Measuring the Competitiveness of Small Businesses

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Abstract

This paper presents a unique methodology to calculate the competitiveness of small businesses. The seven pillar conceptual model of competitiveness put an emphasis to the system approach in the sense of Miller's configuration theory. We present three possible ways to combine the seven pillars of competitiveness: (1) the sum of the seven pillars, (2) the best shot and (3) the weakest link. While the elasticities of the substitutions amongst the seven pillars of competitiveness are basically unknown, we applied a natural logarithmic function that implies a moderate substitution effect. We test our findings on a sample of 695 Hungarian small businesses, identifying strong arguments supporting that the weakest link postulate provides the best view about the interrelation of the pillars. However, the shortcomings call for further research.

1. Introduction

Competitiveness is one of the most critical topics for researchers as well as from public and industrial policy makers. Following the establishment of the US Competitiveness Policy Council, the European Union also revived a similar institution the European Council of Competitiveness in the 1990s. The Lisbon strategy established competitiveness improvement as the most important goal of the EU in the 2000s. Many other countries followed suit, establishing a forum or institution for competitiveness in the 2000s, including Belgium, Egypt, Hungary, Ireland, Japan, and the United Kingdom (Kitson et al 2004).

Despite the growing scientific research interest toward competitiveness, our knowledge is still limited about the exact meaning, content and factors of competitiveness (Krugman 1996, Man et al 2002). Over the last decade, the competitiveness fight has gone on at least four, sometimes interrelated battlefields: (1) definition of competitiveness (2) level of competitiveness, (3) factors and the measure of competitiveness, and (4) effectiveness of competitiveness policy.

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(1) Definition Competitiveness is a multidimensional, fuzzy concept (Budd and Hirmis 2004, Porter and Ketels 2003). Competitiveness can be viewed in terms of the level of investigation: Macro-, meso- and microeconomic approaches all define competitiveness differently (Buzzigoli and Viviani 2009). On the country level, competitiveness, the ability of a country to increase the wealth of its citizens, is different from comparative advantage, the relative advantage of a country to another country due to differences in relative production costs (Porter 1990, 1992, Kitson et al 2004). While regional competitiveness can be similarly defined by changing the "country" term to "region," it should also be considered that regional competitiveness is neither a scaled down version of countries nor an aggregation of the firms. As a consequence, the content and meaning of competitiveness is also changing (Cellini and Soci 2002). Viewing competitiveness on a firm level, some definitions refer to the lower cost production principle (Buzzigoli and Viviani 2009). In contrast, Porter (1992) considers competitiveness as "...a function of dynamic progressiveness, innovation, and an ability to change and improve." (p. 40, also cited by Kitson et al 2004). While Porter and Krugman are frequently in opposing positions, they agree that the core principle of competitiveness is efficiency (Martin 2005).

(2) The level of competitiveness In addition to the macro approach, competitiveness research has become more sophisticated opening to regional, industry (cluster) and firm level investigation. Of these approaches, the concept of regional competitiveness is the most debated: Do countries, smaller and larger regions, urban areas, cities or clusters compete (Krugman 1996, Turok 2004)? Besides the territorial boundaries quarrel, many regional researchers focus on the regional externalities and agglomeration factors that influences the efficiency and productivity of the firms in that particular region (Fujita and Thisse 1996, Porter 1996).

(3) The factors of competitiveness There are numerous measures of competitiveness from simple indicators to complex indexes, all sensitive to the availability of proper data (Buzzigoli and Viviani 2009). While most economists consider the institutional structures to be the key element of competitiveness (Camagni 2002, Kitson et al 2004), Porter (1998) emphasizes the importance of firms in competitiveness as opposed to countries, or regions. An elegant way of regional competitiveness examination is provided by Lengyel (2004). The pyramid model factors identifies the influential factors of economic output, profitability, labor productivity and employment taking into account the social, economic, environmental and cultural processes. In contrast, the resource based view (RBV) of firms maintains that the competitive market position of the firms is mainly determined by the internal rather than the external conditions (Barney 1994, Grant 1991 Foss and Knudsen 1996). The firm that possesses more valuable, rare, non-reproductive and non-substitutive resources is considered to be more competitive than those businesses that do not have these resources (Peteraf 1993).

(4) The effectiveness of public policy Besides the advocates of active public policy support and institutional development of competitiveness, there are some opponents. According to Porter (1990, 1998), the government can play an important role by effective industry and antitrust policies, stimulating demand and specialized factor creation. At the same time, recent Nobel laureate Paul Krugman claims that competitiveness is empirically unfounded, the concept of international competition is wrong and consequently national economic policy focusing on competitiveness can be harmful (Krugman 1994).

Despite the rich literature in competitiveness there are some disregarded areas. Viewing firm level competitiveness, there is a lack of those studies that aim to analyze the competitiveness of smaller sized businesses (see. Clark et al 2004 and Man et al 2002, as exceptions). Most researchers focus on

large, many times multinational firms or clusters (Lengyel 2001, Porter 1990, 1998, Rugman and Verbeke 2001). A likely explanation of this neglect is due to Porter (1998) who claims that competitiveness should only be examined in those sectors where a country has certain competitive advantage. However, the importance of the small businesses should not be ignored. For example, in the EU, the small and medium-sized business sector (SME) constitute around 99.8% of all the businesses, have a 58 % of value added, and employ more than two-third of the private labor force (Audretsch et al 2009).

A relatively new direction in the competitiveness research is index construction. The two most well-know competitiveness indices are the Porter's Global Competitiveness Index reported by World Economic Forum (Porter and Schwab 2009) and the IMD World Competitiveness Yearbook (2010). Both indices are complex measures and serve to evaluate and compare country level competitiveness. Several other indices aim to quantify regional competitiveness (e.g. Huggins 2003, Huovari et al 2002, Lengyel and Lukovics 2006). According to our knowledge, there has been only one attempt to measure firm level competitiveness by constructing one index number. Using a sample of 217 Hungarian companies, Chikán (2006) calculated the company level competitiveness as the function of operability, the ability to change, and performance.

The basic aim of this paper is to develop a conceptual model capable to determine and examine the competitiveness of small businesses. The calculation of the competitiveness points of the firms in an individual basis is a distinctive approach in the competitiveness research. While most competitiveness researches try to focus on identifying the key factors of competitiveness, we view competitiveness from a system perspective. In this respect, the combination of the different elements is more important than a single factor. We focus on showing how the different elements of competitiveness can be recognized and combined together by applying a unique methodology that considers the interrelation of the seven pillars. We present three versions, assuming that competitiveness depends on (1) the overall sum of the pillars, (2) the best shot, and (3) the weakest link.. A small research survey in the Hungarian SME sector serves to present the empirical applicability of the conceptual model and the methodology.

The paper is structured as follows. Section 2 provides the theoretical basis and section 3 presents a conceptual model that is adjusted to fit to the small business framework. The conceptual model mainly builds on the resource-based theory and consists of seven pillars. This section also discusses about the practical application of the theory. Section 4 deals with the issue of combination of the seven pillars into an individual competitiveness point. Three potential solutions are presented: When competitiveness is determined by (1) sum of the seven pillars (2) the best performing pillar value and (3) the worst performing pillar value. The application of this methodology, originated in the public choice theory, is unique in the competitiveness and strategic management literature. The recently created penalty for bottleneck (PFB) method enables us to address the configuration of the factors of competitiveness. Section 5 includes the description of the dataset and of the empirical methodology. Section 6 contains a short discussion about the selection amongst the three possible measures of competitiveness. Finally, section 7 summarizes and concludes. While there are some strong arguments supporting the weakest link postulate, limitations call for further research.

2. Literature survey and theoretical setup

Since our basic aim is to derive a model and an index for small business competitiveness, we rely on firm level rather than national or regional approaches. In line with Porter's benchmarking contribution, there is agreement amongst scholars that firms- not nations and regions- compete (Budd and Hirmis 2004, Porter 1990). However, Porter and his followers claim that firm competitive behavior should be examined within the framework of national or local environment (Nelson, 1992). This approach assumes that the macroeconomic or industry specific characteristics, institutions, and policies affect the performance of the firms in a given geographical entity, industry, cluster region or nation.

Contrary to the frequently applied Porter models that emphasize the role of *industry specific* factors and cluster forces, we rely on the RBV theory (Wernerfelt 1984). RBV theory brings to light to firm specific characteristics that explain differences amongst firms even *within the same industry* (Grant 1991, Molina et al 2004). Barney (1991) identifies four characteristics of these unique resources and capabilities that lead to sustainability: (1) valuable basically means that the resource should be effective and efficient, (2) rarity takes into account the specificity of the resource, (3) imperfect in-imitable refers to the difficulty to reproduce the resource, and (4) substitutability involves the availability of alternative resource. A resource, that can be interpreted as asset, competency, organizational processes, information, knowledge or capability is considered to be unique if it is valuable, rare, difficult to imitate and has no close substitute (Peteraf 1993). Moreover, distinctive resources lead to sustained competitiveness and superior returns (Rugman and Verbeke 2002).

A further problem of competitiveness is measurement. Since competitiveness is a complex phenomenon multiple measures should be applied. Buckley et al (1988) view competitiveness as the dynamic relationship amongst competitive performance, competitive potential and competitive (management) processes. A recent reformulation of this concept is provided by Ambastha and Momaya (2004) who differentiated the three measurements as assets, processes and performances. The early version of the World Competitiveness Report by World Economic Forum considered competitiveness as the dynamic function of competitive assets and processes (Man et al 2002). Turning to the operationalization or the practical use of competitiveness measures, McFetridge (1995) suggested that profitability, cost, productivity and market share are all should be used to measure firm level competitiveness. An integrated way of performance measurement is provided by the balance scorecard method that incorporates four perspectives, the financial, customer, internal business processes, and learning and growth (Kaplan and Norton 1992). It is also not rare to view the elements of competitiveness as the success factors (Arora and Gambardella 1997). Examining 96 articles in leading management journals Hult et al (2008) found that only seven used multiple performance measures of financial, operational and overall effectiveness. In a similar vein, Andersen et al (2006) suggest a holistic view to determine the performance of the business.

Besides measuring the overall or total competitiveness the identification of the factors of competitiveness is also vital. Several authors list numerous, mostly overlapping aspects of competitiveness. Slevin and Covin (1995) identified the most important factors in 12 dimensions.[2] Examining the competitiveness of subcontracts Lu et al (2008) find 35 variables to be critical in firms' competitiveness.

[2] These dimensions are the followings: Strategy/Direction, Human Resource Policies, Intra-Business Unit Communications, Total Quality Management, Product/Service Development and Improvement, Marketing and Sales, Vendor Relationships, Process Improvements, Participative Management, Organization Structure, Business Unit Culture, and International Competition.

To decrease the number of variables to a more fashionable size they grouped them into eight clusters. [3] Besides the general features, the recognition of industry sector specific factors of competitiveness is also present in the literature (Ross et al 1998, Chen and Hambrick 1995). The importance of the intangible assets such as patents, R&D, trademarks, software, a well trained labor force, unique processes, and customer relationships, are provided by Lev (2004). Looking for the single most important determining factors of competitiveness, Molina et al (2004) points out to the role of competent management. From the RBV perspective, Grant (1996) purports that knowledge is the single most important asset of the firm. Entrepreneurship, corporate entrepreneurship or intrapreneurship are also frequently linked to superior performance and competitiveness (Kirzner 1973, Lumpkin and Dess 1996, Covin and Miles 1999).

Another important issue of firm level competitiveness is the formulation of the strategy. Corresponding to our previous discussion, we view two broad types of strategy making: (1) Porter's Five Forces model emphasizes the role of the environment; and (2) the RBV view of strategy that highlights the importance of the firm level individual factors.

The Porter's Five Forces model describes the firm competitiveness strategy in terms of the industry characteristics: The degree of existing firm rivalry, the threat of substitutes, the power of buyers, the power of suppliers, and the threats of entry. By understanding the industry trends, leading managers can formulate efficient strategy to gain competitive advantage over other businesses (Porter 2008).

While the Porter model indentifies the most important factors of competitiveness, it does not explain the individual firm level differences in competitiveness within the same industry. Moreover, Porter mostly disregards the individual characteristics of the firms, that is the core element of the RBV theory (Grant 1991). A straightforward application of the RBV to strategy formulation is to increase competitiveness by developing valuable, rare, hardly reproductive, and inelastic resources and capabilities (Barney 1991, Peteraf 1993). Later developers of the RBV recognized that resource and capability development is a necessary but not a sufficient condition for long term competitiveness. According to Ray et al (2004), RBV should be applied to measure not the performance and the competitiveness of the whole business but only the business processes. Teece et al (1997) introduces the concept of dynamic capability as the application of the combination of resources and capabilities under changing environmental conditions.

Another important component of firm level strategy making is the focus of the strategy or the combination of the elements and/or the processes. For example, Porter identifies four concepts of (diversified) corporate strategy such as practice-portfolio management, restructuring, transferring skills, and sharing activities (Porter 1980). Even Porter emphasized the importance of the balance and the interrelation of the concepts. Others discuss about the importance of fit and mutually reinforcing elements (Miller and Whitney 1999). The balance scorecard provides not only multiple measures of corporate performance but also a way to derive a set of multiple linked objectives and measures that are consistent and mutually reinforcing. By incorporating the cause and effect relationships, the business unit strategy can be executed (Kaplan and Norton 1996).

The popular configuration theory provides another way to view the elements from a system perspective. It argues that the elements of a system cannot fully be understood in isolation (Dess et al 1993). Consequently the investigation of the system as a whole is inevitable (Miller 1986). While it is

[3] These were: Management skills, organization structure, resources, competitive strategy, relationships, bidding, marketing, and technology.

easy to copy a single element, the competitive advantage lies "…in the power of the orchestrating theme and the degree of complementarity it engenders among the elements" (Miller and Whitney 1999, p. 13.). Miller (1996) describes three potential applications of the configuration such as concepts, typologies/taxonomies and organizations. From our perspective, the third approach is the most relevant when configuration is interpreted as a quality or property that varies among organizations. In this case configuration is the "degree to which an organization's elements are orchestrated and connected by a single theme" (Miller, 1996). Higher degree organization mean better configuration. Unlike Miller whose focus was strategy, our single theme is competitiveness. While the configuration theory is very useful to view the firm from a system perspective, it provides little help to apply it practically to an index construction.

In summary, while the Five Forces Model of Porter is a frequently applied tool to examine competitiveness from the industry perspective, the RBV theory is more proper to us to derive a firm level individual competitiveness index. In order to do that we need to (1) identify the factors/element of competitiveness, (2) measure competitiveness and (3) combine the elements of competitiveness.

3. The Conceptual Model

Before we should continue the elaboration of the three points from the previous part of the paper, we should define firm level competitiveness. Following Chikán (2006) and Chikán and Czakó (2009), we define firm level competitiveness as the ability of the firm to serve the customers with valuable product and services under the conditions of maintaining the social and ethical norms. The offered products and services should be profitable to the firm and more attractive to the customers than that of the competitors. The firm ought to perceive changes both within the firm and the market environment and respond to these changes more effectively than its competitors. For our practical use, we distinguish between competitiveness and competencies. Following the literature, we identify five types of competencies: physical and human resources/capabilities, networking, innovational, and administrative routine processes. These competencies allow a firm to compete effectively with other firms and serve customers with valued goods/services. The competitiveness measures of the firm can be determined by profit, and growth measures. Inside resources, capabilities, and processes together form the basic competencies of the businesses that should fit to the costumers' need (demand conditions) and to the competitive pressure of the firms within the industry as well as the treat of substitutes (supply conditions). This conceptualization has its roots in the RBV theory (Grant 1991, Lengnick 1992, Man et al 2002, McGahan1999, Peteraf 1993, Ray et al 2004). Although, the external institutional factors of competition can be important, we focus on the internal factors.

While pure theoretical models are not constrained by data and variable availability this is not valid in the cases of empirical investigations. Therefore, the suggested conceptual model in Figure 1 that is based on the definition of competitiveness and the elements reflects to the limitations of the data set.

As depicted in Figure 1, five of the seven pillars constitute the core competencies of the businesses, physical and human resources or capabilities on the one hand; and innovation, networking and administrative routine processes on the other hand. Core competencies provide the possibility to be competitive; however, competencies should be adjusted to the other two pillars: customers (demand conditions) and competitors (supply conditions).

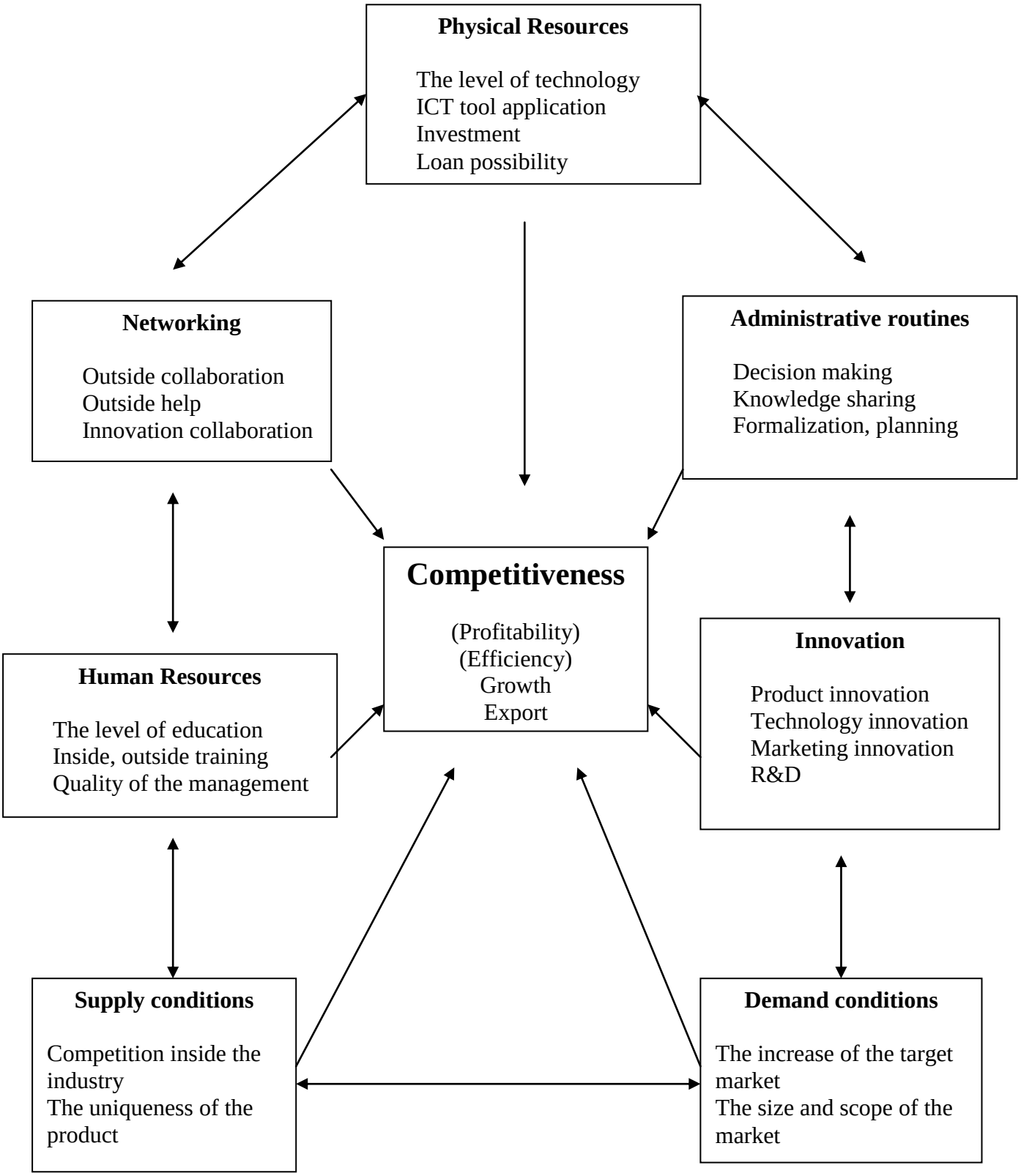
Next, we provide a practical application of the conceptual model using a sample of 695 Hungarian SMEs. The conceptual model also reflects to the availability of the particular variables. However, an important limitation of the data set is the unreliability of the performance measures profit or efficiency data (bracketed terms). Therefore, we use the relative growth of sales and employment to calculate the performance of the business.[4]. The full description of the variables can be found in Appendix 1.

While the previous part of the paper we have focused on firm level competitiveness, here we provide an application of these theories to a small business context. Any small business competitiveness measures and conceptual models should reflect that small businesses are not scaled down version of large firms but they differ in organizations, style of management and the way of competition (Dean et al 1998, Man et al 2002, Malecki and Tootle 1996). For example, of Porter's three strategic choices of cost leadership, differentiation and focus, only the last is appropriate to most small business (Porter, 1998). Despite increasing globalization, small firms compete mainly in the local, domestic markets or market niches. Analyzing the internet offered new opportunities Tetteh and Burn (2001) claim that small firms have to apply entirely different strategies and management techniques than do large firms. Leadership and management differences in the small firm-large firm setup are reinforced by Gray and Mabey (2005). Innovation is also a frequently mentioned factor where small businesses behave differently (Malecki and Tootle 1996, Verhees et al 2004, Utterback and Suárez 1993). SMEs frequently face the lack of proper inside resources that is particularly vital in terms of the human resources and innovation (Bridge et al 2003, Storey 1994). As a consequence, networking, outside collaboration, cooperation as well as efficient inside knowledge-sharing methodologies are the core of effective competition of the SMEs (Dyer and Singh, 1998, Eisenhardt and Schoonhoven 1996, Hakansson and Snehota 1989, Perry 1999).

The above described small business context principles are also reflected in the creation of the seven pillar variables. First, the benchmarking values are determined according to smaller firm sizes. For example, the maximum points in Research and Development can be reached by spending over 1 million HUF (around 4,000 Euro) for R&D or through R&D collaboration with other business or institutions. Second, we give a relatively large weight to the networking, collaboration type of variables. In all five competency pillar variables, the potential use of outside resources, the collaboration with others or the inclusion of outside help, is also involved. However, the filtering of the size effects has not been fully successful. For example, the administrative routines pillar elements, especially the knowledge sharing and the formalization mainly does not really apply to micro-sized businesses.

[4] Clark et al (2004) also used sales data to measure the performance of European SMEs.

Figure 1: The conceptual model of SME competitiveness



4. The Combination of the Seven Pillars

In the previous part we built a multidimensional model claiming that there are seven main, interrelated pillars of competitiveness. However, we have not discussed the practical combination of the seven pillars and the way of a single competitiveness index calculation.

Here, our starting point is the configuration theory that considers the complimentarily of the pillars of competitiveness (Miller 1996). The interaction and the fit of the seven pillars are vital. In the sense of Miller, the combined effect of these factors is key to the overall level of competitiveness. For the practical combination of the factors there are several possibilities from factor analysis, via cluster analysis to simple methodologies such as addition and just calculating the average values. A disadvantage of these mathematical-statistical methods is the lack of theoretical foundation. Without identifying the crucial elements of competitiveness there is no reliable, single measure of competitiveness. Moreover, firms do not really know what the best way of competitiveness improvement is.

Therefore, a new theory based methodology should be developed. The main question is which factors or pillars is the most important playing the determining role in the competitive performance of an individual firm? For answering this question we rely on a theory about the private provision of public goods. According to Hirschleifer (1983) there are three potential solutions: the total amount, the best shot, and the weakest link rule. In the first case the total amount, in the second case the maximum amount, and in the third case the minimum amount determines the provision of public good. The same principle can be applied to define the determinant factors of competitiveness with three potential solutions follows as:

1. The competitiveness points can be calculated by summing the seven pillars.
2. The competitiveness points depend on the best pillar value.
3. The competitiveness points depend on the worst pillar value.

1. In our case, the sum of the seven pillars is equivalent to the averages of the pillar values. Most index calculations rely on this principle. Deriving the firm level competitiveness points, Chikán (2006) calculated the (weighted) average values of the variables. The World Economic Forum Global Competitiveness Index (GCI), that measures the competitiveness point of a country, is also calculated as the weighted average of the twelve pillars (Porter and Schwab 2009, Schwab 2009). While the average value calculation is probably the most frequently used summary measure of different variables with the same scale, it has certain limitation when we turn to policy recommendation. The most important question an individual business raises: How should I increase competitiveness? In this situation, it does not really matter which of the variables or pillars are improved since the effect to the overall competitiveness points will be the same. In the case of the GCI, the advantageous or disadvantageous position of a particular indicator depends on its relative position to the overall rank: if a variable is ranked higher than the country's own rank, then it is considered to be an advantage. A variable ranked equal to or lower than the country's overall rank is considered to be a disadvantage. A useful strategy implication of the sum way of calculation is to improve the below the average value factors.

2. A widely hold view is that the key element of competitiveness is the concept of core competence. According to this vision, firm should focus on their most important strengths, so-called core competencies and outsource all the others (Prahalad and Hamel 1990, Quinn and Hilmer 1994). Of

course, outsourcing of the less important activities has important consequences in narrowing the strategy repertoire. Miller and Chen (1996) warn about the negative consequences: Simplification can decrease certain capabilities and hurt long run competitiveness of the business especially vital under uncertain environmental conditions. The notion of balance of the different element of strategy is provided by the balanced scorecard that shows the formulation of a single strategy of a specific business unit and not for the whole business (Kaplan and Norton 1996). While outsourcing a strategic repertoire of the large firms, networking can be alternative solution for smaller businesses to focus on their strengths (Hakansson and Snehota 1989).

If the firm's competitive position is determined by the strongest pillar value, then the increase of the competitiveness depends on improving the best performing pillar.

3. Unlike the two previous cases that are relatively well-known concepts, the weakest link postulate is not really analyzed in the competitiveness context. Here, we rely on two concepts: The theory of the weakest link (TWL) and the theory of constraints (TOC). A central tenet both of these theories is that the performance of the system depends on the worst performing element in the structure. The TOC claims that the improvement of the system can only be achieved if the constraint, the weakest element is removed or improved (Goldratt 1994). The notion of TWL is frequent in the fields of engineering, production and operation management. For example, the popular Six Sigma management theory holds that the production process can be improved by removing the causes of mistakes, i.e. the weakest link in the system (Nave 2002, Stamatis 2004).

According to the TWL and TOC theories, the most determinant factor of competitiveness is the weakest pillar of the business. The imbalance of the seven pillars, i.e. the differences in the performances causes a loss in the performance of the whole system. The competitiveness of the business depends on the weakest pillar and the magnitude of the loss depends on the size of the weakest link. The increase of the competitiveness can be achieved by improving the weakest link in the system.

A common feature in all of the three cases is the assumption of the independence of the pillars. However, this assumption contradicts the main principle of the configuration theory, i.e. the interdependence of the pillars. This interdependence depends on the degree of substitutability amongst the elements of the system. When the competitiveness points are calculated as the sum or the average of the seven pillars then the substitutability is zero. As a consequence, this methodology is improper to examine the performance of a complex system when the elements are connected to each other.

According to the TWL, there is not a perfect but only a partial substitution among the elements of the system (Tol and Yohe 2006). Thus the weakest pillar has a negative effect on all the other elements in the system. The degree of substitution is vital in terms of the performance of the whole system, presently in the values of the overall competitiveness points. Higher substitutability implies a strong effect of the weakest link on the other elements, lower substitutability means that the elements of the system do not really depend on each other.

The issue of substitutability is present in our other case when the performance depends on the best pillar value. High substitution entails that the performance of the system depends mainly on the best pillar, so a low level in other pillar values can be easily compensated by good performance in the best pillar. On the contrary, low substitution means that the elements of the system are mainly independent, so a good performance of a particular pillar has only a negligible effect on the other pillars in the system.

Now, the main question is: How to calculate the substitution effect? The practical calculation is based on the methodology of the Penalty for Bottleneck (PFB) developed by Acs and Szerb (2009) for an entrepreneurship index calculation. The PFB is capable to address the weakest link postulate. Technically, the bottleneck is achieved for each pillar by adding one plus the natural logarithm of the difference between that pillar's firm score and the score for the weakest pillar for that firm to the score for the weakest pillar for that firm is described in equation 1:

$$x_{i,j} = \min y_i(j) + \ln(1 + y_{i,j} - \min y_i(j)) \quad (1)$$

where $x_{i,j}$ is the modified, after penalty value of the competitiveness pillar *j* of firm *i*
$y_{i,j}$ is the normalized value of the original competitiveness pillar *j* of firm *i*
$\min y_i(j)$ is the minimum value of all of the competitiveness pillars of firm *i*
i = 1, 2,……m, (the number of firms)
j= 1, 2,……7 (the number of competitiveness pillars)

Thus improving the score of the weakest pillar will have a greater effect on the competitiveness than improving the score of stronger pillar. For example, assume the normalized score of a particular pillar in a firm is 0.60, and the lowest value of the pillar is 0.40. The difference is 0.20. The natural logarithm of 1.2 is equal to 0.18. Therefore the final adjusted value of the pillar is 0.40 + 0.18 = 0.58. Larger differences between the pillar values implies higher penalty.[5]

According to the logic of the PFB, it is easy to construct another function that rewards for the good performance of a pillar. Let's call it as the Benefit for Good Performance (BFG). Applying a similar logarithmic reward function equation 1 modifies to equation 2 as the following:

$$x_{i,j} = \max y_i(j) - \ln(1 + \max y_i(j) - y_{i,j}) \quad (2)$$

where $x_{i,j}$ is the modified, after benefit value of the competitiveness pillar *j* of firm *i*
$y_{i,j}$ is the normalized value of the original competitiveness pillar *j* of firm *i*
$\max y_i(j)$ is the maximum value of all of the competitiveness pillars of firm *i*
i = 1, 2,……m, (the number of firms)
j= 1, 2,……7 (the number of competitiveness pillars)

The implication of the BFG to increase competitiveness is to improve the best pillar. For example, assume that the normalized score of a particular pillar is 0.40, and the maximum value of a pillar is 0.80. the difference is 0.40. The natural logarithm of 1.4 is 0.34. the final adjusted value is 0.8 – 0.34 = 0.46. The best pillar has an elevator effect on all of the other weaker pillars in the system. If the best pillar has the maximum value then the best way to increase competitiveness is to increase the second best pillar.

The logarithmic function provides a moderate substitution effect. Other penalty functions such as square root or linear adjustments can also be applied. Unfortunately, we do not have any theoretical basis about the size of the penalty; therefore the suggested moderate penalty function is somehow ad hoc. Another problem is the potential of the different elasticities of substitution amongst the seven pillars. Future research should clarify the magnitude of substitution.

[5] While generally speaking it could happen that the increase in one pillar can cause a decrease of another pillar, it is not the case here because the different pillars of competitiveness are positively correlated to each other (see later).

5. Data Description and Results

In this section we describe the data set of 695 Hungarian SMEs that serve to show the calculation of the competitiveness points. According to the previous part, three ways of calculations are presented: Competitiveness points are calculated (1) as the simple sum of the seven pillars (2) according to the best performing pillar (BFG) and (3) according to the weakest pillar (PFB).

The aim of the data collection was to examine the basic factors of establishment and growth in the Hungarian SME sector. The survey included nine blocks and 53 question groups covering all major functional fields of the business from strategy through innovation, knowledge management, HRM, finance, risk management, and marketing. While the survey was conducted in April-June 2008, the questioned time period was 2004-2007. Based on the conceptual model, we used 24 question groups including 109 questions to analyze the competitiveness of the businesses. While the survey included several types of questions, we applied mainly those that had only two alternatives (yes or no). Since we wished to measure real and conscious commitments the "do not know" answers were considered "no". In the cases of question groups, 4-6 point Likert scale variables were created. Since the original questionnaire did not aim to examine the different question groups together, we did not pay attention to uniform the scaling, unfortunately. In many cases, the application of a more sophisticated scale (5-7) was limited by the shortage of the strategic choices of he smaller sized businesses. The number of created variables, reflecting to Figure 1 is 23, altogether.

The survey was conducted in April-June 2008 by a professional vendor company Szociográf Market and Survey Research Co. After an initial telephone call for approval, a face-to-face interview was carried out with one of the SME owners who were part of the top management in the case when the firm had with less than 20 employees, and one of the top executives – not necessary having ownership in the business - in the case of larger firms.

The initial sample is based on OPTEN company database that includes all the present and former businesses registered in the Business Registry[6]. The aim was to collect a total sample size of 700. Firms were randomly selected but stratification was applied to make sure to have enough businesses in each size category, region and industry sector. The size distribution of the sample as compared to the total number of businesses reported by the Hungarian Statistical Office (HSO) is presented in Table 1. Stratification caused a smaller sample in the 2-9 employee sized category and a larger sized sample in all the other three categories than implied by the representativeness principle. We also show the response rates in different categories.

[6] More information can be found on the OPTEN website: http://www.opten.hu/ismerteto/cegtar-translation-en.html

Table 1: The distribution of the sample based on the number of employees in 2007 as compared to the total number of the same size businesses in 2006

Business size (Number of employees 2007)	Total number/ percent of businesses in 2006*		Initial Sample		Final Sample		Response rate (%)
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
2-9	193,092	84.5	963	58.3	373	53.7	38.6
10-49	29,388	12.9	538	32.6	230	33.1	42.9
50-249	5,010	2.2	127	7.7	75	10.8	59.1
Over 250	924	0.4	25	1.5	17	2.4	38
Total	228,490	100.0	1628	100	695	100.0	41.4

* Based on the HSO report (2008)

Since the initial response rate of below 40% was lower than expected, we increased the number of firms ending at asking for survey participation 1628 firms. A total 702 businesses, each with at least two employees, participated and completed the questionnaire in the survey. After cancelling the inappropriate businesses due to missing data or inconsistent answers, the sample size for further analysis was reduced to 678 small businesses and 17 large firms with a 42% response rate.

We present the practical calculation of the individual competitiveness points, applying a four step method:

1. Normalization In order to have the same scale for each of the variables, we normalized to a 0-1 scale each of the 21 variables.

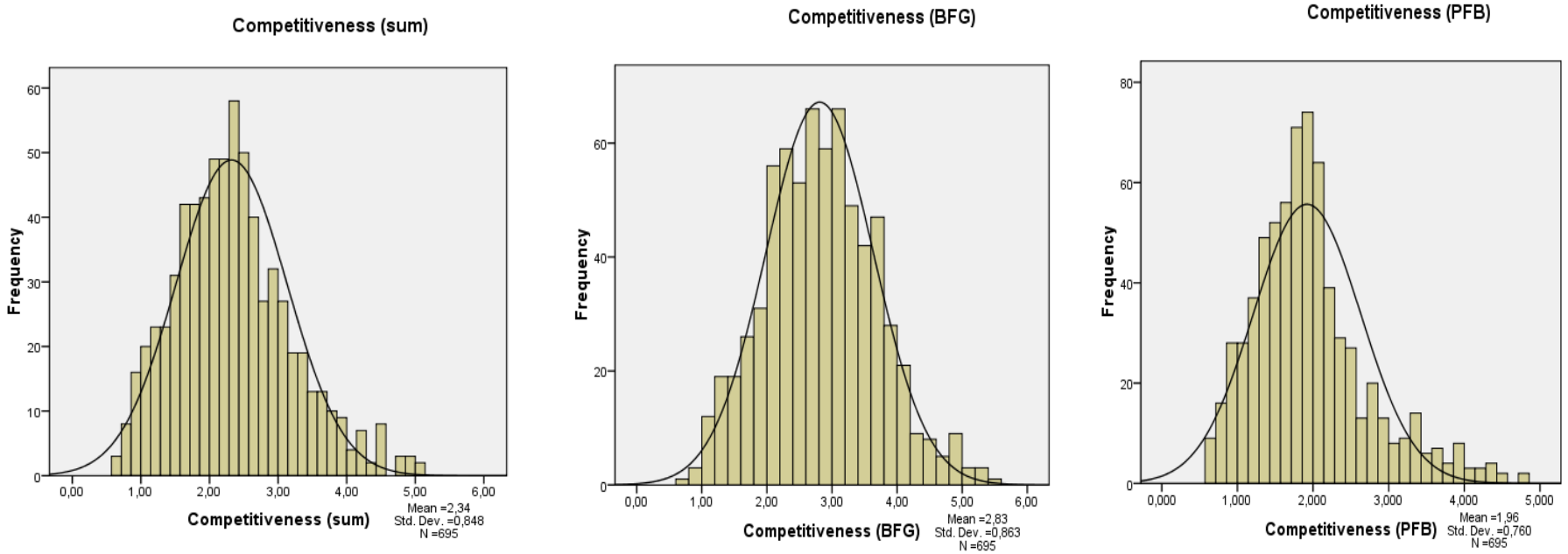
2. The calculation of the pillar values The particular pillar value was calculated as the arithmetic averages of the constituting variables.

3. The calculation of the reward for good performance (BFG) or the penalty for bottleneck (PFB) points from the seven pillars The calculation is based on equations 1 and 2 respectively. The PBF methodology is consistent with the Miller configuration theory emphasizing the combined interplay of the pillars. No adjustment is taking place when competitiveness is calculated as the simple sum of the seven pillars.

4. The calculation of the overall competitiveness point of the individual firms The overall competitiveness point of an individual firm is simply the sum of the seven adjusted pillar values.

The histograms of the calculated competitiveness points of the three cases can be seen in Figure 2. In all cases the distribution of the competitiveness points are close to the normal curve, tilted to left, a little bit. The three means differ a lot. When competitiveness is calculated as the sum of the seven pillars (Competitiveness (sum)), the mean score is 2.34. When the reference is the best pillar (Competitiveness (BFG)) then a mean is the highest, 2.83. In the third case, when the weakest link determines the competitiveness then the mean (Competitiveness (PFB)) is the lowest, 1.96. It is also interesting to see how the competitiveness points relate to the maximum reachable seven points. Competitiveness (sum) is exactly one-third, while Competitiveness (BFG) mean is 40%, Competitiveness (PFB) is no more than 28% of the maximum. Standard deviation shows the direction and rank: It is the highest in the BFG, and the lowest in the PFB case. At the same time, the correlations amongst the three competitiveness points are very high, between 0.92 (between BFG and PBF) and 0.98 (between sum and PFB).

Figure 2: The histograms of the competitiveness points of the three cases



6. Discussion: Which Version is the Best?

In the previous sections we presented a novel methodology of calculating the firm level competitiveness of small business. However, it is still questionable as which one of the three versions is the best fit. While the three competitiveness points show a high correlation to one another, the policy or the strategy implications are considerably different as discussed in section 3. Here we provide some pros and coins about the application of the different versions. There are two types of analysis we are conducting. First, we analyze the three competitiveness points in terms of the growth of sales and employment. Second, we examine the three competitiveness points in terms of the relative competitive advantages of the businesses. The relative competitive advantages are based on the subjective view of the business owners/managers.

While we have some data on actual growth rates the correlation between the actual sales and employment growth is extremely low: between 0.00 and 0.10. At the same times, planned future growth rates are much higher, being between 0.37 and 0.44 (Table 2). The highest correlations between the growth rates and the competitiveness points can be found in the best shot case (BFG). The sum and the PFV versions provide about the same correlation values. This finding does not necessary mean that the BFG methodology is the best but it probably means that small business owners and managers tend to view future growth based on their strongest point.

Table 2: The correlation coefficients between competitiveness points and growth

	Competitiveness (sum)	Competitiveness (BFG)	Competitiveness (PFB)
Growth of net sales in real terms 2004-2008	-0.01	0.00	0.01
Growth of employment 2004-2008	0.08*	0.09*	0.10**
Planned growth of sales in 5 years	0.41**	0.44**	0.40**
Planned growth of employment in 5 years	0.38**	0.41**	0.37**

**: Significant at P=0.01 level; *: Significant at P=0.05 level

We have asked the business owners/managers about their subjective view of their relative strengths in various fields as it is being not, partially or fully their competitive strength. We have also calculated a competitiveness point as the average of the 13 variables. This subjective competitiveness points and the three measures of competitiveness show a moderately strong and significant correlations ranging from 0.47 (PFB) via 0.48 (BFG) to 0.48 (sum). The correlation coefficients of all the subjective elements and the competitiveness points can be seen in Table 3. The differences of the correlation coefficients amongst the various sources of competitiveness and the competitiveness points are marginal. The correlations are better in the cases of the harder, less subjective measures like unique products, advanced technology or innovation, as compared to the more biased factors as quick response to customers demand or outstanding location. The potential reason for the low correlation between the low cost production and the competitiveness points is that our calculated competitiveness points do not

contain production cost factors. Another likely reason is that low cost production is not really the source of competitiveness of a smaller sized business.

Table 3: The correlation coefficients between the subjective competitiveness measures and competitiveness points

	Competitiveness (subjective)	Competitiveness (sum)	Competitiveness (BFG)	Competitiveness (PFB)
Unique products	0.57**	0.43**	0.42**	0.43**
Advanced technology	0.69**	0.43**	0.42**	0.42**
Advanced ICT tool	0.64**	0.33**	0.33**	0.32**
Continuous innovation	0.67**	0.39**	0.39**	0.36**
Low cost product	0.50**	0.13**	0.11**	0.13**
Unique marketing	0.58**	0.26**	0.25**	0.24**
Quick response to costumers demand	0.60**	0.27**	0.25**	0.26**
Outstanding product management	0.64**	0.37**	0.37**	0.35**
Outstanding leadership	0.74**	0.31**	0.32**	0.29**
Outstanding HR	0.68**	0.28**	0.28**	0.27**
Outstanding location	0.62**	0.21**	0.20**	0.21**
Strategic partners	0.65**	0.30**	0.30**	0.29**
Outstanding subcontractors	0.61**	0.32**	0.31**	0.32**

Altogether, it seems that neither the examination of the growth nor the subjective measures of competitiveness have provided decisive proofs or evidences to be able to select amongst the three versions of competitiveness calculation. The three competitiveness points strongly correlate, and the differences in terms of the explanatory power of growth or the subjective measures of competitiveness are not significant. Therefore, further research is required to present more convincing proofs about the best competitiveness points.

7. Summary and Conclusion

While competitiveness has become a very popular topic over the last two decades, extant research mainly focuses on country level and regional investigations, and relatively less has been written about the firm level competitiveness. Even less is known about the competitiveness of the small businesses. While there are several competitiveness indexes on the country and on the regional levels, there has been only one notable example of Chikán (2006) in creating a firm level competitiveness index.

In this paper we presented a unique methodology to calculate the competitiveness of the small businesses. The RBV and Miller's configuration theory served as a basis to construct the seven pillar model of competitiveness emphasizing the gestalt, system approach of competitiveness. The newly created conceptual model and the assignment of the benchmark values make it possible to examine small business as compared to other models that focus on large multinational firms. The conceptual model contains 21 individual variables and seven pillars.

We presented three possible ways to combine the seven pillars of competitiveness. The sum of the seven pillars is the most frequent way of competitiveness index calculation. However, there has not been any reasonable theoretical argument supporting this methodology. The most important weakness of this methodology is the lack of the connection amongst the pillars of competitiveness. The strategy

implication of this model is also not straightforward. The Benefit for Good Performance (BFG) emphasizes the role of the best performing pillar. The theoretical background of the application of this methodology is provided by the core competency argument: The firm should specialize on their strengths and outsource the others. For small businesses networking connections provide a potential way to have an access to the missing competencies. The Penalty for Bottleneck (PFB) argues that the performance depends on the weakest link in the system. The PFB argument is based on the theories of constraint and weakest link. Bottlenecks are defined as the lowest value factor out of the seven pillars of competitiveness. Each pillar value is related to the weakest pillar, and penalized for differences. The strategy implication of the PFB is exactly the opposite of the BFG: The firm should remove the bottleneck by improving the weakest pillar.

While both the BFG and the PFB are consistent with the system approach and the configuration theory, we believe that the PFB argument is the most appropriate for competitiveness point calculation. BFG is probably superior to select amongst the different business units in the case of a large, diversified firm. However, we are examining small businesses that are not diversified, so the business unit analytical tools probably fit better. The business unit strategists emphasize the balance of the different elements. A typical example is Kaplan and Norton (1996) discussing about the role of strategy in balancing the financial and nonfinancial performance of the business. Moreover, our conceptual model contains those pillars that can be considered as the general sources of competitiveness. All business needs physical and human resources, must posses administrative routines, should innovate and collaborate with other businesses and fit these pillars to supply and demand. However, the optimal combination of the seven pillars is definitely different over various industries.

Acs and Szerb (2009) also relied on the weakest link postulate in the calculation of the entrepreneurship index. However, the Global Entrepreneurship Index containing both aggregated individual and institutional variables is different from the present model. A final argument comes from Lazear (2004) who examined the optimal combination of the entrepreneurial traits. Lazear claims that entrepreneurs ought to be a generalist a "jack-of-all-trades". The same principle could be applied to competitiveness measurement: A small business should balance all the pillars to be effective rather than specializing to one particular factor.

A stratified representative sample of 695 Hungarian businesses served as a basis to present the viability of practical application of the methodology and to be able select amongst the different measures. The three different measures of competitiveness are highly correlated to one another. The comparison of the three competitiveness points in terms of planned growth and the subjective view of competitiveness, based on the owners, did not provide any conclusive to be able to select the best method out of the three versions.

Summing up, we strongly believe that our unique methodology is a superior tool to calculate the competitiveness of businesses. Moreover, the model is proper for small business application. However, a crucial point is to select between the best shot-weakest link principles. While there are some arguments supporting the weakest link hypothesis and the application of the PFB over the BFG methodology, the proofs are not convincing. An additional shortcoming of the methodology is the unknown magnitude of the substitution effect. This was the reason of the application of the natural logarithm penalty function that implies a moderate substitution influence. These weaknesses call for further theoretical and empirical researches.

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Appendix 1

Applied variables: Description

Pillars/variables	**Description**
Supply conditions	
Competition inside the industry	The intensity of the competition in a 3 point Likert scale 1: many competitors, 2: a few competitors, 3: no competitors
The increase of the target market	The future increase of the market in a 4 point Likert scale: from 1: considerable shrink to 4: considerable increase
Demand conditions	
The uniqueness of the product	The number of the customers considering the main product of the business new in a 3 point Likert scale, 1: nobody, 2: a part, 3: everybody
The size of the market	The geographical extent of the selling area in Hungary in a 6 point scale from: 1: one place one plant to 6: country-wide
The scope of the market	The type of the plant location in a 5 point scale from 1: place with number of inhabitants below 2000 to 6: Budapest
Physical resources	
The level of technology	The level of the applied technology in a 6 point scale from 1: well below industry average to 6: world new tech
ICT tool application	The intensity of the info-communication tool application in a 5 point scale 1: applies 1-2 ICT tool to 5: applies 9-10 ICT tool
Investment	The size of the investment in 2004-2007 in 5 categories from 1: 0HUF to 5: over 100 million HUF
Loan possibility	The willingness of the business to rely on outside resources in a 4 point scale from 1: no outside finance, 2: short term loan, 2: long term loan, 4: long term loan + outside capital
Human resources	
The level of education	The importance of the human resource: a combination of the share and the number of the employees having tertiary education degree
Inside, outside training	The share of employees participating in inside or outside training in 2004-2007 a 5 point scale from 1: nobody to 5: over 75% of the employees
Quality of the management	A combined measure of the management capabilities of the main decision maker in a 5 point scale
Innovation	
Product innovation	Product innovation in 2004-2007 in 4 categories 1: no innovation 2: renewed product, 3: new product at the firm level 4: new in the country
Technology innovation	Technology innovation in 2004-2007 in 4 categories

	1: no innovation 2: renewed tech, 3: new tech at the firm level 4: new in the country
Marketing innovation	The magnitude of the marketing innovation in 2004-2007
Research and Development (R&D)	Intensity of R&D money and collaboration in 5 point scale in 2004-2007: 1: no R&D to 5: R&D with more than 1 million HUF or R&D collaboration with other
Networking	
Outside collaboration	Intensity of the outside collaboration in 2004-2007 in a 4 point scale from 1: no collaboration to 4: over 4 types of collaborations
Outside help	The average of the outside help evaluated in 10 categories in a 5 point Likert scale
Innovation collaboration	The intensity of outside innovation collaboration in 2004-2007 in a 4 pint scale from 1: no collaboration to 4: regular collaboration
Administrative routines	
Decision making	The type of decision making in he firm in a 5 point scale from 1: one-man-show to 5: collective decision making with outside help
Knowledge sharing	The intensity of knowledge sharing in the business in 4 point scale from 1: no knowledge sharing to 4: regular meeting/various tools
Formalization, planning	The formalization of the administrative routines in 4 point scale in describing working duties, organizational description, business planning, strategy planning