7. Determinants of competitiveness of Polish road carriers

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Abstract

Purpose: The study aims to investigate how economic, legal, geopolitical, and technological factors impact the competitiveness of Polish road hauliers both immediately after and three years after the pandemic.

Design/methodology/approach: The study relies on primary research conducted through a questionnaire survey, secondary research from existing literature, and an analysis of statistical data and consulting companies' insights.

Findings: The study found several key points, including the market favoring freight forwarders during turbulent times, opportunities in digitalization due to difficulties in reducing costs related to fuel, energy, and wages, successful adaptation to legislative changes (especially the mobility package), and the need for market consolidation based on operators' financial health.

Research limitations/implications: The study acknowledges the unique nature of the COVID-19 pandemic, making it challenging to compare it to future crises. However, it provides valuable insights into the impact of the pandemic on various aspects of competitiveness, such as rates, volumes, legal protection, profitability, and new challenges.

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Practical implications: The collected data can help stakeholders better understand the behavior of the road freight industry during times of crisis, which has implications for product prices, environmental impact, and societal purchasing power.

Social implications: The condition of the road transport industry not only affects business but also has broader societal and environmental consequences. Understanding the industry's behavior can shed light on these aspects.

Originality and value: The study stands out for its multifaceted approach to understanding competitiveness in times of crisis within the road freight industry. It's noted as one of the few studies on this specific topic and is valuable for its comparison of the author's findings with those of other researchers and industry opinions. Overall, your text provides a clear and comprehensive overview of your study, making it easy for readers to grasp the purpose, methodology, findings, and implications of your research.

Keywords: COVID, transport, logistics, competition, crisis.

Introduction

Immediately after the first wave of the COVID-19 pandemic, questionnaire surveys and literature studies were conducted to identify the impact of the pandemic on selected aspects of the business of road haulage (Banaszyk et al., 2021). At the time, it was found that in April and May 2020, there was a 37.5% drop in orders in the transportation and warehousing industry. In fact, it may have been much larger in the transportation industry alone. The decline in the transportation and warehousing industry also resulted in order declines in other industries, such as accommodation and food service: 63.15%, retail trade: 31.55%, construction: 26.45%, industrial processing: 25.05% and wholesale trade: 25.15%. The financial standing of Polish road transport companies deteriorated radically. This was a significant threat to their existence, since the sector is characterised by a high degree of dispersion and consists mostly of small enterprises. Given that many small carriers did not have the so-called "financial cushion", and the means of transportation used were financed largely through loans (leasing), a change in the sector's entity structure was expected. Relatively the best performers were large companies. Based on these findings, a forecast of consolidation of the road transport sector was formulated.

Another important determinant of the sector's evolution is the Mobility Package, in force within the European Union since August 2020, successively introducing changes in the regulations governing various areas of transport companies' operations until mid-2026. The changes resulting from the Mobility Package which were introduced in 2022 concerned control of the sector pay and possession of road transport licenses, financial security, registration of company headquarters for vehicles from 2.5 tonnes GVW (Directive (EU) 2020/1057). Therefore, they affect administrative and operational personnel costs.

In turn, geopolitical changes have affected changes in economic indicators, the consequences of which are reflected in the demand for goods and services, as well as in fuel costs and fleet prices. In 2021, new events emerged that have strongly affected road transport companies. Of particular importance is the so-called Fit for 55 package prepared by the European Commission, tightening the permissible CO_2 emission standards for cars. It is presumed that the transformation of this sector will largely consist of a rapid and profound replacement of the transport fleet, thanks to the replacement of hydrocarbon-based drive units with electric-powered ones (battery and hydrogen engines). There are hypotheses that about three-quarters of vehicles will be affected by this change (Suraj, 2022).

The purpose of this study is to determine the impact of current economic, legal, geopolitical and technological conditions on the competitiveness of Polish road carriers, as after three years of dealing with the COVID-19 pandemic it is worth re-diagnosing the road transport sector in Poland. The former hypothetical forecasts were also verified in the light of the results of studies conducted by other researchers in the area of the impact of the COVID-19 pandemic on road haulage, with a particular focus on Poland. In the following section, conclusions are made as to the expected economic and financial requirements of the necessary investments of transport companies incurred to ensure the implementation of the legislation relating to the Mobility Package and the Fit for 55 package. The importance of the informatisation of the sector in question is also briefly discussed.

7.1. The impact of the COVID-19 pandemic on Polish road transport in the light of empirical studies

The introduction already pointed out the main conclusions of the authors' research done in the first half of 2020. In addition to the areas indicated, the studies included: the volume of orders and the structure of transport, demand for transport, problems with payment of transport operators and their contractors as well as financing of transport companies' assets in terms of credit, leasing and investment. Among the findings there was a major slump in road freight, which became dynamic at the end of the third decade of 2020, and then slowed down again at the end of the year. It was also noted that, as time went on, payment problems in transportation were reduced faster than in other industries. Despite the positive developments noted, the situation was very difficult, especially among smaller transport operators. It was predicted that continued difficulties in repaying lease and loan instalments or enforcing payments for services rendered for these entities could even end in the termination of their operations.

In order to verify the conclusions of the own research, a review of scientific literature on a similar topic was made. The bibliometric analysis started with defining the scope of the analysis, which was road freight transport during COVID-19. Next, based on this scope, combinations of keywords were used to search for the related literature in a scientific database. These keywords were road freight transport without quotation marks and "road freight transport" as one phrase as well as "COVID". After generating the combination of keywords, the Scopus, Web of Science, Science Direct and Google Scholar databases were selected due to their updated and wide coverage of existing literature on the proposed topic. We extracted documents only in English and only from the last three years (2021, 2022, 2023), i.e. documents published after the outbreak of the pandemic.

In the Science Direct (Elsevier) database, entering road freight transport without quotation marks yielded 19053 records, while entering the phrase with quotation marks limited the result to 1077 records. As part of the search within these results, the search term "COVID" was entered, resulting in 57 articles that were finally analysed. When searching subsequent databases, the same pattern was followed. Finally, 85 articles from the Scopus database were reviewed, as well as 53 from the Web of Science. As many as 1290 articles were received from the Google Scholar database, which is why they were limited by adding the entry "Poland", which still showed 383 articles. However, no detailed review was made in this case, and the analysis was limited only to those titles that were available in the full text version. It shall be noted that the search results were downloaded in a CSV file, which included each article's title, abstract, author list, funding details, etc. The bibliometric analysis ended with the filtering process, which comprised screening the articles' titles and reading their abstracts to eliminate irrelevant research papers. The database prepared in this way was cleared of repeated results.

The articles found largely focused on specific geographic areas: countries—Colombia, France, Greece, Denmark, Italy, Slovakia, Ireland, Argentina, Austria, China (three times), Germany, Russia, India and Brazil (two times each), as well as cities: New York, Budapest, Bologna and London. There were six articles on Poland that were the most relevant to the subject of the authors' research, and only two of them concerned the impact of the COVID-19 pandemic on Polish road carriers in the light of the authors' own research (Łącka & Suproń, 2021; Nicodeme, 2023; Osińska & Zalewski, 2023; Romanow & Frąś, 2022; Świtała & Łukasiewicz, 2021).

Osińska and Zalewski (2023), in their empirical analysis based on survey data made in July 2020 on 500 road transport enterprises, showed that this specific branch, which is very sensitive to changes in global trade, suffered much from the COVID-19 pandemic because:

- the lockdown, which in Europe began on March 10, 2020, resulted in border crossing restrictions and sanitary restrictions,

- demand for transportation services, measured as the number of transport orders, decreased significantly due to production and trade limitations,
- the prices of freight per 1 km were lower.

Additionally, costs in the transportation industry are increased by leasing instalments for using the newest generations of vehicles. These reasons caused transport enterprises, which mostly belong to micro, small and medium-sized enterprises, to face the risk of bankruptcy. The negative phenomena in the transportation market were accompanied by positive changes (cost reduction) observed on the fuel and currency markets. Global prices of fuel fell due to lower global demand. The Polish currency (PLN) was depreciated against the euro. However, these factors could not fully mitigate the decreased demand, which was observed in most sectors of the economy. Therefore, road transport enterprises widely used the anti-crisis aid offered by the Polish government (Osińska & Zalewski, 2023).

Świtała and Łukasiewicz (2021) stated that respondents (from their own research) indicated a high and very high negative impact of the pandemic on transportation operations, regardless of their employment level, origin of capital and scope of operations. As a result of the COVID-19 restrictions, 80% of the survey participants reported a decrease in demand for transportation services, which in turn resulted in negative consequences in the form of significant difficulties in maintaining financial liquidity. For most transport providers, the decrease in demand for transportation during the first months of the pandemic exceeded 40%. The group of small companies was more likely to experience financial difficulties and take corrective actions than medium-sized and large companies. The relationship found seems quite obvious: in the case of small road carriers, due to the small scale of their operations, there is often a dependence on one link in the supply chain or on a large logistics service provider, which can lead to serious financial difficulties in the face of uncertainty and changing market trends. They also noted that in road transport the only way for supply to adjust to falling demand is for the fleet to be decommissioned, with a simultaneous reduction in the workforce (Paprocki & Letkiewicz, 2020). However, the research shows that carriers did not opt for this measure in most cases.

Comparing the results of our own research and those of other scientists conducted at the same time, it can be unequivocally stated that although their scope was different (substantially smaller than in our own research), the indicated conclusions fully coincided with our own predictions. Among all the analysed studies on the impact of COVID-19 on road freight transport, there was one involving a literature review based on bibliometric and scientometric analyses. The authors (Karam et al., 2022) selected 68 studies on the impact of COVID-19 on freight transport, which makes their work similar to our original analyses.

7.2. The impact of the economic situation on the competitiveness of Polish carriers

Based on the authors' survey results from a sample of 87 trucking companies of all sizes, it was found that shortly after the pandemic outbreak the respondents pointed to a drastic decrease in transportation (Figure 7.1), which was the result of decline in orders. In total, over 80% of respondents recorded a decrease in transport, including a significant decrease marked by over 50% of them.

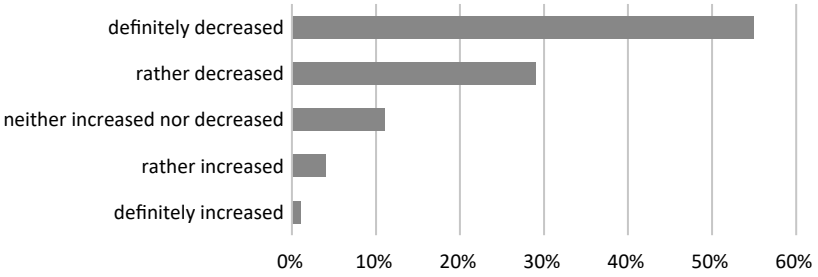

Figure 7.1. Change in the volume of transport by Polish road carriers just after the outbreak of the pandemic
Source: own work.

The difficult market situation related to a smaller number of orders was aggravated by problems resulting from provisions in commercial contracts and general regulations. This applies both to the financial obligations of transport operators and their debtors. The authors' own research showed that the law does not sufficiently protect carriers against situations of failure to comply with the contract of carriage (or its implementation with a delay) due to emergency situations such as a pandemic.

Over 80% of respondents claimed that the law does not sufficiently protect carriers in a situation where the contract cannot be performed. This is related to financial penalties and solvency problems. Due to the fact that the previous crises were of a different nature, there were also no relevant clauses in contracts. Transport companies regularly signal huge problems with payment unreliability of their business partners. The report of the Economic Information Bureau (BIG) stated that representatives of this industry had the greatest problem with arrears exceeding 60 days (44.1%) (BIG InfoMonitor, 2020).

Referring to the current research (SPOTDATA, 2022),[1] which also covers Polish road transport companies operating in foreign and Polish markets, it should be

[1] A total of 83 units of various sizes were surveyed, including micro enterprises which account for more than 80% of the market share.

noted that despite the pandemic crisis and the subsequent difficult challenges related to legislative changes and the war in Ukraine, Poland is the leader of the European road transport market in terms of the volume of transport work performed. Since 2010, there has been particularly strong growth in orders performed in the mode of cabotage and cross-trade transport (SPOTDATA, 2022). In both types of transport, Poland's share is about 40%. More than 60% in terms of tonnage and more than 80% in terms of the value of cargo exported from Poland is transported by road. Thus, the road transport market has steadily increased despite temporary slumps caused by the outbreak of the COVID-19 pandemic, introduction of successive provisions of the Mobility Package or the outbreak of war in Ukraine. This is illustrated in Figure 7.2, taking into account the number of kilometres travelled by Polish carriers. It can be concluded that the dynamics of the increments would have been much higher in other geopolitical and economic circumstances.

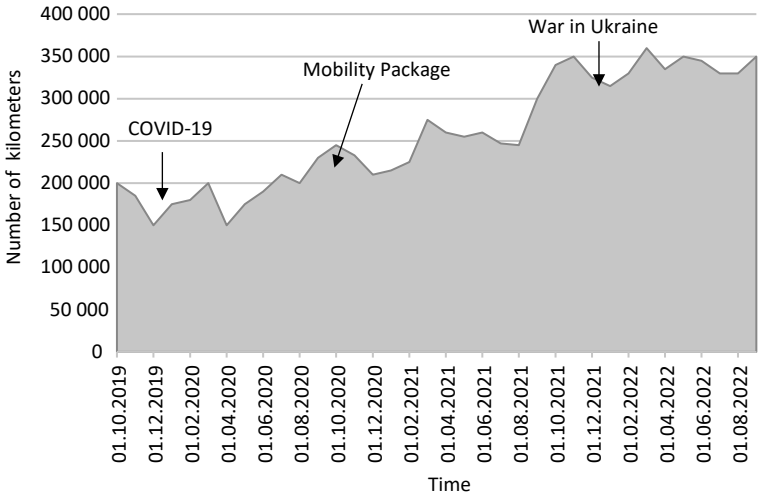

Figure 7.2. Transport operations of the Polish TSL industry based on data from the GBox and 4Trans systems

Source: based on data from Inelo Group's 4Trans 2022 system database (PITD, 2023, p. 8).

In 2020–2021, the volumes of cargo transported and freight work performed were at similar levels. Nevertheless, taking into account previous years, an increase in dynamics in both areas under discussion is noticeable. Given that after the outbreak of the pandemic in Poland, many sectors of the economy slowed down in March 2020, the transport industry did not see similar increases as in previous years; yet, there were no drastic declines either.

International transports by Polish carriers in Russia, Ukraine and Belarus accounted for a negligible percentage. As a result, recent geopolitical events have not significantly affected the volume of transport performed.

In Europe, the growth rate of freight work is estimated to slow to 0.7% per year in domestic traffic and 2.1% in international traffic (Oflakowski, 2023). The slowdown in order volumes will be accompanied by inflationary pressures, even though inflation is currently slowing down. The average annual inflation in 2022 was 14.4% (Statistics Poland). According to various sources, this figure is likely to fall to around 10%–13.5% in 2023. Despite improvement in some economic indicators (Figure 7.3) and good long-term prospects, freight demand is currently held back by consumer purchasing power.

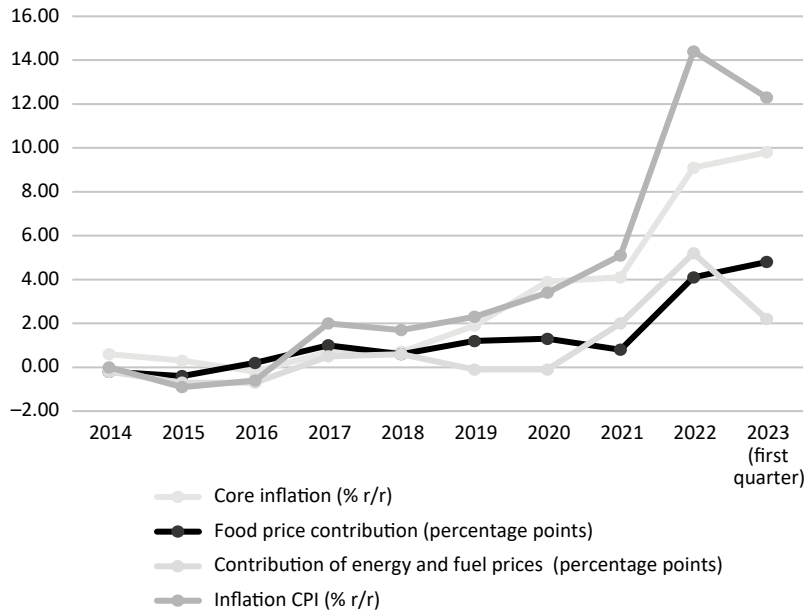

Figure 7.3. Inflation in Poland, food, energy and fuel prices
Source: based on (PKO Bank Polski, 2023).

It is estimated that producer inflation has already peaked, however, consumer inflation will peak in the first quarter of 2023, and the rate will remain in double digits until the end of 2023 (AXI IMMO, 2022; European Commission, 2023). Ultimately, this is expected to translate into weaker freight dynamics. It can be concluded that the Polish economy has avoided entering a technical recession at the beginning of 2023. According to Nicodème (2023) the Polish economy was

growing significantly before the pandemic, recording an increase of 4.7% of its GDP in 2019. The COVID-19 pandemic made the GDP fall by 2.7% in 2020, but a strong rebound was forecast for the upcoming years: +4% in 2021 (in reality it was 6.8%) and +5.4% in 2022 (in reality it was 4.9%). In addition, it is positive that the market for warehouse space in Poland remains at a stable, high level. This is influenced by the price as well as geographic and quality attractiveness of this market segment compared to Europe. The current more than 50% share of speculative space may decrease slightly in the future, due to higher requirements for pre-let contracts. Nevertheless, regardless of the internal structure of this type of space, its supply is growing, which generates demand for warehouse services and, consequently, for transportation. This trend is also expected to be reinforced by the trend of reshoring (i.e. the practice of transferring the organization's production capacity to the same market where the end product is used or sold), and thus shortening supply chains (Hadwick, 2022). This should result in some freight work being shifted to trucking in the future. According to a Reuters report (Hadwick, 2022), Poland, next to Germany, has the most to gain from shortening the supply chains due to its strategic location in Europe and access to other markets (the Schengen area and EU).

7.3. Costs of transport activities

The authors' primary research just after the outbreak of the pandemic indicated that the vast majority of companies at the time were settling at 3%–4% profitability. Only a few entities indicated profitability of more than 10%. Based on supporting data from Santander (2022) it may be noted that despite the economic turmoil, profitability was more slowly increasing among larger entities (Figure 7.4).

Current research conducted by SGH Warsaw School of Economics and published in the form of annual reports shows that in times of crisis, regardless of the reasons, freight companies and small businesses have the hardest time in the transport, shipping and logistics (TSL) sector. The situation is different for larger entities. In the freight market, twenty largest companies registered in Poland (led by Hegelmann Transporte, GEFCO, Adampol S.A., SKAT Transport sp. z o.o. sp.k., Fresh Logistics Polska sp. z o.o.) reported revenue growth ranging from 7% to 76% in 2021 compared to a year earlier, with more than half reporting revenue growth of up to 20% (27. edycja rankingu firm TSL, 2022). Considering that the largest company at that time of the year had revenue of 1,283,438,673 PLN, these are high increases.

Due to the increase in fuel prices, wage costs, energy costs and fleet purchases, companies were forced to raise freight rates during the period under review,

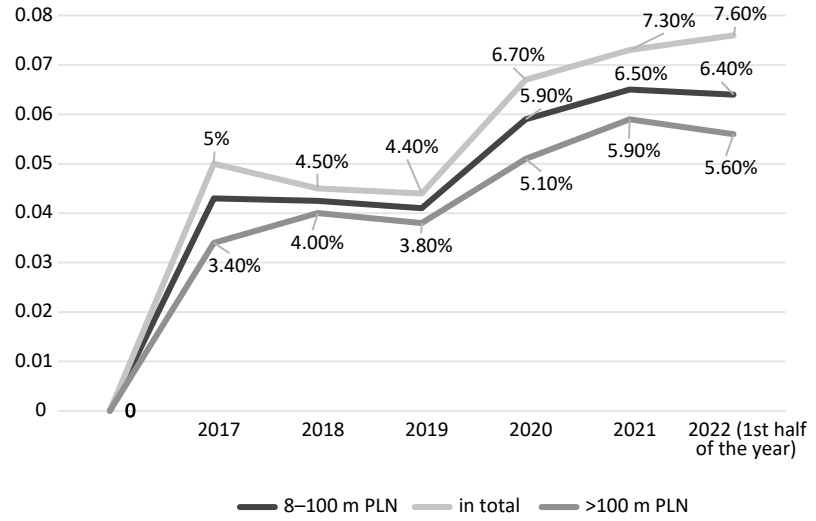

Figure 7.4. Operating profitability of carriers employing more than 9 people in Poland by revenue
Source: (Santander Bank Polska, 2022).

as evidenced by the latest survey conducted by Inelo and the Polish Institute of Road Transport using the CAWI (Computer-Assisted Web Interview) method on a sample of 89 respondents (PITD, 2023). For example, the price of diesel fuel in Q4 2020 was PLN 4.15 per litre, and in Q4 2022 it was already PLN 7.99, 192.5% up from the initial price (Transcash, 2023).

It is worth pointing out that the spot market reacts faster to the aforementioned changes in the economic situation than the contract market. Therefore, it can be predicted that with the declining purchasing power, spot prices will fall first. In the PITD survey (2023), 44% of respondents indicated that they expected spot rates to increase relative to contract rates, and 40% indicated that they did not anticipate such an increase. Thus, opinions in this area are divided. Increasing competitiveness in the freight market is difficult, in the first place, for the companies which largely concentrate their turnover on the spot market. In the situation of contract or fixed haulage, where there are no formal long-term contracts and the routes in question are traditionally operated by specific carriers, these companies are in a more favourable position despite lower rates.

There is a perception in the transportation community that freight increases have not been sufficiently adequate to match real increases in operating costs (Figure 7.5). This situation is also described by Poliak et al. (2021) who cite much earlier sources and refer to the European Union policy. They write that carrier costs increase faster than the price of transport (Ross, 2015, za: Poliak

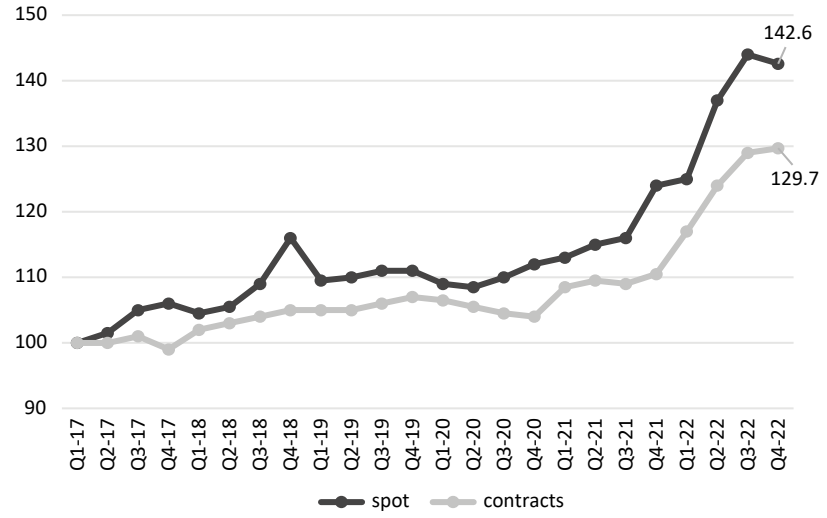

Figure 7.5. Index of spot and contract rates in road freight transport in Europe (Q1 2017 = 100)
Source: based on (Ti&Upply&IRU, 2023).

et al., 2021; Rushton et al., 2010, za: Poliak et al., 2021). The increase in transport prices grows significantly slower compared to costs. This situation has led several carriers to violate the EU law by subcontracting (Rotondo, 2013, za: Poliak et al., 2021). The carriers wanted to gain a competitive advantage despite violating the regulations (Osterloh & Debus, 2012, za: Poliak et al., 2021). To maintain uniform market access conditions, the EU adopted regulations aimed at harmonising the conditions in 2009 (Regulations (EC) No 1071/2009 and 1072/2009). Despite these regulations, various market distortions occur, e.g., the MiLoG German Minimum Wage Act. The EU aims to eliminate these market distortions (Regulation (EU) 2020/1054). Although the provisions were not to come into force until 2022, there were several views from carriers that it would not be achieved by the specified time, and that even after 2022, there will be no uniform conditions for all carriers operating in the EU common market. However, there is still strong competition. The transport price within the EU remained almost unchanged between 2000 and 2019 (Ferrari, 2016; Jourquin, 2019), but costs changed significantly, with labour, toll and fuel costs growing the most. Transportation companies seek to gain a competitive advantage by optimising their costs (Krasnyanskiy & Penshin, 2016). In order to achieve this, they use cost calculations which divide the costs into variable and fixed costs, calculating each transport separately but taking into account only the costs connected with transport (Ferrari, 2016; Kovacs, 2017).

At industry meetings, it is pointed out that the current winners are companies that have not adapted to the changes resulting from the legislation. Theoretically, the ability to charge untaxed and non-contributed business travel benefits was eliminated. As a consequence of these changes, it is estimated in the industry circles that this resulted in an increase of up to 40% in driver payroll costs. However, the increase in rates is not proportionately reflected in higher insurance revenues. The inadequate level of control on the roads and the complicated billing system means that there is still the so-called "grey area" in this field. In the market, smaller carriers in particular are driving at undervalued prices. However, it is difficult to estimate how much of this is due to companies not counting costs accurately, and how much is due to a deliberate strategy of entering into unfair price competition. Furthermore, it also seems difficult to forecast to what extent digitalisation will affect the ability to detect unfair practices. It can therefore be predicted that the number of bankruptcies will be higher in the long term.

Reducing fraudulent behaviour in the industry may be influenced by the obligation to report (as of February 2, 2022) in the Internal Market Information System (IMI). This obligation applies to the implementation of cabotage and cross-trade (and does not apply to bilateral and transit traffic). Diverse systems have been used to date. For example, in Germany—the MiLoG system, and in France—SIPSI. Another good idea, according to practitioners, is to average the per diems at 60 euros per day, and transfer wages in two tranches to make the billing system simpler. Some hopes of incurring competitive fairness from the cost side are also associated with the introduction of tachographs, which will increase transparency in the calculation of wages, and the use on a larger scale of telematics applications coupled with tachographs and other devices. They make it possible to reduce costs by, among other things, analysing drivers' driving styles, measuring tire pressure, recording border crossings as well as optimising routes and refuelling.

Shortly after the start of the pandemic, respondents in the authors' original study (Banaszyk et al., 2022) indicated a reduction in freight levels, but nevertheless this was associated with a drastic reduction in orders and disruption of many supply chains. At the beginning of 2023, some companies were already beginning to feel the drop in freight prices. Their final level will be affected by two opposing trends—the first one related to the slowdown in the economy caused by geopolitical changes and consequent inflation, and the second one related to the Mobility Package and fuel prices, which also relate to geopolitics.

Similarly, new social regulations implemented in the European Union have a negative impact on the economic condition of transport companies. In general, different countries have different rates of motor insurance. In Poland, they are not as expensive as in the countries of the so-called Old Union (consisting of the EU15). A new regulation in this area is to impose an obligation to insure drivers

and vehicles in the countries of the dominant source of commercial turnover and the longest drivers' working hours. Polish transport companies execute orders precisely in the Old Union, which means that another factor increasing the cost of their business is to be expected (PZPM, 2023).

At present, it can be said that with the increase in the cost of doing business, the market for carriers is weakening, while the market for freight forwarders has strengthened. Additionally, in connection with this, greater competitive pressure is expected from price-competitive Belarusian and Ukrainian carriers. Thus, in the future, one can expect penetration into the Polish market not only by resources from the East in the form of drivers, whose share is growing (Santander Bank Poland, 2022), but also in the form of companies.

7.4. Technology and digitalisation in transportation

The European Parliament's Committee on Transport and Tourism (TRAN) prepared a document with an overview of the repercussions of the COVID-19 pandemic on EU freight transport as well as policy recommendations to address the challenges emerging from the crisis. Two main conclusions interconnected with digitalisation have emerged: 1) the digital transformation of the industry accelerated during the pandemic in order to comply with recommendations to reduce physical contact and to capitalise on the demand for online shopping, and 2) the EU and national policy makers should continue to incentivise digital innovation as well as provide a clear legal framework for the use of disruptive vehicles such as drones and digital technologies (Rodrigues et al., 2021).

Digitalisation is seen as raising the competitiveness of the industry in question due to the fact that costs related to fuel, energy and wages are difficult to reduce. The development of digitisation is simultaneously supported by processes of computerisation and automation. This can range from the integration of Enterprise Resource Planning (ERP) and Warehouse Management (WMS) systems enabling dynamic management of delivery windows for transported goods, automation of administrative transport processes using bots and the use of autonomous vehicles in the longer term.

The digitalisation of processes manifests itself primarily in the platformisation of the sale of transportation services, e.g., through the use of transportation exchanges like Trans.eu (Witkowski, 2019). Additionally, solutions connecting transportation companies with other market participants in various business models are offered, e.g., by GoLorry, Cargomatic, CargoBr, Convoy or Cargomatic (Möller et al., 2019). Another form of digitalisation is the implementation of smart solutions in the area of transportation management systems (TMSs) or the use of real-time

transportation visibility platforms. The omnipresence of digital platforms (DPs) across industries yields platform-based business concepts that disrupt the road freight market, enabling the digitalisation of road freight transport management (RFTM). However, the data-driven service capabilities of DPs in supporting RFTM are manifold, and platform research provides opportunities to explore the emerging digital business concepts following the core process of TMSs. This, in particular, results from road freight operators (engaged in the transportation management process) who are increasingly forced to provide customer-centric RFTM via DPs to remain profitable and competitive within the fragmented business environment (Heinbach et al., 2022).

Research carried out by Webfleet shows that the use of mobile applications is also important in the digitisation of transportation operations (Webfleet, 2021). The survey was conducted on a sample of 1,050 respondents making decisions in the area of delivery fleets from France, Germany, the UK, Italy, the Netherlands, Spain and Poland, where Poland was represented by 150 respondents.

The authors of the analysis based on the survey data obtained from 164 road freight transport enterprises in Poland indicate that the management of enterprises' relationships with customers is profoundly determined by the deployment of Intelligent Transportation System (ITS). They propose selected ITS applications as an advancement of logistics customer service in road freight transport enterprises, divided into a group of six applications which are critical within the area of vehicle support, improving the support efficiency of transport and reducing the negative impact of transport on the natural environment, reducing transport time but increasing connectivity and comfort, as well as a group of ten different applications chosen as crucial for general management support and increasing accessibility, cohesiveness and control in management processes in road freight transport enterprises (Kadłubek et al., 2022).

According to PwC researchers (2019), in a report on the outlook for road transport in Poland, advanced software-based technologies and telematics will be a natural extension of the solutions being implemented in the area of digitalisation, but they may prove difficult for smaller carriers to access. Technologies such as the Internet of Things and artificial intelligence are receiving special attention from carriers. In contrast, there is little interest in blockchain-based technologies.

Based on Inelo's system data collected from databases in GBox and 4Trans as well as Metrix indicators from the Trans.eu exchange, it can be concluded that among the so-called 4.0 technologies in the transportation industry, the largest number of companies use cloud technologies (Figure 7.6) (PITD, 2023). The survey was conducted jointly by Inelo and PITD on a sample of nearly 90 respondents.

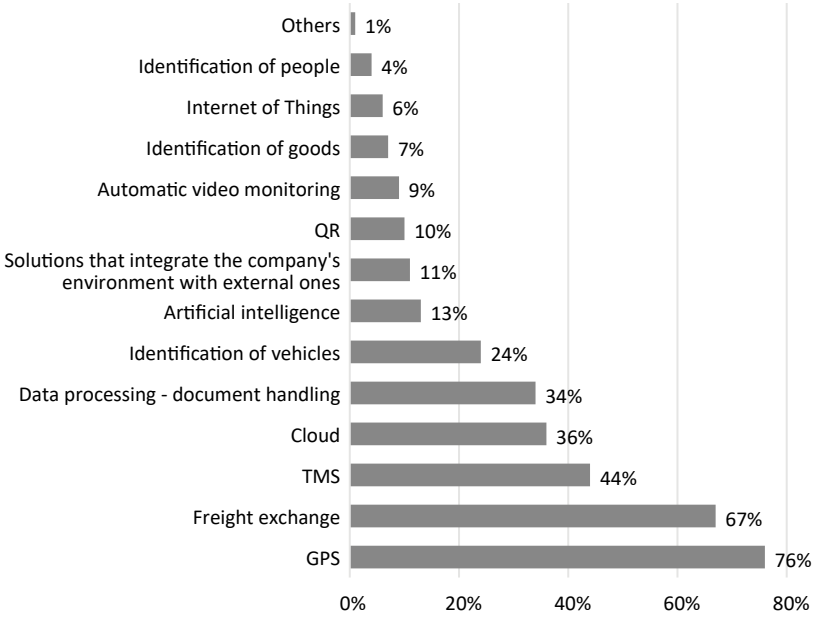

Figure 7.6. Modern technologies used by Polish companies in transportation industry
Source: (PITD, 2023).

Transportation processes are characterised by specific needs, and the level of technology saturation in them is not the same as the needs of other supply chain processes. Among other things, it is shown that technologies such as the Internet of Things, big data, blockchain and artificial intelligence as well as cloud computing have the greatest potential for application in the chain (Agrawal & Narain, 2023). In addition, a number of other technologies are also indicated to be useful (Zekhnini et al., 2020). However, some technologies, such as blockchain, which are also suitable for tracking processes (Pournader et al., 2020), are not available to many carriers for financial and competence reasons.

Based on surveys of industry organisations and exchanges at meetings of business practitioners, it can be concluded that the digitisation potential that lies in the e-CRM functionality is particularly little known among Polish entities (PITD, 2021). It fits in with the content of Regulation (EU) 2020/1056 of the European Parliament and of the Council of 15 July 2020 on electronic information on freight transport. The electronic exchange of freight transport regulatory information (eFTI) in machine-readable format via ICT-based platforms is to be controlled by the Commission on the basis of records of operations until August 2027 and every five years thereafter. Interestingly, based on a survey of a sample of

422 respondents, where 379 entities represented the transportation area (carriers, freight forwarders and distributions), 70% do not know that the use of FTI will be effective from August 2024 (PITD, 2021). Thus, there seems to be poor awareness of the eFTI as a place to register e-CRM. According to PITD's research, currently more than 50% of waybills are issued manually. Despite the imminent adoption of this technology, one-fifth of respondents are not familiar with it, and more than 60% of respondents have said they are not prepared for e-CRM implementation or do not know if they are prepared (PITD, 2021).

It is significant that carriers mainly use digitisation solutions which are not typical 4.0 technologies but IT solutions coupled with the Internet, applications and telematics. In the future, the digitisation of documentation will play a big role offering various types of functionality, e.g., regarding employee acceptance of the use of the Internet of Things to monitor the work of truck drivers (Woźniak, 2020). Another future solution is also the use of smart phone freight application services (Apps) to reduce CO_2 emissions in road freight transport and to identify the core problems for improvements (Li & Yu, 2017).

7.5. Fit for 55 and the Mobility Package and their implications for transport companies

The competitiveness of road transport is also affected by the European Commission's environmental policy. The European Union intends to reduce freight transportation by 30% by 2030 and by 50% by 2050 for shipments exceeding 300 kilometres. In 2019, transport generated almost 955 megatonnes of CO2 equivalent (MtCO2eq) in the European Union (EU) and the United Kingdom (UK). Of this, 36% (344 MtCO2eq) was generated by light-duty trucks and heavy-duty vehicles (HDVs). Taking into account the number of road vehicles in use in Europe, road freight transport seems to be having a disproportionate impact on transportation greenhouse gas (GHG) emissions. The perceived need to make road freight transport cleaner has increased among policymakers in recent years (Gómez et al., 2022). An intensive investment effort is needed to achieve this goal, and it is pointed out that this includes both technological and non-technological investments. The former focus primarily on changing the propulsion units of means of transportation, and the latter on more efficient organisation of transportation (Mavi & Mavi, 2021). These investments in the field of road transport are necessary because of the benefits associated with this field and the high resistance to shifting freight to other branches. This is because it is characterised by a very high degree of flexibility relating both to cargo capacity and convenience associated with the realisation of the door-to-door principle.

The drive to create zero-emission road transportation is forcing the use of alternative fuels in power units. The European Commission suggests focusing attention on and developing such fuels as (*Alternatywne paliwa*, 2023):

- Electricity: road vehicles powered by this energy source do not emit any greenhouse gases. The problem of sources of electricity needs to be solved, as its production can be a source of greenhouse gases. This depends on the so-called energy mix. In parallel, it is required to change the structure of this mix towards developing sources of green energy. In addition, a gradual shift away from the use of hydrocarbon-based drive units enables the use of hybrid vehicles in the transition period, which will reduce the amount of hydrocarbons consumed and reduce the volume of greenhouse gas emissions.
- Hydrogen: road vehicles using this energy source are electrically powered. Electricity, however, is generated by hydrogen cells installed in these vehicles. This technology is still at an early stage of development, as the acquisition of hydrogen poses a difficult problem to overcome. It can be derived from water as a result of the electrolysis process, which, however, proves to be energy inefficient and is itself associated with carbon dioxide emissions.
- Ammonia: this is a long-established combustion technology and the harmful effects of using ammonia as fuel have not been demonstrated. In addition, hydrogen can be extracted from ammonia without emitting carbon dioxide.

The review of the literature conducted by Inkinen and Hämäläinen (2020) shows that the reduction of emissivity can take place not only by changing the sources of power for vehicles. There are three categories: 1) fuels and engine innovations; 2) other innovations and methods to lower emissions and 3) infrastructure: route, spatial planning, controls. The studied articles exposed several environmentally friendly solutions, which are reasonable and executable in the near future. However, some of the solutions might be easier and faster to implement while some need slower incremental implementation.

Poland has the largest fleet in the EU in terms of the number of vehicles, followed by Germany in the second place. In 2020, Poland's and Germany's fleets amounted to 18.3% and 14.3% of the total EU fleet, respectively (see: Eurostat Statistics Explained, Road freight transport by vehicle). Thus, efficient pro-environmental regulations aiming at the reduction of greenhouse gas emissions by diesel engines will have the greatest positive impact on the environment throughout Europe. Undeniably, the major determinants and criteria of regulatory decisions are the costs and benefits of the regulation – both of a social nature and those perceivable by economic entities. Therefore, it is important to select appropriate instruments for the implementation of pro-environmental policy in enterprises to effectively activate the practices and activities of entities in this respect. Large

enterprises may become leaders in environmental protection practices, which results both from their higher awareness of the impact they make on the environment (Kovac et al., 2020) and from the scope of legal regulations. Caring for the environment should be perceived by enterprises as a measurable financial benefit (Żelazna, Bojar & Bojar, 2020), not only in terms of avoidance of potential costs of non-compliance with pro-environmental regulations but also in terms of the benefits related to lower fuel consumption or lower depreciation costs. Therefore, the factors to which enterprises will theoretically show the greatest sensitivity are particularly important from the point of view of the Green Deal policy. The factors determined during the research of Letkiewicz et al. (2023) are the following: fleet renewal programs (tax reduction, subsidies), introducing taxation systems that are based on vehicle exhaust emissions and investments in road infrastructure.

Certainly, gradual transition to alternative drive units will require considerable investment. This task may prove too difficult in Polish transport companies strained by the COVID-19 crisis and the slowing economy.

Conclusions

In the light of the bibliometric analysis conducted in order to identify studies on the subject of the impact of COVID-19 on the road haulage industry in Poland, it can be said that there is little research on this topic, so it is difficult to conduct a broader benchmarking with original research. It should be noted that only two research teams took the trouble to conduct surveys among companies, with other research focusing on analysing the literature. In shall be noted that the conclusions of our own research and that of the other two teams coincided. Furthermore, it should be emphasised that only the research conducted by the authors of this chapter undertook hypothetical forecasting, not just determining the status quo in the pandemic. Therefore, the objective of determining the level of competitiveness of Polish road hauliers in the post-pandemic period was realised based not only on the scientific literature but also on industry research reports.

Currently, due to the implementation of the next phases of the Mobility Package, high lease payments, high fuel and electricity prices, pro-environmental requirements, rising wages and road infrastructure fees, the main beneficiaries of the market are freight forwarders and logistics operators, who find it easier to maintain cash flows by flexibly switching subcontractors. As inflation eases and the market recovers, and macroeconomic indicators generally improve, these trends can be expected to change in favour of carriers.

In the long term, one can foresee market reshuffling and more bankruptcy for small freight companies, which will have to make freight rates more realistic with

increased scrutiny and adjust their accounting to current legislative policies. Currently, smaller trucking companies are agreeing to lower rates in order to drive at all. This is especially true for companies that are not bound by a contract and that previously, during the time of the carrier market, captured attractively priced spots.

According to the study by PITD (2023), companies in the new market conditions, in addition to changes in freight, are trying to seek more profitable contractors (88% of those surveyed) and at the same time diversify revenues (67%). This is in line with the authors' findings from a study conducted within a short time of the pandemic outbreak (Banaszyk, Konecka & Maryniak, 2021). Companies are protecting themselves by entering other industries and other lines of service.

In general, it can be said that the negative impact on costs and, at the same time, the competitiveness of Polish carriers was more due to geopolitical changes in energy and fuel prices, and thus weakening purchasing power, than due to internal, legal EU policies.

The need to invest in modern pro-environmental rolling stock and cutting-edge technologies as well as the need to increase the transparency of operations through digitisation will result in greater bankruptcy dynamics and market concentration. The TSL sector is already in arrears amounting to PLN 1.13 billion, and 70% of this debt is attributable to companies run as sole proprietorships (*Rząd bierze się*, 2023). Practitioners also suggest looking for savings in optimising drivers and car usage (Ołdak, 2022). Admittedly, revenues of TSL companies are higher than in previous years, but this is not evidence of market growth. These revenues have not grown as a result of an increase in the volume handled but rather an increase in freight rates which include indexed fuel costs. Thus, the industry is entering a period of lower market dynamics with a very high cost base.

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