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Perceptions of the Barriers to Localization Before and During the Covid-19 Pandemic: "A Case of Turkish Machinery Manufacturers"

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ABSTRACT

Purpose: COVID-19 caused disruptions in international supply chains. Localization is one of the ways of dealing with this problem. Thus, this paper analyzes Turkish machinery manufacturing companies' perceptions regarding the barriers against localization pre and mid-COVID-19 to see whether the perceptions changed. In addition, the study applies Porter's Diamond Model as a framework to assess whether COVID-19 is perceived as a pressure to upgrade the industry's competitiveness.

Design/Methodology/Approach: The research design of the study was determined as a case study. The reason for this is that the case study is an empirical research form that investigates a current phenomenon and real life in depth with a single or a few units. In this context, the sample of the study was determined as the member companies of Sakarya Machinery Manufacturers Association. In the interviews with these companies, open-ended questions were administered in order to reveal the perceptions of barriers to localization. The interviews were deciphered and open coded. Findings were obtained through qualitative content analysis. In the analysis process, which was handled in two stages, 47 producers before the pandemic and a smaller group of 32 people during the pandemic were evaluated. It was concluded that there are significant perceived barriers to the production and marketing of domestic substitutes.

Findings: Marketing substitutes for previously imported products is perceived as more challenging than producing them. The presence of strong global competitors discourages SMEs from producing substitutes. Some participants have experience in both producing and purchasing domestic substitutes, which further discourages them from making another attempt. The main concerns are the lack of acceptable quality and price advantages. Additionally, the need to achieve economies of scale and limited domestic demand prevent manufacturers from investing in domestic substitutes. The time required to reach high production volumes and quality, along with the unstable macroeconomic environment in Turkey, appear to be two additional factors beyond the Diamond Model. These barriers seem to have changed slightly during the mid-COVID-19 period.

Originality/Value: This paper handles localization both as a solution to supply chain disruptions and an opportunity to increase the competitiveness of the industry. Insights in localization by evaluating the barriers perceived by the Turkish machinery manufacturing industry in a longitudinal manner (pre-mid COVID 19 period) will deepen the concept for further research, especially in developing world.

Keywords: Domestic Substitutes, Localization, The Diamond Model, COVID-19, Machinery Industry, Manufacturing

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1. Introduction

The World Health Organization reported 1,438 epidemic diseases between 2010 and 2018 (Hudecheck, 2020). Due to its worldwide spread, the economic impacts of COVID-19 have been greater than any of the previous epidemics. Many countries implemented lockdowns, manufacturing stopped, and product shipments slowed down because of the travel restrictions and new tariff regulations (Hu, 2022). These impacts have particularly been felt in the manufacturing sector and will continue in the medium and long term.

The machinery industry is a main sector that provides inputs such as investment and intermediate goods to all sectors of the manufacturing industry (Tuncel and Polat, 2016). It lies at the heart of the production and diffusion of technical change. Advances in processes and products invariably require improved machinery (Fransman, 1986). This industry has particular importance for Turkey due to its promising export and manufacturing potential (Tektas *et al.*, 2008). It has been the second-biggest exported product group for nearly two decades (Trademap, 2022).

This industry also has been affected by the supply chain interruptions caused by COVID-19. However, Porter (1990), in his "Competitiveness of Nations" article, gives inspiring examples of turning disadvantages into opportunities. In the 1973 energy crisis, the Italian tile industry found an effective way to produce tiles faster with less energy, resulting in efficiency. Another example is the Swiss companies which upgraded their labor productivity resulting from labor shortage after World War II. According to Porter, "*Part of a company's responsibility is to play an active role in forming clusters and working with its home-nation buyers, suppliers, and channels to help them upgrade and extend their competitive advantages*." Localization is both an opportunity and a responsibility for companies during the Covid-19 period. In the lights of Porter's (1990) Dimond Model, can the supply chain interruptions be evaluated as a pressure on Turkish machinery manufacturers to enhance their supply chain capability? Because companies can gain competitive advantage through supply chain responsiveness (Golgeci and Gligor, 2017). As a result, a strong supply chain disruption orientation can create a competitive advantage (Ponomarov and Holcomb, 2009).

Previously, these companies were used to import some of the components and semi-products to manufacture their final products. During the pandemic, reaching these supplies on time was quite challenging. Local alternatives to the imported supplies will be alternatives if they exist. Even if they exist, purchasing them may not be rational because of their performance, price, quality, etc. Producing the supplies independently can also be an option if the technological requirements are provided. However, product quality issues may still be problems. These companies' perceptions regarding localization barriers are highly significant because these perceptions can be evaluated as the antecedents of their possible actions.

The primary aim of this qualitative study is to discover the barrier perceptions of Turkish machinery manufacturers regarding local production and procurement, in other words, localization, before and during Covid -19 pandemic. With the help of the results gained, we aim to see whether this disruption can be a pressure that contributes to the competitiveness of these companies.

This paper consists of three parts. In the first part, COVID-19 and similar disruptions and the measures taken in response to these disruptions, together with the competitive position of the Turkish machinery manufacturing industry, are handled. In the second part, the changes in the perceptions of Machinery Manufacturers' Association members operating in Sakarya towards domestically produced goods before and during COVID-19 are tried to be discovered. Lastly, the results are discussed in light of the Diamond Model.

2. Literature Review

2.1. Disruptions in Global Supply Chains

As a result of the acceleration of international trade and the cost advantages of overseas production, supply chains have become global. However, as in every structure, the supply chain's increasing complexity and uncertainty over time have caused disruptions. These uncertainties can lead to supply, production, and distribution channel interruptions. In 2018, even before the COVID-19 pandemic, EventWatch reported that disruptions in supply chains had reached their highest rate in the last three years (SCI Week, 2019).

In the literature, disruptions are divided into different categories by different authors. (Wagner and Bode (2008) identified five categories of disruption: demand-side, supply-side, regulatory/legal/bureaucratic, infrastructure, and catastrophic. However, Schmitt *et al.* (2017) divided disruptions into three categories: natural (e.g., earthquakes and tsunamis), accidental (e.g., the Mexican Gulf oil spill), and intentional (e.g., the terrorist attacks in Paris in 2015). Scmitt *et al.* (2017) and Ivanov (2019) also classified natural diseases, artificial diseases, political crises, strikes, and legal conflicts as disruptions. Natural diseases are the riskiest and most common disruptions. For instance, the earthquake and tsunami in Japan in 2011 significantly affected the global production of semiconductor materials. The inadequacy of supplies caused camera prices to increase, especially for companies such as Nikon and Canon (Kumar *et al.* , 2018). COVID-19 seems to be an international and natural type.

Even before the pandemic, the business world had begun to question its global supply chain structures because of trade wars, protectionist policies, and non-tariff barriers or some other reasons. The COVID-19 pandemic accelerated this process. Because it can be the most significant disruption that has affected commercial relationships and integration between most countries worldwide. COVID-19 has significantly increased the demand for primary products while reducing the supply of raw materials due to restrictions in production capacity. This has disrupted both supply chains and production planning. The crisis spread rapidly through the manufacturing industry because of the global integration of trade and supply chains.

The sudden and unpredictable changes in consumer demand and slowdown in production activities have caused an economic slowdown worldwide. The economic contraction that started in China has spread, first to Europe and then to North America. EU countries have experienced their most significant decline since the global financial crisis in 2008, with industrial production falli 17% in April 2020, leading to an annual decline of 28 % (Eurostat, 2020). The impact of logistics delays on commodity prices has also contributed to the contraction in production. The Free Market Commodity Price Index (FMCPI) fell below 20% in one month for the first time. Commodity prices, which fell to 18.6% during the global financial crisis, decreased significantly during the pandemic (CCSA, 2020). According to the OECD, China's growth, foreign direct investment, and ties to other countries through its supply chain network have increased the effects and costs of the virus. Therefore, trade has played an essential role in spreading the effects of COVID-19 (Congressional Research Service, 2021).

According to Statista (2020), China holds a 20% share of the global semifinished goods market, representing a critical part of the global value chain in the machinery sector. The effects of COVID-19 on the Chinese economy have spread to the economies of many other countries. For example, a 2% decrease in exports of Chinese semifinished machinery goods to the European Union (EU) is projected to cause a loss of USD 1.2 billion in the EU machinery sector (Statista, 2020).

According to the report, the economic effects of the pandemic spread through three main trade channels:

(1) directly through supply chains as reduced economic activity spreads from intermediate goods producers to finished goods producers;

(2) as a result of a drop overall in economic activity, which reduced demand for goods in general, including imports;

(3) reduced trade with commodity exporters that supplied producers, which, in turn, reduced their imports and negatively affected exporters' trade and economic activity.

World trade volume decreased by approximately 8% in 2020 (Trademap, 2021). Thanks to the ongoing vaccination process, most of the world's economies began to recover from the pandemic in the first quarter of 2021. The pandemic has caused companies to question the wisdom of investing in distant countries to gain a cost advantage and access global supply chains. The simplification of operational processes, which began in the 1990s through reforms such as reducing inventory levels and establishing multi-layered supply chain structures (Wuest et. Al., 2020) has caused problems that need to be addressed during pandemics.

The long-term impact of the pandemic on the supply chain is still unclear (Yoo and Managi, 2020). Supply chains should reconfigure themselves to manage increasing complexity due to more volatile, uncertain and ambiguous business environments that will bring them closer (Christopher, 2016). The production and supply centers being located close to each other (nearshoring), diversifying suppliers, or identifying alternative local suppliers (localization) can decrease the risk of disruptions and reduce dependency. Companies should think hard more than ever on this issue, especially the SMEs. Because any adverse change in the relationship between an SME and its key supplier or the loss of key production materials could potentially result in significant production and operation disruptions, leading to a higher rate of business failure (Liu and Park, 2021).

Generally, there are two main elements of risk management in response to disruptions: proactive strategies that are implemented before the disruption and reactive strategies that are implemented after the disruption. Proactive strategies include preventing risks by developing digital and technical infrastructure (Ralston and Blackhurst, 2020; Hofmann *et al.* , 2019), sourcing locally or from nearby areas (Kochan and Nowicki, 2018; Iakovou; 2014), and managing risks (Zhu *et al.* , 2017). Reactive strategies include revising business plans (Hernantes *et al.* , 2017; Zsidisin *et al.* , 2005) and determining stock and inventory levels (Lücker *et al.* , 2019; Simchi-Levi *et al.* , 2015).

Due to the proliferation of lean and global supply chain structures, which are highly fragile, proactive approaches have gained importance. In light of the pandemic, the dependency on Asian countries for importing intermediate goods has placed many manufacturers in a difficult situation. In this context, proactive strategies such as favoring domestic products and localizing suppliers are important solutions to the risks created by global supply dependency. For instance, the automotive industry has made improvements in this area, including developing localized sources of supply and using advanced industry 4.0 technologies to mitigate the risks of COVID-19 (Belhadi *et al.* , 2021) The other example is the Asian +1 supplier selection approach has emerged as a risk management strategy.

On the other hand, doing business with local suppliers or procuring goods from nearby regions may also have some disadvantages. Given that global resources tend to have lower prices or higher quality than local alternatives, firms usually favor them. In particular, multinational companies procure raw materials from overseas suppliers rather than local ones (Niu *et al. ,* 2020). In contrast, Hoek (2020) questioned the advantages of global resources' total cost of ownership, noting that nearshoring is more effective. Morover, disruptions and an inability to manage risks can place importing companies at a

disadvantage. Companies should now take unforeseen situations into account in their risk management strategies.

2.2. Insights of the Diamond Model

"*No nation can be competitive in everything.*" Porter (1990) says. Among most other industries, the machinery industry is important for the Turkish economy. Because many more industrialized developing countries such as Argentina, Brazil, India, China, South Korea, and Taiwan are substantial producers and, in some cases, exporters of machinery (Fransman, 1986). Although Turkey is in the 27th rank in the list of the biggest machinery exporting countries, machinery (HS 84) has been the second biggest export product group for decades. Additionally, the rate of innovative companies in the machinery industry is high compared to Turkey's average (Tuncel and Polat, 2016). In accordance with the importance of the industry for the economy and its innovative appearance, Turkish Industry and Technology Ministry specified the industry as one of the primary industries in the "2023 Industry and Technology Strategy Report"(Sanayi ve Teknoloji Bakanlığı, 2023).

Diamond Model, offered by Porter (1990), is adopted for analyzing the competitive positions of various industries in different regions (Fang *et al. ,* 2018) in previous research (Zhao *et al. ,* 2011; Chobanyan and Leigh, 2006; Curran, 2000). So many researchers employ this model because of its creative way of handling the factors of previous models and its ability to provide feasible results (Chung, 2016).

To take a close look at the Diamond Model, Porter (1990) offers four attributes to a nation's competitiveness: factor conditions, demand conditions, related and supporting industries, and the firm's strategy, structure, and rivalry. Although the article's name is called from a macro perspective, Porter underlines that only companies can achieve and sustain competitive advantage. This point is also criticized by Clancy *et al.* (2001). Adopting the micro perspective, being productive and innovative are the two vital requirements for companies to be competitive. In this context, the role of the government should be a catalyst and challenger which encourages the companies to be more competitive. Porter (1990) advises innovating to offset local factor disadvantages rather than outsourcing and developing domestic suppliers and buyers rather than relying on foreign ones. The emphasis on localization to be competitive is the main reason why the Dimanond Model is inspiring for this study. To evaluate Turkish machinery manufacturers' competitive position and to have an opinion about the missing conditions, the model would help to make some comments. The attributes required to be competitive, which Porter (1990) offers, and the previous literature focused machinery manufacturing industry are tried to be harmonized below:

Factor Conditions: According to the model, a nation should only have some of the factors of production required for the product. It can simply import the rest without an impact on innovation. The factors that do not have a specific impact on sustainable competitiveness are fundamental and generalized. On the other hand, advanced or specialized factors are necessary for more sophisticated forms of competitive advantage. A basic factor is passively inherited, such as semiskilled labor, while advanced factors include education institutions that help to create highly-skilled ones (Jin and Moon, 2006).

Machinery manufacturing requires highly-skilled labor, technology, and raw materials (Tektas *et al. ,* 2008). Highly skilled labor with an accumulation of mechanical engineering and software knowledge are critical inputs for innovation in the industry. According to Porter's classification of factors, raw materials are basic inputs that can be exported, and highly skilled labor with an

accumulation of knowledge in mechanical engineering and software is an example of advanced factors which should be created domestically.

Demand Conditions: Sophisticated, demanding buyers create pressure on companies to meet high standards such as upgrading technology, quality improvement, and higher production performance with better services (Kharub and Sharma, 2016). Bayülken (2012) defines the development of the manufacturing industry supporting Porter. For the researcher, the engineering discipline is mobilized, and the designation of development speed and production compositions is according to the new needs and demands. Customer requirements largely determine the direction of the innovation process in the machinery industry. Tuncel and Polat (2016) have some comments on machinery manufacturing market conditions:

- New products are often developed for a specific need of the user, and they are launched into the market.
- Monopolistic competitive market conditions dominate the market.
- Companies specialize in product niches and differentiate from their rivals through their product.
- Technology cooperation between firms and customers is common.
- It is too difficult to take advantage of scale economies. Because the products are usually designed for industrial markets, and production scales are small.

Related and Supportive Industries: According to the model, powerful and internationally competitive home-based suppliers can provide cost-effective inputs in an efficient and fast manner. Additionally, such suppliers can contribute to the innovation of these companies with the help of close working relationships and the constant flow of information.

Firm Strategy, Structure, and Rivalry: The individual motivation to work and expand skills is an important factor in creating competitiveness. However, domestic rivalry is the most important stimulating effect on all the other factors. The rivalry should be domestic because it is intensely personal and more motivating. The geographic concentration of the companies operating in the same sector magnifies the strength of domestic rivalry. Domestic rivalry and geographic concentration are the two attributes that can transform the diamond into a system.

Machinery manufacturing companies in Turkey are located in the west and southwest of Turkey. There are three specialized organized industrial zones for machinery manufacturers in Turkey. Two of them are located in Kocaeli, and one of them is in Sakarya. Kocaeli and Sakarya are very close cities in the nearby of İstanbul. These three cities realized 37% of Turkish machinery exports in 2022. So that this industry is neither concentrated nor scattered; in addition, because of the high variety of the products and monopolistic nature of the competition, high and direct rivalry may not be the case.

Most machine manufacturers are SMEs in Turkey (Tuncel and Polat, 2016; Tektas *et al.* , 2008). Kharub & Sharma (2016) observed that competitiveness among manufacturing SME sectors is mainly affected by intangible resources, which are difficult to imitate by competitors, the demand conditions followed by firm strategy, structure, rivalry, and supporting industries. The competitiveness among manufacturing SME sectors is mainly affected by demand conditions followed by firm strategy, structure, and rivalry (Khurab and Sharma, 2016).

The Role of Government: Governments should help national companies to operate in an innovating and competing environment. They shouldn't be directly involved the process. They can focus

on specialized factor creation, limit direct cooperation amon industry rivals, enforce strong domestic antitrust policies etc.

Turkish Government seems to promote the indirect supports which Porter advises. In addition to these, especially for the SMEs, there are some direct incentives constributing to the costs of machinery, software, labor and marketing operations. However, those incentives seems to be designed for the early stages of developing a new product, entering a new international market, creating an innovative process etc (KOSGEB, 2023). Among the incentives, "Manufacturing Based Import Substitution Support" takes attention. This incentive provides up to 1,7 million USD, 10 year credits with 6 to 24 months unpaid period (T.C. Sanayi ve Teknoloji Bakanlığı, 2018).

Among these studies which employ the Diamond Model, the one which examines the competitiveness of the Turkish heavy manufacturing industry with Industry 4.0 takes attention. Results show that factor conditions (labor and capital) are the most important aspects which affect the development of Industry 4.0 competitiveness in Turkey (Erboz, 2020).

The primary aim of this research is to discover whether there has been any change in the perceptions of machinery manufacturing companies regarding the barriers to local production of imported goods and procurement of domestic substitutes for imported goods given the COVID-19 disruption. The results will make it possible to comment on the possible change of the nation's competitive position in this industry.

3. Methodology

3. 1. Research Design

Case study research is a form of empirical inquiry that investigates a current phenomenon in depth and real life with a single or few units. (Creswell, 2007; Yin, 2018; Miles & Huberman, 1994). While Stake (2005) states that the case study is not a methodology, it is a choice about how to study; Denzin & Lincoln, 2011; Merriam, 1998, and Yin, 2009 suggest that the case study is a comprehensive research strategy. The case study was accepted as the research design in this study. Covid-19 represents a novel phenomenon that has not only altered business operations but also introduced potential future threats. To gain a comprehensive understanding of the attitudes of companies and the context in which these perspectives have developed, a case study design is employed. Moreover, as multiple case studies usually yield more robust, generalizable and testable theory than single-case research (Eisenhardt and Graebner, 2007), 47 companies operating in the machinery sector in Sakarya are analyzed.

The fact that the case study provides an in-depth understanding of the situation under consideration distinguishes it from other research designs. For this reason, the case study in industrial marketing research not only addresses a specific audience but also prepares the ground for questioning. It gives a chance to present new propositions not limited to industrial or business-to-business marketing and may come to the fore as a focus in the future (Farquhar *et al.* , 2020). This study shows that case study research is appropriate in describing the change in the perception of localization in the machinery industry of the pandemic phenomenon that has affected the world.

3.1.1. Sampling

The machinery industry is a leading sector that provides inputs such as investment and intermediate goods to all manufacturing industry sectors (Tuncel and Polat, 2016). It lies at the heart of the production and diffusion of technical change. Advances in processes and products invariably require improved machinery (Fransman, 1986). This industry has particular importance for Turkey due to its

promising export and manufacturing potential (Tektas *et al.* , 2008). It has been the second-biggest exported product group for nearly two decades (Trademap, 2023).

Sakarya province ranks 11th among 81 provinces in Turkey in terms of imports according to 2022 TUIK data (TUIK, 2022). In addition, it is at a strategic point in terms of location for the Istanbul and Kocaeli regions, where the trade volume is intense. Considering all these factors, the study is based on purposeful sampling. The reason for choosing this sample type is that it provides information willingly to understand the study problem and its central phenomenon.

The research population comprises 164 companies that are members of the Sakarya Machinery Manufacturers Association (SAMİB), which gathers the machinery companies in Sakarya under a single roof. After the interviews with the companies in the pre-COVID-19 stage, which is the first part of the study, 47 companies agreed to participate in the research. In the second part of the study, the mid-COVID-19 stage, the number of participating companies decreased to 32.

3.1.2. Data Collection & Coding

Open-ended questions were administered with a semi-structured interview technique to reveal the perceptions of company managers about the obstacles to localization. In the second stage of the study, mid-COVID-19, questions about the experience and expectations of the pandemic were also added.

Questions of the first interview:

1. Who makes the decision to change suppliers in your company? Is it the professional employees or the partners?
2. Are there domestic alternatives to the imported products you purchase?
3. Have you previously conducted research to identify domestic alternatives?
4. When was the last time you conducted research on domestic alternatives?
5. Have you ever tried domestic alternatives?If so, what kind of issues did you face?
6. What might be the underlying reasons for encountering these issues?
7. If not, why did you not try them?
8. Is the imported input a technological product or a raw material?
9. If it is a technological product, have you considered developing it yourself through R&D activities?
10. In your opinion, what barriers exist to the development of an alternative for this product?
11. Do you think that similar products of the same quality can be produced domestically at similar prices to the imported inputs you purchase? Why?
12. Have you considered having your domestic suppliers produce these inputs, or have you made such an offer?

Added Questions in the Second Interview:

1. Have you encountered any issues with your imports during the COVID-19 pandemic?
2. Has the demand for your products from abroad increased during the COVID-19 pandemic?
3. What impact have the pandemic had on your business operations?

The pre-COVID-19 interviews were conducted face-to-face between March and April 2019. The mid-COVID-19 interviews were conducted by telephone between April and May 2020. Face-to-face meetings were not possible for the second stage of interviews due to the curfew and intercity transportation restrictions in Sakarya due to the pandemic. All interviews were conducted by a single interviewer. Prior to the interviews, participants were informed about the scope and purpose of the study.

With their consent, audio recordings of the interviews were made. These recordings were later transcribed.

The transcription process of the audio recordings obtained with the consent of the participants was completed. Themes and codes were created through the open coding method using an inductive approach. The details about the theme and codes are quoted in Figure 1.

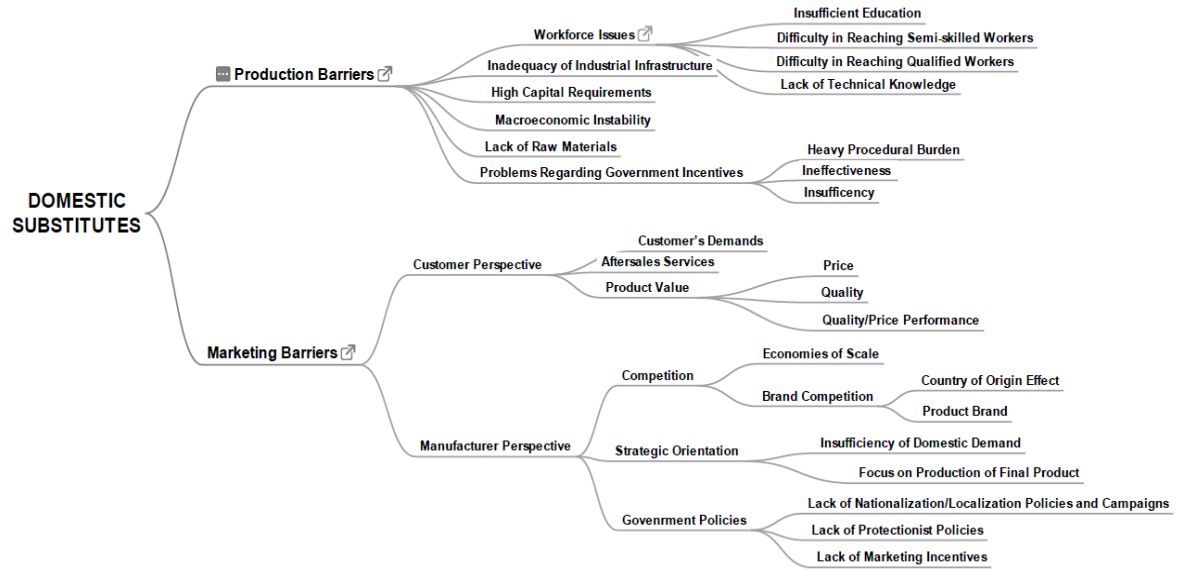

Figure I. Mapping of Production and Marketing Barriers

3.2. Analysis

Content analysis is included in the literature as quantitative/syntax and qualitative/semantic analysis. The semantic dimension of content analysis considers the meaning of the content and forms the qualitative part of the content analysis. Semantic content analysis can analyze the meaning of a word, sentence, paragraph, or text. The syntax dimension, on the other hand, is based on the frequency of the content and forms the quantitative part of the content analysis (Gokce, 2006). Qualitative/semantic content analysis was used in this study.

The interview data were analyzed using MAXQDA, a qualitative analysis software program. The software enables data monitoring, adding new codes, and editing the codes throughout the analysis process.

4. Results

The analysis consists of two stages. Respectively, the perceptions of companies as obstacles to localization in the pre-COVID-19 stage; in the mid-COVID-19 stage, it was analyzed whether the pandemic process caused a change in their perceptions. The results obtained are evaluated in the context of Porter's diamond model at the end of this section.

4.1. Pre- COVID 19 Stage

When evaluating the participants' responses, we first explored their experiences regarding the domestic production of imported goods and local procurement of domestic substitutes. About one-third of the participants stated that domestic substitutes exist for their imported products. Before the COVID-19 pandemic, nearly half of them had tried to diversify their overseas suppliers, and one-third had created

initiatives to locally produce the products they had previously obtained from abroad. These are all proactive strategies.

Production Barriers	Workforce Issues	Insufficient Education
		Difficulty in Reaching Semi-skilled Workers
		Difficulty in Reaching Qualified Workers
		Lack of Technical Knowledge
	Inadequacy of Industrial Infrastructure	
	High Capital Requirements	
	Macroeconomic Instability	
	Lack of Raw Materials	
	Problems Regarding Government Incentives	Heavy Procedural Burden
		Ineffectiveness
		Insufficiency

Next, we analyzed the perceptions of the participants regarding localization barriers. Both interviews were used to develop a general picture of the context. This analysis revealed that the participants considered the concept of localization barriers from two essential perspectives. Firstly, they identified barriers to the domestic production of imported goods. However, even if those barriers are overcome, they still perceive some marketing barriers. Therefore, the marketing and production barriers must be reduced to enable such an initiative.

Barrier Perceptions Regarding Production of Domestic Substitutes of Imported Goods:

Table I outlines the themes and codes identified regarding the perceived barriers against using domestic substitutes for imported products by the companies themselves or their suppliers.

Table I. Production Barriers

One of the barriers perceived by the participants regarding the production of domestic substitutes related to **the workforce**. The participants discussed the difficulties that they had experienced in recruiting staff, especially qualified engineers and intermediate-level staff. In 2020, the median age in Turkey was 32.7 (TUIK, 2022), and the average unemployment rate was 13.2% (TUIK, 2022). Therefore, although there are many young job-seekers, this workforce needs to be adequately skilled. Further, the desire of university graduates to work in jobs for which they are qualified creates difficulties in finding intermediate-level staff. As one participant said,

"…the industry is about to collapse. It will collapse in 4-5 years if we cannot raise intermediate staff."

Regarding the **inadequacy of industrial infrastructure**, the participants stated that their companies need specially designated industrial zones for SMEs. As one participant said,

"…SME budgets are insufficient to invest in existing organized industrial zones." Likewise, the other said: "*I want to take part. One million TL is requested for one decare. How can I find this money?"*

High capital requirements were also commonly cited as a barrier, as all the participating companies were SMEs. Stainless steel, the sector's main input, was often referred to. As one participant said,

"…we are completely dependent on abroad for aluminum and stainless steel in the aerospace and defense industry. How can we produce if we cannot get them?" Another participant said, *"… There are key products such as stainless steel. Our exports may increase if these key products are produced in our country*."

Although there is steel production in Turkey, stainless steel production requires an additional investment which is very high even for the multinational companies.

Research and development, production, brand promotion, and the creation of marketing channels are all processes that require time and capital. However, since Turkey is a developing country, its economy is fragile. For this reason, the participants perceived the investments in developing new products ver risky. As one participant said,

"… You cannot foresee anything in Turkey; you cannot plan. There is a crisis, and you cannot buy materials. Nobody produces it because they cannot sell it. Some companies with crisis predictions stops producing; this time, you go abroad, and there is no such volatility abroad. Despite all that, we are trying to invest".

The companies that referred to high capital requirements were distancing themselves from new investments due to the economic crisis and fluctuations in the exchange rate. According to World Economic Forum Global Competitiveness Index, Turkey ranks 129th in the world for **macroeconomic stability**. Thus, the perceptions of the participants reflect the current situation in Turkey.

Another barrier reported by the participants is the need for more availability in Turkey of the **raw materials** of some products, including magnets and chrome. Thus, the production of domestic substitutes may be costly, even if possible.

The firms wished to benefit from **government incentives** for developing domestic substitutes, but they perceived some obstacles. Some companies considered government incentives to be insufficient. Others suggested that the incentives could be more effective because they are unsuitable for the purpose and involve burdensome procedural requirements. As one participant noted,

"…They asked me to fill a form like an epic, and they say we must write five pages. I am thinking, am I a mechanic or a writer?... The procedures in incentives are not result-oriented and are too long."

Barrier Perceptions Regarding Marketing of Domestic Substitutes of Imported Goods: In the interviews, the companies mentioned more marketing barriers than production barriers. Some participants stated that they did not see any obstacles to production; if such obstacles existed, they could be overcome with government support. The main problem for the participants was the sale of manufactured products.

When asked about the marketing of domestic substitutes, the companies answered from the perspectives of two different roles: customer and manufacturer. From their customer perspective, the firms expressed why they did not prefer existing or potential domestic counterparts, whereas, from their perspective as manufacturers, they mentioned the perceived obstacles to selling the products they produce or can produce. For this reason, the themes distinguish between the consumer's and manufacturer's answers. Table II outlines the themes and codes identified regarding the perceived barriers to the sale of domestic substitutes for imported products by the companies themselves or their suppliers.

Customer Perspective			**Manufacturer Perspective**		
Customer's Demands			Competition	Economies of Scale	
Product Value	Price			Brand Competition	Country of Origin Effect
	Quality				Product Brand
	Quality/Price Performance		Strategic Orientation	Insufficiency of Domestic Demand	
				Focus on the Production of the Final Product	
Aftersales Services			Government Policies	Lack of Nationalization/Localization Policies and Campaigns	
				Lack of Protectionist Policies	
				Lack of Marketing Incentives	

Table II. Marketing Barriers

Customer Perspective: As shown in Table II, the participants who preferred not to use domestic substitutes for imported products were grouped under three principal codes. Most participants who referred to these issues were speaking based on their experiences. Although the participants expressed an intention to buy domestic substitutes, they preferred not to due to the inadequacy of the after-sales service, their customers' direct demands for imported intermediate inputs and the inferior price and quality of domestic products compared to imported products.

Customer demand refers to the situation in which the participants' customers requested brand-name products for certain parts, particularly concerning the engine. In this situation, the companies were obliged to use imported products or lose their customers to a competitor. Thus, the manufacturers did not evaluate domestic substitutes in such situations.

In contrast, the participating companies did compare the imported products and their domestic substitutes in the product value item. However, they preferred the imported products due to their higher quality, as reflected in the most frequently cited sub-code. Most companies that used or intended to use domestic substitutes claimed that the substitutes were of lower quality than imported products and could not meet the industry's quality standards. One participant noted,

"*…our rails need to be like linear arrows. However, we get samples that draw 8," while another said, "We were able to use only 50 of the 100 encoders we purchased. The underlying reason for this is faulty design and poor quality of the products."*

In addition, although the price was not mentioned as often as quality, some companies reported that domestic substitutes were more expensive. They stated they needed to place orders in high volumes to get lower prices, but they could not make orders of this scale.

The last code evaluated under the product value theme was **after-sales service**. Since most of the domestic equivalents were produced by SMEs, the need for an extensive international technical service provider network and low local service quality in the domestic country were two critical obstacles. When referring to the poor after-sales service code, the participants evaluated the service they had received for their purchased domestic capital goods. They felt that when they selected domestic capital products, and those products malfunctioned, the manufacturer did not show due diligence. As one participant said,

"…production is not the biggest problem; component to prove itself in the international market. We produce Turkish products, and we are trying to market them. If your competitor is using Siemens, it is a negative reference for my customer if I use a product that no one, produced in Turkey know, or that has no service when it has an accident in New Zealand".

On the other hand, for intermediate goods to be used in production, the companies mainly evaluated the convenience of accessing the technical services requested by their customers, particularly their foreign customers. If a product malfunctions and there is no service available for that product abroad, it is very costly and challenging for the Turkish company to provide support. For example, suppose a Siemens engine is used in the machinery. In that case, Turkish SMEs can easily export the product because any problems related to the engine can be solved by Siemens' network of technical services providers. However, if the engine manufacturer is a domestic company, it is challenging and costly to solve problems remotely.

All participants stated that they would prefer local substitutes if all these obstacles were eliminated. One participant was even willing to pay a higher price, considering the supply advantage, if the domestic equivalent was the same quality as the imported product.

***Manufacturer Perspective*:** From their perspective as manufacturers, the participants discussed the obstacles they might encounter while marketing domestic substitutes for imported products. The principal codes in this theme were competition, state policies, and strategic orientation, with **competition** being the most frequently cited. The participants stated that the products they imported were relatively well-established brands with which it was impossible to compete. They were concerned that they would not be able to market their products effectively in domestic and foreign markets, especially because of the importance of the country of origin in the machinery sectors of Germany, Italy, and the US, together with the high recognition of brands based in those countries. As one participant stated,

"*Siemens has been around for 100 years. It has given Programmable Logic Controller (PLC) systems to all universities worldwide for 60 years. All those who graduated from those universities know about Siemens. You cannot compete with this brand."*

Companies must compete with high-quality, well-established brands and low-priced Chinese products of reasonable quality. The latter type of products is widely accepted in the global market due to their economies of scale.

The product-based national competitive advantages of Germany, China, the US, and Italy are all superior to that of Turkey. In 2019, the Revealed Comparative Advantage (RCA) for each country in the machinery sector was > 1 (Germany = 1.42; China = 1.41; USA = 1.06; Italy = 1.52), meaning that they are competitive in the global market. In the same year, Turkey's RCA was 0.82, which is not competitive in this sector. Therefore, the secondary data supports the concerns expressed by enterprises.

The participants reported that they were required to reach a specific sales volume to produce products similar to the quality and prices of imported products. However, due to the **low volume of domestic demand**, production should be planned directly for the global market. However, SMEs perceived initiating such an international investment as high risk. One participant noted:

"One should refrain from investing by targeting only the domestic market. Your export market will exist. Nevertheless, the domestic market will be the locomotive for you. In this sense, trying to meet the demand shortage from foreign markets seems risky."

Most participants considered that Turkey's domestic market does not have sufficient actual or potential demand for their investments to be profitable. Another participant stated,

"There is an obstacle to reaching profitable pieces. It does not make much sense to invest before reaching those numbers. There is a vicious circle."

For these reasons, some companies prefer to differentiate their final products rather than produce domestic equivalents of existing products. One participant noted,

"Of course, I can copy. However, there is no point in re-discovering America. We need to add value to it."

Most participating companies mentioned that they required **government support** for domestic market substitutes, the domestic market initially, and later in the international markets. However, they claimed that these supports were not sufficient. First, they stated that the procurement of domestic products should have been encouraged, and the state should take the lead in this area. They emphasized that the government should create campaigns to procure domestic inputs and products and prioritize domestic products in public procurement. Additionally, some companies proposed that the government impose measures against imports, such as customs duties or non-tariff barriers. However, others stated that implementing such measures would not provide a solution. For example, one participant noted:

"There have been many companies in Turkey that set out with the desire to produce domestic products and put obstacles in front of imports. Moreover, they could not produce that product. Since it could not produce, that product entered the country at very high prices."

Meanwhile, a second participant stated:

"We should have produced. For the last 15 years, Turkey has been an import paradise. When we returned a few years ago, the dollar and the euro were meager. That is why everything was imported. For this reason, the domestic manufacturer is not in a position to produce. Many of them went bankrupt."

Another area where participants requested additional government support was brand creation in terms of their products and national brands. Developing countries with global brands were cited as examples. One participant noted,

"*As long as you have some product, you can have a say in the world. For example, today, South Korea has two brands: Hyundai and Samsung. Nevertheless, the country is almost at the level of Germany today*."

4.2. Mid- COVID 19 Stage

This section first describes the changes in the participants' ways of making business and operations and consumer demand for supplies from abroad before and during the COVID-19 pandemic. Secondly, the changes in participants' perceptions of the barriers to localization are outlined.

Two-thirds of the participants stated that they had experienced problems with their imports, while the remaining one-third had not. A quarter of the participants preferred maintaining their stock as a reactive strategy, foreseeing shipping problems due to the ongoing pandemic.

About half of the participants stated that the demand for their products had increased during the pandemic period, while the other half had observed a decrease. These variations may have been caused by the differences in the kinds of products produced by the companies. For example, the demand for packaging machines increased while the demand for timber processing machines decreased.

Most participants suggested that digitalization and remote working were the leading structural changes caused by the pandemic. Other changes, expected to continue after the pandemic, included an increased focus on the productivity of operations, hygiene measures, the creation of flexible supply chains, increased demand for domestic substitutes, and an orientation towards automation.

***Changes in Perceptions of Barriers to the Production of Domestic Substitutes for Imported Goods**:* The second stage of interviews mentioned the production barriers emphasized in the first stage (i.e., high capital requirements, workforce issues, and problems related to government incentives). However, during the second stage, government incentives were more commonly raised. This indicates that companies' expectations of government assistance have increased during the pandemic. While the participants emphasized the ineffectiveness of government incentives in the pre-COVID-19 interviews, in the second stage of interviews, they emphasized the insufficiency of such incentives, suggesting that companies now expect additional incentive programs due to the pandemic from the government.

In the pre-COVID-19 interviews, the participants discussed the difficulties of recruiting semi-skilled and qualified workers and the gaps in workers' education. During the pandemic, the participants emphasized deficiencies in technical knowledge. Perhaps due to downsizing or the widespread use of remote work, problems related to recruitment have become less important.

The participants in the second stage barely mentioned the macroeconomic instability discussed in the first stage of interviews. This may be because the pandemic has caused companies to orient their

efforts toward short- and medium-term issues rather than longer-term ones. Likewise, the inadequacy of industrial infrastructure discussed during the first stage should have been mentioned in the second.

Changes in Perceptions of Barriers to the Marketing of Domestic Substitutes for Imported Goods:

Manufacturer Perspective: No significant changes were observed in the principal codes between the first and second stages of interviews.

In both stages, companies identified competition as the most critical barrier to marketing domestic substitutes for imported products. While the first stage of interviews emphasized brand competition, participants in the second stage identified competition arising from economies of scale as an important barrier. In other words, competition on the price-cost axis became more important during the pandemic.

When the competition barrier is evaluated together with the sub-dimensions of product and country competition, the emphasis on competing with global brands that were present in the first stage of interviews was not observed in the second stage. The emphasis shifted from brand competition to country competition. This macro focus is due to the global nature of the pandemic. For example, all companies have experienced problems importing products, regardless of the brand. As of the second stage of interviews, Turkey had stopped the flights to and from Italy, China, Germany, and France, all of which included suppliers of the participants. Additional precautions applied at the Turkish borders also slowed the flow of goods. As a result, most global brands in the domestic market were in a difficult situation regarding their customers.

The data on perceptions of barriers related to government policies indicated that the emphasis has increased on solvable problems in the short term. For instance, while the requirement to prefer domestic products in public procurement was the least cited government policy code in the first stage of interviews, it was the most emphasized code in the second stage. This suggests that companies need strong guarantees, such as the government purchase guarantee, to make the necessary investment in production during the pandemic. The participants perceived investing during the pandemic period as risky due to the economic contraction in Turkey.

Although deficiencies in protectionist policy were the most frequently mentioned code in the first stage of interviews, this code was mentioned less in the second stage. This indicates that the importance of obtaining the necessary products in any way possible during the pandemic has increased.

The lack of government campaigns concerning nationalization or localization policies, frequently mentioned during the first stage of interviews, should have been mentioned in the second stage. This situation may be because the government has been focused on responding to the pandemic. Another reason may be that such campaigns are a longer-term solution and may not provide enough confidence in the short term.

Finally, insufficient domestic demand and final product development were referred to in both stages of interviews. However, the emphasis shifted from insufficient domestic demand in the first stage to final product orientation in the second stage. This suggests that due to the disruption of international marketing activities and operational processes caused by the pandemic, companies have placed more importance on the domestic market during this period.

Customer Perspective: Some companies that mentioned that they had not considered using domestic substitutes before the pandemic declared that they had begun to consider using such substitutes during the pandemic.

Product value was the most significant barrier to procuring domestic substitutes in both stages of interviews. Although the quality was the most crucial reason for the participants' preference for imported goods over domestic substitutes in both interviews, the price issue gained importance during the pandemic. In the first stage, some participants stated that they preferred imported goods over domestic substitutes due to the availability of after-sales services. However, this factor should have been mentioned in the second stage. Instead, participants focused on the price paid for rather than the benefit obtained from the purchased product. This may be due to financial difficulties and customer demand decrease. Many participants in the first stage of interviews stated that customers had requested specific brands, but this precondition should have been mentioned in the second stage. This further suggests that the change in emphasis was due to the decrease in orders.

4.3. Reevaluation of the Results within the Scope of the Diamond Model

The results of the study are reorganized according to the determinants of the Diamond Model in Table III. The comments part includes both the data obtained from the interviews and results of the previous related literature, regarding Turkish machinery manufacturing industry.

All the factors which were obtained by open-coding technic have a place in the Diamond Model, excluding “competition and its subcodes” and “macroeconomic instability”. Lack of competition is comprehensible. Because, competition is the aim of the Diamond Model, rather than being a discouraging marketing obstacle. However, macroeconomic stability seems to be a requirement to invest new product developments.

Diamond determinants	Sub-dimension of the determinant	Comments
Factor conditions	Industrial Infrastructure	IOZs exist, but their number needs to be increased, and they are hardly reachable by SMEs because of inadequate capital.
	Raw Materials	Stainless steel is a common input for all companies. Although Turkey has minerals, stainless technology does not exist in Turkey and requires high capital to invest.
	Labor	There is a need for highly skilled and semi-skilled employees. University education needs to be improved, and there are no supporting institutes.
	Technology	No barriers are perceived in the case of technology.
	Capital	Stainless steel is a common input in the industry. Although Turkey has minerals, manufacturing stainless steel requires a high capital investment that most big companies cannot afford alone.
Demand Conditions	Market sophistication	Mostly, products are designed in according to the directions of customers. Most of the companies are exporting; they are also in contact with international buyers.
	Market Size	Domestic market size is not sufficient to be competitive. International markets also should have been targeted for new products to be competitive in price.
	After-Sales Service Network	Because of the technical requirements after the sale, customers need to reach the services efficiently. Global after-sales service network requires high capital investments, which SMEs can not afford.
Related and Supporting Industries	Clustering	Only some of the machinery manufacturers in Turkey are concentrated in a specific region. The study sample is in the most clustered part but not in IOZs. The sample companies mentioned neither cooperation nor competition.

Firm Strategy, Structure, and Rivalry	Firm Strategy		Most companies prefer to focus on their final product rather than producing their components. None of them showed the desire to produce local alternatives to imported goods. However, some of them had past experiences.
	Firm Structure		All of them are SMEs. So that making decisions can be easy and fast. They are supposed to be more flexible than big companies.
	Rivalry		The structure of the competition is global and monopolistic. Their customers demand the components, especially the engine, with the brands of multinational established companies. None of them mentioned anything about domestic competition. This can be because of the niche segments dominating the market structure.
Diamond determinants	**Sub-dimension of the determinant**		**Comments**
The Role of Government	**MARKETING**	Lack of Nationalization /Localization Policies and Campaigns	Most of the companies seem to expect direct marketing incentives. Even, some of them mentioned government purchasing guarantee. These types of incentives hurt companies in the long run according to Porter (1990).
		Lack of Protectionist Policies	
		Lack of Marketing Incentives	
	PRODUCTION	Heavy Procedural Burden	Procedures results from Turkish Government's precautions against the misuse of the funds provided. Not cooperating with project consulting companies may have created this perception by SMEs.
		Ineffectiveness	
		Insufficiency	

Table III: Reevaluation of Results from the Porter Diamond Model Perspective

5. Conclusion

Turkish machinery manufacturing industry seems to be on the way to being competitive. Because of the perceived marketing and production barriers, the companies do not show enthusiasm for producing or buying the local alternatives of imported goods. Even the pandemic did not change this view. Oppositely, the general impression is protecting what they have and surviving until the crisis is over. As a result, the pressure and challenge of the shortcomings in their supply chain were not evaluated as a source of advantage to be competitive, as Porter (1990) guesses. However, Porter's two vital elements, "domestic rivalry and geographic concentration" seems not to be matured in this industry. The reason why COVID-19 supply chain disruption isn't evaluated as a disadvantage to be an opportunity can be the missing points in the system.

Apart from Porter's (1990) Diamond Model's determinants of competitiveness, "time" seems to be an input of being competitive. To produce a globally competitive product, companies need time to provide acceptable quality at reasonable prices. They think they should perfect the quality and take advantage of economies of scale. They need time for these. Under the macroeconomic instability survived by most of the developing countries like Turkey, investing in an area that takes time to reach the break-even point seems to be too risky. "Global competitors operating in the industry are established companies which were founded at least three decades ago." is the sentence that the companies mentioned

several times. In addition, our sample seems to attach more importance to domestic market size than Porter (1990) did. Either Porter (1990) underestimated or our sample exaggerated, or some of both.

5.1. Managerial Implications

From the manufacturer and customer perspectives, companies' perceptions of marketing barriers were similar between the first and second stages of interviews. In both stages, the most prominent factor from the manufacturing perspective was competition, including brand competition and economies of scale. On the customer side, problems related to product value, quality, and after-sales services were among the barriers to procuring domestic substitutes.

The scale of SMEs appears to hinder their ability to compete in international markets. In order to be competitive abroad with new products, they must first match the quality of products offered by global companies and subsequently achieve a sufficient sales volume to benefit from economies of scale. However, since domestic demand alone is insufficient to ensure economies of scale, SMEs should target international markets when developing new products.

One potential strategy to secure the necessary resources is clustering. However, for such clustering to be effective, it should focus on marketing and after-sales services in foreign markets rather than production at the local level. Given the highly diverse range of products within the machinery industry, local-level clustering is unlikely to yield the desired outcomes. Due to this fragmented structure, a viable solution could be the establishment of shared offices in target countries, where firms producing similar or identical products at the national level could collaborate in marketing and after-sales services.

Within this framework, the government could develop incentive programs to facilitate the organization of firms. Another form of government support could involve prioritizing local firms in public procurement processes. Although incentive mechanisms often favor local brands, the implementation of such preferences in public procurement appears to be left to the discretion of decision-makers. Although Porter (1990) does not explicitly recommend direct incentives, he acknowledges that such incentives can be effective in the early stages of an industry's growth.

In addition to public institutions, business associations and federations can actively contribute to this process. However, firms' willingness to invest in this area appears to be contingent upon economic stability. Enterprises that are primarily focused on short-term survival under current conditions demonstrate limited inclination toward making long-term investments.

These results illustrate that machinery manufacturers perceive many barriers to producing, marketing, and procuring domestic substitutes for imported products. Solving many of these problems will require time, cooperation, government support, and a clear overarching strategy. There were few changes in the perceived barriers in the interviews conducted before and during the pandemic. However, in the second stage of interviews, the companies focused on the barriers that could be eliminated relatively quickly.

5.2. Limitations and Future Research

The primary and most significant limitation of the study is the difference in the methods used for the first and second interviews. In addition to the necessity of conducting the second interviews over the phone due to pandemic-related constraints, participants were reluctant to answer the questions and share their ideas in detail during the second round of interviews.

Given that this research only dealt with machinery manufacturers in Sakarya, there is an opportunity for further research in the future to examine the effects and perceptions of barriers to domestic substitutes in different sectors and regions. Because machinary sector is a matured sector. Products which are in the introduction or growth stages, time may not be a barrier. Additionally, SMEs are usually financially constrained entreprises. Bigger companies may have more courage to compete with the global counterparts.

As the nature of the case study, the findings can not be generalized. With the support of this study, a quantitative scale can be developed and applied to a bigger sample with a quantitative approach to reach generalizable results.

6. Declarations

6.1. Competing Interests

There is no conflict of interest in this study.

6.2. Authors' Contributions

Authors declare that they have contributed equally to the work.

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