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Analysing the Impact of the Russian-Ukrainian Conflict on the Supply Chain and Providing Solutions for Businesses

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Abstract: The Russian-Ukrainian conflict was one of the most fierce geopolitical conflicts in the world and it is considered to reshape the global supply chain because Russia and Ukraine are exporters of many products which are the raw materials for various industries, such as crude oil, food and metals, leading to a shortage and hence a rise in the price level. It especially caused disruptions in the supply chain of the automobile industry, keeping the wire harnesses from Russia and Ukraine from being exported. This study conducts secondary research with a SWOT analysis of the automobile industry in Asia and Europe, by taking China and Germany as the main subjects for analysis, because the two countries have the largest automobile industry in their continent. The study compares the effect of the conflict in both regions and provides suggestions. It fills the research gap by comparing the effect of supply chain disruptions across regions.

Keywords: Russian-Ukrainian conflict, supply chain disruption, SWOT analysis.

1. Introduction

Russia was the supplier of a variety of raw materials in the world, including crude oil, crops and metals, such as palladium, which is a crucial component in catalytic converters. Ukraine, in addition, was an exporter of various food ingredients, including corn, barley, rapeseed, and sunflower cakes [1].

The war between Ukraine and Russia should lead to huge disruptions in the supply chains worldwide, becoming one of the most serious geopolitical events, which was forecasted to lead to long-lasting changes in the global supply chains. The shortage of raw materials pushed up the cost of production, leading to inflation, particularly in Europe, where the price level grew faster than that due to the COVID-19 outbreak [2]. On the contrary, countries far away from Eastern Europe, such as America experienced less increase in price level due to the war compared to that attributed to the pandemic. Hence, the reason behind such phenomena may be that the US might be less dependent on exports from Russia and Ukraine due to high long-distance transport costs, stressing the huge influence of the supply chain on the price level.

Furthermore, car companies are especially vulnerable to supply chain interruptions owing to the following reasons. Firstly, the supply chain is so complex that it relies on various suppliers for components, producing a domino effect once some unexpected events occur [3]. Secondly, just-in-time inventory systems are quite popular, reducing the resilience of the supply chains towards shocks. Besides, the high-value nature of the compatible makes it hard to find substitutes if shocks occur.

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Therefore, the topic of the influence of the Russian-Ukraine conflict on the supply chain of the automobile industry is an essential current issue to discuss and it also focuses on an industry that is affected severely.

2. Literature Review

This literature review will provide some theoretical framework and definitions for the concepts discussed in this essay. Supply chain management refers to the practice of integrating important company operations from ultimate users to initial suppliers, offering goods, services, and information that benefits consumers and other stakeholders, which is not constrained to B2B practices [4]. Later, scholars narrowed the definition down to a system connecting various businesses through products, offerings and data. Supply chain disruptions are known as a combination of unexpected occasions that causes disturbances to the movement of commodities and businesses severely [5]. It can be categorised in different ways. For example, internal disruptions include operational issues, such as faults with the machinery or quality assurance issues and cross-functional challenges, such as communication problems between departments; whilst external disruptions involve aspects beyond the company's control, for example, natural disasters or geopolitical conflicts [6].

Solutions typically focus on improving supply chain resilience, which could be defined as the adaptive ability of the supply chains to prepare for unforeseen occurrences, cope with and recover from disturbances, by keeping the continuation of operation at the appropriate degree of connectivity while maintaining oversight over structure and function [7]. Al Naimi et al. reviewed essays in the last 10 years and demonstrated 15 characteristics that are considered essential to supply chain resilience and, in this essay, the top 5 characteristics will be introduced.

Collaboration refers to a company's or supply chain's capacity to collaborate with partnerships and other supply chain organisations productively and to react swiftly to supply chain interruptions. In addition, flexibility would improve the speed and increase the number of possible alternations. Readiness refers to being sufficiently prepared to reduce vulnerability, whereas response and recovery enable firms to respond quickly to crises. Visibility and velocity are 2 dimensions of agility which is expected to speed up the recovery [8].

2.1. Research Gaps

The current studies give rise to the importance of supply chain resilience, by offering both empirical studies through interviews, case studies, literature reviews, modelling and conceptual papers. In contrast, there is a research gap on how the Russian-Ukraine conflict affects the companies in various countries and further research is needed on how the automotive industry in different regions (e.g., Asia, Europe, and North America) responds to supply chain disruptions. These studies can shed light on how regional differences in policies, infrastructure, and market trends affect supply chain resilience. Hence, the study attempts to apply SWOT analysis to evaluate the effect of supply chain disruptions in Europe and Asia.

3. Research Framework and Methodology

In this section, the framework of this essay written to fill the research gap will be introduced, followed by a description of the model adopted for analysis. This essay attempts to evaluate the effect of supply chain disruptions on European and Asian markets and hence provide a comparison between the effects. It would start by providing a description of the situation. Then, a SWOT analysis would be used to evaluate the effect on both regions. Finally, a solution for both continents would be identified. This essay will mainly adopt the SWOT analysis using secondary research for evaluation. To further

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operationalise, the author will analyse the automobile market in Germany which is the biggest nation producing automobiles to represent Europe and that in China, the major producer of automobiles.

According to Helms and Nixon, it is a strategic management tool which ensures decision-making by limiting the amount of data encountered. It has been adopted by scholars for more than half a century. As one of the most popular tools in strategic planning, it has been used in evaluating various subjects, such as individual entrepreneurs, businesses, governments, non-profit organisations, industries and even countries. As is illustrated in its name, this method is divided into 4 aspects, which are strengths, weaknesses, opportunities and threats, which all play essential roles in business strategies and decision-making [9].

3.1. Internal Factors

Strengths and weaknesses are the factors within organisations that improve or hinder performance. The former stands for the commodities or characteristics that could assist an organisation in reaching its goals, such as efficient processes or goodwill, offering a competitive edge to help reduce the threats and take advantage of the opportunities. However, weaknesses, for instance, inferior geographical location or outdated technology, would reduce the performance but recognition of these would be crucial for turning weaknesses into strengths [10].

3.2. External Factors

Opportunities and threats are the external opportunities to be utilised or threats that may impose a negative influence on organisations. Opportunities could arise from government policies, changes in consumer favour or the development of technology, providing situations for businesses to utilise their strengths to reach goals. Threats, on the contrary, require businesses to develop strategies to protect themselves from possible risks which involve economic, social, political and demographical factors.

4. SWOT Analysis

This section will briefly introduce the characteristics of the automobile supply chain and the consequences of supply chain disruptions due to the Russian-Ukraine conflict by providing examples. An automobile supply chain typically involves various tiers of production and Original Equipment Manufacturer (OEM). To be more specific, OEMs generally put various components together at the top of the supply chain. Lower-tier suppliers supply components to higher-tier suppliers. For example, tier 1 manufacturers would turn the sub-assembled products produced by tier 2 manufacturers into a segment of the automobile, such as an entire seat or brakes [11]. The automobile market in Russia and Ukraine was the largest car market in the world. Hence, the war leads to huge changes. A case in point is the harness wire production. As a major exporter of harness wire for Europe, Ukraine companies apply flux-cored wire for surfacing [12]. Most of those companies closed down their factories in Ukraine for safety considerations or due to disruption in downstream supply chains, leading to a shortage of such commodities, which affected the production of their customers, such as BMW, who also closed its factory in Ukraine. Hence, it would be concluded that the downstream disruptions accumulate to impair the production of OEM.

Despite fuel-driven vehicles, the production costs of electric cars also rose because of the disruption in noble gases, such as nickel and cobalt, which are used in batteries. Because such elements are produced in tiny quantities in other European nations, the prices of such elements are estimated to rise by more than 20% [13].

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4.1. Strength

Both countries had an advanced automobile industry, and all attempted to improve the supply chain resilience after the Russian-Ukraine Conflict. As for Germany, the automobile industry has been improving domestic investment to reduce dependency on global supply chains. Efficiency is ensured because the managers can control the processes [14].

Furthermore, as a country known for its sophisticated manufacturing capabilities, especially for component manufacturing and coordination with car manufacturers. The companies also continued to invest in research and development to offer more innovative and superior products. In addition, the quality control in the country is also very strict, offering high-quality products [15]. Moreover, the country used its labour well and offered high wages to attract highly skilled workers in its production factories to integrate the role of the company into innovation, further enhancing the quality. The industry 4.0 campaign was launched in Germany to construct new factories and encourage technological advancements and it attracted widespread attention. Similarly, Chinese companies in the automobile industry also invested in improving efficiency. A case in point is intelligent manufacturing, which is believed to boost investment efficiency [16]. In addition, the country of China is also in an excellent position to steer the industry due to the technology. Although some problems such as the absence of key technology exist, the sector attracted investment both domestically and abroad, pushing innovation in various aspects, including information and communication technology (ICT), data processing, and platform services which are crucial to the growth of connected and smart automobiles [17].

Both countries' economies focus on exporting high-quality or low-price productions to maintain their market share. They both had large income gaps.

However, the dominant competitive advantage of China was the low wages of labour, although the wages increased faster than the productivity. Germany, on the contrary, offered high wages to attract high-skilled labour to maintain the high quality of products by investing in innovation and education and satisfying consumers' needs, which refrained the economy from the emerging countries producing cheap products. To conclude, Chinese industries developed fast in the last decades and its major edge is the cheap price resulted from the low wage of labour. However, Germany benefitted from its productivity which exceeded that of China because of education, offering high-quality and irreplaceable products.

4.2. Weakness

Both countries, to some extent, rely on Russian and Ukraine products. German automobile industries relied on Russia and Ukraine, importing wire harnesses, noble gases and energy from the countries. One possible reason is that Germans flavoured the Russian and Ukrainian cultures due to the hospitality and the similarity in the two cultures' focus on punctuality and reliability. In addition, Russian, Ukrainian and German industries both focused on technology [18].

The Chinese automobile industry also relied on stable energy suppliers, especially coal in Russia and Ukraine and the rise in price of energy led to market volatility, pushing up the cost [19]. In addition, the industry also had its limitations, such as reliance on foreign technology and limitations in the ownership structure [20]. In general, the German automobile industry relied more on Russia and Ukraine compared to the Chinese industry. The German automobile industry relies on Russian components, energy and noble gases, whereas the Chinese response to the Russian-Ukrainian conflict concentrated on energy and food storage and diversification, indicating that the country's automobile industry may not rely on the Russian and Ukrainian components although there could be a high level of reliance on Russian and Ukraine energy and food.

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4.3. Opportunity

Both countries imposed policies on transferring to alternative sources of energy. Firstly, the European Governments turned to America who experienced a 9% increase in export volume for energy. In addition, the European Union (EU) also quickened the switch to renewable energy with the REPowerEU plan. To decrease the dependence on Russian crude oil by 2027 and to become carbon neutral by 2050, the EU carried out various policies, such as increasing the use of solar energy by the European Solar Rooftop Initiative, which raised the proportion of renewable energy in the EU's energy combination to 45% [21].

Moreover, the European nations had a relatively resilient infrastructure to deal with the challenges. Despite the comprehensive transport system including motorways, railways, harbours and airports, the EU is also dedicated to erecting the trans-European transport network to enhance connectivity and resilience in the transport system. City logistics and technological advancements such as big data both improved resilience [22].

Facing the conflict, Chinese businesses may lower the risks associated with geopolitical tensions and lessen their dependency on foreign suppliers by investing in domestic manufacturing and sourcing. For instance, the country enhances the storage of energy sources to reduce reliance [23]. In addition, the government also implemented policies to develop green energy vehicles by offering subsidies to the company's manufacturing electric cars and it also has the goal to reach carbon neutrality by 2060, although consumers showed resilience in the adaptation attributed to the inconvenient charging facilities, battery technology issues and high prices [24]. China also built a series of transportation infrastructures to improve resilience, although the logistical network proved to be underdeveloped by the end of the 20th century. However, the general level of infrastructure resilience was poor from 2002 to 2018 and resilience continued to be low [25]. The policies adopted by the governments of both countries are similar, concentrating on reducing resilience and developing renewable energy sources. However, Germany focused on addressing the current energy shortage issue by purchasing energy from America, whilst China who was less affected, strategically increased the storage.

Furthermore, as for the goal of carbon neutrality, Germany focused on renewable energy generation, while China focused on renewable energy generation and developing electric cars. As for infrastructure resilience, Germany may be more advanced compared to China based on existing literature.

4.4. Threat

Both countries faced an increase in transport costs after the war. The Europeans implemented measures to reduce the financial capacity to start a war by barring Russian aeroplanes from EU airspace, prohibiting Russian ships from entering EU ports and disallowing exports of goods and innovations to the aviation, marine, and space industries. Transport bottlenecks led to an increase in cost, pushing up the price level [26].

The logistical companies sought alternatives to the Chinese Silk Road, switching transport from the China-Europe Railway Express to the sea or other railways because there were 2 crucial routes linking Chongqing and Xi'an and Hungarian Budapest in Ukraine, experiencing war. This is particularly the case in the automobile industry, as it became so hard to purchase a car that consumer had to wait for one year in 2022. The bottlenecks in the transport of raw materials may increase the cost of production and firms may raise the price to maintain profit, leading to inflation. In addition, the trade war between the US and PRC also restricted the purchase of some products made in China, making the supply chain more complex.

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Although both countries faced logistical challenges, Germany experienced a rise in transport costs as the sanction of Russian products resulted in sourcing alternative suppliers, leading to a rise in transport costs. China also faced the problem of looking for alternative means of transportation besides the China-Europe railway, boosting the cost. However, as shown in Figure 1, although the inflation rates of both countries increased in February after the war, China's inflation rate is still lower than that of Germany. Therefore, it can be concluded that the inflationary pressure threat faced by China is smaller than that of Germany. Hence, it would be concluded that China faced fewer threats caused by inflationary pressure than Germany.

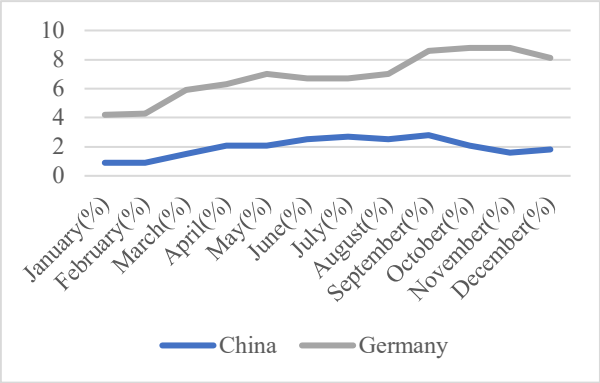

Figure 1: Inflation rate of China and Germany in 2022 [27].

5. Suggestions

As for German companies, they could take advantage of the high-quality and advanced manufacturing capacities by offering high wages to attract skilled labour. However, the wage-price spiral may lead to a higher cost in the era of the Russian-Ukrainian conflict when the supply chain disruptions raised the cost of raw materials. Though it might not be feasible to push down the wage to reduce cost in German culture, some strategies should be adopted. As for the supply chain disruptions due to the high reliance on Russian production, a switch to alternative imports or green energy may be feasible.

Firstly, German companies should continue to seek efficiency, taking advantage of, for example, their skilled labour and innovation. The method to improve it could be improving communication and enhancing visibility. Furthermore, reducing costs by reducing unnecessary jobs and reduce expenses might be crucial [28]. In addition, agility may be essential to business by improving the adaptability of production and suppliers' interchangeability, especially in response to such situations [29]. Meanwhile, companies should invest in renewable energy such as solar panels and wind turbines, as it is a new trend.

For Chinese companies, the low wage of labour and the cheap price of products may not lead to inflationary pressures despite the resilience towards purchasing exports from China. However, the infrastructure resilience and the productivity of labour required to be improved. Reliance on Russian and Ukrainian exports was relatively low, so the conflict offered an opportunity to improve supply chain resilience by improving storage and encouraging green energy.

Firstly, it could be crucial to motivate employees and continue innovating to raise productivity. In addition, infrastructure, such as chargers for electric cars, in particular, may be a field to invest in, in order to improve infrastructure resilience towards unexcepted shocks and promote green energy, reducing reliance on imports and raising supply chain resilience. In addition, similarly, it should be crucial to reduce the cost of logistics by seeking economic alternatives for the China-Europe railway.

Furthermore, the war may be an opportunity for Chinese firms to export the products in replace of the ones produced by companies facing supply chain disruptions.

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6. Conclusion

Overall, this paper conducted a SWOT analysis of the automobile industry in China and Germany facing the Russian-Ukrainian conflict, pointing out the difference between the two countries' automobile industries in different aspects and providing solutions for both industries. To be more specific, the German industry offered high-quality products with a higher wage, whereas Chinese automobile industries offer cheap goods, by offering a low wage. However, the former relied on Russian and Ukrainian imports more and hence suffered from more inflation, stressing the importance of supply chain resilience and reducing costs to combat inflation. On the contrary, as for the Chinese automobile industry, due to the low reliance, there were few inflationary pressures. However, the automobile industry in that country faced logistical challenges. Hence, it would be crucial to seek alternatives while utilising the conflict as an opportunity to improve domestic supply chain resilience. Both countries had carbon-neutrality goals except for the distinctive focus on electric car in China. Hence, the study fills the research gap of the lack of papers comparing the effect of the Ukraine-Russia war between regions, Asia and Europe, by picking the two countries with the largest automobile industry to represent two continents. It also provides distinctive suggestions for firms in the automotive industry in both countries, to assist their decision-making. Therefore, further studies should focus on conducting primary research by conducting a survey to managers in automobile industries to obtain some specific consequences of supply chain disruptions and how the companies respond to them to obtain valid information. Studies could also focus on the automobile industries in underdeveloped regions.

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