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C O N T E N T I

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Abstract

Company capabilities such as agility, interoperability, flexibility, responsiveness, adaptability and cooperation are essential not only for the success of individual companies, but also for the efficiency and resilience of the entire supply chain. Developing such capabilities enables companies to respond more quickly to external and internal challenges while maintaining their competitiveness. At the supply chain level, these capabilities are particularly important as they ensure rapid adaptation to disruptions while minimising risks and maximising efficiency.

Developing knowledge can be a key driver of competitiveness and in a supply chain management context the process of knowledge accumulation often includes informal channels and professional experience. Relationship management abilities are essential in maintaining successful cooperation within the supply chain and can also contribute to knowledge transfer across supply chain partners. The aim of this paper is to build a theoretical framework in which it can be examined whether more advanced relationship management abilities result in better knowledge transfer within

the supply chain. The further aim of the study is to examine human aspects in supply chain management (SCM), emphasizing their significance and supplementing the existing literature. In our paper, knowledge transfer is associated with learning from supply chain partners. To test how the quality of relationships between supply chain partners influences the degree of mutual learning and cooperation, survey data with responses from 335 Hungarian medium sized and large firms are analysed. Empirical results reveal that relationship management abilities and learning from supply chain partners are positively associated, and the strength of this association also depends on the level of knowledge transfer: at relatively low or high knowledge transfer levels the positive effect of relationship management abilities on learning from supply chain partners was found weaker. These results provide several managerial implications and also highlight the importance of continuous efforts to improve business relationships within the supply chain.

Keywords: company capabilities, quality of relationships, knowledge sharing, supply chain management

1. INTRODUCTION

In today's volatile and interconnected markets, the capabilities of individual firms and their broader supply chains (SCs) have become critical determinants of competitive advantage. Organisational capabilities such as agility, flexibility, interoperability and responsiveness enable firms not only to withstand external shocks but also to proactively reconfigure resources and processes in dynamic environments (Teece et al., 1997; Beske, 2012; Helfat & Peteraf, 2015). Importantly, these capabilities extend beyond firm boundaries: firms that can effectively manage relationships with upstream suppliers and downstream customers create channels for both explicit and tacit knowledge exchange, fostering continuous learning and innovation across the supply chain (Demeter & Losonci, 2019; Scholten et al., 2019). Demeter and Losonci (2019) highlight that a knowledge transfer system within multinational network may include practices that serve to transfer explicit and tacit knowledge as well.

Supply Chain Relationship Management (SCRM) represents the strategic practice of building trust-based, long-term partnerships underpinned by mechanisms such as information sharing, joint risk assessment and aligned performance metrics (Christopher & Peck, 2004; Blome et al., 2014). High-quality relationships not only improve coordination and resilience but also facilitate knowledge transfer - defined here as the intensity with which firms learn from their most important suppliers and customers through formal and informal practices (Hennequin et al., 2025; Melkonyan et al., 2019; Rezaei Vandchali et al., 2020). Prior research underscores that the depth of inter-organisational learning can vary with firm size, sector and geographic location, suggesting heterogeneous effects of relationship management on knowledge outcomes (Clohessy & Acton, 2019; Giannakis, 2008; Teller et al., 2016).

Despite growing recognition of knowledge transfer's strategic importance, there remains need for an integrated theoretical framework that explicitly links relationship management capabilities to mutual learning across supply chain actors. The aim of

this paper is twofold. First, to develop a conceptual model hypothesising that more advanced relationship management abilities lead to higher levels of supply chain knowledge transfer and second, to empirically test this hypothesis using survey data from 335 Hungarian medium-sized and large firms. By examining how relationship quality influences bilateral learning intensity (while accounting for sectoral, regional and size effects) our study seeks to yield actionable insights for managers striving to enhance both firm-level capabilities and supply chain resilience. In our study, we seek to answer the following research question: **to what extent do a company's relationship management abilities influence knowledge transfer with its suppliers and customers?**

The paper will be built up as follows. After the introduction section we collect the main theoretical contributions including company capabilities, supply chain relationship management and knowledge transfer in Section 2. In Section 3, we turn to the hypothesis development of our study, followed by a presentation of both the data and the research methodology in Section 4. In Section 5 we share the main results and in the final section we drawn the conclusions and formulate future research directions.

2. LITERATURE REVIEW

2.1 Company Capabilities

Corporate capabilities - such as learning, adaptation and collaboration competences - are crucial for value creation and competitiveness in supply chains (Zouari et al., 2021, Jámbor & Nagy, 2022). For organisations operating in dynamic environments, operational excellence is not enough; according to Teece et al. (1997) there is a need to develop organisational capabilities that enable rapid response, proactive collaboration and effective reconfiguration of resources (Teece et al., 1997) which finding has emerged throughout the past 30 years (Beske, 2012, Helfat & Peteraf, 2015, Mohaghegh & Größler, 2022, Kareem& Kummitha, 2020, Herburger et al., 2024).

These capabilities are not only manifested in internal operations but also have a crucial impact on the effectiveness of knowledge transfer and the quality of partner relationships (Helfat & Peteraf, 2015, Mohaghegh & Größler, 2022, Herburger et al., 2024). Learning and adaptive firms are able to integrate knowledge from supplier and customer networks in a structured way, while relationship management capabilities contribute to the development of responsive and collaborative supply chain structures. This confirms that today's competition is not only between companies but between capability-based supply chains (Blome et al., 2014, Giannakis, 2008, Rezaei Vandchali et al., 2020; Saini et al., 2019, Scholten et al., 2019, Teller et al., 2016).

2.2 Supply Chain Relationship Management

SCRM represents a strategic dimension of supply chain collaboration that aims to build and maintain long-term, trust-based partnerships that extend beyond

transactional interactions, and it is often connected to sustainable operations among SCs (Dubey et al., 2017; Håkansson & Ford, 2002; Rezaei Vandchali et al., 2020).

According to Christopher & Peck (2004) relationship management plays a key role in supply chain resilience, especially in turbulent environments which seem to be more common in the 2020s (Faruquee et al., 2021; Rejeb et al., 2021; Zhang et al., 2021).

Relationship capital and collaborative mechanisms such as information sharing, joint risk assessment and alignment of performance indicators facilitate flexibility, leverage innovation potential and build sustainable competitive advantage (Emon et al., 2024; Rejeb et al., 2021; Teller et al., 2016). The shared data and know-how are the fundamentals of knowledge transfer activities which might contribute to effective operations planned for a long-term among the SCs.

2.3 Knowledge Transfer

Knowledge transfer has become a key factor for the efficiency and flexibility of supply chains in this globalised and digitalised economic environment (Corral de Zubielqui et al., 2019; da Silva et al., 2019). Knowledge transfer between organisations is not only about sharing technological information or processes but also about strategic thinking, especially in crisis situations or rapidly changing market needs (Blome et al., 2014; Saini et al., 2019). Trust, the interoperability of information systems and the willingness to learn are key factors in the success of knowledge transfer. Trust mechanisms function as crucial coordination and performance-shaping factors in supply chain relationships and knowledge transfer processes, as they are capable of reducing transaction uncertainties and promoting mutual cooperation and the sustainability of long-term value creation (Gelei & Dobos, 2016; 2022; 2025). Therefore, examining trust in SCM relationships is essential not only for understanding interactions between partners, but also for exploring the network dynamics that determine competitiveness and innovation potential. The development of knowledge networks contributes to competitiveness, facilitates the development of adaptive learning of supply chains (Giannakis, 2008; Kogler & Rauch, 2020; Whitehead et al., 2019). The implementation of knowledge transfer varies in more forms, such as joint product development projects including OEM-supplier relationships (Joshi, 2017), the use of shared data platforms like integrated supply chains (Biahmou et al., 2019), joint training, benchmark workshops (Matook et al., 2009; Nagy et al., 2020), or the creation of open innovation hubs where suppliers and customers develop new solutions together for instance Procter & Gamble's ‘Connect + Develop’ platform (Agafitei & Avasilcai, 2015; Alabi, 2024).

The learning mechanisms can be divided into six categories: Processual learning, Anticipative learning, Situational learning, Collaborative learning, Experiential learning, and Vicarious learning (Scholten et al., 2019). These together might contribute to successful coping mechanism with challenges. Processual learning, for example, describes the unintentional routine development that occurs during organisational growth and strategic change, while anticipatory learning describes the intentional knowledge transfer facilitated through formal training and networking. Situational and collective learning generates new routines through ad hoc solutions in

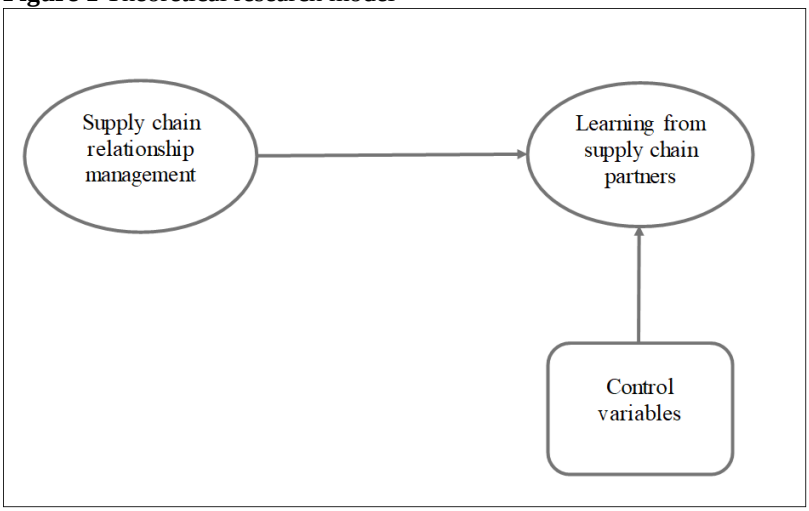
moments of crisis. In contrast, experiential and vicarious learning, used during the recovery phase, involves reflective, systematic knowledge building, which also strengthens organisational adaptive capacities. These mechanisms not only describe the evolution of operational routines but also contribute to the conscious construction of dynamic capabilities, in particular supply chain resilience.

3. HYPOTHESIS DEVELOPMENT

Building on the dynamic capabilities and relationship management literatures, we posit that stronger collaborative mechanisms with key supply chain actors foster more intensive bilateral learning. High-quality relationships (characterized by trust, open communication and aligned performance metrics) enable the exchange of both explicit and tacit knowledge, reducing information asymmetries and promoting joint problem-solving (Christopher & Peck, 2004; Blome et al., 2014).

Previous literature suggests that SCRM affects knowledge transfer positively, but we found a gap regarding what can be the most important factors or circumstances which influence the extension of this knowledge transfer. We hypothesize that supply chain relationship-management and knowledge-transfer can be related (after controlling for the effect of firm size, sectoral and regional context). The theoretical research model is illustrated in Figure 1.

Figure 1 Theoretical research model



Source: authors' own construction

Figure 1 depicts our theoretical framework, in which the association between relationship management quality serves as the primary driver (independent variable) of knowledge transfer intensity (dependent variable), with a direct arrow illustrating

this main effect. Firm size, sectoral and regional context are modelled as control variables.

4. DATA AND RESEARCH METHOD

4.1 Data

The analysis is based on survey data from the Competitiveness Research Centre (CRC) at Corvinus University of Budapest which is a periodic survey of Hungarian firms since 1996. The recent wave (seventh) involved face-to-face interviews conducted from end of 2024 through beginning of 2025, Table 1 shows the main descriptive statistics of the sample. To analyze the main research question of this study (how the quality of relationships between supply chain partners influences the degree of mutual learning and cooperation) we conducted our analysis to the 335 companies (Hungarian medium-sized and large firms with at least 50 employees in four sectors (manufacturing, construction, trade, transport & storage). The companies were selected from the total Hungarian population of 3748 companies) in the dataset. Firms were randomly selected and contacted by regional coordinators. In case a firm declined the participation in our survey, it was replaced with a randomly drawn, specification-matched firm.

The latest competitiveness questionnaire drew heavily on previous surveys, which were revised, updated and methodologically improved by a group of experts set up at the request of the CRC. The perception-based questionnaire comprised approximately 600 items organized into one single questionnaire covering corporate strategy and key functional areas like production, marketing, finance, human resource and leadership management, supply chain management, digitalisation etc.).

Table 1 Descriptive statistics

	Frequency	**Percent (%)**
Region		
Budapest (capital city)	122	36.4
Other	213	63.6
Firm size		
Medium-sized	292	87.2
Large	43	12.8
Sector		
Manufacturing	164	49.0
Other	171	51.0

Source: authors' calculations

Based on the number of employees, the firms are either medium sized with number of employees between 50 and 250 (87.2%) or large (12.8%). Manufacturing sector represents 49% of respondents, and 36.4% of the firms are located in the capital city. Representativeness was assessed ex post by comparing the sample's size (50–249 vs. 250+) and sector (the Hungarian activity classification, called TEÁOR) distributions to those of the full population, reporting 95% CIs and p-values. By these checks, size and most sector shares were close to population proportions, though developed regions are over-represented (notably Budapest and Central Hungary). In short, selection was probability-based within the >50-employee frame. Representativeness was required (and documented) primarily along firm size and sector, with an acknowledged regional imbalance.

4.2 Methodology

When providing answers to questions during data collection, respondents were asked to evaluate how much they agree with statements, with possible answers ranging from "not at all" (indicated by 1) to "completely" (indicated by 5). In case of the relationship management ability, the questions were about evaluating the adequacy of the own relationship management ability in given dimensions, and in case of the supply chain knowledge transfer questions respondents were asked to assess how well the statements fit to the operation of their companies. The supply chain knowledge transfer questions are a subset of questions that aim to measure corporate agility. The supply chain relationship management ability questions and the supply chain knowledge transfer questions are based on previous qualitative research performed by the authors.

Table 2 shows the questions asked in the survey describing the firms' supply chain relationship management and knowledge transfer. These below listed six statements in the questionnaire (2nd row in Table 2.) collectively capture the core competencies a firm needs to manage its supply chain relationships effectively. First, the ability to select the right partner ensures strategic fit and alignment of goals from the beginning. Ongoing relationship management measures how well the firm nurtures trust, transparency and mutual support. Measuring the ability to develop established business relationships reflects a firm's capacity to deepen collaboration over time, turning transactions into partnerships. Focusing on interpersonal relationships with key colleagues highlights the human element underlying every business interaction, which is crucial for resilience and responsiveness. Effective conflict management demonstrates a firm's skill in resolving disputes constructively, preventing small issues from derailing cooperation. Finally, assessing the competence in closing business relationships recognizes that exiting a partnership gracefully can preserve reputation and leave the door open for future opportunities.

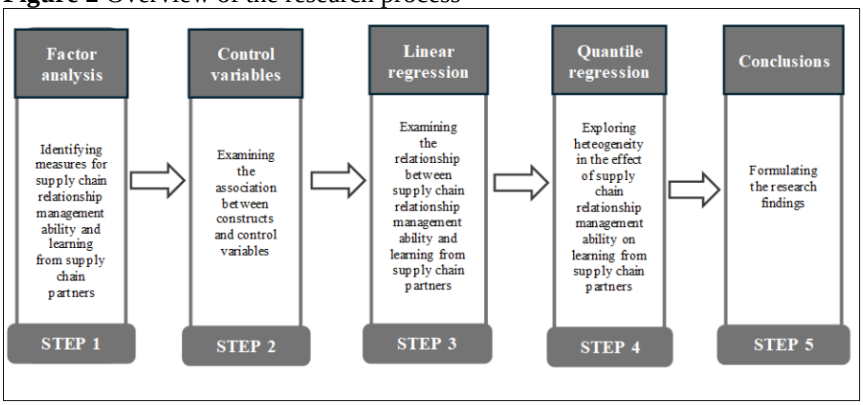
Table 2 Supply chain management related questions of the questionnaire.

Supply chain management section in the questionnaire	**Statements**
1. Please rate how well you think your relationship management skills are in relation to your supply chain partners in the following areas.	a) Ability to select adequate partners. b) Relationship management. c) Ability to develop established business relationships. d) Developing interpersonal relationships with key colleagues in the business relationship. e) Conflict management in business relationships. f) Closing business relationships.
2. Please indicate how intensively you learn from your relationships with your business partners.	a) The intensity of learning from your most important supplier at the company. b) The intensity of learning from your most important customer at the company.

Source: authors' construction

These above mentioned two items in the 3rd row of the table focus squarely on a firm's capacity to absorb and leverage external knowledge, making them strong indicators of knowledge-transfer abilities. By assessing the intensity of learning from the most important supplier, the firm reveals its openness to upstream insights (such as process innovations, quality improvements and new material applications) that suppliers uniquely possess. Similarly, measuring learning from the most important customer captures the firm's responsiveness to market feedback, emerging needs and best-practice end-user applications. Together, these statements highlight critical, bilateral learning channels that drive continuous improvement and competitive advantage. With this type of questioning ("most important supplier" and "most important customer"), our goal was to ensure that respondents could focus their thoughts on a specific partner and provide a sufficiently focused answer to the question. They also implicitly measure the strength of communication, trust and mutual engagement that underpin effective knowledge exchange. Additionally, by separately evaluating supplier- and customer-sourced learning, the firm can pinpoint asymmetries in its external learning processes. The research process, that is based on these questions, is illustrated by Figure 2.

Figure 2 Overview of the research process



Source: authors' construction

To measure supply chain relationship management ability and supply chain knowledge transfer, exploratory factor analysis (based on principal component analysis) is performed, the main results are summarized in Table 3.

Table 3 Summary of measures

	loading	TVE	KMO	Cronbach's alpha
SUPPLY CHAIN RELATIONSHIP MANAGEMENT ABILITY		*0.559*	*0.820*	*0.841*
Ability to select adequate partners.	0.720			
Initial relationship management.	0.715			
Ability to develop established business relationships.	0.765			
Development of interpersonal relationships with key colleagues in business relationships.	0.780			
Conflict management in business relationships.	0.735			
Closing business relationships.	0.767			
LEARNING FROM SUPPLY CHAIN PARTNERS		*0.874*	*0.500*	*0.856*
Intensity of learning from your most important supplier at the company.	0.935			
Intensity of learning from your most important customer at the company.	0.935			

Note: The table contains principal component analysis results (component matrix data, Kaiser-Meyer-Olkin measure of sampling adequacy, and total variance explained for each construct separately) and Cronbach's alpha.
Source: authors' calculations

As Table 3 indicates, convergent validity can be considered as adequate, because all loading values are above 0.7. Internal reliability can also be considered adequate, since Cronbach's alpha values are above 0.8. In addition to the variables measuring supply chain relationship management ability and supply chain knowledge transfer, the empirical analysis includes binary variables indicating whether the firm can be classified as large (based on the number of employees), whether the firm is located in the capital city and whether the firm belongs to the manufacturing sector.

5. RESULTS

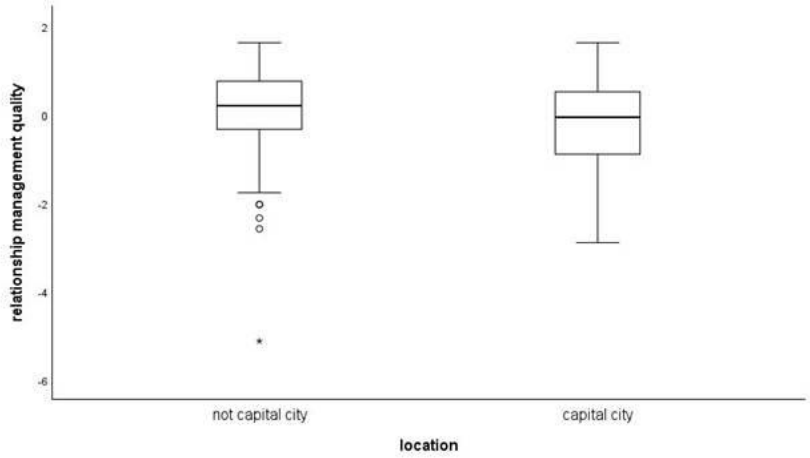
The main research question of the paper is associated with the relationship between supply chain relationship management ability and supply chain knowledge transfer (indicated by learning from supply chain partners in the paper). This relationship is examined with regression modelling, and the calculations have been performed with IBM SPSS Statistics Version 29.0.

Linear regression may be applied to explore the relationship between supply chain relationship management ability and supply chain knowledge transfer. In this section first simple and multiple linear regression results are compared, since it is possible that this relationship is also influenced by other factors. Previous literature about supply chain management characteristics is voluminous, and it suggests that several factors may have effects on supply chains, for example sectoral (Hennequin et al., 2025), regional (Melkonyan et al., 2019), and firm size effects (Clohessy & Acton, 2019) are possible. Therefore, to explore the effect of these factors in the relationship between supply chain relationship management ability and supply chain knowledge transfer, binary control variables are applied to examine possible effects of regional factors (whether the firm is located in the capital city), firm size (whether the firm can be classified as large firm, based on the number of employees) and sectoral factors (whether the firm belongs to manufacturing sector).

Mann-Whitney test results can be applied to examine whether supply chain relationship management ability and supply chain knowledge transfer are associated with variables indicating sectoral, regional or firm size differences. The empirical results highlight that the SCRM ability only has a statistically significant relationship with the binary variable indicating location in the capital city (U=10958.5, asympt.p=0.017), while no statistically significant relationship could be found in case of the variables indicating manufacturing sector (U=13111.5, asympt.p=0.304) and large firms (U=5780.5, asympt.p=0.401). In case of supply chain knowledge transfer a statistically significant association could only be found with the binary variable indicating large firms (U=4912, asympt.p=0.019), and the relationship between supply chain knowledge transfer and the binary variables indicating location in the capital city (U=11685, asympt.p=0.120) and manufacturing sector (U=12634.5, asympt.p=0.112) was not statistically significant based on the empirical data. Figure

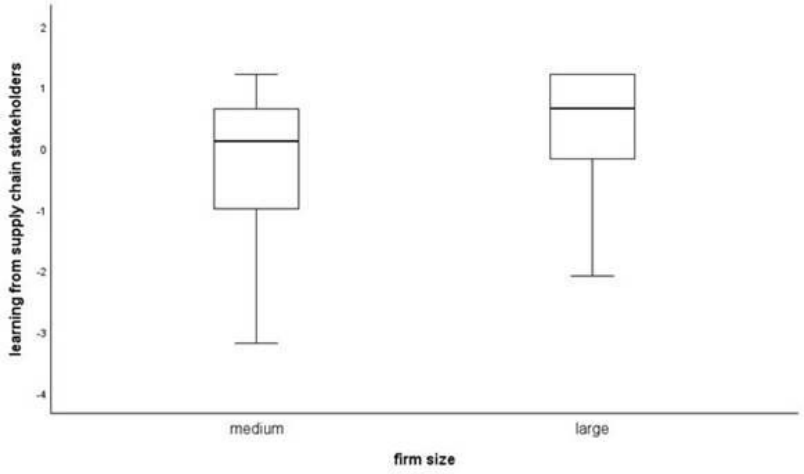
3 and Figure 4 illustrate these findings in case of the statistically significant associations between the variables.

Figure 3 Regional effects on supply chain relationship management quality



Source: authors' own construction

Figure 4 Firm size effects on learning from supply chain stakeholders



Source: authors' own construction

Based on previous literature and the Mann-Whitney test results, the three binary variables related to regional, sectoral and firm size differences are included as control variables in the multiple regression model. Table 4 summarizes the results of the simple and multiple linear regression models.

Table 4 Linear regression results

	Simple model	Extended model
Constant	0.000 (1.000)	-0.069 (0.411)
Relationship management ability	0.438** (<0.001)	0.430** (<0.001)
Control variables		
Capital city (binary)		-0.007 (0.948)
Large firm (binary)		0.255 (0.086)
Manufacturing sector (binary)		0.080 (0.429)
Model fit		
R^2	0.192	0.202
Adjusted R^2	0.190	0.192

Notes: The dependent variable is the intensity of learning from supply chain partners. The values in parentheses are p-values. The asterisks ** denote statistical significance at the 1% level.
Source: own calculations

As Table 4 indicates, the coefficient of SCRM ability is statistically significant in both regression models. This result suggests that supply chain relationship management ability significantly positively influences supply chain knowledge transfer, while the coefficients of the control variables are not statistically significant (at 5 % significance level).

Although linear regression results highlight the significance of the relationship between SCRM ability and supply chain knowledge transfer, the results do not indicate differences across effects on higher or lower levels of supply chain knowledge transfer. To explore heterogeneity in the effect of supply chain relationship management ability on supply chain knowledge transfer, quantile regression is performed (at the 25%, 50% and 75% quantile values). To compare results with the simple linear regression (without the statistically not significant control variables), quantile regression results are calculated without control variables. Table 5 presents the estimated effect of the supply chain relationship management ability variable for the 25th percentile, 50th percentile (median) and the 75th percentile. The pseudo R-squared values are 0.104, 0.124 and 0.108 for the quantile regression models for the 25th percentile, 50th percentile (median) and the 75th percentile, respectively.

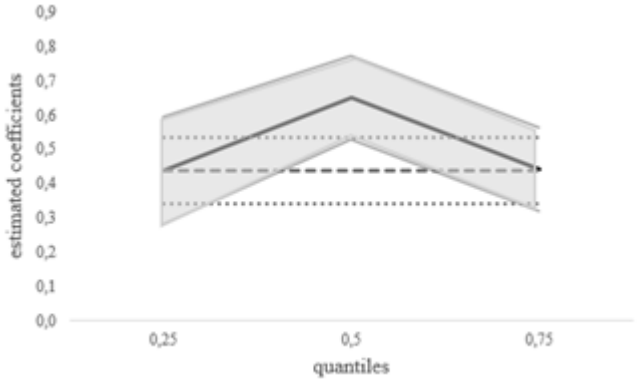
Table 5 Quantile regression results

quantile	coefficient	95% confidence	
		lower bound	upper bound
0.25	0.437** (<0.001)	0.282	0.593
0.50	0.650** (<0.001)	0.528	0.773
0.75	0.442** (<0.001)	0.321	0.562

Notes: The values in parentheses are p-values. The asterisks ** denote statistical significance at the 1% level.
Source: own calculations

Figure 5 indicates how the estimated coefficients at the three quantile values differ from the estimated coefficient belonging to the supply chain relationship management ability variable in the simple linear regression model. In Figure 4, the horizontal axis indicates the quantile scale and the vertical axis indicates the effect of supply chain relationship management ability on supply chain knowledge transfer so that the values of the estimated coefficient at a given quantile (and the 95% upper and lower bounds indicated by the shaded area) are compared to the coefficient (and the 95% confidence interval) in the simple linear regression model (without control variables).

Figure 5 Comparison of estimated coefficients



Source: authors' own calculations

The pattern in Figure 5 also provides support for the research hypothesis about the association between supply chain relationship management ability and supply chain knowledge transfer. The findings highlight that although there is heterogeneity in the effect of SCRM ability on supply chain knowledge transfer, the estimated

coefficients in case of the three quantile values are statistically significant and positive. The empirical results also indicate that, when compared to lower or higher quantile values, the effect of SCRM ability on supply chain knowledge transfer is higher at the 50 % quantile (median) of the supply chain knowledge transfer distribution, suggesting that supply chain relationship management ability may have a more pronounced effect on supply chain knowledge transfer (by learning from supply chain partners) if the knowledge transfer level is not relatively low or high. Based on the presented regression results it may be concluded that the empirical findings support the research hypothesis about the positive effect of supply chain relationship management ability on supply chain knowledge transfer.

6. DISCUSSION & CONCLUSION

Related to management implications we can highlight several management areas to focus on. On the one hand in order to maximise learning outcomes, it is not enough to establish one-off relationships but partnership skills (e.g. conflict management, partner selection processes, interpersonal communication solutions) need to be continuously measured and developed in a cyclical process. This direction can be called as continuous relationship development and based on this it is worth developing various KPIs. For example: “number of new partner initiatives”, “documentation of lessons learned after project closures” or “average length of collaborations” etc.

Another key element of relationship management skills includes effective communication, constructive conflict management and strengthening interpersonal training. It would be important to launch internal workshops or organise joint training sessions for employees where they can focus on developing these skills. It is also worth involving external facilitators and mediators to help build trust between partners and promote open knowledge sharing.

During knowledge transfer, structured digital knowledge bases and collaboration tools (e.g. corporate wiki, cloud-based document management) support the continuous flow of information. For example, gamification elements (e.g. scoring systems, recognition badges) can be incorporated so that partners can actively contribute to the content and it is clear who is participating in the knowledge transfer and to what extent. The continuous monitoring of knowledge transfer and the integration of feedback into everyday operations are of particular importance.

With above mentioned solutions, companies can not only build and manage their relationships more consciously but also optimise their knowledge transfer processes, thereby securing a sustainable competitive advantage for themselves on both company and supply chain level in the long term.

Despite its contributions, this study has several limitations that characterise the findings and must be taken into account when drawing conclusions. The evidence derives from a cross-sectional, single-country survey of 335 medium and large

Hungarian firms collected via face-to-face interviews, which constrains causal inference, may introduce interviewer and social-desirability effects, and limits external generalizability beyond this size class, sector mix and institutional context. All focal constructs are measured using single-respondent, perceptual assessments at one point in time. Although reliability indices are acceptable, perceptual measurement error cannot be ruled out. Construct breadth is also constrained (knowledge transfer is captured with two items: learning from the most important supplier and customer, and relationship-management ability, while multi-item, focuses on selected facets) while the factor structure is established with exploratory rather than confirmatory analysis, and measurement invariance across subgroups is not assessed. Finally, the use of firm-level, non-dyadic data precludes matching perspectives across partner pairs and the analysis does not incorporate objective performance outcomes or specific digital-platform characteristics, which together circumscribe the scope of inference.

Future research could employ longitudinal designs to capture how the evolution of relationship management practices over time influences knowledge transfer trajectories and firm performance. Researchers might also examine the role of digital platforms and blockchain-enabled information sharing in enhancing trust and reducing asymmetries in supplier–buyer learning. Comparative studies across different national institutional contexts would shed light on how regulatory environments and cultural norms moderate the link between relationship-management and learning. Finally, in-depth qualitative case studies could unpack the micro-foundations of tacit knowledge exchange and identify the informal mechanisms that quantitative surveys may overlook.

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