on the competitiveness dimensions. SMEs' data from Hungary and the United States of America were collected from the Hungarian OPTEN database and the Wharton Compustat database running from January 2013 to December 2017. A shortlist of data was determined by filtering and using only those firms that have available data in all of the years investigated, and/or have most of the data that was needed for the research variables (since not every balance sheet and income statement data is obligatory to report about). In the case of the missing values, the linear interpolation method was applied based on company ID in the case of the Hungarian data set, on four-digit SIC codes in the US data set (industry bias is solved in the US sample). The final sample included 225 Hungarian firms per year and a total of 1,135 firm-years of observations and 982 US firms and a total of 4,607 firm-years of observations.

Based on identified competitiveness dimensions and the connected financial performance measures, the following explanatory variables' impact on firm-level competitiveness will be analyzed:

$$Financial\ performance = f(size; age, liquidity, leverage, gross\ margin, growth). \quad (1)$$

This relation was estimated with dynamic panel data regression. Regarding the research questions and hypotheses, regression analysis is the most appropriate methodology for answering these

questions. Because regression analysis is a process of analyzing the relationship between a metric dependent and one or more independent variables, it will enable us to construct an optimal model that will detect the firm-level competitiveness drivers. After all, in the regression calculation, the existence, direction, and strength of the relationship between the variables need to be estimated.

Table 2 provides the calculation methodology for the chosen dependent and independent variables, where the first three variables are the dependant and the rest of are the independent variables.

**Table 2.** Variable definitions and calculation methodology

Variable	Definition
Labor productivity LABOR	Natural log of (earnings before interest and taxes)/number of employees
R&D expenditure R&D	Natural log of development expenditure/net sales
Total asset turnover TAT	Natural log of net sales/total assets
Growth GR	Natural log of the change in net sales compared to the previous year.
Liquidity LIQ	Natural log of the firm's current ratio (current assets divided by current liabilities)
Leverage LEV	Natural log of the firm's total debt ratio (interest-bearing debt divided by the value of total assets)
Size S	Natural log of the firm's net sales
Survival, age AGE	Natural log of the number of days elapsed between the last day of the reporting year and the date of incorporation
Gross margin GM	Natural log of (net sales minus cost of goods sold)/net sales

Based on the variables shown in Table 2, three different regression equations were assessed, each regressing one of the three dependent (TAT, LABOR, R&D) variables on the same set of explanatory variables. Due to the structure of the dataset, and to be able to deal with cross-sectional and time issues, panel data estimation was utilized. The following regression model was analyzed:

$$Y_{it} = b_0 + b_1X_{it} + a_i + u_{it}, \quad (2)$$

where  $Y_{it}$  was one of the dependant financial per-

formance measures (TAT, LABOR, R&D) for firm  $i$  in year  $t$ . At the same time,  $X_{it}$  represents the independent variables, which are publicly available financial and business data of the firm  $i$ ,  $b_0$ , and  $b_1$  in equation (2) are regression parameters,  $a_i$  is the unknown intercept for each firm and  $u_{it}$  is the error term.

A different intercept was modeled for each firm due to cross-sectional heterogeneity and the time-variant variables. The Durbin-Wu-Hausman test (commonly called the Hausman specification test) was applied to decide whether the fixed-effects or random-effects model had to be used. The Hausman test assesses the correlation between unique errors and regressors (Greene, 2011). According to the fixed-effects model's assumption, the time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics.

### 3. RESULTS

The Hausman specification test's null hypothesis assumes that the preferred random model estimate is insignificantly different from the fixed effects estimate can be rejected (despite the relatively large chi-square values in the case of the US sample, since only the  $p$ -value is of interest).

Therefore, a fixed-effect panel data regression was applied. In addition to firm fixed effects, the yearly period fixed effects were added to the model based on the analysis conducted by Akben-Selcuk (2016), to take the influence of economic fluctuations also into account. The lagged values of the dependent variables were included as explanatory variables to assess the impact of past performance. To address potential heteroscedasticity concerns, the Eicker-White standard errors were included in the output tables (White, 1980).

**Table 3.** Chi-square ( $\chi^2$ ) statistics in the Hungarian and US sample

Models	HUN	US
1st model (TAT)	$\chi^2 = 54.65 (p < 0.000)$	$\chi^2 = 4602.89 (p < 0.000)$
2nd model (Labor)	$\chi^2 = 97.00 (p < 0.000)$	$\chi^2 = 7969.89 (p < 0.000)$
3rd model (R&D)	$\chi^2 = 284.62 (p < 0.000)$	$\chi^2 = 1763.63 (p < 0.000)$

**Table 4.** Correlation matrix

Variable	Size	Age	Liquidity	Leverage	Gross margin	Growth
<b>(a)</b>						
Size	1.0000					
Age	0.2684	1.0000				
Liquidity	-0.0063	0.0952	1.0000			
Leverage	0.0497	-0.0054	-0.5504	1.0000		
Gross margin	0.0363	0.0416	0.1288	-0.1005	1.0000	
Growth	-0.2510	-0.1191	-0.1004	0.0417	-0.0345	1.0000
<b>(b)</b>						
Size	1.0000					
Age	0.0416	1.0000				
Liquidity	-0.3662	-0.0127	1.0000			
Leverage	0.1679	-0.0037	-0.1687	1.0000		
Gross margin	-0.4775	-0.1618	0.2075	-0.0641	1.0000	
Growth	-0.4261	-0.1313	0.2211	0.0137	0.2499	1.0000

Multicollinearity is tested with the absolute correlation coefficients, that need to be below the threshold value of 0.6, to avoid highly linearly related predictors. Table 4 shows the correlation matrix of the independent variables for the Hungarian data (a), and the US data (b), and proves that multicollinearity is not a concern in the research.

The following section presents the results of the panel regression analysis. It discusses the variables that significantly affect the financial performance based competitiveness of the Hungarian and US firms, assessed by their total asset turnover, labor productivity, and R&D expenditure. Table 5 presents descriptive statistics on the variables involved in the regression model. Since the natural log of all the data was calculated and used for further analysis, it is useless to interpret the table's mean values. Still, the standard deviation uncovers some crucial issues about the sample's characteristics. As it was expected, total asset turnover, employee number based labor productivity, and R&D expenditures vary the most among the companies involved. This standard deviation is much lower in the US sample. However, according to their assets, on average smaller companies landed in the sample (while filtering the available data, a filter was applied down to those companies that reported R&D related expenditures in the last five years in both the Hungarian and US dataset).

The results of the panel data regression are shown in Tables 6-8. According to the first regression model, in the case of the Hungarian companies, almost none of the variables employed proved to be significant in explaining the variation in financial performance measured by their asset-based productivity indicator, the total asset turnover. Only the lagged variable shows a significant relationship; thus, past productivity drives future productivity. The explanatory powers of the models reflected by the R-square results are both acceptable, in the case of the US sample, even higher than 40%.

In the US, sample size, growth, and past productivity positively and significantly affect productivity. A surprising result of what liquidity and the gross margin ratio is showing. The more liquid a company is, the less productive it becomes, and the same can be recognized regarding gross margin. The higher the profit ratio, the less productive the company will be. Although it needs to be further investigated, the phenomena could have to do something with the relatively high cash reserves of some innovative companies, even among small and medium-sized ones, and with the profit improvement strategy of the companies during the investigated period (cost reduction instead of revenue focus, which could lead to short term

**Table 5.** Descriptive statistics for the Hungarian data (a) and the US sample (b)

Variable	Obs.	Mean	Std. Dev.	Min	Max
<b>(a)</b>					
TAT	1,134	1.203893	1.525393	0	40.91667
LABOR	1,043	7.076587	1.58996	-2.175487	20.39022
R&D	1,122	-4.561356	2.642897	-14.93674	6.231988
Size	1,130	13.90377	2.362864	0	21.78941
Age	1,134	8.636723	0.567587	4.290459	9.250522
Liquidity	1,134	0.38149	0.927147	-6.68364	9.400443
Leverage	1,130	-0.8852084	1.014979	-18.14462	4.746231
Gross margin	1,125	-0.3265258	0.6152943	-10.05315	5.55354
Growth	1,134	-0.1080171	1.802178	-7.597189	11.24482
<b>(b)</b>					
TAT	4,607	-0.5668153	0.6475244	-3.457663	1.323907
LABOR	4,539	3.566334	0.8795423	-1.459097	7.071211
R&D	4,607	-2.434605	1.646921	-8.570286	1.517174
Size	4,607	5.612155	1.740378	-2.830218	11.54184
Age	4,597	8.522113	0.726999	3	10.11
Liquidity	4,601	0.8510303	0.4390953	-4.915878	2.971165
Leverage	4,537	-2.23451	1.012024	-14.29851	1.951456
Gross margin	4,598	-0.8182443	0.4096149	-4.562449	-0.0539591
Growth	4,550	-2.077526	1.141958	-14.11886	5.888441



**Table 6.** Results of the fixed effect panel regression, 1st model, dependent variable: TAT

TAT	Hungarian data					US data				
	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]
Size	0.006	0.007	0.920	0.361	-0.007 0.019	0.23	0.01	17.37	<b>0.00</b>	0.20 0.25
Age	-0.151	0.105	-1.440	0.152	-0.358 0.056	0.00	0.00	-0.01	0.99	0.00 0.00
Liquidity	0.167	0.139	1.200	0.233	-0.108 0.442	-0.05	0.02	-2.41	<b>0.02</b>	-0.09 -0.01
Leverage	-0.053	0.051	-1.050	0.294	-0.153 0.046	0.00	0.01	-0.67	0.50	-0.02 0.01
Gross margin	-0.083	0.102	-0.810	0.418	-0.284 0.118	-0.07	0.03	-2.32	<b>0.02</b>	-0.14 -0.01
Growth	0.010	0.011	0.930	0.352	-0.011 0.031	0.01	0.00	2.23	<b>0.03</b>	0.00 0.01
TAT t-1	0.432	0.021	20.930	<b>0.000</b>	0.391 0.473	0.27	0.02	12.48	<b>0.00</b>	0.23 0.31
Constant	1.779	0.943	1.890	0.061	-0.079 3.638	-1.72	0.10	-16.99	0.00	-1.92 -1.52
F-statistic	128.42					F-statistic	123.13			
Prob > F	0.000					Prob > F	0.000			
R <sup>2</sup>	<b>0.2699</b>					R <sup>2</sup>	<b>0.4201</b>			
Nr of obs	<b>1,120</b>					Nr of obs	<b>4,473</b>			

productivity concerns). The two sample's varying results mirror firm-specific, country-specific, and even size-specific effects.

The second regression model has even higher explanatory power than the first one when explaining the labor productivity ratio's variation in financial performance. The Hungarian companies show a significant negative connection with the profitability ratio among explanatory variables, and a positive connection to past labor productivity. The higher the profitability, the less productive the employees will be. Profitability shows a negative impact again, but this time on employee productivity. Does the higher profit come with or from less (productive) employees (a sign of automatization or motivation problems, employee treatment in general)? The US data also shows

an expected significant and positive relationship with the profitability and growth rates. The remaining variables do not significantly affect labor productivity.

According to the third model, older Hungarian small and medium-sized companies are less willing to invest in research and development. This significant relationship cannot be found in the US dataset. The lagged variables drive the dependent variable again in both cases. In the Hungarian dataset size and in the US sample size, growth and liquidity are negatively related to R&D expenditures. While US companies that carry higher amounts of interest-bearing debt spend more on research and development larger (according to their asset amount), SMEs are less willing to innovate and spend money on R&D.

**Table 7.** Results of the fixed effect panel regression, 2nd model, dependent variable: LABOR

LABOR	Hungarian data					US data				
	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]
Size	0.01	0.01	1.16	0.25	-0.01 0.04	-0.08	0.09	-0.83	0.41	-0.26 0.10
Age	0.16	0.18	0.92	0.36	-0.19 0.51	0.00	0.00	0.33	0.74	0.00 0.00
Liquidity	0.02	0.10	0.18	0.86	-0.18 0.21	0.08	0.08	1.09	0.28	-0.07 0.23
Leverage	0.00	0.03	0.08	0.93	-0.05 0.06	0.01	0.01	1.04	0.30	-0.01 0.04
Gross margin	-0.43	0.17	-2.55	<b>0.01</b>	-0.77 -0.10	0.31	0.12	2.61	<b>0.01</b>	0.08 0.54
growth	0.01	0.01	0.77	0.44	-0.02 0.04	0.03	0.01	2.63	<b>0.01</b>	0.01 0.05
Labor t-1	0.52	0.06	8.57	<b>0.00</b>	0.40 0.65	0.15	0.05	3.28	<b>0.00</b>	0.06 0.25
Constant	1.67	1.45	1.15	0.25	-1.19 4.53	3.69	0.82	4.47	0.00	2.07 5.31
F-statistic	15.9					F-statistic	8.07			
Prob > F	0.000					Prob > F	0.000			
R <sup>2</sup>	<b>0.4464</b>					R <sup>2</sup>	<b>0.4447</b>			
Nr of obs	<b>1,014</b>					Nr of obs	<b>4,444</b>			

**Table 8.** Results of the fixed effect panel regression, 3rd model, dependent variable: R&D

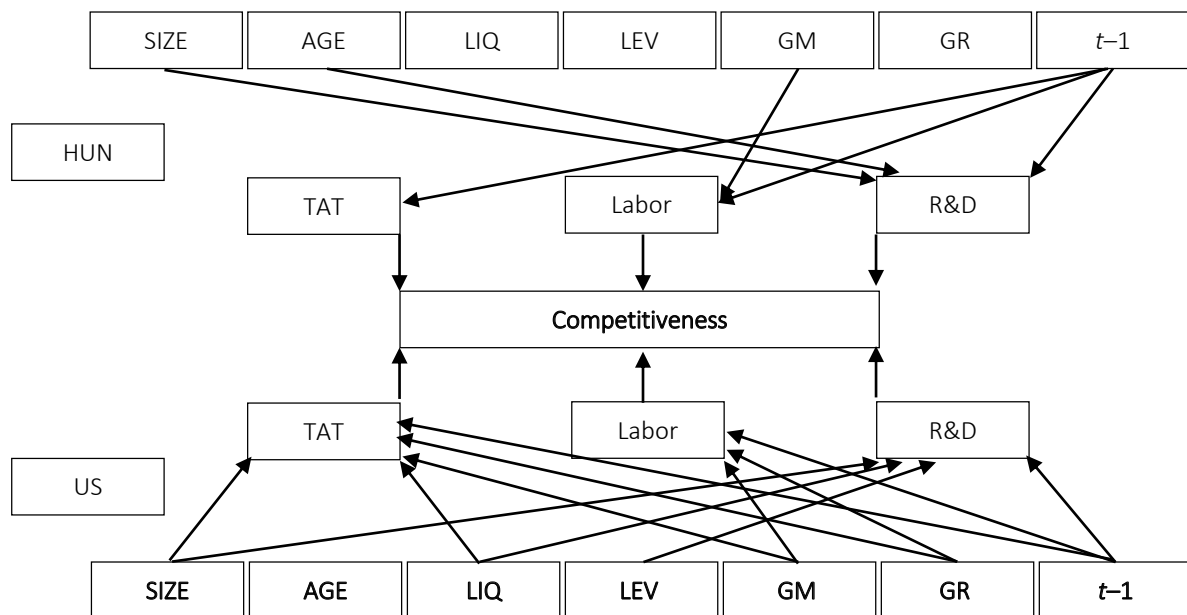
R&D	Hungarian data						US data					
	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]		Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]	
Size	-0.02	0.01	-1.93	0.05	-0.04	0.00	-0.25	0.07	-3.51	0.00	-0.39	-0.11
Age	-0.40	0.17	-2.31	0.02	-0.74	-0.06	0.01	0.00	-2.06	0.83	0.00	0.00
Liquidity	-0.11	0.08	-1.40	0.16	-0.26	0.04	-0.10	0.05	-1.93	0.05	-0.20	0.00
Leverage	-0.06	0.04	-1.48	0.14	-0.14	0.02	0.02	0.01	1.89	0.05	0.00	0.04
Gross margin	-0.06	0.05	-1.27	0.21	-0.16	0.03	-0.00	0.06	-0.07	0.98	-0.12	0.11
Growth	-0.02	0.02	-1.08	0.28	-0.06	0.02	-0.03	0.01	-5.63	0.00	-0.04	-0.02
R&D T-1	0.55	0.03	16.93	0.00	0.49	0.62	0.33	0.05	6.76	0.00	0.23	0.42
Constant	1.61	1.47	1.10	0.27	-1.28	4.51	-0.06	0.46	-0.13	0.90	-0.95	0.83
F-statistic	50.34						F-statistic 34.18					
Prob > F	0.000						Prob > F 0.000					
R <sup>2</sup>	0.3943						R <sup>2</sup> 0.3902					
Nr of obs	1,111						Nr of obs 4,473					

### 4. DISCUSSION

Figure 2 summarizes the relationship between the dependant and independent variables. Only four variables in the Hungarian sample ended up valid in the models, size, age, gross margin, and lagged values of each dependent variable. Liquidity, leverage, and growth rate cannot explain the productivity and innovativeness of the Hungarian SMEs. In the US data-based analysis, age is the only independent variable related to any dependent variable. Growth rate and lagged values have a significant impact on every dependent variable. This result highlights important financial areas and determi-

nants for managers who seek more data and guidance about the variables affecting the firm’s financial performance based competitiveness. Financial managers could build on these results and monitor these factors in their decision support system. At the same time, active control mechanisms could be directed on them for the sake of performance enhancement. Overall, profitability and size ended up as the factors that could improve (one way or another) financial performance and competitiveness (in both samples).

According to the research’s empirical findings, financial and accounting data-based measures can



**Figure 2.** Relation of dependent and independent variables in the two datasets-based research

**Table 9.** Specific impact of the financial areas on competitiveness in the Hungarian and US samples

Source: Own construction.

Financial performance measures	Expected	The impact in the Hungarian sample	The impact in the US sample
Market share	+/-	-	+
Profitability	+	-	+/-
Growth	+	Not relevant	+
Survival	+/-	-	Not relevant
Liquidity	+/-	Not relevant	-
Leverage	+/-	Not relevant	+

play an important role in shaping the firm-level competitiveness of both the Hungarian and US SMEs. As Table 9 summarizes, the expected relationship was identified in the case of almost every explanatory variable among US SMEs. Age was the only factor that ended up not being a relevant determinant of the financial performance and competitiveness that we are analyzing. The expected impact signs were explored in the previous literature; only the negative effect of profitability in the first model indicates different intension of overall competition in the markets, or operation and resource shift (Boone, 2004). Only three variables can explain

the variation in the chosen productivity measures and R&D expenditure in the Hungarian sample. Surprisingly, the impacts of these variables are all negative, where previous evidence exists, except the case of labor productivity. Here, this research applied a shift from the profitability focus to existing and future resource determined focus.

For an investor in Hungary, „the smaller and younger, the better” SMEs with financial performance and competitiveness, and in the US, large, profitable SMEs with growth potential will be worth to invest.

## CONCLUSION

Competitiveness has gained widespread attention in economic literature over the past decades.

This paper intended to authentically connect the competitiveness dimension to financial performance measures and indirectly to the latter's drivers. The financial performance was measured by the productivity and R&D expenditure related ratios as potential measures of one of the three competitiveness dimensions.

A firm's competitive performance was proxied by two performance/productivity indicators, by the total asset turnover and labor productivity, while competitive potential, the ability to innovate by the R&D expenditures as a percentage of net sales.

The time scope of the analysis covered the years between 2013 and 2017, and the sample consisted of 225 Hungarian SMEs and 982 US SMEs according to their size measured by total assets and their number of employees. On average, 1,100 and 4,500 firm-year observations were analyzed. The robust standard error included fixed-effect panel regression results showing that financial and accounting data-based measures could significantly shape firm-level competitiveness in both samples.

Based on the research results, the following conclusions could be drawn. First, the two samples provided two entirely different pictures about the drivers of the Hungarian and US SMEs' financial performance. The Hungarian firms are still narrowing down their focus on profitability, incumbent firms are unwilling to innovate, and plans and predictions are built on historical parameter values.

In the US results, the gross margin ratio's profitability has a significant but mixed impact on the chosen dependent variables; in two cases, a negative relationship was documented (TAT, R&D). The leverage

variable has shown a positive sign for the R&D regression, suggesting that more leveraged US firms tend to spend more on research and development. The next surprising result that emerged from the empirical research is that the current ratio measure of liquidity has a negative impact on total asset turnover and R&D expenditures. As expected, a mixed result was found regarding the firm size. Firm size proved to positively and significantly affect asset productivity, but a negative one on R&D expenditures. Finally, growth has been found to positively impact productivity and a significant negative effect on R&D. In contrast, all three financial performance measures are positively related to their lagged values.

The results derived from the analysis helped to explore the relationship between financial performance and the chosen firm-specific variables (size, age, liquidity, leverage, gross margin, growth, lagged values). The differences between the countries suggest economic development-related origins. Managers of an emerging country based SME could consider the Hungarian results, while managers of a developed country could consider the US results for decision support improvements. They could control some of the firm's resources and capabilities to obtain enhanced performance outcomes. Investors could also find useful hints regarding their investment aim and focus.

However, there are areas of this research that need to be further investigated. Further research can aim the search for country-specific or development-related characteristics of firm-level competitiveness. The relationship between the competitiveness dimensions and the chosen dependent variables needs to be tested as well. Additional research potential is in the analysis of further emerging and developed country-based SMEs.

## AUTHOR CONTRIBUTIONS

Conceptualization: Vivien Csapi.

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Formal analysis: Vivien Csapi.

Investigation: Virgínia Balogh.

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Writing – review & editing: Vivien Csapi, Virgínia Balogh.

## ACKNOWLEDGMENT

The research was financed by the Higher Education Institutional Excellence Programme of the Ministry for Innovation and Technology in Hungary, within the framework of the 4th thematic programme „Enhancing the Role of Domestic Companies in the Reindustrialization of Hungary” of the University of Pécs.

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