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PROCUREMENT VS INBOUND LOGISTICS: A CASE STUDY OF CZECH COMPANIES*

Ekaterina Chytilová ^{1*}, Jarmila Straková ²

^{1,2} *Institute of Technology and Business, Department of Corporate Strategy, Institute of Technology and Business in Ceske Budejovice; Faculty of Corporate Strategy, Okružní 517/10, 370 10 České Budějovice, Czech Republic*

E-mails: ^{1*} chytilova@vste.cz (Corresponding author); ² strakova@vste.cz

Received 11 January 2025; accepted 31 March 2025; published 30 June 2025

Abstract. The main aim of this paper was to establish the link between the importance of procurement and inbound logistics, investment in these areas and the economic impact during the recession. The research question was answered by testing seven hypotheses that focused on the interrelationship between procurement and inbound logistics on issues of perceived importance, investment, and the impact of economic results on this relationship. The parametric two-sample one-factor ANOVA was used to test the hypotheses. The correlation between the change in the importance of procurement and inbound logistics was most confirmed for micro-service firms. The shift in importance during the recession affected investment only in procurement, not in inbound logistics processes. A stronger link between the change in the importance of procurement and the change in the importance of inbound logistics was observed for profitable enterprises. The limitations of the research include, for example, geographical limitations (the research focuses on companies in the Czech Republic) and time limitations (i.e., the study focuses exclusively on a short-term (1 year) observation period).

Keywords: value chain; primary and support processes; measuring efficiency; procurement; inbound logistics

Reference to this paper should be made as follows: Chytilová, E., Straková, J. 2025. Procurement VS inbound logistics: a case study of Czech companies. *Entrepreneurship and Sustainability Issues*, 12(4), 74-86. <http://doi.org/10.9770/q6455753663>

JEL Classifications: M10, M21

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1. Introduction

The value chain concept can be viewed from two perspectives: internal (focusing on internal operational efficiency) and external (focusing on the linkages between external systems) (Baštuř et al., 2020; Aliane et al., 2023; Xu & Zhang, 2024). Current issues in supply chain management (external perspective of the value chain) include, for example, the issue of supply chain feasibility (Supply Chain Visibility-SCV) (Kalaïarasan et al., 2021) and management in times of economic recession (Navrátilová, 2021). The COVID-19 pandemic has disrupted global value chains. Castañeda-Navarrete et al. (2021) exposed vulnerabilities in global supply chains, creating supply, demand and logistics challenges (Chase et al., 2022). The pandemic has been shown to have a negative impact on both procurement processes and supplier-customer relationships in the global supply chain (Hayakawa & Mukunoki, 2021). The degree of impact depended on each industry's characteristics, such as the ability to work remotely, the durability of goods, and participation in global supply chains (Espitia et al., 2022). The ultimate goal of SCM and all related processes is to achieve the necessary supply chain performance (Song et al., 2022). An effective procurement strategy that focuses on, e.g., identifying the right supplier, supplier management, etc., reduces procurement costs and strengthens the supply chain (Fontana et al., 2021; Modgil et

* This paper has been prepared with the support of the VSTE Institute of Corporate Strategy, Department of Management. Article ID: IDUPS24017.

al., 2022). Internal value chain efficiency is one of the key issues in the current business environment (Zimmermannová et al., 2016). In view of this, decision-making within the value chain concept is also gaining importance (Kuzniar, 2017; Anwer et al., 2020).

The five primary activities, namely inbound logistics, operations, outbound logistics, marketing and sales, and service, are the activities that involve creation, transfer, and providing service to the customers (Porter, 1985). These activities are reinforced by support activities that consist of firm infrastructure, human resource management, technology development, and procurement (Porter, 1985).

Based on the above findings, it is logical to focus on the differences in the perception and development of inbound logistics and procurement within the internal Value Chain concept. Procurement includes activities related to building and streamlining supplier-customer relationship management. Inbound logistics, on the other hand, deals primarily with the material flow towards the company, its planning and operational management (Ong et al., 2024).

Procurement management plays a significant role in building supply chain resilience. As a result of the COVID-19 pandemic, new strategies and measures suitable for a resilient procurement system have been identified (Shivajee et al., 2023). Some procurement strategies increase sales and profit for manufacturers but can negatively impact vendors and the entire supply chain if not set up appropriately (Wang & Ma, 2023). Current procurement issues include, for example, the area of digitalisation (transition to e-procurement) (Mélou & Spruk, 2020; Wilhelm & Villena, 2021), sustainability (sustainable procurement) (Opoku et al., 2022; Etse et al., 2023). The development of digital procurement has a positive impact on supply chain performance (Hallikas et al., 2021). Procurement and distribution processes can be improved through sustainable approaches considering the three dimensions of sustainability (Cammarano et al., 2022).

Inbound logistics is one of the key issues in material flow management (Fontaine et al., 2017). Material management is a key part of manufacturing logistics that manages production inbounds, outputs and processes (Song et al., 2022). One of the current issues in inbound logistics is the so-called WMS (warehouse management system) and how to monitor its performance (Pereira et al., 2020).

The boundaries between logistics and procurement, R&D, production, marketing, information management and other departments are gradually blurring and tend to integrate (Song et al., 2022). Monitoring and optimising linkages within value chains is key when considering integration within GVCs (Pereira et al., 2020). The importance of research on linkages within global value chains is highlighted by (Epede & Wang, 2022), among others. However, there are necessary prerequisites, resources and strategies that need to be put together to ensure successful integration and growth (upgrading) within GVCs (Epede & Wang, 2022).

In line with modern economic theory, it can be assumed that changes in the external environment will affect procurement and inbound logistics differently. Both process categories (input logistics and procurement) implement the material flow into the company. Inbound logistics focuses on the operational management of material flow, while procurement deals with the building and strategic planning of supplier-customer relationships. As a traditional primary process, the authors expect that inbound logistics will succumb to more changes and be perceived as more affected than procurement.

On the one hand, these processes have a similar goal (timely and complete provision of the company with the necessary material elements), both of which must be implemented in the company. On the other hand, the activities and focus of the processes themselves differ (procurement addresses purchasing as part of strategic development, and input logistics concentrates on material provision of immediate needs). The paper explores how these processes are perceived and implemented in the wake of the recession.

The paper's main objective is to determine the difference in the perceived importance of procurement and inbound logistics and to see if there is a link between importance, investment in the area and economic impact in times of recession.

To achieve the objective of the paper, four research questions are defined:

RQ1: Is there a link between the importance of inbound logistics and the importance of procurement?

RQ2: How do selected factors (factors: size, industry, presence (national, multinational) affect the link between the importance of procurement and inbound logistics?

RQ3: How does the growth in the importance of procurement and inbound logistics affect investment in these areas?

RQ4: How is the change in the importance of procurement and inbound logistics related to the profitability of the firm?

2. Research objective and methodology

Several studies have been carried out with themes related to the objectives of this paper. For example, the aim of Pattanayak & Punyatoya (2020) was to investigate the effect of electronic sourcing (EP) and supply chain technology internalisation (SCTI) on supply chain performance (SCP-Supply Chain Performance) through supply chain integration (SCI-Supply Chain Integration). A questionnaire survey was used to collect data. Structural equation modelling (SEM) using AMOS software was used to test the hypotheses.

The study by Kumar & Ganguly (2020) focuses on the research on the effect of supply chain coordination on a firm's financial performance through external diffusion of e-procurement. A survey of professionals working with B2B e-procurement was used to collect data. For data processing, a validated measurement model using confirmatory factor analysis was used to establish reliability and validity, followed by structural equation modelling (SEM) using AMOS 22 software to test the hypotheses of the research model. A phantom model approach by Kumar & Ganguly (2020) was used to test for multi-agent effects.

Liu et al. (2019) assess the impact of procurement strategy on supply chain performance. For data processing, the authors used theoretical modelling to generate data. The basis of their analysis is a two-stage Stackelberg game model, which they extended with loss aversion scenarios of logistics integrators and service providers. The results were obtained by comparing the four models to assess the impact of loss aversion on the decisions of supply chain participants and then optimising the purchase volume and pricing strategy, which provided insights into the effects of demand upgrading and loss aversion on decision-making processes in the logistics service chain.

The objective of Boruchowitch & Fritz (2022) was to explore the function of procurement in creating sustainable value in the value chain and to identify how procurement can contribute to operationalising sustainable development goals in the firm. Interviews with key procurement and sustainability employees, ethnographic observations, and content analysis were conducted to collect data. A qualitative mixed-methodology approach was used to process the data to provide contextual insight into everyday practices and identify patterns and themes.

The main objective of Kosmol et al. (2019) was to understand the mutual readiness of supply chain partners for e-procurement and identify the factors and performance impacts associated with adopting these digital practices. A literature search and dyadic case studies were conducted to collect data. A cross-case comparative case study method was used to process the data, in which all case studies were compared and contrasted to identify common patterns and dynamics of change. This process involved data coding, thematic analysis, and synthesis of patterns across the eight companies studied.

Plantinga et al. (2020) focused on exploring the alignment between procurement tools and organisations' strategic objectives. Document analysis, observation, and interaction with participants during the development of a new procurement process tool were used to collect data. Action research was used to process the data to explore and improve the process of developing a procurement tool in practice, divided into five phases: diagnosis, action planning, action implementation, evaluation, and defining learning.

Hayakawa & Mukunoki (2021) are oriented to explore the impact of the COVID-19 pandemic on global value chains with respect to bilateral trade in finished engineering products between January and June 2019 and 2020.

Data was drawn from public sources such as the IHS Markit World Trade Atlas. To process the data, they applied a simple empirical model that analyses trade flows of finished machinery products between different countries. The model includes variables such as regional trade agreements, the GDP of countries, and the number of cases/deaths of COVID-19. The Poisson pseudo maximum likelihood (PPML) method and logarithms were used to analyse and evaluate some variables. The aim of Espitia et al. (2022) was to explore the impacts of the COVID-19 pandemic on global value chains. Data were used for two time periods: January-June 2019 and January-June 2020. Data were obtained from the COVID-19 Trade Watch and other data sources such as customs offices, Eurostat, the US Department of the Treasury and the US International Trade Commission. Regression analysis was used to process the data to examine the relationships between bilateral trade growth and various factors, including supply and demand shocks associated with the COVID-19 pandemic. There is, therefore, a certain contradiction within the current state of scientific knowledge. On the one hand, procurement and inbound logistics are among the key elements of the value chain and are considered as sources of potential competitiveness of the company. On the other hand, there is a lack of a common assessment of the evolution of the perception and behaviour of procurement and inbound logistics and the extent to which they are interconnected in the face of external asymmetric threats. There is a lack of a comprehensive assessment of the logically linked sequence of "importance - investment - economic impact" for both procurement and inbound logistics, and especially their comparison in the context of trend monitoring.

In the interest of reproducibility, please concisely describe the research material and scientific methods used. If these are not original methods, reference the paper where this method was originally published.

To meet the main objective of the paper, the following hypotheses were set as research questions:

RQ1: Is there a link between the importance of inbound logistics and the importance of procurement?

H0: There is no relationship between a change in the importance of inbound logistics and a change in the importance of procurement,

H1: there is a direct relationship between the change in the importance of inbound logistics and the change in the importance of procurement.

RQ2: How do selected factors (size, industry, scope) influence the link between the changing importance of procurement and inbound logistics during the recession?

H2: The company's size directly impacts the degree of association between the change in the importance of inbound logistics and the change in the importance of procurement (the larger the company, the greater the association).

H3: The degree of association between the importance of inbound logistics and procurement varies by business sector.

H4: There is a direct relationship between the scale of operation and the degree of association between the change in the importance of inbound logistics and procurement.

RQ3: How does the changing importance of procurement and inbound logistics affect investment in these areas during the recession?

H5: The change in the importance of procurement is unrelated to the change in investment in the area.

H6: the change in the importance of inbound logistics is related to the change in investment in inbound logistics.

RQ4: Does the degree of association between the change in the importance of procurement and the change in the importance of inbound logistics depend on the change in economic performance in a recession?

H7: The degree of association between the change in the importance of inbound logistics and procurement varies according to the nature of the change in economic performance during the recession.

The research structure is presented in Figure 1 below.

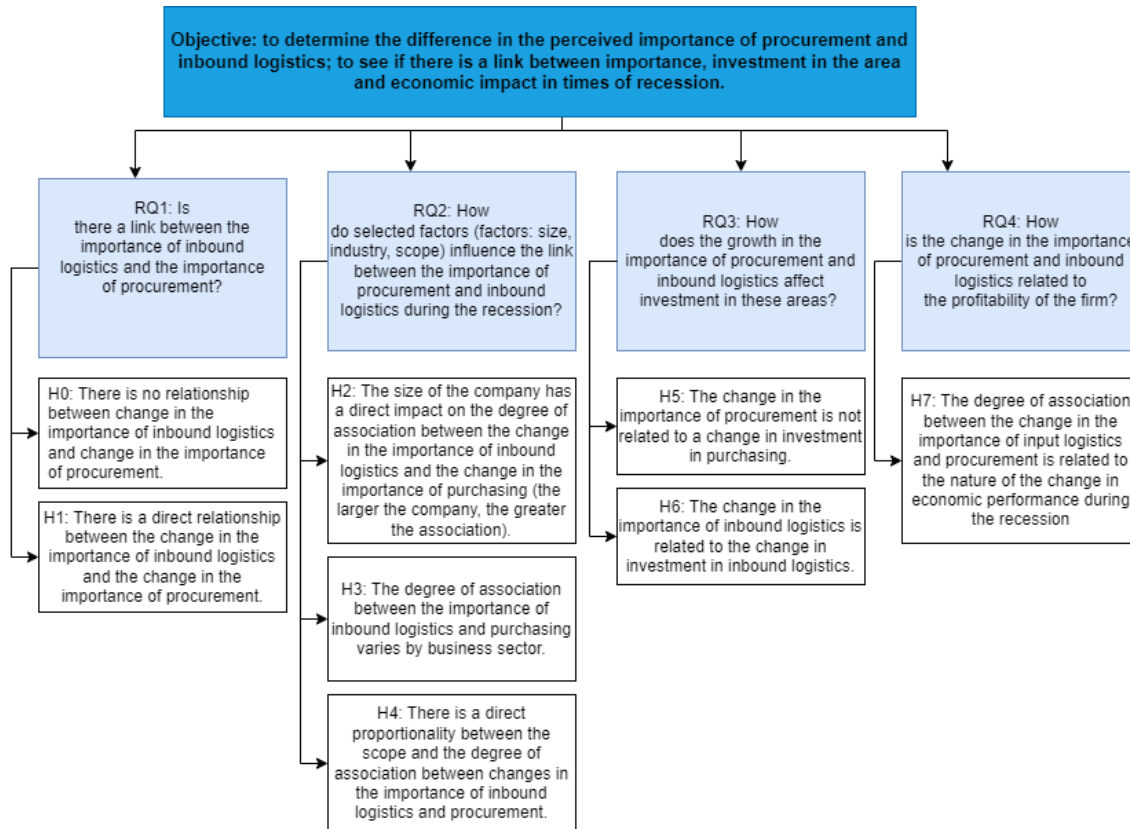


Figure 1. The structure of the research

Source: own processing

Methods of data collection

To meet the objectives of the paper, a primary quantitative survey will be conducted in Czech companies. The selection of respondents will be random and voluntary. The minimum return rate is set at 200 respondents. The questions include the measurement of the enterprise, size of the enterprise, the scope of the enterprise, the financial situation before COVID-19, the financial situation during COVID-19, investment costs before and during the pandemic in the area of procurement, investment costs before and during the pandemic in the area of inbound logistics, importance of inbound logistics and procurement before and during the pandemic. The description of the sample for hypothesis testing is presented in Table 1.

Table 1. Description of variables for hypothesis testing

Hypothesis	Description of variables in the sample		
H0/H1	Change in importance of inbound logistics: A01: no change, A02: increase in importance, A03-decrease in importance	Change the meaning of purchase: A11: no change, A12: increase in importance, A13-decrease in importance	
H2	Change in importance of inbound logistics: A01: no change, A02: increase in importance, A03-decrease in importance	Change the meaning of purchase: A11: no change, A12: increase in importance, A13-decrease in importance	B21: micro-small enterprise B22: medium-sized B23: large enterprise
H3	Change in importance of inbound logistics: A01: no change, A02: increase in importance, A03-decrease in importance	Change the meaning of purchase: A11: no change, A12: increase in importance, A13-decrease in importance	B31: services B32: trade B33: industry
H4	Change in importance of inbound logistics: A01: no change, A02: increase in importance, A03-decrease in importance	Change the meaning of purchase: A11: no change, A12: increase in importance, A13-decrease in importance	B41: local B42: regional B43: national B44: transnational

H5	A51: no change in the meaning of the purchase, A52: decrease in purchase importance, A53: increase in purchase importance,	B51: Investment growth, B52: no change in investment, B53: decrease in investment.
H6	A61: no change in the importance of inbound logistics A62: decrease in the importance of inbound logistics, A63: increase in the importance of inbound logistics,	B61: investment growth, B62: no change in investment, B63: decrease in investment.
H7	Change in importance of inbound logistics: A01: no change, A02: increase in importance, A03-decrease in importance	Change the meaning of purchase: A11: no change, A12: increase in importance, A13-decrease in importance
		A71: there is a relationship (growth-growth, decline-decline, stagnation-stagnation) A72: no relationship (all others)

Source: own processing

Methods of data processing

The hypotheses will be tested in several stages. During the first stage, H0/H1 testing will be conducted. One-factor ANOVA will be used. Hypothesis H1 is considered to be confirmed if the p-value does not exceed 5 per cent. Otherwise, H0 is confirmed. During the second stage, H2, H3, H4 will be tested. One-factor Anova will be used for testing. The significance threshold is set at a 5 per cent p-value. The third stage focuses on testing H5 and H6. Again, the one-factor Anova tool will be used. The significance threshold is set at 5 per cent. During the fourth stage, H7 testing is conducted. The one-factor Anova tool will be used. The p-value significance threshold is set at 5 per cent.

4. Results and discussion

A total of 395 enterprises participated in the questionnaire survey. The composition by sector, size of enterprises and scope within this sample is presented in Figure 2 below.

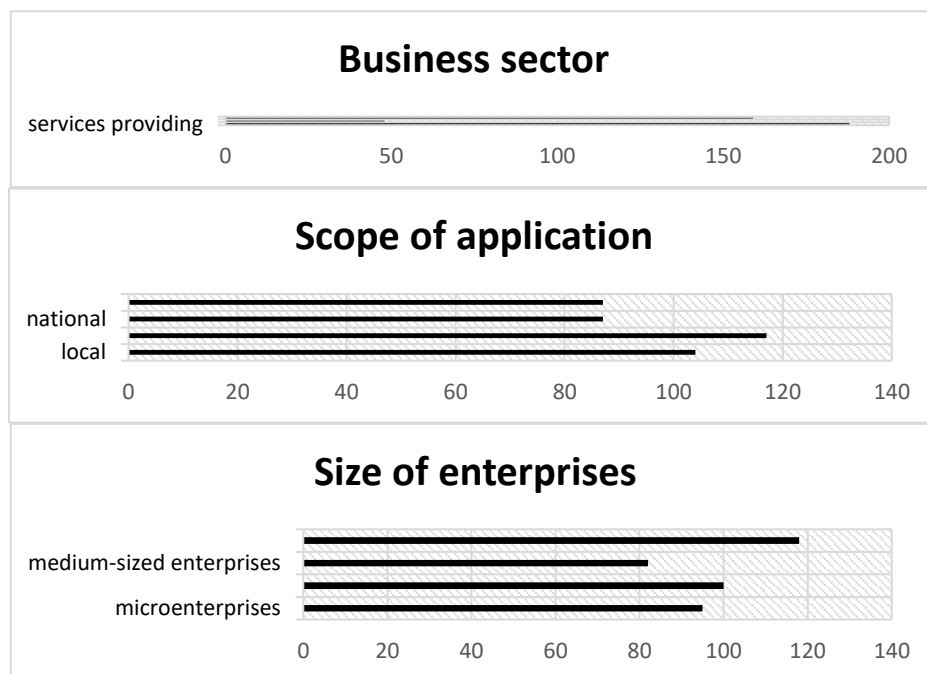


Figure 2. Distribution of respondents by factors: size, sector, scope

Source: own processing

RQ1: Is there a relationship between the importance of inbound logistics and the importance of procurement? The results of H0/H1 testing are presented in Table 2.

Table 2. The result of testing H0/H1.

H0/H1 test, one-criteria ANOVA test					
	Changing the meaning of inbound logistics				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Changing the meaning of purchase	2	10.17	5.086	12.48	0.00000558 ***
Residuals	392	159.79	0.408		

Source: own processing

The test results suggest that a change in the importance of procurement is associated with a change in the importance of inbound logistics. Hypothesis H1 is confirmed. Thus, the following hypotheses (H2-H7) will be tested.

RQ2: What selected factors (factors: size, industry, scope) influence the link between the changing importance of procurement and inbound logistics during the recession?

The results of H2 testing are presented in Table 3.

Table 3. H2 test results

H2 test, one-criteria ANOVA test					
	Changing the meaning of inbound logistics				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Microenterprises					
Changing the meaning of purchase	2	2.816	1.408	4.294	0.0165*
Residuals	92	30.173	0.328		
Small enterprises					
Changing the meaning of purchase	2	2.65	1.325	3.193	0.0454*
Residuals	97	40.26	0.415		
Medium-sized enterprises					
Changing the meaning of purchase	2	1.77	0.8840	2.108	0.128
Residuals	79	33.12	0.4193		
Large enterprises					
Changing the meaning of purchase	2	3.46	1.7308	3.598	0.0305*
Residuals	115	55.33	0.4811		

Source: own processing

H2 testing showed that the association between the change in the importance of inbound logistics and the importance of procurement exists only for micro, small and large enterprises. For medium-sized enterprises, the link is not demonstrated. The strongest association between the importance of inbound logistics and the importance of procurement is defined in micro-enterprises. Since no direct relationship between firm size and the degree of association between the change in the importance of inbound logistics and procurement has been demonstrated, hypothesis H2 is not supported. Firm size does not directly affect the degree of association between the importance of inbound logistics and procurement. The results of H3 testing are shown in Table 4.

Table 4. H3 test results

Test H3, one-criteria ANOVA test					
	Changing the meaning of inbound logistics				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Services					
Changing the meaning of purchase	2	7.65	3.825	10.3	0.0000575 ***
Residuals	185	68.71	0.371		
Production					
Changing the meaning of purchase	2	4.57	2.2872	5.011	0.00777 **
Residuals	156	71.20	0.4564		
Sales					
Changing the meaning of purchase	2	0.104	0.0521	0.139	0.871
Residuals	45	16.875	0.3750		

Source: own processing

Based on H3 testing, the link between the importance of inbound logistics and the importance of procurement is confirmed for firms in the service and manufacturing sectors. On the contrary, this link was not confirmed for trading companies. The strongest link between the importance of inbound logistics and procurement is defined for service providers. Hypothesis H3 is confirmed: the degree of association between the importance of inbound logistics and procurement varies by business sector.

The results of H4 testing are shown in Table 5.

Table 5. H4 test results

Test H4, one-criteria ANOVA test					
	Changing the meaning of inbound logistics				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Local					
Changing the meaning of purchase	2	5.89	2.942	8.998	0.000253 ***
Residuals	101	33.03	0.327		
Regional					
Changing the meaning of purchase	2	0.20	0.0981	0.203	0.816
Residuals	84	40.52	0.4823		
National					
Changing the meaning of purchase	2	1.216	0.6079	1.655	0.197
Residuals	84	30.853	0.3673		
Multinational					
Changing the meaning of purchase	2	4.66	2.3302	5.083	0.0768*
Residuals	114	52.26	0.4584		

Source: own processing

According to the results of H4 testing, the link between the importance of inbound logistics and procurement was confirmed for companies with local (local) operations and multinational companies. The link was not confirmed for enterprises with regional or national scope. The hypothesis was not confirmed. There is no direct correlation between the extent of the scope and the degree of association between the change in the importance of inbound logistics and procurement.

RQ3: How does the changing importance of procurement and inbound logistics affect investment in these areas during the recession?

The results of H5 testing are presented in Table 6.

Table 6. H5 test results

Test H5, one-criteria ANOVA test					
	Change in investment in procurement				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Changing the meaning of purchase	2	10.44	5.218	8.727	0.000196 ***
Residuals	392	234.36	0.598		

Source: own processing

Based on the H5 testing, a link between the change in the importance of procurement and investment in the procurement area was demonstrated during the testing. The hypothesis is confirmed: with the increase in the

importance of procurement comes an increase in investment in procurement. The results of H6 testing are presented in Table 7.

Table 7. H6 test results

Test H6, one-criteria ANOVA test					
	Change in investment in inbound logistics				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Changing the meaning of inbound logistics	2	2.09	1.0428	1.72	0.18
Residuals	392	237.64	0.6062		

Source: own processing

The results of the H6 test show no direct relationship between the change in the importance of inbound logistics and the change in investment in inbound logistics. Hypothesis H6 is rejected. An increase in investment in this area does not accompany the increase in the importance of inbound logistics.

RQ4: Does the degree of association between the change in the importance of procurement and the change in the importance of inbound logistics depend on the change in the economy resulting in a recession?

The results of H7 testing are shown in Table 8.

Table 8. H7 test results

Test H7, one-criteria ANOVA test					
	Changing the meaning of procurement (supplier-customer relationships)				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Negative change ER (economic result)					
Changing the meaning of inbound logistics	2	7.26	3.629	7.574	0.000861 ***
Residuals	101	48.40	0.479		
Neutral change ER					
Changing the meaning of inbound logistics	2	0.216	0.1078	0.261	0.773
Residuals	26	10.750	0.4135		
Positive change ER					
Changing the meaning of inbound logistics	2	6.9	3.45	7.504	0.000679 ***
Residuals	259	119.1	0.46		

Source: own processing

The relationship between the change in the importance of procurement and the change in the importance of inbound logistics is demonstrated for firms with an adverse change in profitability (ER) and firms with a positive change in ER. The association is not confirmed for firms with a stagnation of economic results. The hypothesis is confirmed: the degree of association between the change in the importance of inbound logistics and procurement varies according to the nature of the change in the economic result during the recession period. In answering RQ1, the link between the growing importance of supplier-customer relationships and the importance of inbound logistics in the recession was confirmed.

The evolution of logistics capabilities and their impact on supply chain resilience is confirmed by a study by Song et al. (2022). The interrelationship between Global Value Chain elements is also noted by Epede & Wang (2022). The results suggest specific factors that could enable SMEs to use knowledge to support the

development of GVCs. Thus, the interconnectedness of the procurement domain and the importance of the inbound logistics domain fit entirely into the current state of scientific knowledge of the GVC domain.

According to our results of the RQ2 solution, it can be concluded that the size of the company is a factor that influences the degree of the link between the change in the importance of inbound logistics and the change in the importance of procurement during the recession. However, a direct relationship between firm size and the degree of association between the change in the importance of inbound logistics and procurement has not been established. The business sector was defined as another factor influencing the degree of association between the change in the importance of inbound logistics and the change in the importance of procurement. The strongest association between change in the importance of procurement and change in the importance of inbound logistics was found for service providers. The link was also confirmed for manufacturing firms. The scope of operations impacts the link between the change in the importance of procurement and the change in the importance of inbound logistics. The correlation was confirmed for enterprises with a local (local) presence and multinationals. However, there is no direct correlation between the scope of the enterprise and the association between the change in the importance of procurement and the change in the importance of inbound logistics. The results are consistent with the findings of Espitia et al. (2022).

A study by Espitia et al. (2022) reported that the vulnerability/resilience of supply chains varied by factors such as industry, the ability to work remotely, the durability of goods, and participation in global supply chains. Song et al. (2022) list the degree of digitalisation, innovation and modularisation, and risk management, among the factors that influence interconnectedness. The results of our research show that the degree of association between the change in the importance of procurement and the change in the importance of inbound logistics is not constant across firm size, business sector or scope. The greatest association was found for micro-enterprises in the service sector with a local (site) presence.

Based on the results of RQ3, it can be concluded that there is a link between the importance of procurement and investment in procurement. On the other hand, the association between the importance of inbound logistics and area investment was not confirmed.

Thus, our results build on the findings of Hayakawa & Mukunoki (2021), which identify a greater influence of supply chain effects than output effects on trade flows and point to the importance of diversification of inbound sources and effective inventory management for the resilience of global trade in a recession.

The responses to RQ4 suggest that the degree of association between the change in the importance of inbound logistics and procurement varies according to the nature of the change in the economic outcome during a recession. For firms with a positive change in ER, there is a stronger association between the change in the importance of procurement and the change in the importance of inbound logistics in a recession. The testing findings correspond with the results of Kumar & Ganguly (2020), who state that the degree of e-procurement development directly affects the firm's financial performance.

Conclusions

The main objective of this paper is to investigate the difference in the perceived importance of procurement and inbound logistics and to see if there is a link between importance, investment in the area and economic impact in times of recession.

Recommendations for the target segment can be summarised in several points. The main recommendation is a detailed consideration and comprehensive monitoring of investment and efficiency in relation to the changing importance of procurement and inbound logistics, as well as other primary and secondary processes within the GVC concept. Transparency and openness must be ensured when monitoring the performance of each process. The research has several limitations. It focuses only on the Czech environment during the specific period of the COVID-19 pandemic. The survey was carried out in the short term. Therefore, it is not certain that with longer-term follow-up, the values and, consequently, the research context will be at the same level. The sample under

some questions may not meet the validity requirements, e.g. under H3 testing, only 45 business enterprises were in the sample.

Based on the results, the direction of future research can be defined. It is necessary to carry out research from a longer-term perspective, i.e., both in economic growth and economic recession. Another research direction is to look for interrelationships between other aspects of GVCs. Further research should focus on identifying the drivers of change in business performance in the context of individual business processes.

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Funding: This paper has been prepared with the support of the VSTE Institute of Corporate Strategy, Department of Management. Article ID: IDUPS24017.

Data Availability Statement: Data available on request from the authors.

Author Contributions: Conceptualisation: *Straková, Jarmila*; methodology: *Chytilová Ekaterina*; data analysis: *Chytilová Ekaterina*, writing—original draft preparation: *Chytilová, Ekaterina*, writing; review and editing: *Chytilová, Ekaterina*; visualisation: *Chytilová Ekaterina*. All authors have read and agreed to the published version of the manuscript.

Ekaterina CHYTILOVÁ, Ph.D. is the Assistant Professor in Institute of Technology and Business in Ceske Budejovice. Research interests: Value Chain, Supply Chain, efficiency measurement.

ORCID ID: <https://orcid.org/0000-0002-8559-5669>

doc. Ing. Jarmila STRAKOVÁ, Ph.D. is the Vice-Rector for Strategy and Development, Associate Professor, Deputy Head of the Department of Management of the Institute of Technology and Business in České Budějovice, Czech Republic. Research interests: Strategic Management.

ORCID ID: <https://orcid.org/0000-0002-3048-3467>

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