

DIFFERENCES AND SIMILARITIES OF SUPPLY CHAIN INTEGRATION OF HUNGARIAN AND GERMAN SMES

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Summary

Cooperation between enterprises plays a particularly important role in the operation of small- and medium-sized enterprises as they considerably depend on their supply chain partners. Simultaneously with the development of supply chain partnerships and the growing complexity of the chains, supply chain integration is determined by more and more factors, such as supply chain strategies, information sharing, power relations, soft side of partnerships etc. The study presents an indicator (SCI index), which is suitable for measuring supply chain cooperation and shows the features of integration of Hungarian and German SMEs operating in the food industry. One of the advantages of the SCI index is that it is applicable independently of any national, regional or industrial characteristics as its variables measure the factors of integration in general.

Key words: food industry, supply chain integration, small and medium enterprises

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Introduction

In recent years both practitioners and researchers state that, in the last decade time-based competition has increased. Similarly, the significance of cooperation, integration and alliance. “Only two words matter for leaders today: Truth and Trust” (Welch, 2015).

Under the circumstances of the competition of supply chains, the performance of a given chain basically depends on how the output of the supply chain can meet the requirements of the final customer. Gaining a high level of customer satisfaction builds upon how supply chain members can handle their conflicts of interest and upon the depth and quality of supply chain integration built among chain members.

Literature review

Industry 4.0 has a unique feature: it states that partnerships have a huge potential of value adding. When applying it to supply chain integration, it can be interpreted as a synonym for coordination and cooperation among supply chain members in a wider sense. Simultaneously with the development of supply chain partnerships and the growing complexity of the chains, supply chain integration is determined by more and more factors, such as supply chain strategies, information sharing, power relations, soft side of partnerships – trust, commitment, communication, etc. (Dapiran and Hogarth-Scott, 2003, Caniels and Gelderman, 2007, Choudhury et al., 2008, Harris et al., 2011). In the success of supply chain integration, different factors play a critical role by industries, by countries, by cultures (see for example Herczeg and Vastag, 2012). Consequently, integration does not have a predetermined level, but targets, fields and closeness of cooperation should be planned and implemented considering the characteristics of the industries and supply chain features.

Supply chain integration can be broken into supplier integration, internal integration and customer integration on the basis of the role of SCI in business strategy (Narasimhan and Kim, 2002, Jayaram and Tan, 2010). Internal integration focuses on activities within a company. It is the degree to which an enterprise structures its own organizational strategies, practices and processes into collaborative, synchronized processes, in order to fulfill its customers’ requirements. External integration emphasizes the importance of close, mutually beneficial cooperation. At the same time, these two have a close relationship with each other and play an important role in how supply chain members could maximize the value created by the supply chain by setting common goals. (Flynn et al., 2010) According to Funda and Robinson (2005), almost 50% of cost saving can be achieved by companies by moving towards overall (external and internal) integration.

Researchers’ opinion on the significance of integration types (mostly on supplier- and customer integration) is divided. Devaraj et al. (2007) proved by empirical research that it is more beneficial for enterprises if they build close relationships with their suppliers at first (so not with their customers). Contrary to the opinion above, based on the research results of Zhao et al. (2008) the competitiveness and the performance of a company is mainly determined by the depth and quality of customer integration (CI). The most significant elements of CI are information sharing and the harmonization of internal procedures with the processes of the customers.

Regarding the basis of the comparison detailed in the below chapters, we chose the Bavarian SMEs because they have been achieving outstanding company performance year by year, in which supply chain performance plays an important role. Bavaria is one of the most economically powerful regions in Europe, where small- and medium-sized enterprises (beside large companies) have a great effect not only on production but on the service sector as well. The strength of the German SMEs is well showed by the fact that in 2012 only the German (and the

Austrian) small- and medium-sized companies could exceed the levels of gross value added and the rate of employment of 2008 (the year before the economic crisis). Most of the member states could not hit the levels achieved before the crisis (European Commission, 2012).

In addition, German SMEs are leading companies in the field of factors of the soft side of supply chain integration, which factors are getting more and more relevance in inter-organizational cooperation.

Finally, we also underline the significance of the economic partnership between the two countries, as Germany is the most important trading partner in export for Hungary.

Database and Methodology

As the methodology of this study, a survey was done in the range of SMEs from Hungary and Germany by personal interviews on questionnaires. In our survey we have focused on SMEs (such as the number of employees betw. 10-200 - see highlighted figures in Table 1), dealing with the production, wholesale and retail of food, beverages and tobacco. As Table 1 indicates, there are around 2300 companies of that category in Hungary, the number of companies in Germany reaches 24300, around ten times higher than in Hungary.

Table 1: The number of Hungarian and German enterprises operating in the food industry based on size classes and economic activities⁵

2011 Size category	Hungary					Total	Germany					Total
	10	11	12	463	472		10	11	12	463	472	
<i>micro enterprises</i>	3,031	2,165	0	4,317	7,206	16,719	15,884	1,157	0	9,651	33,051	59,743
<i>small-sized enterprises</i>	1,045	130	0	448	232	1,855	10,431	596	16	3,398	5,008	19,449
<i>medium-sized enterprises</i>	282	31	1	93	14	422	2,113	379	5	1006	1332	4,835
<i>large enterprises</i>	54	8	4	14	0	79	507	37	11	97	60	712
Total	4,412	2,334	5	4,872	7,452	19,075	28,935	2,169	32	14,152	39,451	84,739

Source: own elaboration on the basis of Eurostat databases, 2013

Out of these we were able to contact slightly more than 600 Hungarian and 500 German SMEs. The response rate was acceptable in Hungary (196 SMEs), nevertheless we only had 32 responses of German companies. Although we are aware of the vulnerability of the results, we believe that a comparison has been still worth doing it, because most of the questionnaires were filled in by strategic decision makers (mostly logistics managers or executive directors).

The hypothesis of this research focuses on the *comparison of strength* of supply chain partnerships of Hungarian and German enterprises. With this object, we created a supply chain integration (SCI) indicator for the whole sample (Hungarian and German enterprises together). According to the hypothesis of this paper, “*German small and medium-sized enterprises are on a higher level of supply chain integration (e.g. their supply chain integration indicator is higher) than Hungarian SMEs operating in the food industry*”. We tested the hypothesis with regards to supplier-side partnerships (supplier-side SCI), to the customer-side partnerships (customer-side SCI) and to the combined SCI indicator. More details on the SCI indicators are presented in chapter “Results”.

⁵ 10: Production of Food Products, 11: Production of Beverages, 12: Production of Tobacco Products, 463: Wholesale of Beverages, Food- and Tobacco Products, 472: Retail of Beverages, Food- and Tobacco Products

Hereby we only present the steps and methodology of the elaboration of the supply chain integration indicator briefly. At first, supplier- and customer-side SCI indicators were generated by using the methodology of the factor analysis. In order to meet the requirements of factor analysis, more variables measured by the questionnaire were transformed. Our objective, regarding the development of supplier- and customer-side supply chain integration index, was to present the highest possible number of partnership variables measured by the questionnaire in the indicator to make the explanatory power of the model acceptable for reflecting the degree of integration reliably. The explanatory power of the model was continuously tested by three different methods: the KMO index, the Bartlett's test and the TVE (Total Variance Expressed).

Table 2 contains the factors of cooperation of the supplier- and customer-side SCI indicators. The indicators of both sides include the same variables (apart from one indicator “asking for advice from customers in order to improve interface processes”).

Table 2: Variables of the supplier- and customer-side integration indicators

supplier-side SCI		customer-side SCI	
Applying modern supply chain methods, principles	Vendor Managed Inventory (VMI)	Applying modern supply chain methods, principles	Vendor Managed Inventory (VMI)
	postponement		postponement
	risk sharing		risk sharing
	transparency of logistics costs (open book)		transparency of logistics costs (open book)
	Electronic Data Interchange (EDI)		Electronic Data Interchange (EDI)
	sharing market information		sharing market information
Type of inter-organizational cooperation on the supplier-side		Type of inter-organizational cooperation on the customer-side	
Cooperation aspects beyond the general terms of agreement	length of cooperation	Cooperation aspects beyond the general terms of agreement	length of cooperation
	informal communication with the partner		informal communication with the partner
	periodically evaluation of the partnership with the partner		periodically evaluation of the partnership with the partner
	using performance indicators applying to the cooperation		using performance indicators applying to the cooperation
Factors of trust	formal control over the suppliers	Factors of trust	formal control over the customers
	informal control over the suppliers		informal control over the customers
	sharing knowledge and experiences with the suppliers		sharing knowledge and experiences with the customers
	trust in suppliers		trust in customers
	ask for advice in order to improve interface processes		

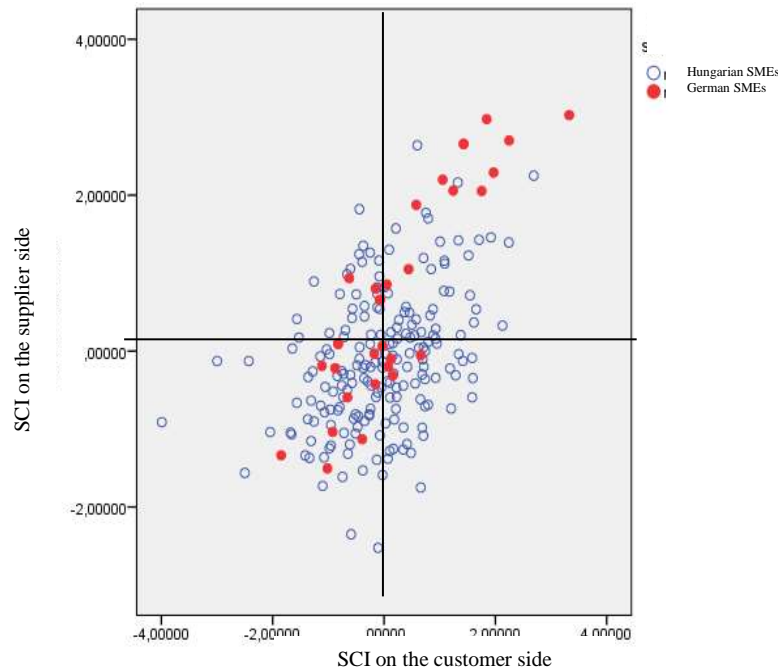
Source: own construction, 2014

Unfortunately more variables cannot be kept in the models, because the explanatory power would not be enough. Thus the below-mentioned models are those that include the most variables possible and have the highest explanatory power at the same time. One of the advantages of these models is that they provide a good opportunity for comparing supplier- and customer-side integration with each other. Indicators generated this way are suitable for representing the extent of integration on a [-4;4] scale (Figure 1).

Results

In order to be able to characterize the degree of integration by a single indicator (combined SCI) (independently from whether it rather belongs to the customer or supplier side), we measured the distance of each company from the origin in the dimension of supplier- and customer SCIs. Figure 1 shows those four categories in which the companies examined by us can be classified depending on the degree of supplier- and customer-side supply chain integration.

Figure 1: Extent of supplier- and customer-side integration amongst SMEs in the food industry



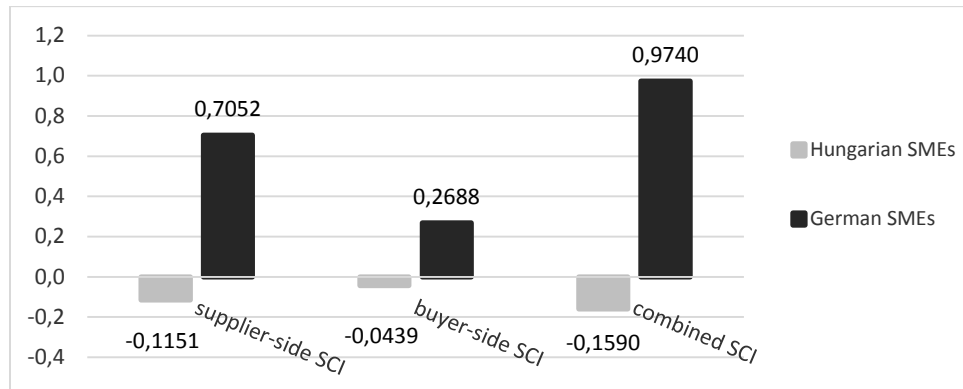
Source: own construction, 2014

We denominated them in the following way:

- *SMEs committed to integration*: these are enterprises belonging to the first quarter of figure 1 (26% of the Hungarian companies, 37,5% of the German companies), their integration indicator is high both on supplier- and customer sides.
- *Supplier-oriented SMEs*: these companies can be found in the second quarter of the map (15,8% of the Hungarian SMEs, 21,8% of the German SMEs), their integration indicator is positive on the supplier side, but negative on the customer side.
- *Customer-oriented SMEs*: interviewed companies in the fourth quarter, whose integration index is high on the customer side, but low on the supplier side (21,5% of the interviewed Hungarian companies, 12,5% of the German ones).
- *Non-cooperating SMEs*: companies in the third quarter, both integration indicators are low (36,7% of the Hungarian enterprises, 28,1% of the German firms).

Having done the sample tests of the analysis of variance necessary for the justification of the hypothesis, we have experienced a significant difference between the degree of supply chain integration of German and Hungarian companies on the supplier side (F sig.: 0.000) and between their combined SCI indexes (F sig.: 0.001) At the same time, a difference on the customer side is less remarkable. Thus the difference between Hungarian and German companies is significant statistically as well, illustrated in Figure 2.

Figure 2: Comparison of supply chain indicators of the Hungarian and the German SMEs



Source: own construction, 2014

Based on the above, we can have the following observations based on the SCI indicators of the of the two countries:

- The frequency of application of modern supply chain methods, principles shows a mixed picture. The frequency of application of *VMI* is nearly the same in the two countries, on both the input and output side. The method of *postponement* is applied at a higher rate by German companies and *risk sharing* appears at a higher rate at Hungarian enterprises, although the difference is not significant. There is significant difference in the *application of EDI* as it is nearly 16% on the supplier- and a bit over 20% on customer side. The same figures in the case of German SMEs are 24% and 31%. Providing the transparency of *logistics costs* is not characteristics of the companies of either country.
- One of the main reasons of the difference in the integration indexes is the attitude of SMEs towards supply chain partnerships. While in the case of Hungarian SMEs relationships of medium strength are dominant both on supplier and customer side, German SMEs operate in typically stronger forms of cooperation, for example in the frame of strategic alliances. The ratio of participation in strategic alliances in the case of German SMEs is 34% both on supplier and customer side (in contrast with the 5% and 8% we can experience by Hungarian SMEs). The conclusion that German companies can be characterized by longer-term partnerships then the Hungarian ones is related to the above statement.
- Hungarian companies find the *communication with their partners* and the *common evaluation of their cooperation* less important. Evaluation can typically be made on the basis of practical experience as the companies of neither country find the development and application of performance indicators related to cooperation particularly important.
- With regard to the *degree of trust*, we experienced that Hungarian SMEs are considerably behind the German enterprises. (It can also be experienced by looking at the variables of trust separately.)
- If we look at the expectations of the examined companies from their supply chain partners, we can experience interesting differences. Hungarian companies, unlike the Germans, expressed several objections, which can be categorized in two groups. On the one hand they mentioned their expectations about common activities, objectives (common development, common information system, longer-term cooperation, establishing partnerships based on mutual trust),

on the other hand those by which they are able to improve mainly their own operation (higher flexibility of partners, more information from partners). German companies typically formulated such expectations that can improve the operation of more members of the chain, for example: developing the transparency of processes and costs in the chain, unifying the systems of traceability.

Conclusion, future research

Based on the results of the comparison we can state that German SMEs are on a higher level of integration than the Hungarian ones. Although the above-mentioned findings should be treated by reservations, the revealed differences are so significant, in spite of the low number of companies in the German sample, that they outline the factors of integration in which Hungarian SMEs operating in food industry are behind quite well. Findings also show that differences basically come from different aims of the cooperation (short-term, company-based attitude/long-term, thinking in chains) and from differences in the level of trust toward supply chain partners. Due to the long-term attitude towards partnerships, German small- and medium-sized enterprises take part in strategic alliances in higher proportion than Hungarian SMEs. Cooperation of Hungarian companies take place mostly in the most essential functional areas, such as procurement on the input side, sales on the output side. Although German companies consider cooperation on the basic input and output processes as “important”, they place great emphasis on common research and development activities.

Examinations on trust towards supply chain partners revealed that Hungarian enterprises control their partners more often and they share their information on inventory, knowledge, experiences with their partners rarely, and they do not tend to ask for advice from partners in order to improve internal and external processes. The lower level of trust hampers information sharing, may slow inter-organizational transactions, and thus decreases the efficiency of supply chain processes.

As variables contained by the SCI indicators are not sector-specific, their objective is to measure the degree of integration in general, they can also be applied in other sectors. In the future it would be useful to conduct this research for SME operating in other industries, as the results could raise interesting questions, such as which integration factors would be included in the indicators in each industries. In this way we could recognize which areas of integration are the most remarkable, what kind of strengths and shortcomings can be observed in certain industries.

We consider the improvement of the supply chain integration indicator will be more important in the future. First we would examine what the reasons are for the drop out of the variables (for instance power relations) from the SCI indicators. It is possible that the questions used for the measurement of the variables should be changed in order to expand the indicator with new variables of integration. The scales of measurement of the variables should also be considered. Secondly, we would definitely expand the indicator with further integration factors, as more details could be learnt on the shortcomings of partnerships with this expansion. In this manner these findings could promote further directions of the development of supply chain partnerships.

Based on the results of the comparative analysis of Hungarian and German SMEs, by the expansion of the developed supply chain integration index, the determination of such supply chain integration benchmarks would be beneficial to the Hungarian companies, their supply chain partnerships could be strengthened by targeting thereof. Naturally, the proper selection of

partners must obtain an important role in this process, Hungarian SMEs must have clear objectives and proper partner selection criteria therefore.

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