

# Competitiveness and efficiency analyses of the Hungarian small businesses<sup>1</sup>

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## Abstract

*The analysis of the multidimensional connections between resources and capabilities, and the way organizations use them as competitive weapons have become a central element of the strategic management literature. Drawing on the resource-based view and the configuration theory, this study proposes a competitiveness measure that incorporates system dynamics in the analysis. The empirical application considers a unique sample of 436 Hungarian small and medium-sized firms. The results support the view that competitiveness is a multidimensional construct. Additionally, we show that businesses follow different pathways to enhance their competitiveness level. The findings tend to give ammunition to the argument that effective support policies should accommodate the profile of the targeted businesses.*

**Keywords:** competitiveness; efficiency; small business; DEA; Hungary

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## Introduction

This paper proposes a managerial tool to evaluate organizational competitiveness. A common premise in strategic management literature is that organizations acquire or develop specialized resources and capabilities that interact with the existing ones for creating competences as they pursue organizational competitiveness, and therefore superior performance [1],[12]. Competitiveness is an attractive concept characterized by its long-term

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orientation, controllability and dynamism [6]. Previous research has attempted to assess competitiveness using aggregate estimates that capture the individual contribution of different resources and capabilities to competitiveness. The construct competitiveness has been analyzed from multiple angles including territorial studies (see e.g. [4]) and research at the business level in developed economies (see e.g. [5]).

Notwithstanding the growing awareness of the importance of stimulating business competitiveness for scholars and policy makers, two issues remain unaddressed. First, underlying studies on competitiveness are methodological approaches that ignore the different interactions that might exist between the variables that shape business competitiveness. Second, the analysis of the factors that explain competitiveness in emerging economies remains, to the best of our knowledge, empirically untested in the strategic management literature.

To address these issues, the main contribution of this paper is to propose a competitiveness index based on a system dynamics model that incorporates into the analysis system-level constraints between the analyzed resources and capabilities. Furthermore, we show how the proposed measure functions by examining business efficiency through the use of a non-parametric technique (Data Envelopment Analysis), incorporating competitiveness measures in the business' objective function. The second stage analysis introduces, along with the business competitiveness index, exogenous variables related to organizational factors that might explain efficiency differences among firms. The empirical application considers a sample of 436 Hungarian SMEs operating in manufacturing, construction, retailing, and services sectors during 2008-2012.

## **2. Theoretical underpinning**

Organizations seek to develop and gain bundles of knowledge and skills, labeled capabilities, which enable organizations to employ their internal resources more effectively (e.g. capital, labor, and materials). Building on the resource-based view of the firm (RBV), the associations that results from connecting resources and capabilities, termed competences, lead to create or enhance organizational competitiveness [1][11]. RBV theorists claim that business' internal characteristics are the major components of competitiveness [2], [9].

Competitiveness is a multidimensional construct and is characterized by its long-term orientation, controllability and dynamism [6]. Increased competitiveness allows the organization at adopting value-adding strategies that make it difficult to be replaced by

competitors and contribute to its profit margins [10]. Organizations with a rich pool of resources and capabilities maintain their competitive edge on the basis that their resources are not easily duplicable or surpassable[1]. Most studies dealing with business competitiveness link competitiveness to various organizational, operational and performance dimensions.

Despite these rigorous efforts, existing studies focus on developed economies and there remains the need to accurately assess competitiveness in developing and emerging economies. Additionally, the theoretical deductions resulting from the literature review reveal widespread support to the notion that competitiveness is a complex construct linked to organization's resources and capabilities, and that performance improvements follow enhanced competitiveness. Previous attempts to measure competitiveness rely on the estimation of aggregate measures in which the analyzed components individually contribute to the competitiveness construct, regardless of the observed values for the rest of resources and capabilities analyzed. Yet, the efficient exploitation of resources and capabilities is conditioned by their availability, as the competences that contribute to enhance competitiveness emerge from a complex set of collective interactions between available resources and capabilities rather than from individual contributions of each resource or capability.

### **3. A proposal for assessing business competitiveness**

We argue that a conceptually robust approach to competitiveness should include a wide array of resources and capabilities, as well as recognize the multidimensional nature of their relationships. To address this challenge, the proposed competitiveness measure introduces system dynamics into the analysis by capturing multiple interactions between the analyzed system variables (resources and capabilities). The configuration theory, originally developed by Miller[7][8], argues that the elements of a system cannot fully be understood in isolation, so the analysis of the system as a whole is inevitable. For the purposes of this paper, configuration is meant as a multidimensional phenomenon that varies across organizations, and is defined as the 'degree to which an organization's elements are orchestrated and connected by a single theme' [7]. This definition is in line with RBV theory postulates [1], and accordingly we define small businesses' competitiveness as follows:

*Small business competitiveness is the mutually dependent bundle of ten pillars—human capital, financing, networking, products, administrative routines and processes, competitive strategy, applied technology, marketing methodology, internationalization, and*

*availability of online resources and information communication technologies—that allow a firm to effectively compete with other firms and serve customers with valued goods/services.*

The ten pillars of competitiveness consist of 56 variables, and these variables were selected following insights from the RBV theory. The benchmarks are the best available scores in each variable, while all remaining values are related to these benchmarks. The maximum values of each pillar (benchmark) are based on the best Hungarian practices. The pillar scores are calculated as the average value of the variables included in each pillar as  $p_{i,(j)} = \frac{\sum_1^W q_{i,w}}{w}$ , where  $p_{i,j}$  is the pillar score for the  $i$ th firm ( $i=1, \dots, N$ ) and the  $j$ th pillar ( $j=1, \dots, 10$ ), and  $K$  is the number of variables included in the analyzed pillar. The normalized value is obtained for each pillar score ( $p_{i,j}^*$ ) as  $p_{i,j}^* = \frac{p_{i,j}}{\max p_{i,j}}$ . In order to enhance estimation accuracy, we equalized the marginal effect of each pillar ( $p_{i,j}^*$ ) by solving  $\sum_{i=1}^N p_{i,j}^{*f} - \delta \bar{p}_j^* = 0$  for each firm ( $i$ ). In the latter expression,  $\delta$  represents the “strength of adjustment” for the  $j$ th pillar, and the  $f$ th moment of  $p_{i,j}^*$  is the pillar’s average value ( $\bar{p}_j^*$ ).

Finally, we consider mutual dependence of the ten pillars that form the competitiveness index by introducing a penalty for bottleneck in the estimation of the competitiveness index. Following the configuration theory [7][8], improvements can be only achieved by strengthening the weakest link – the bottleneck – that constraints the performance of the whole system. Good performing pillars can only partially and not fully compensate for badly performing pillars. This imbalance pulls back the competitive performance of the particular firm. The penalty function is defined as:

$$h_{i,j} = \min p_{i,j}^* + \left(1 - e^{-(p_{i,j}^* - \min p_{i,j}^*)}\right) \quad (1)$$

where  $h_{i,j}$  is the post-penalty value for the  $j$ th pillar for the  $i$ th firm,  $p_{i,j}^*$  is the normalized pillar value for firm  $i$  and pillar  $j$ , and  $\min p_{i,j}^*$  is the lowest pillar value in the firm  $i$ . Finally, after these transformations we estimate the competitiveness index ( $CI$ ) for each firm as the sum of the ten penalty adjusted pillars as:

$$CI_i = \sum_j^{10} h_{i,j} \quad (2)$$

## 4. Sample, variable definition and method

### 4.1 Sample

The data collection process was conducted by a leading professional survey firm. The selection process of the surveyed firms is two folded. First, we included surviving firms that took part of the first stage of the research project in 2010 [13]. Here, 549 firms out of 795 originally surveyed firms were still operational in 2012. Second, we selected a random sample of firms from the OPTEN company database. A total number of 950 surveys were obtained (response rate: 9.55%). However, data availability limited the final sample to 436 observations (effective response rate: 4.36%). The industry configuration of the final sample reveals that 29.82% of firms operate in manufacturing sectors, 10.09% in the construction sector, 28.21% in retailing sectors, and 31.88% in service sectors.

**4.2 Benchmarking business competitiveness through Data Envelopment Analysis**

When dealing with multiple inputs yielding multiple outputs, efficiency literature usually makes use of Data Envelopment Analysis (hereafter DEA) frontier methods [3]. DEA is a non-parametric technique that, through linear programming, approximates the true but unknown technology without imposing any restriction on the sample distribution. DEA is a complex benchmarking technique that yields a production possibilities set where efficient decision-making units positioned on this surface shape the frontier. For the rest of units DEA computes an inefficiency score indicating the units’ distance to the best practice frontier. We apply the following linear program models the described technology and compute the efficiency score for each firm:

$$\begin{aligned}
 T(x_i, y_i) = & \max q_i \\
 \text{subject to } & \sum_{i=1}^N \lambda_i y_{i,m} \geq q_i y_{i,m} \quad , m = 1, K, M \\
 & \sum_{i=1}^N \lambda_i x_{i,r} \leq x_{i,r} \quad , r = 1, K, R \\
 & \sum_{i=1}^N \lambda_i = 1 \\
 & \lambda_i \geq 0 \quad , i = 1, K, N
 \end{aligned}
 \tag{3}$$

The restriction  $\sum_{i=1}^N \lambda_i = 1$  imposes variable returns to scale to the convex technology in equation (3). The term  $q_i$  is the efficiency score obtained for each country, and for efficient countries  $q_i = 1$ . For inefficient countries  $q_i > 1$  and  $q_i - 1$  points to the degree of inefficiency. Figure 1 presents a simplified representation of the distance function. The final model specification considers that businesses employ the mutually dependent set of ten pillars (x) described in Section 3 to produce three outputs related to business activity (sales), economic performance (rate of returns on assets, measured as the ratio of net profit divided by assets)

and operating performance (labor productivity measured as the ratio of sales divided by employees) (y).

#### **4.3 Second stage analysis: Competitive paths followed by Hungarian firms**

The second stage proposes a cluster analysis to further evaluate business performance and determine if the proposed competitiveness index helps explain performance differences among Hungarian SMEs. The first variable included in the cluster analysis is the competitiveness index presented in equation (2). Second we include business growth measuring as  $(\text{Employment}_{i,t} - \text{Employment}_{i,t-c}) / [(\text{Employment}_{i,t} + \text{Employment}_{i,t-c}) / 2]$  to obtain an asymptotically normally distributed measure during the analyzed period. Additionally, we include in the analysis firm size, measured as the natural logarithm of the number of employees in 2012, and firm age expressed as the natural logarithm of market experience.

To attain the second stage analysis, this paper proposes a nonhierarchical cluster analysis (K-means). Second, a discriminant analysis further validates the cluster analysis. The results from the discriminant analysis (Table 1) indicate that the approach proposed to examine Hungarian SMEs is appropriate.

**Table 1. Results of the discriminant analysis**

True groups	Classification according to the discriminant analysis					Observations
	1	2	3	4	5	
Group 1	167 (95.98%)	5 (2.87%)	1 (0.57%)	1 (0.57%)	0 (0.00%)	174
Group 2	2 (5.26%)	36 (94.74%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	38
Group 3	0 (0.00%)	0 (0.00%)	108 (97.30%)	2 (1.80%)	1 (0.90%)	111
Group 4	1 (1.56%)	0 (0.00%)	0 (0.00%)	63 (98.44%)	0 (0.00%)	64
Group 5	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (2.04%)	48 (97.96%)	49

## **5. Empirical results**

### **5.1 Efficiency assessment**

This section deals with the efficiency assessment of Hungarian SMEs (equation (3)). Table 2 shows the summary statistics of the efficiency scores. Results show that the average inefficiency of the analyzed Hungarian businesses is 0.3167 (31.67%). For interpretation purposes, this finding indicates that to operate efficiently the sampled Hungarian SMEs can simultaneously expand their outputs by 29.26%, while keeping their stock of resources and

capabilities fixed. Note that 34.63% of businesses are efficient, and that efficient businesses are not highly concentrated in any industry sector but rather spread out across the analyzed sectors.

**Table 2. DEA model: Efficiency level of Hungarian firms**

	Mean	Std. dev.	Efficient units (%)	Obs.
Full sample	1.2926	0.4464	151 (34.63%)	436
Manufacturing firms	1.2663	0.3577	45 (34.62%)	130
Construction firms	1.1913	0.3303	26 (59.09%)	44
Retailing firms	1.2924	0.4597	37 (30.08%)	123
Service oriented firms	1.3494	0.5296	43 (30.94%)	139

At the industry level, results in Table 2 indicate that businesses operating in the construction sector are the most efficient (average inefficiency: 19.13%). Nevertheless, this result should be read with caution as the relatively small sample size in this sector implies that a lower number of potential benchmark businesses can be used to estimate the efficiency scores. For the rest of industry sectors, estimated inefficiency is rather similar and it ranges from 26.63% (manufacturing businesses) to 34.94% (service sectors).

A common concern in efficiency analyses relates to the quality of estimations. Large businesses with a greater scale capacity and access to resources may form the best practice frontier, a fact that biases the analysis [3]. The result of the correlation analysis shows that the efficiency score and the natural log of business size are not correlated in a significant way (Pearson correlation: 0.0793 and p-value = 0.5420). This important finding confirms the robustness of the estimation of the efficiency scores (equation (3)), as business size is not an influential factor for shaping the estimated best practice frontier.

## ***5.2 Analysis of the impact of competitiveness on performance***

Table 3 presents the findings for the five groups of businesses that emerge from the cluster analysis. Group 1 includes high performing businesses. Businesses in this group are the largest (average employment: 36.39), and score the highest in terms of competitiveness (average: 4.56). Businesses in group 2 show an average competitiveness index of 4.34, while average inefficiency stands at 19.75% (efficient businesses: 36.84%). Also, businesses in this group report the highest employment growth rate (61.20%). Different from the case of Group 1, superior competitiveness of businesses in Groups 2 mostly results from the development of long-term competitive and marketing strategies, the deeper adoption of new and/or innovative technologies at the operational level, and the efficient use of information technologies.

**Table 3.Results: Cluster analysis**

	Group 1	Group 2	Group 3	Group 4	Group 5	Total
Inefficiency	18.23%	19.75%	16.72%	96.48%	16.42%	29.26%
Competitiveness index	4.5644	4.3392	4.1780	3.8586	3.7590	4.2523
Employment growth	0.0126	0.6120	0.0165	-0.0073	-0.4948	0.0059
Firm size	36.3851	23.7895	10.4234	13.1406	13.6122	22.7064
Firm age	15.2874	11.8684	15.2072	13.9219	16.1633	14.8670
<b>Competitiveness Pillars:</b>						
Human capital	0.4761††	0.4724	0.4694	0.3884†	0.4438	0.4595
Financing	0.4746††	0.4672	0.4413	0.4126†	0.4139	0.4495
Networking	0.4962††	0.4604	0.4283	0.4061	0.4010†	0.4518
Product	0.4857††	0.4430	0.4476	0.4235	0.3936†	0.4528
Administrative routines	0.4951††	0.4231	0.4255	0.4089	0.3639†	0.4437
Competitive strategy	0.4999	0.5162††	0.4316	0.4364	0.3776†	0.4609
Technology	0.4744	0.4817††	0.4484	0.4570†	0.4665	0.4659
Marketing	0.4587	0.4717††	0.4431	0.4447	0.3994†	0.4519
Internationalization	0.5111††	0.5001	0.4614	0.3563†	0.4189	0.4644
Online presence	0.4509	0.5247††	0.4698	0.3911†	0.4194	0.4728
Observations	174	38	111	64	49	436

For each pillar used to calculate the competitiveness index (equation (2)), † indicates the lowest value, while †† indicates the highest value.

Group 3 comprises the smallest businesses (average employment: 10.42) and 67.57% of businesses operate in retailing and service sectors (75 businesses). The average competitiveness level of these firms is 4.18, while the average inefficiency is 16.72% (efficient firms: 36.94%). Yet, compared to other clusters, businesses in this group do not excel in any particular competitive pillar.

Poor performing businesses are grouped in clusters 4 and 5; however, the dissimilar competitiveness results in these groups are explained by different components. Comparing the results for Groups 4 and 5, we note that in the former poor competitiveness is mainly explained by the lack of access to resources such as human capital, finance, and technology; whereas in the latter the negative competitiveness result comes from the lack of more strategic (network of suppliers and customers) and knowledge-based resources (competitive and marketing strategies).

## 6. Conclusions

In this paper we adopt a system dynamics approach to develop a managerial tool for evaluating business competitiveness. Building on insights from the RBV theory and the configuration theory, our comprehensive competitiveness measure employs an index



methodology that allows multiple interactions between the different pillars that shape competitiveness, and helps explore potential bottlenecks that might restrain system performance. The results are in line with the notion that competitiveness is a complex multidimensional construct that encompasses a wide array of organizational resources and capabilities [1], [9]. More specifically, findings reveal two main pathways to achieve superior competitiveness levels. On the one hand, enhanced business competitiveness results from the access to higher levels of human capital and financial resources, coupled with greater product development and internationalization strategies. On the other hand, we identified a group of businesses for which competitiveness mostly emerges from the development of competitive and marketing strategies and the adoption of operational and information technologies.

These findings have important implications for scholars, practitioners and policy makers. The proposed competitiveness index extends previous research efforts by adopting a system dynamics approach that allows multiple interactions between the analyzed components, while accounting for the boundaries of the system's performance. Additionally, this paper increases the literature dealing with the determinants of small firms' competitiveness in transition economies. The results suggest that businesses need a balance between various competitive pillars. Overemphasis on a few competitive pillars does not guarantee long-term competitiveness, which can in turn result from multiple interactions of different competitive pillars. Thus, businesses seeking to enhance competitiveness should first evaluate their competitive strengths and weaknesses. In this sense, the proposed competitiveness measure might represent the instrument to carry out this business-level analysis, and provide managers with valuable information that help direct future actions and investments to improve the business' competitive position.

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