

The Impact of COVID-19 on Hungarian Freight Transport

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Abstract: The logistics and transport sector has experienced unprecedented growth over the past decade. It is one of the most dynamically developing business sectors. The unexpected pandemic crisis had a severe impact on the business activities of various entities, significantly affecting not only the existence of business entities but also their business success. The goal of the present research was to examine the emergence and impact of COVID-19, with a particular focus on the logistics sector, primarily transport activities. The study is addressing freight transport in Hungary, using a questionnaire survey that included the participation of 312 business entities. Data processing was conducted using SPSS statistical software as a quantitative method. Based on the research results, the authors recommend the implementation of innovations and green logistics practices to ensure sustainable business activities within this sector. Based on the findings, it can be stated that the more diverse a company's activities are, and the faster it can respond to economic challenges, the smaller the losses it will incur.

Keywords: Transport, logistics, business, Hungary, COVID-19

1. Introduction

The goal of this study is to assess the impact of the pandemic COVID-19 on the logistics sector, with a particular focus on transport. Global supply chains in various industries have faced significant challenges. Despite demonstrating high levels of stability and flexibility in past decades, their operation has been disrupted by many factors since the outbreak of the pandemic. This disruption has adversely affected the entire logistics chain, both in terms of production and logistics processes. Moreover, a significant shift in demand has been detected. This study aims to determine

how a pandemic can change the activities of logistics service providers, which traditionally rely on international outsourcing and low inventory levels.

Due to the global organization of production, supply chains have expanded. Some production functions take place across multiple continents, and the dependence of supply chains on Chinese imports has become significant worldwide. This dependency explains why the current crisis has affected industries where safety stocks are sufficient for short run. As [1] states, “The coronavirus pandemic is perhaps the most significant health emergency situation of our time. It shows us something we knew before, but did not really care about the consequences: diversity of our relationships at all levels, the complexity of the world and its social, political, economic, interpersonal and psychological logics.”. Thus, Covid-19 has not only affected businesses in non-European countries but also those within Europe, particularly in the service sector [2]. In this regard, the pandemic has made businesses to adopt new procedures, processes and technologies to mitigate its negative impacts [3-5]. These technologies have also stimulated innovative actions within enterprises [6-8], such as R&D activities [9].

Similar measures to slow the spread of pandemic were introduced worldwide, including within the European Union region. Key measures introduced included border closures [10], restrictions on air travel [11], the closure of certain types of shops, and limitations on opening hours [12], stricter rules on public gatherings, and the closure of cultural and educational institutions. Most of the research done by experts shows that social protection measures during the pandemic varied from one state to another [13]. However, the effects of government interventions in EU member states have slightly mitigated the social and economic shocks caused by the pandemic [14]. Moreover, legislative measures, such as product restrictions [15] and enhanced safety standards [9] have been implemented by governments.

It did not cause problems in the case of European supply chains, and many did not anticipate that it might have a negative impact on their operations. The border closures introduced in March 2019 made the international goods transport difficult. This was further exacerbated by an increasing number of drivers on sick leave, infected by the virus. Although the desired products were available, transporting them to their intended destinations became problematic. The process gradually slowed down due to supplier inventory issues. However, suppliers with no inventory or transporting goods with short warranty periods, or those dealing with specialized products faced significant challenges in procuring raw materials and fulfilling customer demands [16].

The problems in the logistics sector caused by the coronavirus epidemic were first felt in China. Therefore, disruptions in Chinese production were reflected in the activity of international supply chains. The major container ports in China were overloaded with goods as travel restrictions prevented truck drivers from performing their work. Consequently, the halting of supply activities

in exporting countries led to a global shortage of spare parts across most sectors. This shortage affected the automotive industry, companies producing electronic goods, the pharmaceutical industry, manufacturers of medical aids, or consumer goods [17].

Several theories have been proposed to mitigate the international economic crisis. One of the most comprehensive action plans is detailed in an article published by the Institute of Economics of the Economic and Regional Research Center. Wyplosz identifies key policy areas that need to be addressed in crisis management: fiscal policy, monetary policy, financial regulatory policy, social security policy, sectoral policies, and trade policy [18]. A comparison of the Hungarian transport sector is illustrated in Figure 1.

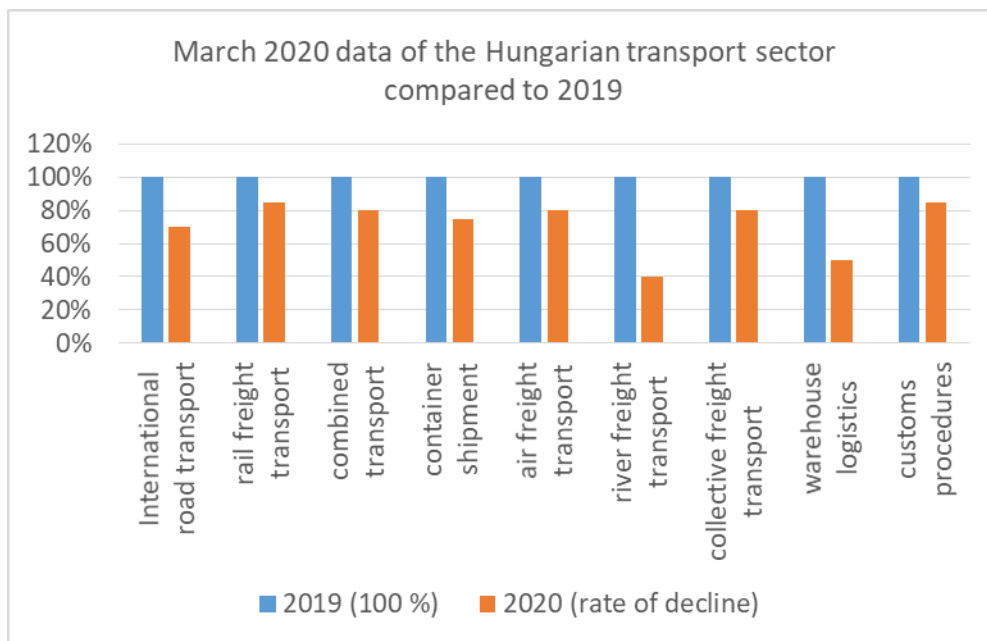


Fig. 1 March 2020 data about Hungarian freight transportation. Source: [19]

The emergence of the coronavirus pandemic caused losses in the traditional freight transport sector. However, there were also sectors that managed to navigate the pandemic successfully. Courier companies experienced a peculiar dichotomy: inter-company orders decreased, while retail online orders increased significantly. This trend can be attributed to several reasons. Due to strict pandemic regulations, the traditional brick and mortar retailers closed or restricted their opening hours, which was clearly reflected in the portfolio of orders as well. In addition to regular purchases, many people ordered face masks, disinfectants, and vitamins. Due to the introduction of home office and online learning, the demand for home delivery of electronic and IT devices has increased. Sports equipment, gardening tools, renovation materials were ordered to make time spent at home healthier and more comfortable [20].

The performance of leading Hungarian courier services following the outbreak of the pandemic was the following: The number of parcels delivered by **DPD** Hungary Kft. Had doubled both domestically and internationally by the end of April. According to **GLS**, no significant impact of

the pandemic could be demonstrated affecting their assets or liabilities. **UPS** international parcel service was negatively affected by border closures and other restrictions. The company decided to cut costs, including reducing the size of its vehicle fleet. According to data of **Magyar Posta Zrt.**, the daily turnover was already higher by 20% in first two weeks of April compared to November 2019 data. The turnover of **Express One** Hungary Kft. had increased by more than 30% over a few weeks compared to the same period in the previous year [21]. The situation of courier services in spring 2020 is presented in Table 1.

Table 1 Product categories delivered by courier services in spring 2020. Source: [22]

Product category	11 th week	12 th week	13 th week	14 th week
Gifts	-31%	-22%	20%	84%
Auto parts & Engine components	31%	-14%	-27%	30%
Mother & Baby Products	18%	18%	-16%	11%
Furniture, home decor	-12%	-22%	32%	31%
Fashion, apparel	-4%	8%	2%	21%
Food and Dietary Supplements	58%	23%	-21%	-16%
Construction, Gardening, DIY	56%	16%	-5%	1%
Erotic Products	-18%	-1%	13%	40%
Household Tools and Equipment	-1%	-10%	9%	20%
Hobby Tools	23%	20%	-9%	36%
Office Technology	5%	27%	-10%	1%
Beverages and Tobacco	6%	8%	-2%	64%
Toys	13%	56%	6%	36%
Books	-3%	-26%	12%	29%
Mobile Phones and Accessories	11%	-3%	20%	3%
Sport and Leisure	-4%	40%	-22%	66%
IT	1%	26%	4%	14%
Cosmetics and Personal Care	21%	2%	-16%	12%
Consumer Electronics	31%	-18%	-5%	29%
Web plaza	-28%	-7%	95%	-20%
Percentage change in total turnover	28%	-14%	9%	19%

2. Data and Methods

The goal of the research was to present the emergence and impact of the COVID-19 pandemic, with a particular focus on the logistics sector, primarily transport. In order to achieve this goal, the following main research hypotheses were formulated:

H1: For businesses that experienced the consequences of the pandemic later, the implemented measures led to faster results.

H2: Businesses engaged in specific activities experienced smaller losses caused by rising pandemic-related costs compared to businesses without such specific activities.

H3: Businesses with high sales revenue faced lower losses due to pandemic-related costs than businesses with lower sales revenue.

The empirical research was conducted through an online questionnaire survey from 13 February 2022 to 9 March 2022. Approximately 1,000 companies whose professional profile matched the content of the questionnaire were approached. For sampling, a specific type of random sampling method, stratified sampling, was employed, where the stratification factor was the company's headquarters. Out of 321 questionnaires completed and returned, 312 met the parameters of the defined target group and were included in the analysis. Responses that fell outside the target group or contained irrelevant data for the research were filtered out during the data cleaning process. The responses rate for the questionnaire was 32.2%. Prior to analysis, the collected data was coded using the SPSS statistical software. We primarily used descriptive statistics in order to process the survey data. Subsequently, bivariate and multivariate data analysis methods were applied to test the research hypotheses.

3. Results

Before testing the hypotheses, we first introduce the business sample used in the research. More than 40% of the companies participating in this research have their headquarters in Budapest, while nearly one-third of them are located in Pest County. Additionally, 6.5% of the companies are based in Komárom-Esztergom County, 5.2% in Fejér County, 3.9% in Szabolcs-Szatmár-Bereg County, and the remaining companies are distributed across 7 other counties. The primary field of operation for most businesses (78%) is international transport, followed by domestic transport (54.5%), warehousing (49%), customs clearance (42%), international transport (40%), domestic transport (30%), and parcel service (11%). The businesses engage in import and export activities in almost equal proportions. In terms of transport modes, 87% of the businesses are involved in road transport, 52% in rail transport, 48% in container shipping, and air cargo transport is conducted by 47% of the businesses. Additionally, 4% of the respondents identified themselves as air cargo forwarders, 3% as sea and road freight forwarders, and 1% as rail freight forwarders. Almost two-thirds of the businesses also conduct specialized activities alongside their core operations. Among these, 52% of the businesses engage in collective transportation, 48% in combined freight transport, and 13% in fair and exhibition transport. Conversely, 34% of the respondents did not report any specific specialized activity. A similar distribution applies to supplementary activities, with over two-thirds of businesses engaging in these alongside their core operations. The most common supplementary activities of businesses are customs clearance (62%), warehouse logistics (52%), parcel service (12%). Meanwhile, 1% of businesses reported involvement in activities such as cargo insurance, ADR transport, transport of oversized goods, refrigerated and frozen food packaging,

repair services, handling of dangerous goods, special packaging solutions for refrigerated or pharmaceutical products and consultancy services. Notably, 26% of the companies do not engage in any supplementary activity. The transport activities of the companies are not restricted to a specific type of product. Nearly all of the companies handle a diverse range of goods, the portfolio of products ranging from raw materials to technical equipment used in healthcare. Specifically, 75% of the businesses is involved in transport of car parts and other industrial components, 58% in transporting electronic and household goods, 49% handle household and consumer goods, 42% focus on food and daily produce, construction and DIY goods are transported by 38%, healthcare items and medicine are transported by 35%, clothes and sport items were mentioned in the case of 34% of the businesses. Other types of products were listed by 1 company each.

Businesses experienced the effects of the pandemic for the first time in different periods. A total of 45.5% of businesses were first faced with the effects of the pandemic in the first quarter of 2020, while 42.9% reported experiencing the effects of COVID-19 in the second quarter of 2020. The remaining 6.5% reported negative impacts in the third quarter of 2020, while 5.2% of businesses only felt the negative impact in the fourth quarter of the same year. Businesses experienced the consequences of the pandemic across different areas. Negative effects on costs were reported by 60% of businesses, while 57% had problems with the quantity of orders, and 53% reported problems in delivery schedules. Additionally, 46% of businesses reported challenges in accessing transport vehicles, and 44% had problems with the availability of free sea containers. Workforce-related issues were noted by 32.5% of businesses, and changes in warehouse logistics were observed by 13%. A small number of respondents (1 each) reported changes in the work environment, such as transitioning to home office arrangements, or challenges related to airline capacities.

A total of 32.5% of businesses reported negative impacts on their workforce, and changes in warehouse logistics were experienced by 13% of businesses. Additionally, one respondent reported changes in work environment (remote work) and problems related to airline capacities each.

We investigated the specific measures taken by businesses to combat the negative consequences of the pandemic. The most common solution was the introduction of remote work where it was possible. Some businesses reduced their costs, reassigned their activities, reorganized work schedules, hired new employees, or used temporary labor to fill workforce gaps. „It was necessary to increase the wage of drivers (primarily above the average)”, as one of the respondents stated. Several companies took similar steps, raising wages to retain employees and prevent staff turnover. Other businesses optimized scheduling processes to improve efficiency. Larger companies applied risk management, restructuring, and optimization across different operational areas. They negotiated with their partners about the necessary measures that had to be taken or agreed on

increasing or reducing transport costs. They sought alternative solutions to meet customer needs. New subcontractors were engaged to replace lost capacity and, as well as to maintain quality services. Many companies saw digital technology as the key solution. Part of the respondents reduced their truck fleets, while others sought additional transport opportunities. Several businesses collaborated with smaller shipping companies and smaller companies or explored alternative transport routes. Notably, some companies rented charters for routes between China and the EU or between the EU and the USA, while others explored new air cargo transport routes. The measures introduced included also finding market niche, introducing new services, and focusing on marketing and sales activities. Some companies reported on the measures taken to tackle the pandemic, including staff-related actions, such as separating external staff from internal employees, wearing face masks, maintaining regular contact with the appropriate authorities, implementing measures related to lifting quarantine rules, and lobbying for border-crossing solutions. The introduced measures did not lead to a solution immediately. 18% of the respondents reported that the introduced measures were unsuccessful. However, 65% of the respondents reported that they experienced a positive change within a few months, while 5% reported feeling positive change within a year or more. For 12% of businesses, the impact of the measures could not be assessed.

The section below will deal with the test of research hypotheses.

H1: For businesses that experienced the consequences of the pandemic later, the implemented measures led to faster results.

Table 2 Symmetric Measures. Source: authors

	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal Gamma	.355	.072	4.441	.000
N of Valid Cases	312			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Based on the cross-table analysis (Table 2), the obtained value of Gamma significance (0.000) is lower than the significance level (0.05). Therefore, the test is statistically significant and supports part of hypothesis H1, indicating a significant but relatively weak (0.355) relationship between the variables.

Furthermore, as shown in Fig. 2, it can be concluded that for companies where the consequences of the pandemic were observed later, the results of the introduced measures were assessed after a longer period. This finding leads to the rejection of Hypothesis H1. Specifically, for companies where the consequences of the pandemic were felt earlier, the measures introduced yielded results sooner.

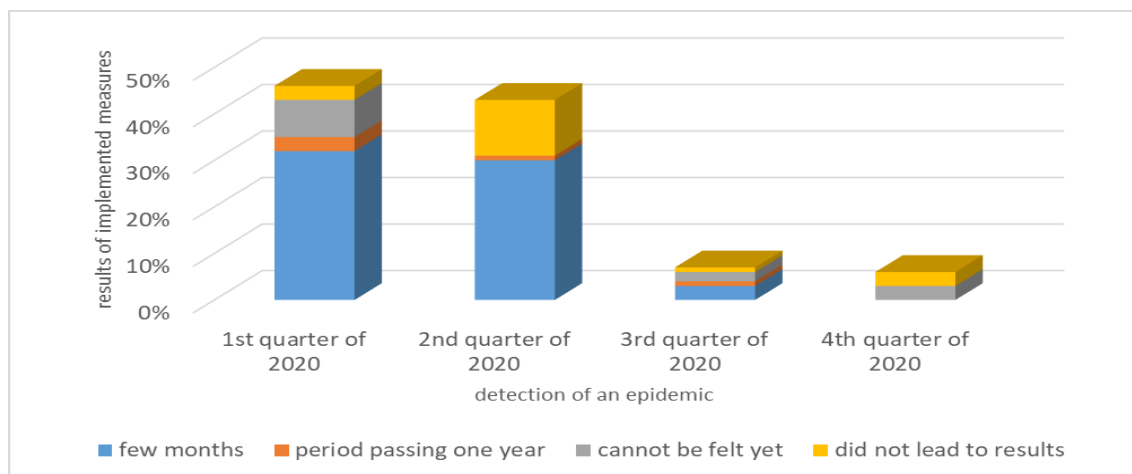


Fig. 2: The impact of COVID-19 in different time intervals. Source: Authors based on data collection of Farkas Istvan Zsolt

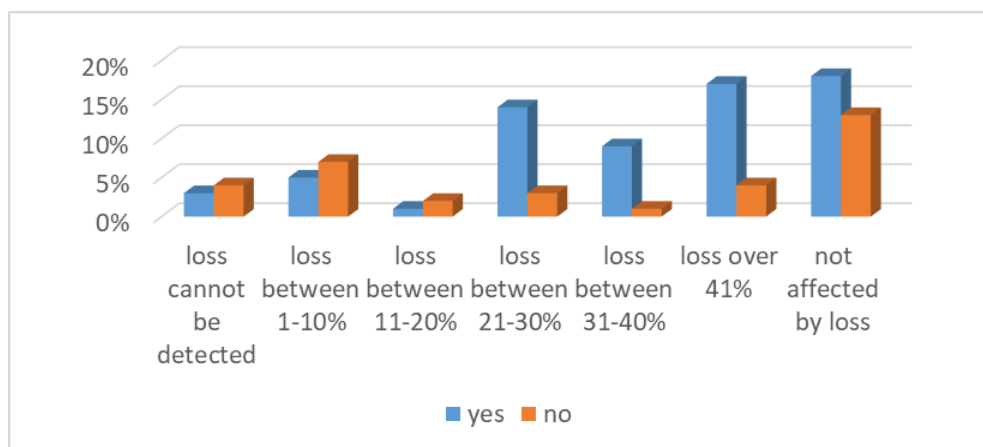


Fig. 3 Experienced loss for companies conducting and not conducting special activities. Source: Authors based on data collection of Farkas István Zsolt

H2: Businesses engaged in specific activities experienced smaller losses caused by rising pandemic-related costs compared to businesses without such specific activities (Fig.3).

Table 3 was analyzed as follows: Independent variable: Conducting special activity. Dependent variable: Costs (areas of costs). Of the businesses in the research sample, 67% also engage in some kind of special activity. Since the dependent variable is non-metric but measured on a metric scale, the research results were analyzed using a one-way analysis of variance. The conditions for applying the variance test, which require the dependent variable to be measured at least on an interval scale and to follow a normal distribution based on the Kolmogorov-Smirnov test (sign. 0.000), were met. The variance-homogeneity was checked by running a Levene's test, which proved heteroscedasticity. It is important to emphasize that the F-test is robust, which means that the violation of homoscedasticity does not necessarily lead to a distorted F-value.

Table 3 ANOVA. Source: authors

experiencing loss

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.895	1	16.895	4.432	.036
Within Groups	1181.845	310	3.812		
Total	1198.740	311			

Since the significance level related to F-test was 0.036, which is lower than 0.05, we can conclude that the category averages differ significantly. This indicates that conducting or not conducting a special activity leads to different perception of loss. Based on the result of the tests performed, Hypothesis H2 is thus accepted.

H3: Businesses with high sales revenue faced lower losses due to pandemic-related costs than businesses with lower sales revenue.

As the first step of the analysis, we examined the sales revenue of the businesses participating in the research sample. Forty percent of the interviewed companies reported an annual turnover exceeding 2.5 billion HUF. Across the revenue groups, most businesses experienced more than a 20% revenue loss.

To explore the relationship between two metric variables, we conducted a correlation analysis, the results of which are presented in Table 4. Pearson's coefficient was used to examine the linear correlation. Since correlation analysis is very sensitive to outliers, we first examined the existence of both variables. No outliers were identified in either the companies' sales revenue or their reported revenue losses, and therefore, none of the respondents were excluded from the analysis.

Table 4 Correlations. Source: authors

		loss	sales revenue
Loss	Pearson Correlation	1	-.055
	Sig. (2-tailed)		.336
	N	312	312
sales revenue	Pearson Correlation	-.055	1
	Sig. (2-tailed)	.336	
	N	312	312

The value of Pearson's correlation coefficient is -0.555, which indicates a weak negative relationship between the examined variables. The hypothesis is thus rejected based on the analysis performed above.

4. Discussion and Conclusion

The outbreak of the COVID-19 pandemic posed a new challenge to countries worldwide. New paths and solutions must be found in order to avoid economic crises or devastating consequences of the pandemic for the global economy. Global supply chains may shorten and shift toward regionalization. Supply bases could become multi-centered, with increased security stock levels. As the demand for rapid data acquisition grows across all sectors of economic life, the accelerating development of digitization and automation gains increasing importance. Robotization presents an alternative and rational solution to these challenges. However, the pandemic pointed out the negative aspects of globalization. Disruptions in supply chains, production units, suppliers, sub-contractors performing subtasks make the operation of large companies impossible in the long term. The rationalization of financial and economic areas has become necessary. The joint integration of innovation and green logistics offers a potential solution for globalized economies. It can create jobs for those who became unemployed during the pandemic, while also strengthening national economies. This research focused on current trends in Hungarian freight transport in the context of Covid-19 pandemic. Three hypotheses were formulated. Only one of the hypotheses (H2) was supported, while two hypotheses (H1 and H3) were rejected. A total of 312 entities participated in this research. Based on the findings, we recommend implementing green logistics and innovations as tools for sustainable freight transport and transport business.

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