LAB University of Applied Sciences

The Impact of Current EU - China Trade Policies on Finnish Machinery Firms

A Focus on Tariffs and KONE Case Study

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Nghia Nguyen

Abstract

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Abstract

The thesis is to analyse the economic impacts of tariffs on Finnish machinery companies. By examining recent tariff rates imposed by the EU and China on machinery and related goods, the study explores how these tariffs affect the operations and market access of Finnish machinery firms in China. Additionally, the research also aims to investigate the broader implications of EU-China trade relations on the strategic approaches of Finnish companies.

The research adopts a mixed-method approach, combining quantitative and qualitative analysis, with a case study methodology focusing on KONE to examine the impact of tariffs on Finnish machinery firms. The study relies on secondary data ensuring objective and evidence-based findings without requiring access to confidential information. By analysing trends, patterns, and documented outcomes, the study generalises insights into how Finnish machinery firms navigate trade barriers. The study integrates theoretical insights from international trade theories with practical insights from KONE's example, providing a comprehensive understanding of how trade policies shape firm behaviour.

The study finds that EU-China trade policies, particularly tariffs, significantly influence the operations and strategies of Finnish machinery firm like KONE. Tariffs imposed by China increase cost for Finnish exports, dictating firms to adapt through strategies such as FDI, supply chain localisation, and production within China to mitigate the effects. Meanwhile, EU's tariffs impact input costs for domestic operations. These policies not only affect market access but also drive firms to innovate and restructure to maintain competitiveness. The findings highlight the complex interplay between trade policies and firm behaviour, offering insights into how Finnish machinery firms navigate such challenges.

Keywords

Trade Policies, Tariffs, EU, China, Intra-Industry, Resilient Supply Chain, FDI.

Contents

List of Abbreviations

BRI: Belt and Road Initiative

CAI: Comprehensive Agreement on Investment

CN: Combined Nomenclature

E&E: Elevator and Escalator

EC: European Commission

EU: European Union

FDI: Foreign Direct Investment

ICT: Information and Communication Technology

MIR: Minimum Import Requirement

MPL: Marginal Product of Labour

PPF: Production Possibility Frontier

TRQs: Tariff-Rate-Quotas

1 Introduction

1.1 Background

EU and China are the two biggest trading partners in the world since they account for over a third of the world's GDP and their exports are also over a third of the global trade. After the United States, even though there is a decline in trading of 14% compared to 2022, China is still the second largest trading partner with the EU which has been shown by the bilateral trading value worth €739 billion in 2023. According to the European Commission, China is the EU's third-largest partner for exports and the biggest for imports which has been represented by the deficit of the trade balance in favour of China of €292 billion in 2023. (European Commission 2024.)

Since the opening of diplomatic relations between EU and China, their relationship has developed significantly in a broad range of issues. Until recently, their relationship had been viewed in economic terms. In 2014, the EU became China's largest trading partner, while in the year of 2020, for the first time, China became EU's largest trade partner. (BBC 2021.)

Under President Xi Jinping, China has adopted more assertive foreign policies while Ursula von der Leyen, since becoming president of the European Commission, has clearly explained the EU's ambition in the important role of international relations. The boundary between economics and geopolitics has blurred since then in both China and the EU. (Interesse 2024.)

Moreover, in recent years, the EU has concerned regarding systemic imbalances of China's economy. First, China's industrial policies and practices have created a significant distortion for a wide range of WTO members. Second, China's aggression on import substitution and self-sufficient policies have discriminated European companies in the Chinese market. Third, many European businesses are concerned about the politicalisation of the business environment in China since economic challenges have increased while regulatory obstacles remain unchanged. (European Commission 2024.)

In 2019, European Commission published a strategic outlook on the relationship between the EU and China, in which contains ten actions. Objectives of this strategic outlook are to deepen its engagement with China to promote common interest, to seek more balanced and reciprocal conditions in the economic relationship between both sides, and finally, to maintain the EU's prosperity, values, and social model for a long-term future. (European Commission 2024.)

Moreover, in 2020, EU and China have reached a common agreement in principle on the Comprehensive Agreement on Investment (CAI). The agreement attempts to balance the EU's ambition to access the larger market and the conservative attitude of China towards opening its market for foreign investment. The CAI contains commitments on market access and disciplines that will level out the competitive environment for EU investors in China, including clear rules on state-owned enterprises, transparency obligations for subsidies, and rules on forced technology transfers prohibition. This milestone is remarkable for enhancing the trade and investment links between the EU and China. (European Commission 2020.)

Regarding Finland, the aftermath of the Ukraine war has shifted the trade and travel routes between Finland and China significantly. The European country sanctions against Russia has disrupted critical transit routes linking China and Europe, resulting in the downturn of trade activities between Finland and China. Railway cargo transport had been developed rapidly before the war, now, has been abandoned. (Joshi 2024.)

Furthermore, the visit of President Alexander Stubb to China has marked the 74th anniversary of diplomatic ties with China. A variety of subjects related to a complex landscape, such as trade relations, security concerns, and strategic cooperation, has been discussed by the Finnish president in order to confirm Finland position as a self-interested yet principled partner. This move has shown an effort of Finland to balance the relations between Finland-EU, Finland-US, and Finland-China during the evolving global tensions. (Aubié & Shen 2024.)

Moreover, major Finnish corporations have established significant investment in China. Despite differences in market size and trade strategies between two countries, Finland and China have fostered an economic partnership since then by stable political ties. Finland's advanced expertise in technology, innovation, and sustainable solutions makes it a valuable partner for China. The two countries have further strengthened their relationship with a variety of joint research projects in energy, information and communication technology (ICT), and nanotechnology. However, even though the efforts of both countries in improving the business playground and promoting the development of two economies. Persisting challenges have forced Finnish businesses to adapt these obstacles while exploring potential prospects in sustainable development. (Interesse, 2024.)

There are six key cooperation areas between China and Finland which have been developed through a number of high-level dialogues over time. First, while climate-change matters propose the threat on global prosperity, both China and Finland attempt to leverage their unique expertise to transform their economies towards sustainable development. With

Finland's expertise in clean technology and renewable energy, collaborations through joint projects in research and technology transfer will promote attempts to implement eco-friendly practices across various industries. Second, as the populations in both countries experience ageing, Finland offers valuable insights based on its innovative approaches to elderly care to help China develop smart systems for elderly care. Third, regarding transportation and connectivity, both countries have recognised the disruption of connected routes between two countries due to the raging war, several attempts from both sides to enhance logistics and improve connectivity have been promoted and occurred. Fourth, to catch up the evolving of digital landscape, through ICT projects, both countries share best practices to boost economic growth and improve life quality. Fifth, academic partnerships and cultural events take place to encourage cultural and educational exchanges between two countries in which deepen the relationship between Chinese and Finnish societies. Finally, to achieve its ambition in the Belt and Road Initiative (BRI), China has been invested significantly into Finland through FDI in which concentrated on a few major acquisitions in the technology sector, even though Finland has not formally participated in this project despite its member status of the Asian Infrastructure Investment Bank. (Interesse, 2024.)

On the one hand, Finland has advantages in producing world-class products and technologies in forestry, electronics, machinery production, metal processing, information and communication, energy, and environment. On the other hand, China offers high-quality and affordable textiles, apparels, audio-visual products, electrical appliances, and chemicals which are well-received in Finland. Bilateral trade between two countries is inevitable and significant. Although Finland's exports to China faced a contraction of 12% in 2023 from the previous year. This decline was attributed to China's decrease in domestic demand. China's proportion of consumption expenditure on its GDP dropped by almost 3%, around €480 billion, from the peak in 2019. This impacted negatively to Finnish goods. Still, China remained Finland's fifth most critical export destination. (Bank of Finland 2024; World Bank.)

The growth of China's economy associated with the interdependence of economies globally has concreted the significance of China to the EU, and especially Finland. The recent intense of geopolitics imposes potential challenges significantly for Finnish businesses to seek the way to access into the bigger market of China. Therefore, a cautious analysis of trade policies between EU and China is a must and inevitable in order to provide insights for better decision-making.

1.2 Research Questions

The main question that this thesis needs to answer is:

- How do EU-China tariffs impact the Finnish machinery industry at the firm level?

In order to answer this main question, these sub-questions will be explored as follows:

- Why does Finland trade with China in the first place?
- What specific tariffs does EU and China impose on machinery exports from the other? And how do these tariffs affect Finnish machinery firms?
- In what ways have recent changes in EU-China trade relations influenced the export strategies of Finnish machinery companies?

The first sub-question serves as a background for further examination of tariffs effect on the Finnish machinery industry. The second sub-question attempts to analyse the direct effects of tariffs on trade volume and competitiveness. At the same time, it examines the challenges of Finnish companies when trying to access into the Chinese market. Finally, the last one illustrates the implications of evolving trade policies on business strategies and adaptations. The first two questions will disclose the influences of trade policies on the industry while the last one unveils the adaptability of the business in its strategies.

1.3 Objectives, Significance of the Study, and Its Limitations

The thesis objective is to analyse the economic consequences of tariffs on Finnish machinery companies. The author will investigate recent tariff rates of EU and China imposing on machinery and machinery-related goods to study how these barriers influence Finnish machinery firms' operations and market access in China. Besides that, the author also attempts to explore the boarder implications of EU – China relations on Finnish companies' strategies.

The author believes that the study is significant to policymakers, businesses, and academia. Because first of all, there is only a few research available, related to Finland alone regarding the significance of the matter. Secondly, it also provides a snapshot on the influence of trade policies on Finland's industrial operations. From that, the research's users are able to grasp the current situation to make a better decision or a suitable policy to deal with domestical market failure to promote the common welfare. Finally, hopefully, the study will also become a reference for literature reviewing for further research.

Due to the complexity of the topic, the author is expected to narrow down the scope of the topic. First of all, trade policies that are considered in the thesis, is mainly tariffs. A further reference of other types of policies such as quotas, subsidies, or the price ceiling will also be mentioned at some point throughout the thesis, especially in the theoretical chapter of

the thesis or a few words of discussion in the case study chapter. This further reference's purpose is only to justify the impact and significance of tariffs. Also, it provides a clear perspective on the problem and mechanism of trade policies on international trade. To the author, this is inevitable since it is hard to judge the effectiveness of tariffs without comparing them with other polices theoretically.

Secondly, the impact of tariffs on Finnish firms is the only concern in the research. The author will not examine consequences of the trade relation between Finland and China towards the prosperity of the whole Finnish economy. So, such matters as income distribution across classes or changes of production factors between labour and capital will not be analysed in the case study part. Trade theories related to the trade mechanism between two countries will still be discussed briefly in the theoretical chapter. Because those models are served as a backbone for understanding how tariffs, or trade policies in general, dictate the movements of production factors in an economy. These theories make clear on why countries should enter trade in the first place, and on why same types of products still can be traded between countries under the intra-industry trade context.

Finally, the availability of data for public accesses from firms, such as KONE, is also a restriction on the scope of the thesis. Because such data is usually confidential. Therefore, the author utilises most of data can be collected from firm's annual reports, industrial reports, and government's statistical data. From those available data, the author will try his best to extract insights to answer the research question by reasoning and theory-based deductions. Especially, the author will also make an assumption based on actual conditions to examine the effect of tariffs on KONE wherever the author feels necessary in order to further elaboration.

1.4 Research Methodology

The research will be conducted by a mixed approach of quantitative analysis and qualitative analysis. The case study methodology focuses on a single company, KONE, to explore the impact of EU-China trade policies on the Finnish machinery firms. This allows for an examination of KONE's strategies, trade dynamics, and adaptations. The result provides specific insights into how trade policies influence firm behaviour.

The case study is supported by the use of secondary data. The secondary data analysis relies heavily on secondary data sources, including KONE's annual reports, trade policy documents, statistical data from the Finnish government, academic literature, and industry analysis. This approach ensures that the findings are based on documented evidence and scientific reasoning rather than primary data collection, such as surveys or interviews. The

secondary data analysis approach also allows the study to be examined justly without requiring access to confidential or inside information. The approach enables the author to overcome the confidentiality barriers in which the author is unable to interview with KONE's insiders. By focusing on trends, patterns, and documented outcomes, secondary data allows for meaningful analysis and generalisable insights into how Finnish machinery firms might navigate similar challenges. Most importantly, the secondary data approach assures the objective of the research. By focusing on the observable outcomes of trade policies, secondary data provides objective and externally validated information rather than relying on potentially biased or unverifiable internal sources.

On the other hand, the qualitative analysis on KONE's operation, such as its FDI strategy, supply chain localisation, and responses to tariffs and quotas, helps uncover broader implications and patterns that can be generalised to the Finnish machinery firms. With an exploratory and interpretive approach, the author explores and interprets the broader implications of the findings for the Finnish machinery industry and EU-China trade relations. The broader implication can be achieved through the combination of theoretical and practical insights. Theoretical insights are grounded in international trade theories, while practical insights are drawn from KONE's business practices which highlight real-world responses to trade policy challenges.

Finally, the research places KONE's case within the broader context. This allows for generalisation of key findings while acknowledging the firm's unique position in the market. The comparative contextualisation provides a holistic view of company-level outcomes within the broader macroeconomic and policy contexts. This approach shows how different companies or industries respond to similar challenges, which will allow for an understanding of opportunities and risks in accessing the China's market in the presence of tariffs.

1.5 Structure of the Thesis

The thesis report will be divided into four chapters. The first chapter is an introduction of the thesis. In this section, the author will provide the brief background related to the topic. At the same time, research objectives, its significance, research questions, and methodology will also be presented in this section. The second chapter is the theoretical framework section. This section will lay the foundation for understanding the economic theories related to international trade and trade policies. Theoretical trade models, trade policies' definitions, and its implications will be discussed here with the focus on how these theories relate to EU-China relations and their impact on the Finnish machinery industry. This chapter provides the theoretical lens through which the trade policies and their impact will be analysed in following chapters. The fully case study of tariffs' effects on KONE will be examined in

the next chapter. From the examination on KONE, the author will generalise the insights from the case study to imply other Finnish machinery firms. Besides that, the author also discusses what opportunities and challenges may exist based on the example of KONE. Finally, the last chapter will conclude the whole thesis by stating the summarisation of key findings, contributions, and implications of the study. It will also suggest areas for further study. In other words, this last chapter ties everything together and presents the final conclusions of the research.

2 Theoretical Framework

2.1 International Trade Theory

In order to understand the effects of trade policies, the author believes that the answer for why a country should enter into trade with another country in the first place, is a necessary first step. Therefore, before diving into trade policy theories, international trade theories will be discussed briefly. This overview will also explore reasons for why countries impose trade policies to restrict international trade, despite the fact that trade brings wealth and improves the prosperity of the economy as a whole. Moreover, international trade theories also provide a theoretical perspective to identify the opportunities and challenges that Finnish machinery firms may face when accessing the Chinese market.

During the early of 19th century, a British political economist David Ricardo had been irritated on the effects of the Corn Laws which made the British impossible to import wheat from the rest of the Europe, and also dissatisfied in the contemporary Political Economy on determining the laws which regulate the distribution of the produce of the earth among classes (Ricardo 1821, 1-5). He published his 'On Principles of Political Economy and Taxation' which is an in-depth analysis on the principles of economic forces that drives the economy. In this work, Ricardo (1821, 1-5) laid the foundation for the theory of international trade which challenged the mercantilism concept of accumulating rare resources – gold or silver. His advocation on industry specialisation and free trade, which later has been introduced as the term 'comparative advantage' by John Stuart Mill in 1844 (Mill 1844), argued that international trade is always beneficial to all the players, even if one country has absolute advantage in every sector compared to its trading counterparts. (Ricardo 1821, 77-93.)

Moreover, the key assumption in his theory is that labour is the only factor of production since the reference of other factors like capital or land throughout his analysis had been purposedly omitted. In other words, the comparative advantage of countries differs in their labour productivity in producing different goods. (Ricardo 1821, 77-93.) Even though this assumption is a very narrow assumption for the modern complex economy, it reflected the situation of his contemporary economies and is qualified to illustrate the benefits of free trade. The proposition had been claimed as follows:

> *Under a system of perfectly free commerce, each country naturally devotes its capital and labour to such employments as are most beneficial to each. This pursuit of individual advantage is admirably connected with the universal good of the whole. By stimulating industry, by rewarding ingenuity, and by using most efficaciously the pe-*

> *culiar powers bestowed by nature, it distributes labour most effectively and most economically; while, by increasing the general mass of productions, it diffuses general benefit, and binds together, by one common tie of interest and intercourse, the universal society of nations throughout the civilised world. It is this principle which determines that wine shall be made in France and Portugal, that corn shall be grown in America and Poland, and that hardware and other goods shall be manufactured in England.* (Ricardo 1821, 81.)

Each country differs in its own way. Each country possesses differently the limited quantities of resources, labour, skills, and productivity. In other words, a country can only be able to produce the specific amount of goods based on its production capacity, which results from the intertwine of the different characteristics that country possesses. Therefore, in order to produce more one type of good, it has to produce fewer other goods. This trade-off is also to the reason why a country should enter international trade to benefit its whole welfare. (Ricardo 1821, 77-93.)

The concept of comparative advantage of a country relative to the others had been developed through the propositions as follows. Because *the value of all foreign goods is measured by the quantity of the produce of our land and labour, which is given in exchange for them* (Ricardo 1821, 77). It will be advantageous to Portugal to devote its capital to produce products that it has greater productivity rather than to the manufacture of commodities that are probably in inferior quality as well as quantity (Ricardo 1821, 82). To put it formally, a country has comparative advantage in producing a good if the opportunity cost in producing that good relative to other goods is lower than it is in other countries. Therefore, this concept suggests that a country should specialise in producing goods that it has relatively efficiently in production then trade those goods for others which they it is less efficient in producing.

However, will countries specialise in producing goods where they have a comparative advantage and trade with other nation? The phenomenon of specialisation had been described by Ricardo (1821, 81-82) as *in one and the same country, profits are, generally speaking, always on the same level. If the profits of capital employed in Yorkshire, should exceed those of capital employed in London, capital would speedily move from London to Yorkshire, and an equality of profits would be affected.* In other words, if profits of one sector have been created due to the excess of the market price over the natural price of a commodity, the flows of capital will move to that sector of production until driving the market price down as the same level as the natural price. Therefore, we can confidently conclude that an economy will specialise in producing a particular good if its relative price surpasses the opportunity cost of producing another good (Krugman et al. 2023, 54).

From now, it can be understood how each country ends up in specialising its production towards particular products that it has comparative advantage at throughout the interaction of international trade. However, it does not mean that Finland, due to its expertise in machinery production, will export its machines and import apparels indefinitely forever. The trade volume between two countries is determined by the relative price of a commodity in one country compared to its price in the other. This phenomenon is just as same as the normal principle of supply and demand in general economics. If the relative price of a commodity in one country is higher than that in another country, that commodity supply will flow into that country until the relative price is equalised eventually (Krugman et al. 2023, 56-58). Since the price of a commodity is determined by the demand and supply forces of that commodity, if a country produce that commodity more costly than other commodities which that supply cannot keep up with the demand level. The price of that commodity will increase which in turns also raising its relative price in terms of another commodity. Then the imported supply from international trade will flow into that economy to satisfy its demand on that commodity. Exports will continue until the relative price falls below the level necessary to remain profitable, at which point they will stop.

How gains can be recognised in international trade? International trade expands consumption possibilities in both countries. By specialising and trading, each country gains access to a larger quantity of goods than if they produced everything domestically, even if one country possesses absolute advantage in all sectors compared to the other. Ricardo (1821, 82-84) illustrated that Portugal and England can both expand their consumption beyond what they could achieve in autarky by Portugal employs her capital in the production of wine, for the amount that allows her to obtain more cloth from England than if she divided her total capital to produce cloth by herself. In other words, the benefits of international trade lies in viewing it as an indirect means of production (Krugman et al. 2023, 60).

If international trade proposed by this model yields that benefits to both sides, why would many people oppose to the idea and impose trade policies to restrict the flows of trade? The answer lies in the limitations of the assumption that labour is the only factor for production, which is absolutely different from the complex reality of modern economies. Transportation costs, environmental cost, healthy concerns, and etc, may drive up the cost of exports makes it unprofitable to do that anymore. Moreover, if a country experiences either an improvement in its export employment or a change in wage structure. In the former case, if its export product is inelastic, its price will decease due to the shift of its supply curve to the right, as a result, its terms of trade will become worsen. In the latter case, if its labour force shrinks which raise up the labour cost. As soon as the cost exceeds its relative price, there is no profitability to continue that business anymore, leading to the abandonment of that

employment. Furthermore, the most significant reason is that Ricardo's trade theory assumes an evenly distribution of welfare among social classes. A gain of one party will make the other worsen. If China shifts all of its capacity into producing apparel, then people who used to be in the machinery industry will lose their jobs and their income will be wiped out while people in apparel businesses will experience a gain in their wages due to the increase in labour demand in the sector. (Samuelson 1981, 407-414; Mill 1844; Samuelson 1972, 443-453; Krugman et al. 2023, 61-66.)

Nevertheless, even though there are limitations, the concept is simplified to explain why countries enter international trade, how they end up in specialising several industries rather than producing all products by themselves, and especially, how they have comparative advantage even if they have no absolute advantage in any sectors compared to other countries. Comparative advantage, which is described by the Nobel laureate economist Paul Samuelson (1972, 443-453) as the prime example of an economic principle that is undeniably true yet not immediately apparent to intelligent individuals, is a fundamental concept that lays modern international trade models and explains numerous phenomena associated with global trade.

The assumption of freely mobility of labour from one industry to another makes everybody benefit from trade without being hurt. This scenario is unrealistic in the real world. In practice, the gains are distributed significant unevenly among classes. The most obvious reason that anyone can see is that resources of production can never be able to move immediately from one type of employment to another or without any significant cost. This trade-off costs make some gain from trade while other loses. Another reason is that each industry demands different input factors for production, thus a change in the mix of goods in country's production leads to the reduction of demand in some factors while increasing the demand for others (Krugman et al. 2023, 77).

Ronald W. Jones (1971, 3-21) published an analysis on a three-factor model, also known as the specific factors model, which is widely used to analyse the short-term effects of international trade on the distribution of income within a country (Jones 1971, 3-21). This model can be considered as an extension of the simple Ricardian model, in which, as same as the Ricardian model, this model assumes that there are two goods produced in a country and its labour supply can be allocated between two industries. The difference is the existence of other factors of production beside labour joined the model. Factors of production are categorised into two labels. A mobile factor is labour (L) since it can move between sectors, while other factors - such as capital (K) and land (T for terrain) – are considered as specific factors implying that these factors can be used only in the production of particular

products and the demand of these factors differ from sector to sector. However, one must understand that specific factors are not fixed as a permanent condition. They might change through the course of time. In other words, in a long-term sense, these specific factors can be considered as a single mobile factor, called capital. Nevertheless, this model analyses the short-term consequences, thus these specific factors are seen as immobile factors from one industry to another. (Jones 1971, 3-21; Krugman et al. 2023, 78-89.)

When an economy enters international trade, the economy's PPF will shift according to the relative prices of the world market rather than domestic relative prices. Because as mentioned previously in the discussion of comparative advantage, different countries have different comparative advantages according to their own nature, resources, technologies, and productivity of the economy. These differences influence the world market through the relative demand and supply of the world market. As a result, when a country opens its border for trading, the world relative prices will dictate what goods that the country exports and what that the country imports. The mechanism in shifting its production possibilities is the same as when there is a change in relative prices in domestic markets. Therefore, the country will export goods whose world relative prices are higher, while it will import goods whose world relative prices are lower. Correspondingly, factors that are specific to the export sectors, will be better off. And specific factors that are related to import sectors will be hurt from international trade. This is also the reason that those factors from import businesses spend significantly their income to lobby the proposal to restrict the international trade. (Jones 1971, 3-21; Krugman et al., 90-93.)

Besides the general effects of trade on income distribution, the speed of equalisation process of mobile factors between specific factors could produce severity in the disparity of income distribution among factors. In the case of high elasticity, when labour can substitute easily between specific factors in each sector, the fluidly adjustment of wages between industries makes the income distribution effects less extreme. On the other hand, when labour is less elastic, or in other words, it does not adapt easily to shifts between specific factors in different sectors. The impact on factors income is more profoundly. When the demand for more labour in sector, whose relative prices increase, rises. If labour equalisation takes longer time to adjust or less uniform, factors in high-demand sector experience larger gains while factors in low-demand sector (including specific factors and unadaptable or slow-adaptable mobile factors) experience greater loss, resulting in the greater disparity in income distribution. The implications are the same for the impacts of international trade on domestic sectors. If the wage equalisation cannot adjust easily, factors in export businesses will experience larger benefits while factors in import sectors will suffer the loss of their income more significantly. (Jones 1971, 3-21.)

Despite the clash between factors on income distribution which produces winners and losers in the economy, the majority of economists does not deny the aggregate gains of the economy as a whole in trading internationally. Because, as suggested in the comparative discussion, when a country enters trade with other countries, international trade allows it to consume the mix of goods differently from the mix of goods that it produced autarky. Samuelson (1962, 820-829) argued that this expansion of choices creates the potential to redistribute income across the economy in a way that benefits everyone. For example, income support programs can act as a cushion for groups that have been lost from trade. In the end, unfortunately, everyone could benefit from international trade does not exactly mean that everyone actually does.

In considering the long-term outcomes when all factors are able to shift between sectors, the Heckscher-Ohlin theory, which was first developed by Ohlin (1933), takes into account the matter of time. This difference, in which the specific factor model fails to portrait, allows all factors of production being able to mobile across sectors.

An economy will shift its production toward sector that is intensive in the factor that the economy has in abundance. The increase of production of the good that uses the economy's abundant factor more intensively, will eventually push the economy to a point on the PPF where it is specialised according to its comparative advantage. Moreover, in terms of trade-driven specialisation, the actual point of production depends also on both domestic and international demand. Factor endowments and trade allow an economy to produce at a point where it can consume goods, that are more intensive in the factor the economy is short, by exporting goods that the economy is intensive in the factor. At this production point, it reflects a balance of domestic supply capabilities and global demand preferences. In other words, trade enables an economy to operate on its PPF rather than somewhere inside the curve by specialising in comparative advantage sectors. Because, in the autarky case, domestic market does obviously not always demand a greater quantity of goods that it has comparative advantage on the current abundance of the factor, rather than different mix of goods depending on their preferences. Because of trade, the economy imports any quantity of goods to satisfy its domestic demand by only focusing on production of goods where its resources are allocated most efficiently, given factor availability and relative factor intensities. (Ohlin 1933, 10-139.)

Since the price of goods increases leading to the increase in demand of factors used to produce those goods, prices of those factors will also increase. More generally, as industries pay for factors based on the revenue generated from their goods, therefore, the prices of factors are influenced by the prices of goods. Specifically, if the price of a labour-intensive

good increases, the demand for labour will also increase leading to the increase in wage relative to capital returns. Conversely, capital returns relative to wage will raise along with the rise in the price of a capital-intensive good. This phenomenon demonstrates the relationship between factor prices and good prices. (Ohlin 1933, 35-48; Ohlin 1933, 91-113.)

Resources endowments – the relative abundance of factors in an economy – determines the economy's comparative advantage and shapes trade patterns and production specialisation. First of all, countries will experience the cost advantage in producing goods whose resources being used intensively are abundance to the country, allowing them to export these goods competitively. The reason for this has been mentioned above. When factors have been utilised intensively in the long-term, the opportunity cost of factor reallocation reversely is more expensive than doubling down on exploiting more available resources abundance. Moreover, unlike other theories focusing on the differences in technology between countries, specialisations across countries are variant primarily due to variations in resources endowments. Because differences in resources endowments lead to the difference in production costs across countries. (Ohlin 1933, 10-48; Ohlin 1933, 91-113.)

Relative price plays a key role in determining the pattern of international trade, as differences in the availability and relative abundance of factors across countries lead to variations in production costs for different goods. Importantly, relative abundance is assessed as a ratio rather than absolute quantities. By comparing the labour-to-capital ratio between two countries, it becomes clear that no single country is abundant in all resources. And these differences in production costs lead to differences in relative prices of goods across countries. Furthermore, countries will have comparative advantage in producing goods that are used their abundant factors intensively since employing factors that are abundant in the economy is cheaper leading to a lower relative price for those goods domestically. When those goods are exporting to the global market, those cheap relative prices, which are reflected by the country's lower production costs, create incentives for other countries to import them in exchange for other goods that they produced cheaper relatively. This phenomenon forms the basis of the pattern of trade by which each country exports goods that aligns with its comparative advantage based on factor endowments. In other words, countries generally export goods that are intensive in the factors they possess in abundance. (Ohlin 1933, 35-113; Deardorff 1982, 683-694.)

Most importantly, price convergence reflects the complex interrelationship between the pattern of trade, relative prices of goods, and factor prices in each country. Trade acts as mechanisms for equalising prices. First, each country specialises in production of goods that it has comparative advantage based on its factor abundance. When the country exports

these goods into the world market, these goods are sold at relatively lower prices on the international market. As the international supply of these goods increases, their price starts to fall in the global market. On the other hand, imported goods are relatively more costly to produce domestically. By importing these goods from countries with a comparative advantage in producing them, the importing country experiences a downward adjustment in domestic prices for those goods. This process of exporting cheaper goods and importing relatively expensive goods in terms of domestic production costs over a period of time causes countries start to pay the same relative prices accordingly. As it seems, domestic prices are, in turns, interdependent with international prices. A shift in global prices can cause a disruption domestically. The effects influence production decisions and factor allocation within the economy. As mentioned earlier, the high opportunity costs in terms of the given level of factor endowments causes the economy to suffer the despair significantly if there is a shift in factor-intensive allocation reversely. Even goods that are not traded directly can also be impacted by changing in prices of related goods through input-output linkages and factor allocation due to changes in cost structure. (Ohlin 1933, 59-108.)

Obviously, to achieve the equalisation between factor prices, it is accompanied by strict conditions. First, two countries must possess the same level of technology in production so that goods can be produced at the same level of efficiency. Second, trade between countries must completely free. No tariffs, quotas, or transport costs whatsoever is a prerequisite for prices to equalise. Third, both countries must produce the same set of products to ensure demand for factors remains interdependent. As it seems, the case is unrealistic in the actual world. (Ohlin 1933, 91-113; Samuelson 1949, 181-197.)

Despite unrealistic conditions, the concept has been proved to be completely true theoretically by several research from his peers. Paul Samuelson (1948, 163-184) provided a mathematical proof for factor-price equalisation through his paper ‘International Trade and the Equalisation of Factor Prices’. A year later, Samuelson (1949, 181-197) continued publishing another paper that revised this theorem to criticise and clarify the strict conditions necessary for factor-price equalisation to occur. The dependence of this theorem on complete specialisation, identical production functions, and the same level of technology across countries has been emphasized in this article. Abba Lerner (1952, 1-15) published the study, which later has been acknowledged by Paul Samuelson that this research by Abba Lerner had been completed before his work in 1948 a decade earlier, to justify the legitimate of the theorem. Later, Paul Samuelson (1971, 365-384) published another article to reaffirm Ohlin’s insights in a broader context. Samuelson defended the application of Heckscher-Ohlin model to real-world trade dynamics, despite its assumptions and limitations. The article also emphasized that even though factor prices equalisation is never fully achievable in

the actual world, the tendencies and directional effects that Ohlin described were consistent with empirical observations. And this paper is also an intellectual acknowledgement of Ohlin's theoretical groundwork and justified Ohlin's concept.

Theories introduced so far assume that market competition is perfectly functional. So that, all monopoly profits have been competed away via the demand and supply mechanism in the market. Moreover, those models of comparative advantage are based on the assumption that there is a constant return to scale. When an economy doubles its input for production, the output will also be double. In practice, this is rarely the case since many industries are characterized by economies of scale, also known as increasing returns, in which large firms always have more advantages in terms of costs of production compared to small firms. Doubled the amount of input in these industries leads to a larger-than-double amount of output of production. This means that at a fixed wage rate, the average cost of production decreases as output increases (Krugman et al. 2023, 178-180).

Economies of scale can be categorised into two types based on whether they arise from an increase in the number of firms in the industry or from individual firms producing more at a given cost level. The existence of external economies of scale depends on the cost per unit of the entire industry rather than that of any single firm. In contrast, internal economies of scale refer to the cost per unit being influenced by the size of an individual firm, irrespective of the industry's overall size. (Krugman et al. 2023, 178-180.)

Different types of economies of scale imply the difference of the structure of the industry. When there is an external economy of scale in an industry, the industry will consist of many small firms where there is no advantage to large firms. And the competition in the industry is considered to be perfect. On the other hand, internal economies of scale give large firms a significant advantage over small firms which, in turns, creates an imperfect competition in the market. Due to the different implications for market structure, both types of economies of scale are important in considering the causes of international trade. (Marshall 1879, 41-53; Krugman et al. 2023, 178-180.)

External economies drive a lot of trade both within and between countries. There is the existence of a forward-falling supply curve due to the external economies of scale. In other words, firms are willing to set their price lower resulting from the fall in their average cost of production as industry output rises. And this effect is significant on countries' supply and the pattern of trade. When countries enter international trade, the country, whose production costs are cheaper in the employment, will expand this employment while other countries will contract that. Over time, when this process feeds itself, as an economy output in the industry rises, leading to its costs will fall further. Conversely, as the industry's output of

other economies falls, its costs will rise. In the end, as expected, all production of this employment will be concentrated in those countries that experience the external economies of scale in that industry. Moreover, as commodity prices are initially lower in countries that their production costs are lower, associated with that is the forward-falling in those countries' supply curve, increased production as a result of trade leads to the further decrease in the prices. As it seems, this implies that trade results in the fall in the prices in either country than that was before trade. And this implication is very different with other models discussed so far. In the absence of increasing returns, as standard models suggested, relative prices will converge as a result of trade. This difference exists because international trade making possibilities for world production of that product to be concentrated in a single location, thus, reducing costs by the benefits of even stronger external economies. (Krugman 1991, 483-499; Krugman 2009, 561-571; Krugman et al. 2023, 184-186.)

In considering increasing returns that are internal to the firm, as mentioned above, a market structure becomes imperfect in which larger firms have more advantages than smaller firms. Because, in a perfect competitive market where the price is driven down, small firms are harder to recover from the high costs incurred from the initial output-units production. Therefore, those firms have been forced to leave the market. This process would continue until an equilibrium, produced from the imperfect competition, is attained. As a result, this type of competition is inevitable in the presence of increasing returns at the level of the firm. In order to survive, firms are forced to either develop highly differentiated products or to leave the market leading to the decrease of the number of surviving firms. Under these circumstances, surviving firms are considered themselves as price setters. (Krugman 1979, 469-479, Krugman 1980, 950-959; Hummels & Levinsohn 1995, 799-836; Krugman et al. 2023, 196-205.)

Monopoly profits are rarely earned uncontested. High profits tend to attract new competitors into the market. Thus, in practice, purely monopoly is rare, but in most of the cases, competitors develop their products differently. In this circumstance, even though there are many firms in the same industry, product differentiation allows companies to set their product prices. Since they are in the same industry, for any given number of competitors available, firm experiences lower sales at any chosen price regardless its remaining ability to set prices. The demand curve of each firm will shift inward when more new competitors established. As a result, lower demand implies lower profits. Therefore, as long as such additional entry is still profitable, there is the incentive for new firms entering the business. Thus, in the oligopoly situation where there are only a small number of firms that have enough market share to influence market aggregates, pricing decisions of firms are interdependent. Each firm has to consider the expected response of competitors when setting prices. On

the other hand, in the case of monopolistic competition where the number of firms are large. Pricing decisions are no longer being able to affect market aggregates, resulting in those decisions are also no longer interrelated. (Krugman et al. 2023, 201-213.)

In the machinery industry where there is the presence of economies of scale, the market size restricts the variety of goods and also the scale of production. By trading, these constraints will be released. Because in the larger market, there will usually be both more firms and more sales per firm while consumers will be offered both lower prices and a greater variety of goods than in small markets. Yet, these gains are only achievable if countries engage in international trade. (Krugman et al. 2023, 201-213.)

The mechanism also highlights two new important characteristics about trade with monopolistic competition compared to other trade models that are based on comparative advantage. First, differentiated products and internal economies of scale allow similar countries with no comparative advantage differences being able to trade with each other. This feature is a very different kind of trade, which is referred to as intra-industry trade. Second, both countries gain benefits from trade in which consumers in both countries have a greater variety of products at a lower price as firms concentrate their production and take advantages of economies of scale. (Krugman 1979, 469-479, Krugman 1980, 950-959; Krugman 1981, 959-973; Krugman et al. 2023, 201-213.)

Competition from market integration effects firms differently. Because different firms have different cost curves due to their different marginal cost level. Assume firms face the same demand curve in which leading differences between different quality give the same predictions for firms' performance. Thus, marginal cost differences across firms will determine which firms are winners and which firms are losers in this new competition. A firm with a lower marginal cost will set the price at the lower while still remaining the same or higher mark-up over marginal cost. This leads to more demand for the firm's product which, in turns, produces more output and earns more profits. (Krugman 1979, 469-479, Krugman 1980, 950-959; Krugman 1981, 959-973; Postrel 2005; Melitz & Trefler 2012, 91-118; Krugman et al. 2023, 213-217.)

Despite the huge benefits of this intra-industry trade, in practice, integration rarely goes that far due to the existence of trade costs, which is indeed reduced but does not completely disappear. Trade costs associated with this border crossing are a major reason why national trade has been reduced so much. These costs drastically drag down the net benefits earned from trade. In turns, the number of firms are less willing or able to tap consumer sources abroad. This phenomenon has been described via the study of Bernard et al. (2018, 565-619).

Regarding an additional cost for each unit of output that it sells in the abroad market, firms now will set different prices for the quantity of export relative to that of their domestic market. Consequently, different quantities sold in each market leading to different profit levels earned in each market. Therefore, pricing and quantity producing decisions can be made separately. A decision regarding the domestic market will have no relevance on the profitability of different decisions for exporting. Therefore, this explains why only a subset of firms export while the rest does not. And this also explains why this subset of firms will consist of only relatively larger and more productive firms. Because when adding an additional amount of trade costs, many smaller firms' marginal costs exceed the threshold level of cost that allows them to be profitable in the export market. (Bernard et al. 2018, 565-619.)

Finally, international trade allows countries to take advantage of both external and internal increasing returns at the level of the industry and also of firms, respectively. It also yields significant benefits for producers and consumers. In which producers experience the lower costs of production due to the achievable advantage of economies of scale, the increase in market share because of market integration, and in turns the increase in profits earned. While consumers are happy with the greater variety of products available at the lower prices. However, additional trade costs lead to the number of firms being unwilling or unable to reach the overseas market. Overtime, different marginal costs of each firms dictate the winners and losers in the course of increasing competition. These differences in marginal costs also explain why there is only a small number of firms, whose size is relatively large, and whose productivity is relatively high, that conduct exporting.

2.2 International Trade Policy

Trade theories discussed above provide the major reason for why a country should engage in international trade. Despite the gains from trade yield significantly the rise in welfare for the economy as a whole, an unevenly income distribution across social classes within the economy, trade costs, and national security make countries being unwilling to enter trade fully. Relatively, few markets for industrial products meet the assumption of perfect competition as assuming in those trade theory models. Firms do not usually consider themselves as pure price-takers. In many if not most markets, there are only a few numbers of important firms, and these companies are also aware of interdependence among their actions. For example, regarding some of largest Finnish industrial firms, despite under the intra-industry trade, the market resembles the monopolistic competition in some extent. One cannot deny the power of economies of scale of those firms on pricing decisions and output production decisions. This observation seems obvious, at least to the author. Yet, until two or three

decades ago, the theory of international trade was almost dominated by models and theories in which the assumption of perfect competition prevails in all markets. And this was true for both of the theory of international trade and of the analysis of trade policy. Even till now, through the hard work of a number of authors, the positive theory of trade under imperfect competition has reached a certain achievement and acceptance. But the case is not the same with the theory of trade policy under imperfect competition since this opens room for arguments for government intervention. A distinctive characteristic of trade policy under imperfect competition compared with that in perfectly competitive markets is that a trade policy may alter the markup of price in which leads to either benefit or harm to the country that initiates that policy. So, the question, of which trade policies are suitable to be adopted to fully optimise the maximum benefits from trade while minimizing the negative effects on the country's social structure and welfare, needed to be discussed.

2.2.1 Trade Policy under Perfect Competition

First of all, a tariff is the simplest instrument of trade policies. This type of tax levies on a good when it is imported into a country. There are two types of tariffs. Specific tariffs are levied as a fixed charge for each unit of goods imported, while ad valorem tariffs are taxes that are charged as a fraction of the value of the imported goods. The effect of either tariffs is to raise the cost of shipping to a country. This oldest form of trade policy usually has two purposes – to earn revenue for the government and to protect particular domestic sectors. The rises of trading bloc and agreements have watered down the importance of tariffs in modern times. Modern government usually prefers to protect domestic industries through a variety of nontariff barriers. However, since the start of the Trump administration's trade war, the power of this kind of policy has been rapidly reversed. Also, because the effect of a tariff is served as a benchmark for evaluating the effects of other trade policies. Thus, an understanding of the effects of a tariff remains vital. (Krugman et al. 2023, 243-245.)

As Ricardo (1821) described, trade will arise if there is the difference of prices between countries in the absence of trade. When the price of a good in one country is higher relative to the other country, goods will be imported into that country leading to the increase in the price of that goods in the exporting country while driving down the price of that goods in the importing country until the difference in prices has been eliminated. To elaborate in terms of modern economic principles, the world equilibrium is reached when import demand of one country equals other country's export supply. In which import demand curve – an excess of the quantity of a country's consumers demand over what that country's producers supply – is sloped downward because the increase in the product price reduces the quantity of demand, and the export supply curve – an excess of the quantity a country's producers

supply over what that country's consumers demand, has an upward slope. (Krugman et al. 2023, 243-245.)

When a tariff is imposed, a good will not be transferred unless the price of that good in the importing country exceeds that in the exporting country as an amount equals to the amount of the levied tariff. In other words, the internal price in the importing country will raise from the equilibrium-level price to the new level P_t, while lowering the price in the exporting country to an amount that $P_t - P_t^*$ must be just equal the tariff rate t. Figure 1 illustrates how tariffs effect on the prices and quantity supply on both countries.

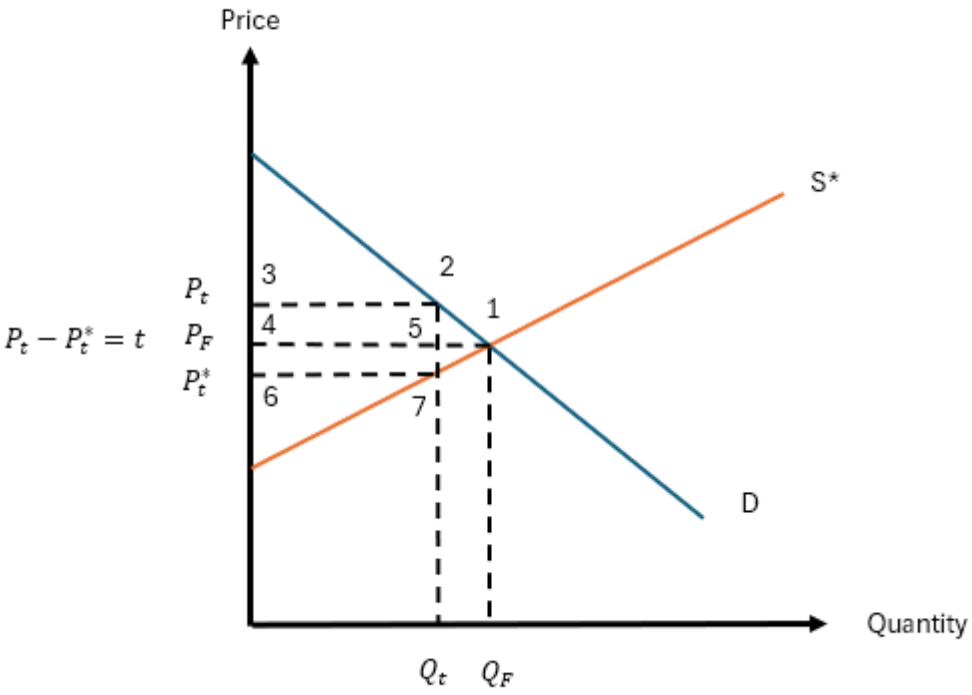

Figure 1. Effects of a Tariff (adapted from Krugman et al. 2023, 246)

Clearly, the producers and the government in the importing country are better off on the expense of the importing country's consumers due to the imposing tariff. Assume that the income distribution is not an issue because of either the same social value of the government revenue and the producer and consumer surplus, or the efficiency of all other markets other than this one. Then, the welfare effects of the tariff can be measured by the effects on consumer surplus, producer surplus, and government revenue. As a result, in the importing country, there is a reduction in the welfare of consumer and producer surplus by the area, 12345, under the import demand curve. While the revenue of government generated by the tariff is the area of 2367, in which the tariff rate multiplied by the post-tariff volume imported. Thus, the overall welfare effect is the difference between these two, which represents the

loss of the area 125 and the gain of the area 4576. This gain can be referred to as a terms of trade effect, resulting in the completed vanish of this area if the importing country is a small country which is unable to influence its terms of trade. And, in turns, the distortion loss of due to the adjustment between supply and demand would be the only thing left. This proved a critical point here from the figure that some sufficiently small tariff always increases welfare. Contrast, for larger tariffs, there is a trade-off between the distortion loss and the terms of trade gain. (Helpman & Krugman 1989, 12-13; Krugman et al. 2023, 242-257.)

If the government, instead of imposing a tariff, decided to impose a quota on imports – a direct restriction on the quantity of goods that may be imported, whose licenses usually have been issuing to certain group of individuals or firms. This limitation restricts the quantity of goods that can be imported to the amount of Q_t. Clearly, this practice has the same effect in increasing internal prices as a tariff would. The only difference is that the accrual government revenue now flows into the license recipients' pocket instead. Although the price and output effects of a quota are equivalent to that of a tariff in competitive markets, the welfare effects depend on the ways that import licenses are distributed. If the recipients receive licenses through bidding in a governmental auction, then the tariff-equivalent rent earned will offset the auction price. In this case, the welfare effect is just as same as that of a tariff. If these licenses are assigned to its citizens, then the residents will receive the rent. But in either case, the overall welfare effect would be the same as long as we ignore domestic income distribution issues. On the other hand, if the recipients are foreigners, the country will suffer an unambiguously loss of the area 12367 in order to protect the country. And the reason for such a self-punishing policy, in which have become the protectionist measure of choice in the last couple of decades is still a major puzzle for the political economy. (Helpman & Krugman 1989, 14; Krugman et al. 2023, 259-264.)

On the other hand, an export subsidy is one of trade policies used frequently by the exporting countries in an industry. This is a payment to a firm or individual that exports goods across the border to other countries. As same as tariffs, these subsidies can also be either specific or ad valorem. The effects of an export subsidy on prices, or the country's terms of trade, are exactly the reverse of those of a tariff imposed by the importing country. Figure 2 illustrates the effects of an export subsidy of $s\ per\ unit$. (Krugman et al. 2023, 258.)

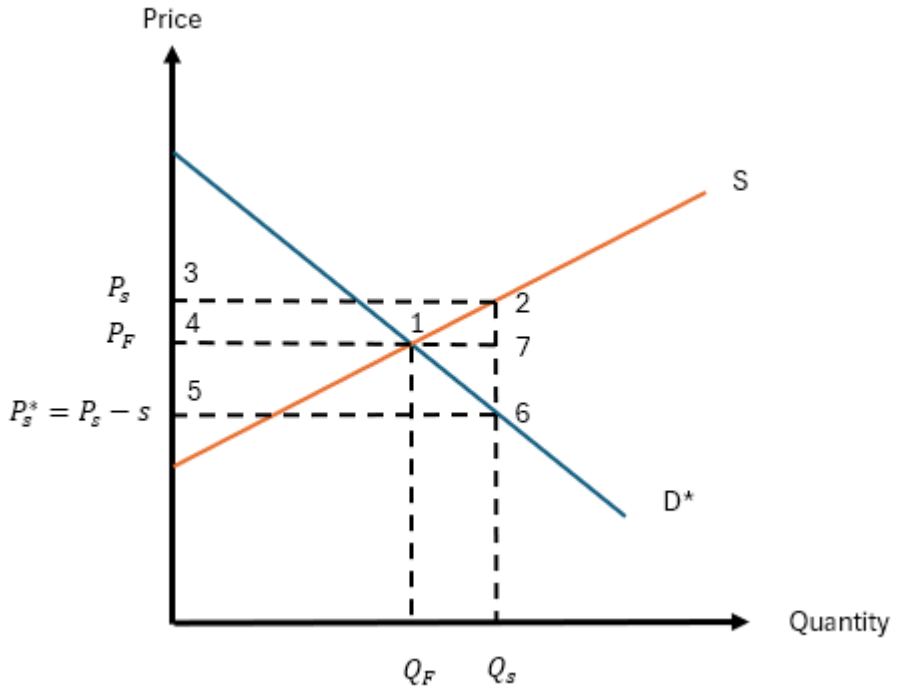

Figure 2. Effects of an Export Subsidy of $s\ per\ unit$ (adapted from Helpman & Krugman 1989, 15)

As it has shown in Figure 2, the subsidy increases the quantity of supply to Q_s, resulting in the increase in the good price in the domestic market, P_s. Equivalently, this benefits producers on the cost of domestic consumers, with the net change in consumer plus producer surplus by the area of 1234. Meanwhile, the rise from Q_F to Q_s indicates the bill of subsidy is the area of 2356. Clearly, the subsidy amount is much larger than the benefits, with the net loss of the distortion loss of 127 and the loss of terms of trade 4567. Comparing the effects of a subsidy with a tariff, obviously, the former worsens the country's terms of trade while the latter improves them. (Helpman & Krugman 1989, 15-16.)

On the export side, the possibility of a welfare-improvement must lie on an export tax, which is a levy charges on an export (Helpman & Krugman 1989, 15-16). Figure 3 demonstrates the effects of an export tax.

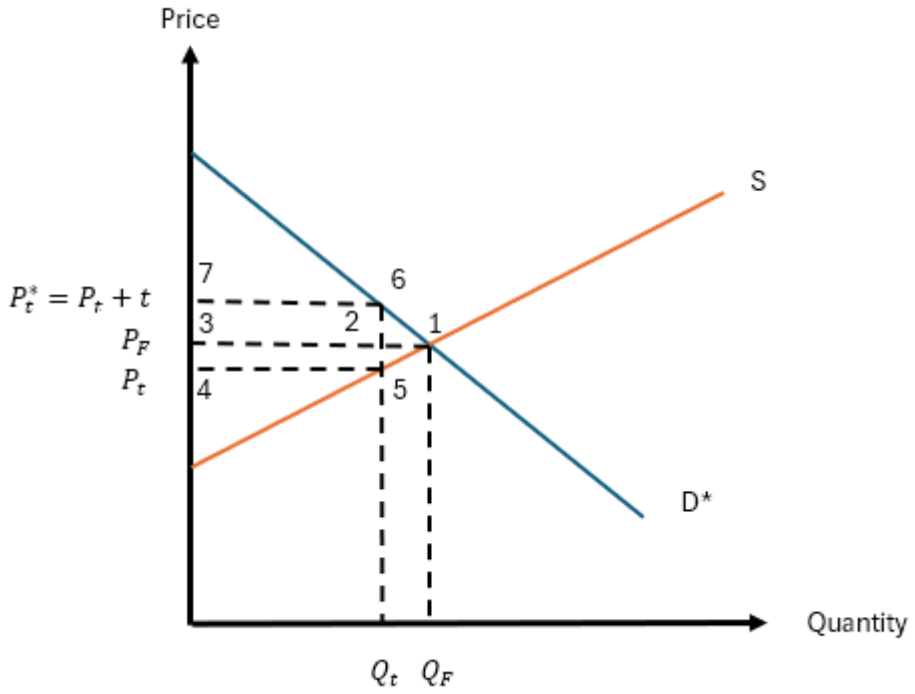

Figure 3. Effects of an Export Tax (adapted from Helpman & Krugman 1989, 15)

Figure 3 shows that the domestic price of exports falls to P_t, reducing the total sum of consumer and producer surplus by the area of 12345. The tax revenue is yielded by the amount of after-tax export volume multiplied by the tax rate, which equals the area of 4567. Offsetting the distortion loss of the area 125 against the gain of terms of trade 2376, as same as in the case of tariff, there is always an improvement of the country welfare if it imposes a sufficiently small export tax. Moreover, if the importing country imposed an import quota which was assigned to the exporting country's residents. The effect of this policy produces the exactly result as the imposing of export tax in the exporting country. Clearly, there are certain kinds of protectionism can actually benefit the exporting country at the importing country's expense. Thus, in practice, the political economy of trade is somewhat questionable. (Helpman & Krugman 1989, 15-16.)

As discussed above, sufficiently small taxes on trade, either on imports or exports, will raise the taxing country's welfare. However, the rate cannot go all the way up because, at some point, the loss of a further tax imposed outweighs the benefits. Thus, generally speaking, the optimal tax must be set at the level that the gain from improved terms of trade is just equal to the loss of from the distortion of supply and demand forces. In other words, to maximise welfare, a taxing country makes sure that the marginal social cost of a good equal

to its marginal social value in all uses. The illustration of the optimal tariffs level of exports and imports will be shown in Figure 4 and Figure 5, respectively. (Helpman & Krugman 1989, 17-22.)

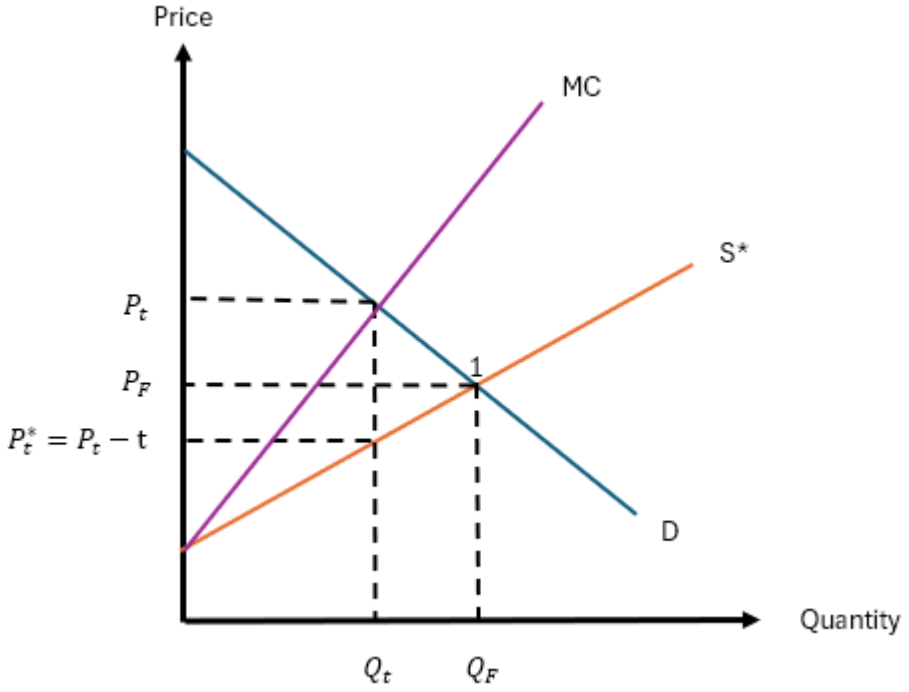

Figure 4. Optimal Level of Exports (adapted from Helpman & Krugman 1989, 17)

Since either exporting or importing an additional unit of a good, the country is either to cut off its consumption or to increase its production. The social cost is measured by the domestic price. So, social marginal cost of exports is measured by the export supply curve. However, the social return from an additional unit of exports is measured by the marginal revenue from that export rather than the price of the export. Thus, a marginal revenue curve must lie below the export demand curve because the more the exports are, the greater the depression on the price of marginal units. As a result, the optimal export must be at the point where export supply curve intersects with the marginal revenue curve, at point 2 rather than point 1, as shown in Figure 4. (Helpman & Krugman 1989, 17-22.)

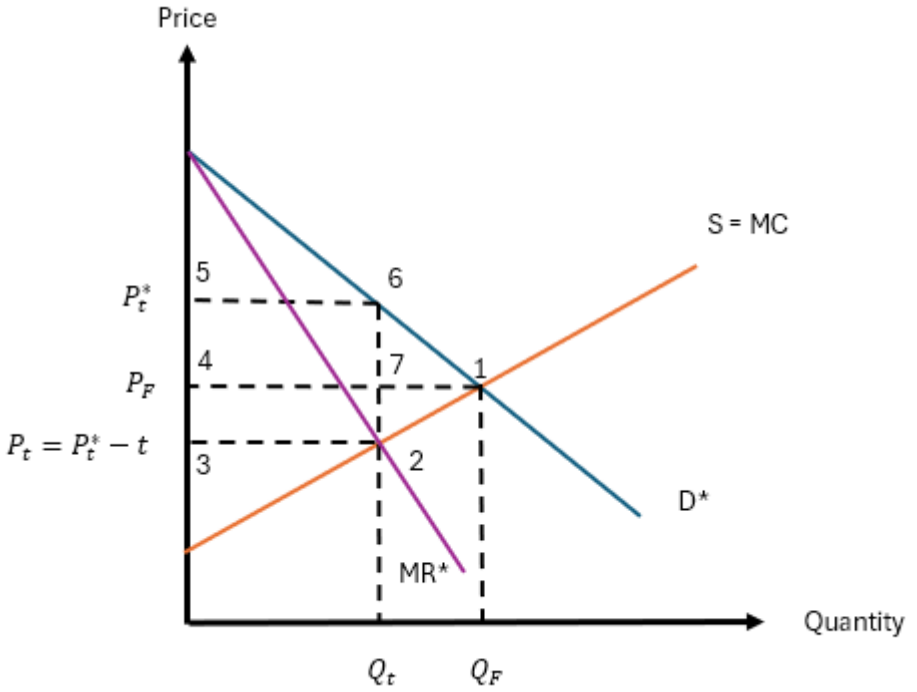

Figure 5. Optimal Level of Imports (adapted from Helpman & Krugman 1989, 19)

On the other hand, in the case of optimising the import tariff, the true cost of an additional unit of imports is not its price, but its price plus the effect of purchasing an additional unit on the cost of marginal units. So, the optimal tariff must be set at the level in which the internal price equal to this marginal cost, as shown in Figure 5. Moreover, leaving the details of mathematical proofs on the side, comparing the optimal export tax in terms of the elasticity of foreign demand for exports and the optimal import tariff in terms of the elasticity of the foreign supply curve, this shows that the more elastic the relevant foreign curve is, the lower the optimal rate must be set, in turns, the less effect of the measure-imposing nation has on its terms of trade. Where the country is so small that unable to affect its terms of trade, free trade is the optimal policy. (Helpman & Krugman 1989, 17-22.)

This brief examination on the optimal taxes above also illustrates the debate between protectionists and free-trade advocators. As it seems, the terms of trade argument against free trade have important limitation. Since small countries have very little ability to deviate the world prices of either imports or exports, the advocates of imposing the optimal taxes make no practical senses to them. On the other hand, when big countries exercise their national monopoly power to exploit benefits from other countries' expenses, this act easily leads to retaliation from other large countries, whose cycle would, in turns, undermine the attempts at international trade policy coordination. (Krugman et al. 2023, 280-284.)

The concept of consumer and producer surplus, in which the cost-benefit analysis of trade policy depends on, leads to the argument of the domestic market failure against free trade. Suppose the production of goods yields experience that will improve the technology of the economy as a whole. Thus, firms in the sector cannot really utilise this benefit, in turns, do not take into account in the output decisions. The cost-benefit analyse cannot posture this underlying gain. Protectionists argue that since there is a marginal social benefit to additional production, imposing tariffs or other trade measures is justified. And this argument is a particular case for the concept of the theory of the second best. Generally speaking, if other markets are not working properly, a government intervention that appears to distort incentives in one market may actually yield the overall welfare by offsetting the consequences market failures elsewhere. In other words, it is justifiable that interfering external economic relations can actually water-down the symptom of imperfections in the internal economic functioning of an economy. That is also what Trump's administration attempted to do when it increased tariffs in order to promote the domestic production and to stimulate the domestic labour market. To defend for free trade, domestic failures must be treated by domestic policies rather than international trade policies. A tariff may raise welfare in spite of the distortion of production and consumption elsewhere since the policy leads to the increase in production that yields social benefits. However, if the same production increase were achieved by a production subsidy. The welfare is still increasing while the consumption loss will be avoided by the remaining price of that good. So, by targeting directly a particular activity, unintended distortions elsewhere in the economy can be avoidable. Those trade policies justified by the second-best theory are always a second-best one, not the first-best policies. (Krugman et al. 2023, 280-284.)

2.2.2 On Protection and Monopoly

International trade increases competition and thus that protection creates domestic monopoly. Bhagwati (1965.) extended the idea further that different types of protection produce their effects differently on monopoly power. In particular, the quantitative restrictions are worse than tariffs. In the case of an import-competing monopolist, protection creates the market power where none would otherwise survive, and import quotas enhance this power more than tariffs themselves. Due to the threat of import competition, firms in importing sectors are not free to choose a profit-maximising price along their marginal revenue curve. Because import sectors are where an economy has disadvantaged in production relatively to other countries. So, under free trade, the world price P_W represents an upper celling on the firm's price. Without protection, the firm must behave as if it was a perfectly competitor, and therefore, its output will be at the point where P_W intersects with its marginal cost curve.

In other words, this is a monopolist without a monopoly power. (Helpman & Krugman 1989, 28-46.)

When an import tariff is imposed, the import-available price will be the world price plus the amount of the tariff, $P_W + t$. The impact of a tariff is influenced by the output and price of domestic firms, which in turn depend on the size of the tariff imposed. If the tariff price $P_W + t$ is less than the price at which the tariff is prohibitive – where the marginal cost of production equals the domestic demand. Then the firm position is basically the same as under free trade because its price is constrained by the price of imported competitors. In other words, the higher the tariff within this range, both the output and price of the firm increases albeit no monopoly power. When the tariff is in the range between the prohibitive price and the firm's profit-maximising price, the price of potential imports is still constrained the firm to charge its monopoly price. So, in this range, the firm will charge the price of $P_W + t$ but only produce the amount being demanded domestically at that price. As it seems in this case, no actual imports are imported, but the threat of potential imports will still effect on the firm pricing decision. And it is clear that the increase of the tariff within this range leads to the increase in the firm's price at the lesser amount of output since domestic consumers will consume less when the price is high. Finally, when the tariff is so high that the tariff-inclusive import price is greater than the profit-maximising price, the constraint of imports competition on the firm's monopoly power will be cease. The firm is free to set its monopoly price and changes in the tariff with this range will produce no effects. (Bhagwati 1965; Helpman & Krugman 1989, 28-46.)

On the other hand, an import quota affects differently with the case of a tariff because there are no such cases in which the increase in the domestic price without creating monopoly power. At any binding quota, the firm will behave in a monopolistic fashion – either the quota is set smaller or larger than the free trade level of imports. A quota limits the maximum amount of quantity that is able to import, and the domestic firm will satisfy the residual demand. To elaborate, when the quota is imposed less than the free trade level of imports, the firm will produce the quantity level of output at where its marginal cost equals its new marginal revenue and charge the corresponding profit-maximising price level. While in the case that the quota exceeds the free trade level of imports, the closer it is to the free trade level of imports, the more likely it is that the firm will reduce its output. In particular, a quota equals to precisely the free trade level, the reduction of output and the increase in price are definitely inevitable. As a result, even though a tariff and a quota led to the same level of imports, the quota will give more monopoly power into the firm's hand in which leads to a higher domestic price and a lower amount of output than the tariff. This may be seen immediately that, as even in the prohibitive tariff level, despite that no imports occur, the threat of

imports still constrains the domestic price. While an import quota eliminates this constraint and creates more monopoly power of the firm in freely setting its price and output at the monopoly level. (Bhagwati 1965; Helpman & Krugman 1989, 28-46.)

Moreover, when imports are not a perfect substitute for domestic product, the firm still has some monopoly power under free trade. Protection should no longer have the effect of creating monopoly power as it was. By imposing a tariff to raise the competing import price, there will be an increase in demand for the domestic firm's output at any given price. If the firm holds its price constant to allow its sales to rise, one can confirm that there is no increase in monopoly power registered here as long as its marginal cost is still at the same level. While if the firm decides to raise its price and output, then an increase in monopoly is confirmed. However, which case that the firm undertakes depends on the shift of its marginal revenue curve. On the other hand, if the imports are limited by a binding quota, since the good is imperfectly substitute, the new demand curve become steeper, leading to the shift of the marginal revenue curve lower than that under a tariff effect. This phenomenon resulted from that a rise in domestic price will also push the price of competing imports up with it. As a result, under the quota protection, the output is lower while the price is much higher than the same level of imports yielded by the tariff. This appears to confirm the result of the perfect substitution. (Bhagwati 1965; Helpman & Krugman 1989, 28-46.)

As the discussion in the sub-section, a protecting policy imposed to protect an imperfectly competitive domestic industry actually hurts national welfare. Moreover, this is a positive analysis of what will happen if a government chooses to do so rather than a normative analysis in which suggests what a government should do. To provide a prescription under a second-worst case scenario, given a degree of import restriction, a tariff is not as bad as a quota.

In the consideration of how effective protection policies against foreign monopolist to protect domestic welfare, assume the domestic demand is downward sloped in which represents that the market is either no domestic supply or the perfectly competitive industry, and the efficiency of the foreign firm is too well leading to the constant marginal cost of supplying into the domestic market. To maximise its profit, this foreign firm will export the output at the level Q_m that its marginal cost intersects with its marginal cost at the price level P_m^* as much as this domestic market is willing to pay. As the same effect of price control in the domestic context discussed above, there is a degree that a monopolist's price can be restricted because its price is initially above marginal cost. This implies that as long as the price is above its marginal cost, a somewhat lower price than its free trade level is still enough to produce incentives for this foreign firm to supply as much as domestic consumers demand. Thus, if

a particular sector's welfare is the only concern, the best policy is to introduce the ceiling price at the marginal cost level. This ensures the lowest unit cost of import and the lowest level of domestic price, in turns, the highest degree of welfare. (Helpman & Krugman 1989, 49-81.)

Price ceilings on imports are not a common policy because it is unrealistic to expect a government would be able to drive so hard and make a precisely bargain for achieving the full benefit from this price ceiling practice. On the other hand, tariffs are more often used to achieve advantages in foreign trade. As discussed in the perfectly competitive case, it's shown that it is at least possible to achieve gains for national welfare from tariffs levied on foreign exporters. Obviously, in the absence of government's intervention, the foreign monopolist will set its price to maximise its profits at where its marginal cost meets its marginal revenue, resulting in a significant increase in domestic price while decreasing the output imported. Principally, when a tariff is imposed, this drives the marginal cost of foreign monopolist upwards, leading to a lower price charged and a higher output available compared to the free trade case. Consequently, consumer and producer surplus declines, while the government revenue increase. The net benefit effect is the difference between the loss of economic surplus and the tariff revenue. According to the original argument made by Brander and Spencer (1984), a small tariff is desirable for a better-off outcome. However, in terms of generalise this result beyond the linear demand curve in the work of Brander and Spencer, imposing a small tariff to yield welfare benefits is justified only if the demand curve is flatter than the marginal revenue curve. This, however, is not always the case because when the demand curve is inelastic, $1 > \varepsilon > 0$, a tariff is clearly harmful to the nation in this case. By this implication, a small import subsidy would benefit the country in this case. In conclusion, tariffs should only be used as a second-best policy if marginal revenue declines faster than price, conversely, when marginal revenue declines slower than price, import subsidies will be desirable. In the former case, trade taxes lead to a contraction of imports to improve national welfare, while they expand imports in the latter case. (Helpman & Krugman 1989, 49-81.)

The previous conclusion of the trade taxes effects also provides an idea on the effects of a quantity restriction policy. Assuming that quotas are licensed to domestic residents, if marginal revenue is flatter than the demand curve, or when the optimal tariff is negative, an import quota is obviously worsening national welfare than improving it. Because in this case, an expansion of imports is needed, not a contraction. So, a minimum import requirement (MIR) is desirable in this case to set the level of imports equals to that was set by an import subsidy, where the quota exceeds the monopoly level of output that the foreign monopolist desired to supply to maximise its profitability. And when a MIR is imposed, the importing

country's welfare will be higher than when the country imposes an import subsidy. Because a transfer of resources from the importing country to the foreign monopolist that is constituted by a subsidy policy can be saved. Moreover, in fact, an MIR is the preferred policy rather than a tariff. Because when MIRs were feasible, they can approach the outcome of an optimal price ceiling, which is considered as the first-best outcome. Alternatively, when marginal revenue declines faster than price, as same as the mechanism of tariffs, a contraction from a quantity restriction is required. In both cases – tariffs and quotas, imports, consumption, and domestic price are the same. Nevertheless, a quota policy is less preferred due to the loss of the equivalent of tariff revenue accrues to the foreign firm and the reduction of consumer surplus without the offset from the gain of government revenue or of domestic importers profits. In the presence of a foreign monopolist, a quota in fact hurts the importing country's welfare the most. (Shibata 1968, 137-142; Krishna 1988, 828-836; Helpman & Krugman 1989, 49-81.)

2.2.3 Intra-Industry Trade

Helpman (1987, 62-81) emphasized the importance of increasing returns and imperfect competition in the world economy because of the prevalence of intra-industry trade. This is the result of the interaction between product differentiation and economies of scale. Since there is the vast number of differentiated products in each industry that customers regard as imperfect substitutes. For example, a marine motor cannot substitute with several automobile motors; or even two resemble elevator products with different packages of included services cannot substitute with each other. Because economies of scale, each country can only produce a limited number of products. So, when international trade is allowed, each country can specialise in the different range of products, then trade them to satisfy the variety of demand. (Helpman & Krugman 1985.)

Intra-industry trade also occurs due to the price-discrimination practices, which first proposed by Brander (1981, 1-14). The result of reciprocal dumping from firms. They segment their markets by restricting their sales in the domestic market in order to push the domestic price up while selling aggressively in the foreign markets. Especially, in the presence of monopoly in markets, the loss of selling at the lower markup on exports will be minimised. (Brander & Krugman 1983, 313-321.)

In order to consider the effect of tariffs under intra-industry trade, it is worth to remind a few points discussed in the economies of scale section above. First, because of the imperfect competition, there is no reason for two firms to try to produce the same good when there are a large number of potential products. Thus, each good will be produced by a single firm only. This leads to the pricing decision as same as that of a monopolist, in which set its

marginal revenue equal to marginal cost. Second, monopolist profits will be competed away in the absence of entry and exit restrictions. This implies that a price equals to average cost. Third, since the price of a good in the external market is proportional to the domestic price, constant elasticity demands results in the constant elasticity of overall demand. Associated with the pricing rule and the zero-profit condition, international trade has no effect on either the output or the markup, resulting in no effect on the number of goods produced in each country.

As a result, this implies that when an ad valorem tariff is introduced, this only affects the proportion of prices between countries while the elasticity of demand faced by an individual firm has not been impacted. Thus, the number of goods produced by each country and the specialisation of the production in different goods remain unchanged. By applying the analysis of optimal tariff, this also implies that a small tariff will definitely yield benefits for the exporting country. (Helpman & Krugman 1989, 133-153.)

In a competitive market setting, the optimal tariff can be represented as a function of the elasticity of import demand of the foreign country, $\bar{\tau} = 1/(\varepsilon^* - 1)$, where ε^* represents the elasticity of foreign import demand. Leaving beside the mathematic proof to determine the elasticity of foreign import demand, the optimal tariff under intra-industry trade is $\bar{\tau} = 1/s_F^* (\sigma - 1)$, where s_F^* indicates the expenditure share on foreign country goods and σ represents the elasticity of substitution between any two products. This tells us that no matter how small the country is, the optimal tariff never goes to zero. Because even if the country is very small in which its expenditure is negligible compared to the world expenditure, it still has the optimal tariff rate of $1/(\sigma - 1)$. There are two interpretations for this phenomenon. First, the idea is that in the monopolistic competition, there is no price-takers. So, even a small country can still specialise in some products that no one wants to produce. This leads this country to act as a price-setter, which, in turns, influences its terms of trade. In the second interpretation, this emphasises the role of imperfect competition. The true cost of domestic products to a country is their marginal cost. Under the monopolistic competition, this marginal cost is less than the market price, where monopolists obtain its maximising profitability. On the other hand, the true cost of imported good is its market price plus any effect of additional demand on that price which is negligible if the country is small. Thus, for a small country, the true cost of imported goods is basically the market price. Therefore, tariffs will make domestic goods seem relatively cheaper than imported goods, which, in turns, give a signal for domestic consumers to stimulate the consumption of domestic products. (Gros 1987, 357-367; Helpman & Krugman 1989, 133-153.)

Using the general analysis of Flam and Helpman (1987, 79-102) to elaborate more on the second interpretation, through the EU practice, if Finland imposes a small tariff against China's differentiated products, not against the outside good which ties down the terms of trade and leave difference between price and marginal cost as the only source of tariff effects. First, this practice will increase the consumer price of imported differentiated products in terms of other goods, also resulting in the increase in the skilled-labour wage rate in terms of unskilled labour. Second, this will generate Finland's revenue. And third, this will encourage consumers to switch consumption from differentiated goods imported from China to domestic products produced in Finland. As a result, for a small tariff, the revenue generated will cancel out with the loss of consumer surplus due to the increase of product price. Then the rise of domestic goods demand is the only thing left from this equation. This implies a larger producer surplus, thus a higher wage for Finnish skilled labour. The general point here is that, since domestics consumers consume too little domestic products because the marginal cost of producing goods at home country is less than its market price due to its high efficiency, a tariff can stimulate the domestic consumption in favour of domestic products which, in turns, raise real national income (Helpman & Krugman 1989, 133-153).

Moreover, the idea of imposing a tariff to lower the domestic price sounds paradoxical. After all, a tariff is basically a tax and obviously it tends to raise the price. Intuitively, if there is a good that can be produced in either of two countries with the same cost. Associated with that, there are substantial costs to transfer the good between countries. In the presence of sufficient economies of scale which is enough to offset the huge transportation cost to allow the good is produced in only one country, this country will end up producing the good and export them to the other country. Evidently, the good price will be lower in this country's market since there is no transporting costs incurred. Now, if the other country imposes a tariff on this good. This will change the relative advantage of locating production in two countries. If the tariff is large enough, while the production costs and market sizes are similar. The production of this good will shift to the tax-imposing country. This actually lower the price in the tax-imposing country since, now, consumers do not have to pay for transportation cost to obtain the good as before. So, a tariff, by shifting the manufacturing production will actually lower consumer prices. According to a model developed by Venables (1987, 700-717), this intuition is actually true. Even though the idea of imposing a tariff to lower the domestic prices is remarkable, it does have limitations. The critical one is that unless the transportation costs are substantial large, this can be true only for a modest tariff rate. Secondly, this prospect will only be meaningful in practical sense only if there are large transportation costs associated with a substantial large-scale economy. Because if there is only

a large transportation cost, there is not much of intra-industry trade. (Helpman & Krugman 1989, 133-153.)

As discussed so far, under imperfect competition, the effects of trade policies influence quite differently on firms and also national welfare. When there is an existence of monopolist in the domestic market, trade policies imposed to block free trade tends to hurt national welfare as a whole. On the other hand, in the presence of the threat of foreign monopolists, the effects of trade policies work differently depending on particular circumstances. Generally speaking, the price ceiling measure is a first-best policy to protect a nation against foreign monopolistic forces while quotas are the worst policy most of the time.

3 KONE and the Impact of EU-China Trade Policies

3.1 Company Overview and Relevance to Study

Founded in 1910, KONE Oyj has established itself as one of the leading manufacturers and service providers in the global elevator and escalator (E&E) market. KONE provides elevators, escalators, and automatic building doors, as well as solutions for maintenance and modernisation to add value to buildings throughout their life cycle. Innovative solutions and commitment to sustainability has been recognised by consumers for its differentiated products and marked its reputation on the global market. KONE's ultimate purpose is to shape the future of cities in which are constantly evolving. It strives to make urban life more vibrant and liveable by enabling safe, sustainable, effortless people flow. More than a hundred years of experience associated with over sixty-thousand employees around the world, KONE has operated in more than sixty countries and served close to six-hundred-thousand customers. To satisfy global demand and its ambition, headquartered in Helsinki, Finland, KONE has invested in eight global R&D centres and ten manufacturing units in seven countries, as well as a worldwide network of agents and authorised representatives. In 2023, it had annual net sales of €11 billion, accounted for over 1.6 million units of elevator and escalator maintenance base. (KONE 2023.)

Moreover, in the New Building Solutions market in 2023, KONE was a market leader with close to 20% of global market share, in which new sales in the Chinese market occupied almost 60% of total share. It has proved the strong position of KONE in China's market and China's significance to KONE itself. Figure 6 shows KONE's market size in 2023 (KONE 2023.)

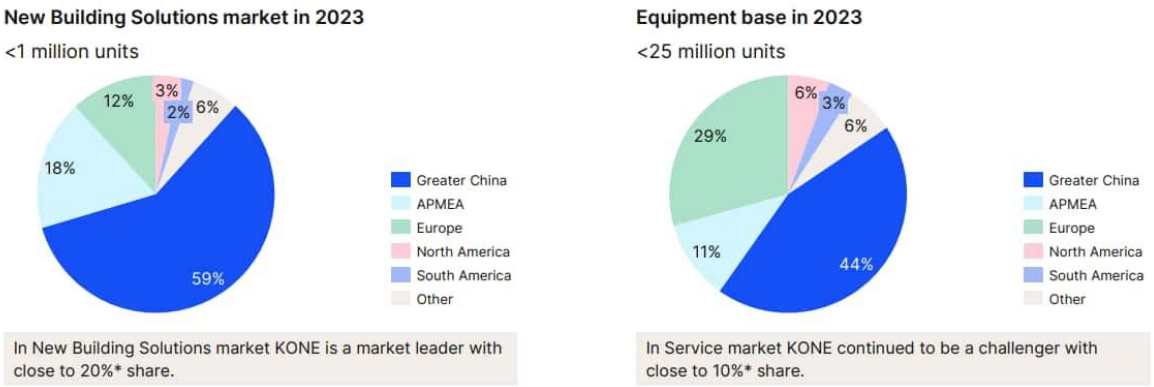

Figure 6. KONE's elevator and escalator market size in 2023 (KONE 2023)

According to KONE's annual report in 2023, KONE's sales grew by 5% at comparable exchange rates as a result of strong growth in Services and Modernisation sales despite the decline in New Building Solutions sales by 3.1% due to the sluggish Chinese market.

KONE's elevator and escalator base continued to grow and was well over 1.6 million units at the end of 2023. In terms of sales, sales in China occupied approximately 26% of total sales which declined clearly due to the weak order in the first half of the year.

It is clearly that KONE has been highly significant to both the Finnish economy and the domestic machinery industry. With its large annual revenue, KONE has contributed substantially to the national GDP and helped sustain various sectors through its operations and supply chains. KONE is also a key exporter of Finland, with a significant portion of products sold internationally. This is not only enhancing Finland's trade balance but also promoting the country for advanced technology and manufacturing.

The reason for choosing KONE as a case study for examining the impact of trade policies on Finnish machinery firms was due to the nature of the machinery industry. Finnish machinery industry possesses features of an oligopolistic competition in which is dominated by only several large firms due to its high initial investment nature. Moreover, product differentiation allows each firm to specialise on different type of products, which distinguishes with products of other firms. This leads to the increase in monopolistic power in each firm on its pricing decisions and output production. This kind of monopolistic behaviour is becoming even greater due to the greater accessibility of Finnish products to global market as a result of heavily investment in economies of scale in each firm. This creates an abyss that blocks the majority of new entrants into the market. Therefore, an analysis of one company like KONE is suitable for generalising the similar effects on the rest of machinery firms.

Besides that, KONE's long-standing trade relationship with China was also a major reason for choosing it for case studying. According to KONE's report in 2022, KONE was a leader in this elevator and escalator industry, its deliveries and service units represented approximately 35% of KONE's global sales. KONE has also been a partner serving more than 30,000 Chinese customers, in which covering 16 of China's Top 20 developers. Factories in Kunshan & Nanxun have delivered accumulatively more than 1.3 million units, associated with more than 530,000 units of equipment maintained across all provinces of China. In China, urbanisation and aging population has continued to drive E&E market development, as shown in Figure 7. KONE's strategy is to maintain its leadership in all market segments

with competitive offerings and effective channel coverage to meet a growing demand in China's market. (Johnson 2022.)

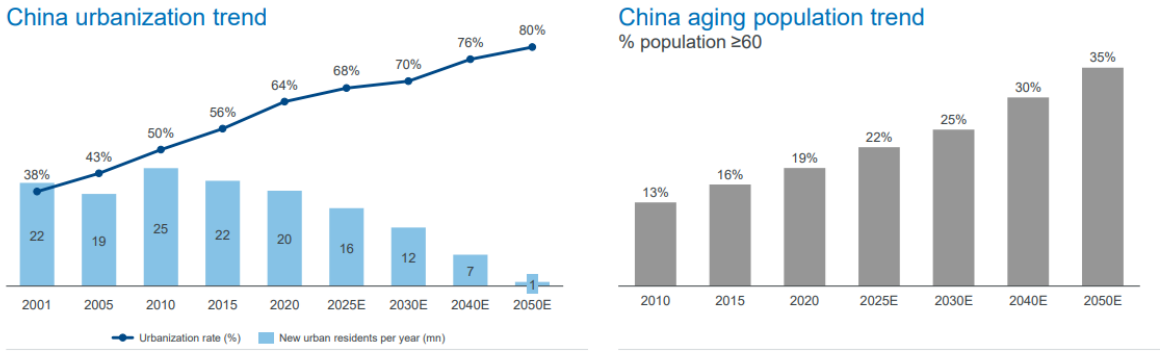

Figure 7. China's urbanisation trend and aging population trend (Johnson 2022)

As KONE continues to expand its operation in China, it is necessary to navigate through the complexities of EU-China trade policies, which are increasingly influenced by geopolitical tensions and economic considerations. On October 4th, EU member states voted on whether to impose definitive tariffs on China's electric vehicles which China has been aggressively against (Manca 2024). This increasing tariff may lead to a retaliation from China which, in turns, can lead to the trade war between EU and China. This will obviously affect significantly on KONE's operational strategy in China, and also other Finnish firms in general. Moreover, KONE's adaptation in its strategies in response to structural changes in the Chinese market is also a great example to examine the suitable way for Finnish machinery firms (KONE's Interim Report for January-March 2020). The complex and subject to change of regulatory compliance is also an important aspect that KONE must ensure to comply to in order to maintain its position in the China market. Therefore, KONE was a suitable candidate for examining the impact of trade policies, especially tariffs, on a Finnish firm.

3.2 The Impact of Trade Polices on KONE

Before considering the impact of tariffs, let us first look at KONE's actual performance in the year of 2022 and 2023 to see if there are any insights that illustrate KONE's behaviour. The author wants to point out one critical consideration that KONE, over the course of more than one hundred years of operations, has invested and built factories inside different regions to serve its main markets globally in order to avoid substantial trade costs of cross-ocean transfers. So, we can examine KONE as it is in a single 'domestic' market – the domestic global market. Table 1 extracts KONE's current marginal changes of revenue and costs.

Table 1. KONE's marginal changes in revenue and costs

	2021	2022	2023
Order Received Units	196 000	172 000	164 000
Average Unit Price	45 167 €	53 089 €	52 303 €
Marginal Revenue		- 14 360 €	11 519 €
Marginal Cost		- 27 050 €	14 787 €

First of all, the table illustrates a decline pattern in demand over the period. In 2021, KONE experienced a peak demand ordered of 196,000 units. This was driven by the market recovery from the earlier pandemic disruptions. This indicated a strong demand for KONE's products, due to factors such as increased infrastructure investment, and construction projects resuming. However, the continuously decline throughout the year of 2022 and 2023, by 12.2% and a further 4.7%, respectively, suggests that the initial post-pandemic boost was unsustainable. The reason for this decline could include the supply chain disruption due to the raging war in Ukraine, raising interest rates in mature markets, inflationary pressures across countries, the greater financial constraints for property producers in China, and also increased competition. It can be seen clearly by that at the roughly same level of average price of 53,000€, the demand shifted inwardly.

There was an increase in average price per unit from 2021 to 2022, by approximately 17.4%. This price increase indicates a strategic response from KONE to offset the anticipated decline in demand while maintain revenue levels. However, the negative marginal revenue suggests that this price increase strategy had affected the demand elasticity unfavourably. The slightly price adjustment in 2023, alongside improved marginal revenue, implies a more balanced pricing that likely maintaining its competitive position while avoiding sharp decline in demand. This strategy suggests KONE's efforts to attempt finding a sustainable price point that would attract a sufficient demand without significant discounts or aggressive pricing like what KONE had done in 2022 to cope with a downturn of the market conditions.

On the other hand, the negative marginal cost in 2022 indicates overcapacity and operational inefficiencies. It may suggest the mis-forecasting on the re-bounding market demand due to the unexpected disruptions of supply chains. This also reflects KONE's efforts to either utilise excess production resources or clear inventory, perhaps through aggressive cost-cutting, discounts, or increased production efficiency to spread fixed costs. To the author, this is likely that KONE increased its production efficiency to a substantially high level of economies of scale to meet the unfinished projects from the high demand in the previous year. While it might also discount aggressively to clear inventory in order to achieve the appropriate level of demand to maintain revenue levels through the hardship of supply chain disruptions. The effort's result was demonstrated by the improved marginal cost figure in

2023. This positive figure indicates improved alignment of production with demand level, better inventory management, and a shift away from unsustainable discounting practices. Possibly, because the pattern of market was easier to predict than the sharp turns up and down throughout the period of post-pandemic and pre-war.

The changes in marginal revenue and marginal cost suggest that KONE might have been focused more on retaining market share and moving inventory rather than maximizing its profits in the year of 2022. The author agrees that this was the suitable strategy for a re-bounding of post-pandemic market in which, under the competitive market, once one loses the market share, one can be behind other competitors forever. However, the improvement in both marginal revenue and marginal cost by 2023 suggests a shift to a more profitability-focused approach where the patterns of market has been more stable and predictable.

The data provides some insight into KONE's pricing power and flexibility despite it does not suggest monopolistic power, which is a common demonstration of the oligopoly market that also associated with economies of scale and product differentiation. In highly competitive or perfectly competitive markets, firms generally cannot raise prices without losing market share significantly. However, the fact that KONE increased prices, reflected by an increase of 17.4% in average price per unit in 2022, while maintaining a large volume of orders has indicated KONE's power on some control over pricing, despite its flexibility has limits by which suggested from the relationship of demand elasticity and KONE's marginal revenue. From the data we can once more time confirm that, in an oligopolistic market, KONE behaves monopolistic in some extent due to its large scale of economy, product differentiation, brand reputation, quality, and advanced technology.

Next, we examine if tariffs affect KONE performance in any extent. Table 2 shows tariff rates of the EU and China towards Most-Favoured-Nations (MFNs) on E&E products and components producing them.

Table 2. Tariffs on elevator and escalator products and components – HS22 (WTO)

Description	HS Code	EU's AV Duty	China's AV Duty
Passenger or Goods Lifts	8428 10	0,00 %	7,00 %
Escalators and Moving Walkways	8428 40	0,00 %	5,00 %
Parts of Lifts, Skip Hoists, Escalators, and Conveyors	8431 31	0,00 %	3,00 %
Other Parts for Handling, Loading, or Unloading Machinery	8431 39	0,00 %	5,00 %

As shown in Table 2, there is no tariff imposed on E&E products and components in the EU region. This lack of tariffs explains why KONE has faced demand fluctuations and pricing

adjustments even though its significant share in the EU market. Theoretically, no tariff allows KONE to import components from China for its production as much as needed to satisfy demand at a low price due to China's comparative advantage in producing them. On KONE side, freely importing low-cost components, associated with its large-scale economy and product differentiation, KONE can behave monopolistically in the EU and Finland market as long as there are no large firms producing the same type of products that KONE does. KONE is able to manipulate its price and production output in the way that maximises its profitability. As shown in the proof above where KONE was able to maintain its price level, while the shrinkage of demand led KONE to approach its profit-maximising level.

On the other hand, without tariff protection, KONE faces potential price competition from global competitors exporting to the EU, or other EU-based producers – either they are originally EU-based, or they are established through FDI by foreign firms – who experience the same benefit on production costs as same as KONE. This increases the sensitivity of demand over changes in price. In other words, free imports welcome new entrants to enter the market as long as they can produce at the same level of economies of scale as KONE to compete with KONE's market share. Even though the existence of product differentiation indicates that there is no reason for other large firms – either new entrants or old competitors – to produce the same type of product. This still implies one important benefit of free trade, which is to promote a competitive market. Because, as Krugman's new trade theory suggests, as long as there is an opening entry for firms that produce the same-functioning product, regardless of its differentiation in details, which uses mostly the same type components of input. Then monopolistic profits will be competed away despite the monopolistic behaviour of existing firms. Due to the warm welcome for new entrants, the greater the number of firms is, the greater the constraints imposed on firms, resulting in an improvement of the whole economy – either the whole EU or Finland.

In spite of 3% - 7% of tariffs imposing by China, KONE's FDI in China through its two production sites and one R&D site located in Kunshan and Nanxun allows it to bypass these tariffs charged on imports. This strategy has enabled KONE to produce locally for the Chinese market and make its pricing more competitive. This advantage has sustained KONE's market share in China regardless increasing local and international competition. This result is coming from KONE's ability to use local suppliers for its Chinese production, which enhancing further its cost efficiencies. This explains KONE's ability to adjust its operations to improve its marginal revenue and marginal cost effectively in a short period of time. Without those factories, KONE might have faced higher average costs per export unit, impacting its pricing strategy and squeezing its margins more significantly.

To see how tariffs affect KONE, an assumption is necessary to be made. Assuming there is no FDI into China's mainland, this scenario assumes KONE being forced entering international trade. If KONE wants to access into the Chinese market where it finds a significant potential benefit from the 1.4 billion-people market. Due to the tariff of 7% and 5% imposed on elevators and escalators, respectively, the average cost per unit increases in every unit that KONE exports to China. The rise in average cost per unit also shifts KONE's marginal cost curve upwards tariff-proportionally. As a result, if KONE maintains the same level of price. The profits of its elevator exports will be shrunken significantly by that. Moreover, in practice, KONE is forced to raise its prices of those exports in order to avoid being fined due to the so-called anti-dumping in which, as described by protectionists, prevents foreign firms from taking advantage of their production to exploit the domestic welfare by quoting their product prices as a lower markup. In other words, KONE incurs either two negative effects – the squeezing of product markup or the sales loss from prices increasing – because of China's tariffs. Table 3 will show how a 7% tariff leads to the decrease of 60% in profits if KONE decided to maintain its price, given all else is constant as the same level in annual report 2023.

Table 3. Performance Comparison under the Effect of Tariffs

	No Tariff	**Tariff**
China's Units Ordered	42 620	42 640
Average Unit Cost	46 811 €	50 087 €
Total Costs	1 995 072 482,08 €	2 135 729 305,03 €
Average Unit Price	52 303 €	52 303 €
Sales	2 229 155 939,02 €	2 230 202 000,00 €
Profits	234 083 456,94 €	94 472 694,97 €
Difference		40,36 %

Assume that the China's market condition and KONE position in the market as it was during the beginning of 2022 to the end of 2023, The elasticity of demand is estimated by using the geometric mean of changes in average unit price (Formula 1) and the geometric mean of changes in KONE's sales in China (Formula 2) in the two-year period of 2022 and 2023. There was a decline of demand in China during two consecutive years by 3.2% and 9.9% respectively.

$$\Delta\%_P = \sqrt[2]{\Delta\%_{P22} * \Delta\%_{P23}} = 0.076 \quad (1)$$

$$\Delta\%_S = \sqrt[2]{\Delta\%_{S22} * \Delta\%_{S23}} = -0.066 \quad (2)$$

From (1) and (2), the estimated elasticity of demand for new E&E products (Formula 3) is,

$$\varepsilon = \frac{\Delta\%_S}{\Delta\%_P} = \frac{-0.066}{0.076} = -0.87 \quad (3)$$

As Formula 3 is shown, the result implies that in normal circumstances, the Chinese E&E market is inelastic to the price of KONE's products because of the intertwined combination of the aging population, modernisation, market growth, and the strong presence of KONE's monopolistic pricing flexibility. Consequently, the increase in prices give no effects on quantity demanded at all. Table 4 illustrates this phenomenon.

Table 4. The Impact of Tariffs on Cost, Price, Demand, and Profits.

	No Tariff	Tariff of 7%	Tariff of 5%
China's Units Ordered	42 620	40 028	40 769
Average Unit Cost	46 811 €	50 087 €	49 151,25 €
Total Costs	1 995 072 482,08 €	2 004 925 482,08 €	2 003 843 344,21 €
Average Unit Price	52 303 €	55 964 €	54 918 €
Sales	2 229 155 939,02 €	2 240 164 999,43 €	2 238 955 893,46 €
Profits	234 083 456,94 €	235 239 517,35 €	235 112 549,24 €
Difference		100,49 %	100,44 %

The result implies the fundamental characteristic of tariffs mentioned in the theoretical part above. Tariffs only affect the proportion of prices between countries while give no effect whatsoever on the elasticity of the market. Table 4 proves this old fundamental principle of economics. Consequently, imposing tariffs on such inelastic products actually hurts economy's welfare rather than protecting it, regardless any level of tariffs. Because now, the gain of government revenue is paid by its domestic consumers.

However, the assumption of the elasticity of demand above is domestical. That elasticity figure is in terms of the demand for KONE's products, which is based on KONE's performance supported by its local production and supply chains within the China mainland. It does not reflect how China's demand reacts on foreign imports. In order to examine how tariffs impact Finnish firm in general, a further approach is required. Reminding that, in the theoretical chapter, the tariff rate can also be described by the elasticity of foreign import demand, which is demonstrated by Formula 4.

$$\bar{\tau} = \frac{1}{\varepsilon^* - 1} \qquad (4)$$

Where $\bar{\tau}$ is the optimal tariff rate, while ε^* indicates the elasticity of foreign import demand. Thus, the elasticity of foreign import demand can be computed as Formula 5.

$$\varepsilon^* = 1 + \frac{1}{\bar{\tau}} \qquad (5)$$

$$\varepsilon^* \approx 15.29$$

The result indicates that foreign import demand is very sensitive to price changes. A small change in the price of imports would lead to a much larger percentage change in the quantity demanded. An increase of 7% from KONE's initial average unit price to cover the increasing cost will eliminate all import demand on KONE's elevator products, as shown in Formula 6.

$$\Delta\%_D = \Delta\%_P * (-\varepsilon^*) \qquad (6)$$

$$\Delta\%_D = -107\%$$

The result, as suggested in the theoretical chapter, indicates that the tariff has blocked KONE's monopolistic power in pricing, if KONE exports its products from Finland. In other words, the range that KONE is able to adjust its price, has been limited. Now, KONE cannot charge the monopolistic price to maximise its profits anymore. This demonstration has proved clearly the effectiveness of tariffs in preventing foreign monopolistic powers and the significant impact on Finnish machinery firms' operation.

In 2024, the EU decided to extend its Tariff-Rate Quota (TRQ) on steel imports (European Commission 2024). The TRQs cover the categories of 26 types of steel products. Once this quota is exceeded, a typical 25% of tariff will apply on additional imports. This two-tier structure introduces new layers of cost and supply considerations for KONE. Under a TRQ, KONE is allowed to import steel for its production within a limited amount at a lower tariff. But as soon as its demand for steel exceeds the set volume, any additional steel would be subject to be charged a higher rate of tariff. Therefore, during the high demanding periods, KONE's marginal costs could increase, if it sources more than the in-quota volume. This creates the volatility within KONE's input cost's structure as how much it demands imports relative to the quota threshold. When KONE is in out-of-quota range, it would face unpredictable steel cost in which complexes its cost management. As a result, steel procurement must be needed to plan more careful and precisely in order to optimise ordering while avoiding out-of-quota tariffs. Buffering inventory within the in-quota limit could increase storage costs and push up working capital for KONE.

The impact is clearly when the volatility of input cost becomes more fluctuating. It is harder to maintain stable pricing under this condition, especially if out-of-quota tariffs increase production costs significantly. KONE faces a decision whether to absorb the extra costs while squeezing its margin, or pass them to customers which in turns, could erode demand, particularly in elastic markets. Based on these hardships, once more time, KONE's strategy on pouring FDI into different regions helps it to bypass these risks by spreading its production capacity across factories located around the world.

Concluding, the interplay between China's tariffs, EU's TRQs, and the influence of intra-industry trade impact KONE's cost structure and pricing strategy. This combination dictates KONE to balance its pricing strategy alignment with demand sensitivity. The recent financial data reflects that KONE's adaptive strategies implying the importance of cost-effective production and responsive supply chains in maintaining profitability. Moreover, KONE's extensive FDI strategy plays a critical role in mitigating the effects of restrictive trade policies like tariffs, quotas, and other trade barriers. By establishing production sites across various regions, KONE minimises its reliance on cross-border imports for components and its finished products. This network of multiple manufacturing sites enhances its supply chain resilience. This allows KONE to optimise operations and respond more effectively to local needs. And last but not least, this helps KONE to maintain, or even improve its competitive edge across diverse regulatory environments.

3.3 Generalisation Insights from KONE

First of all, Finnish machinery firms, whose products or product-related components are free to export into the EU, can benefit from tariff-free advantages to strengthen their competitive position in the EU market by either exporting their finished products resembled in other countries into the EU, or importing components at low prices from other countries for their final production. Firms can achieve the cost benefits significantly. On the other hand, tariff-free entry at the same time leads to the increase in competition in the EU market. Demand will be more sensitive to changes in prices. As a result, any monopolistic profits will be competed away by new entrants despite product differentiation among competitors. In other words, zero-tariff constrains firms' power to dictate their pricing, resulting in an increase in consumer surpluses which experience through freely consumption of the variety of products at low prices from the intra-industry trade.

Otherwise, Finnish machinery firms will incur higher costs on any export units into non-EU markets like China due to the tariffs imposed by the government. This higher cost would erode firms' profit margins if firms decided to maintain the same price level as it is in the domestic market. This profit squeezing might be catastrophic if the competition is intense in which translated from the high elasticity of demand over prices. Finnish firms that heavily rely on their exports either from or to other countries that are outside the EU, must develop strategies to mitigate the effects of these tariffs. On the other hand, if the market is insensitive to price in which might be due to the expansion of the market or its monopolistic characteristics. Then as long as the market condition is still imperfect, firms can pass the tariff-incurred costs on consumers by raising prices. This in turns hurts consumers and overall

welfare in that market since they, now, are the one who pays for the gain of government revenue.

Two calculations of the elasticity of demand also highlight a significant insight into the impact of tariffs on Finnish firms' export capability. If Finnish firms conduct purely exports from Finland to China, which are usually applied for those small- and medium-size enterprises. Finnish firms' marginal cost, marginal revenue, and pricing power are constrained by the amount of tariffs imposed. China's tariffs discourage Chinese demand on these imports from Finland. This put a significant restriction on Finnish companies' ability to access into the Chinese market. On the other hand, if Finnish firms have already possessed production facilities located within China, which are the case for those big corporations such as KONE, Metsä, or Valmet. In the presence of intra-industry trade, associated with the strong appearance of their brand, reputation, and products' availability, China's tariffs give no effect to the demand of their products, leading to the preservation of their pricing power and potential profits. In this case, firms are able to pass the export costs to Chinese consumers without damaging their product demand.

In terms of mitigation strategies, KONE's expansion by FDI into China by establishing two production sites helps it to avoid tariffs and gain direct access to the market, while at the same time allowing KONE to lower production costs by using local suppliers. This leverages KONE's adaptability to local market conditions flexibly. FDI is a preferably strategy for any Finnish machinery firms, which possess enough capacity of economies of scale and financial capital, that want to access international markets. By establishing local production facilities, they are not only bypassing the tariff barrier, but also take advantage of local sourcing, reducing supply chain costs, and risks associated with cross-border trades. This model is increasingly common to Finnish machinery firms, whose supply chains are complex and required large capital investments, as the way to maintain profitability and competitive edge in regions imposing tariffs or regulatory restrictions.

Beside the effect on individual firms, lowering or even absenting import tariffs promotes the competition in the market and prevent any monopolistic or cartel practices. Growing competition compels firms to innovative and develop unique products to sustain their market share. Additionally, this competitive landscape encourages firms to explore opportunities for expansion and diversify their offerings into new markets. This encourages firms to scale its operation beyond Finnish traditional markets. Obviously, how low a tariff is, or whether an economy should impose any tariffs in the first place at all depends on the country to estimate its optimal level of tariff to maximise its welfare.

The quotas imposed by the EU like the steel quota very likely affect Finnish machinery firms, which rely heavily on those commodities as a core component in production. While its impact on KONE is not fully known. However, theoretical proofs show that the imposition of quotas may increase production costs for Finnish firms that rely on external sources of commodities. Especially, the complex trade barriers such as TRQs propose more challenges for Finnish firms to manage its cost structure. Finnish firms are required to estimate and plan their production carefully and precisely to aligns with demand in order to avoid any excess productions, in which could lead firms to pay extra costs for importing out-of-quota commodities.

Finally, the Finnish machinery industry often engages in intra-industry trade, especially with technologically advanced products. This type of trade allows Finnish firms to specialise in certain products that they do best while sourcing other components from other countries where they have complementary capabilities and comparative advantage in producing them. This balance practices in exporting finished products while importing components for producing enable Finnish firms like KONE to optimise their supply chain and maintain cost-effectiveness, while pertain their competitive edge. Imposing tariffs or trade barriers tend to disrupt this balance by imposing more costs on firms which, in turns, likely to be passing on consumers.

3.4 Opportunities and Challenges in the Chinese Market

Before discussing opportunities and challenges in the Chinese Market appearing to Finnish machinery firms, let us look at the trade dynamics of Finland and China during the course of 2021 to 2023. Figure 8 shows the value of Finnish export to and import from China.

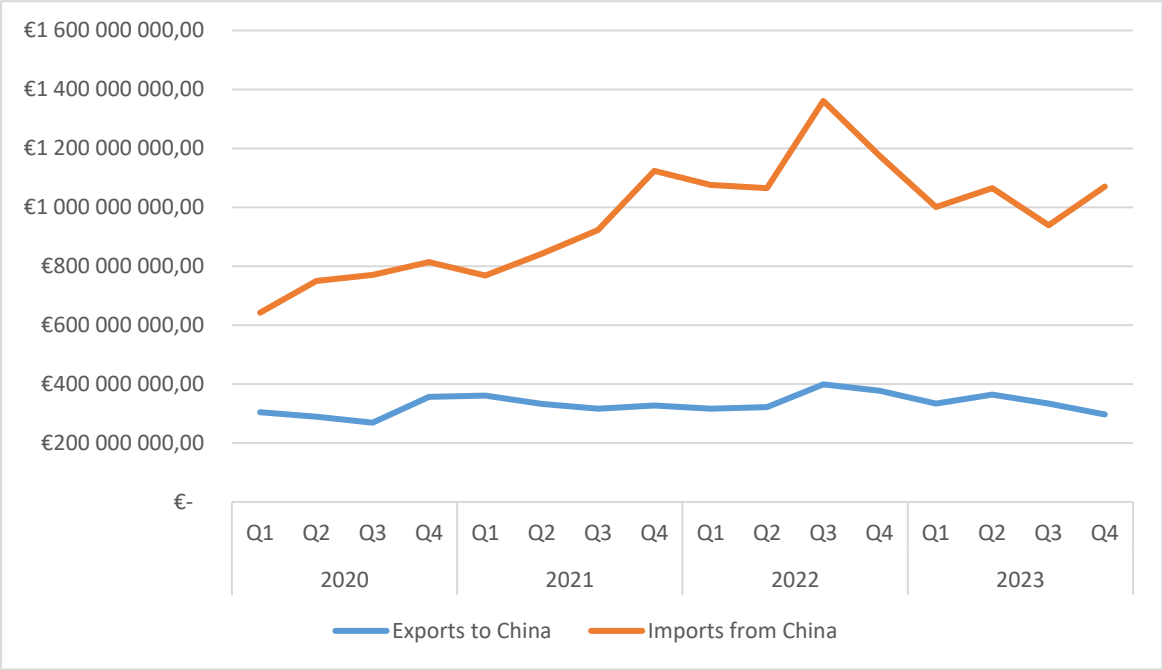

Figure 8. Trade Dynamics between Finland and China 2020-2023

Figure 8 is accounted all machinery products categorised in chapter 84,85,87 and 90 in the Combined Nomenclature (CN) system in which represent the majority of machinery products that Finland has comparative advantage in producing relative to other countries. This suggests the trade deficit of Finland during the period. The import value from China was increasing over time. This illustrates an upward pattern of importing goods from China. The significant increase in the end of 2021 till the third quarter of 2022 suggested a rebound of Finnish market's demand after the recovery of post-pandemic. On the other hand, Finland's exporting has remained the same level over time.

If this figure stands alone, protectionists and activists may use that to criticise Finnish performance and the EU free-trade policies and support their broken protecting policies. Because the difference between exports and imports of Finland can be explained as follow. First, Finland has advantage in manufacturing technologically advanced products. Therefore, Finnish machinery firms tend to outsource their component production to other countries where labour are cheaper in doing so. Meanwhile, finished products produced from Finland is more advanced, resulting in the higher value of product. And these high quality and advance products usually have been exported into rich countries rather than developing countries. Table 5 illustrates how different the product value is between two countries. The full descriptive statistics will be provided under appendix.

Table 5. Comparison of Average Value per Unit between Finland and China

	Finland	**China**
Average Value per Unit	96 971,81 €	27 396,86 €

As is shown in Table 5, the average value per unit of Finnish product is more than triple than that of China. In other words, Finnish terms of trade relative to China is approximately 3. This indicates that the Finnish machinery industry is more efficient than China's production. In economic words, this terms of trade means that for every unit of imports from China, Finland can obtain three units of exports in value.

Moreover, instead of exporting its high value products oversea which obviously incur significant costs and risks along the way, especially the raging war and the intense geopolitics around the world. Large-sized machinery firms from Finland prefer to directly investing through FDI into China's mainland to take advantage of low input costs while enabling them to bypass any difficulties imposed by trade policies from China. Particularly, the CAI signed between the EU and China promotes this type of strategy in Finnish firms more frequently. Therefore, the volume of exports from Finland is mostly accounted for small- and medium-sized firms, whose financial capital is in constraint and not allow them to exercise any FDI strategic movements either horizontally or vertically.

Furthermore, tariffs and trade barriers through uncertain regulation and discriminating policies imposed on Finnish exporters from China are also a reason to explain why Finnish firms hesitate to export its products crossing China's border. As a survey by FinnCham (2023), 65 out of 365 Finnish companies, in which 25% respondents are machinery firms, reflected that the unpredictable outlook of Chinese business environment recently. This indicates the Chinese regulatory landscape remains complex and can be unpredictable, especially during the trade disputes. This unpredictability may require Finnish firms to make costly adjustments to comply with changing standards and regulations. This is a significant challenge that Finnish firms, especially in the machinery sector whose products are complex and resembled from a countless number of different components. The delay could raise operational costs and slow down time-to-market. This in turns also scrutinise firms' financial capital.

Now, we will see what challenges that Finnish firms would face in exporting products to China. After that, we will discuss what opportunities walking beside those challenges. First of all, beside the complex regulatory environment that the author discuss previously. The most obvious that we can experience during the course of recent years, is the downturn of Chinese economic conditions and the market uncertainty. After the unsustainable rebound after the post-pandemic in 2021, China's economic has slowed down significantly. Associating with the constraints of Chinese producers on financial capitals makes the situation even worsen. This uncertain economy may decrease demand for high-cost products, especially those that are high elasticity over prices and those that are experiencing an intense

competition. This situation would impact substantially for those Finnish firms that their businesses tie to Chinese construction and industrial markets.

The next challenge may come from the intensified local competition in China's mainland. The Chinese machinery industry has developed rapidly over years due to the transferring technology requirements from Mr. Xi's government since then. This result indicates a number of local companies is trying to gain ground in areas where Finnish firms used to hold comparative advantages. This government-backed competitive increase will make it challenging for Finnish firms to remain its market share.

Moreover, tariffs and non-tariffs trade barriers such as quotas imposed by the EU could also put Finnish firms to significant disadvantages if these firms want to export their products to China. Because now, they are actually incurring trade costs from two sides – importing components and exporting finished products. This squeezes firms' small margins from the intense competition to zero. When quotas are imposed, the effects are the same on the input side whether firms source their inputs from abroad or in domestic EU markets. That is also the reason why quotas are the worst policy.

Finally, the looming potential trade war between the EU and China is also a significant factor that Finnish firms should want to consider. In October 2024, the EU imposes a substantially high rate of tariff on China-based EVs. In response, China may implement retaliatory tariffs against EU's exports, very likely including machinery products. This trade war act may compete all profits left from exporting to China away. As a result, many firms in the industry will find themselves in the unfavourable position in which makes them impossible to export for profits. This retaliation may also intertwine with other effects, leading to the significant disruption of global supply chains like it did during the trade war of Trump's administration.

On the other hand, opportunities always exist for whom can grasp. China remains a major market for advanced machinery, especially as it continues to urbanise and invest significantly into large-scaled projects. Finnish machinery products are always known for their high-quality and technological innovation. These characteristics may well position Finnish firms to meet this demand.

Besides that, the CAI encourages Finnish firms to direct their FDI flows into China. By establishing or extending FDI in China, Finnish firms may be better integrating into the Chinese local supply chain, in which costs are relatively cheaper compared to that in the EU. This strategic movement can also allow firms to avoid any discrimination in the process of exporting goods through China's border. This strategy has been proved beneficial to KONE, which has localised its production to bypass tariffs and meet local regulatory requirements.

Increased FDI may also enable companies to get along with the Chinese government in which potentially gaining favour and market access.

Finland has been long well recognised in its efforts on sustainable innovation and green technology. This allows Finnish firms to offer their energy-efficient machines and sustainable solutions to meet China's demand in regarding sectors. With China's attempts to push towards sustainability under initiatives like 'Dual Carbon' in which China compromises to reach its carbon neutrality in 2060, the high demand will be expected in these green businesses.

Summarising, Finnish machinery firms have significant opportunities to expand its operations towards China due to its high efficiency in production, advanced technology, expected high demand on their products, and substantial capital availability. However, the potential retaliatory trade barriers imposed by China to counter the significant high tariff that the EU imposed previously might create relatively challenges for firms to access the Chinese market. The potential trade war may also lead to the significant disruption of global supply chains. To cope with these uncertainties, a suitable strategy must be made, such as increasing FDI into China, seeking new markets for their products, or sourcing their components away from China or creating a new local supply chain network. Each strategy has its own advantage and disadvantage. Depending on the nature of its own firm that determine which strategy is the best. Contrasting with business strategy, in terms of trade policies, as discussed from the theoretical parts to this point, one can surely confirm that quotas are the worst trade policies.

4 Conclusion

4.1 Answers to Research Questions

The KONE case study, associated with theoretical lens from trade theories, discussed above, has provided insights into the understanding of tariffs imposed by the EU and China.

Why does Finland trade with China in the first place?

The analysis on KONE and a brief snapshot on trade dynamics between Finland and China also illustrate why Finland and China trade with each other in the first place. First of all, trade allows each country to specialise in manufacturing goods that each has comparative advantage, which has been suggested by Ricardo's (1821) comparative advantage and Ohlin's (1933) factor endowments. China, being labour-abundant and benefiting from economies of scale, has comparative advantage in manufacturing cost-efficient components, raw materials, and machinery parts, which Finnish industries, including the machinery sector, depend on. While Finland specialises in high-value-added machinery areas where Chinese demand for advanced technology and high-quality sustainable machinery is strong.

Secondly, the market potential in China attracts Finnish machinery firms. The demand for advanced machinery has grown significant due to China's urbanisation and industrialisation. The expanding Chinese middle class and government initiatives towards sustainability align well with Finnish industrial specialisation and capabilities, creating opportunities for Finnish exports.

Thirdly, intra-industry trade enables each country to specialise in several types of products and trade with another country for other types of products. This feature characterises the trade of machinery industry between Finland and China, in which Finland focuses on producing its high-value finished products while importing components or low-value products from China to satisfy Finland's variety of consumption. Furthermore, this dynamic is supported by KONE's strong presence in both markets. This intra-industry trade allows KONE to be at a strong competitive position. KONE can produce its products in both Finland and China for both local and export purposes. This intra-industry trade provides resilience for KONE against any unfavourable market conditions, as KONE can adjust its supply chains to minimise marginal cost by utilising local suppliers' network. Then KONE can export its products either back to Finland or to China to satisfy any demand level for its products at home country and abroad.

What specific tariffs does EU and China impose on machinery exports from the other? And how do these tariffs affect Finnish machinery firms?

Depends on the degree of specification of machinery categorisation, ad valorem tariffs vary from each category to another. From the case study of KONE, insights on the effects of tariffs on Finnish machinery firms are as follows.

On the one hand, tariffs imposed by the EU on China's exports make sourcing more expensive for Finnish machinery firms despites of the initial low-cost of China's products. EU's tariffs discourage Finnish firms to source their input materials outside the EU. Regarding such products that incur no tariff at all like those E&E products and components, no tariff promotes a greater competitive market within the EU. Since without a tariff, all firms experience the same benefit. This opens room for new entrants entering the market where monopolistic profits are available. Profits will be competed away until the number of producers reaches its equilibrium. Finnish firms that operate in the EU market are required to innovate and operate more effectively to drive the production cost down in order to maintain their market share. Moreover, the competition encourages Finnish firms to seek ways to expand and diversify their products into new markets. Furthermore, such complex trade policies like TRQs propose more challenges for Finnish firms to manage its cost structure. Finnish firms are required to estimate and plan their production and sourcing more carefully.

On the other hand, tariffs imposed by China create significant challenges for Finnish machinery firms to export their products. As it has shown by the KONE study case, China's tariffs prevent foreign producers' influence on the China market competition. Such Finnish machinery firms that have a higher marginal cost curve, are discouraged to export their products crossing the border. Because the increase in marginal cost per unit has eroded their profits. There is basically no other way to maintain the same level of markup as they charge in the EU's domestic market. Because the range that firms are able to adjust prices has been limited by the effect of tariffs. This contraction poses a significant risk of leaving the market on those firms. Most importantly, such high tariffs influence Finnish firms' expansion strategy. They dictate firms to produce and to source their supply chains locally within China's mainland through FDI. However, if the product is inelastic, then as suggested by the theories and the demonstration of the case study, tariffs produce no effect at all on Finnish firms. Because since the product cannot be substituted, the increase of cost will be passed to Chinese consumers. In this case, Finnish firms remain their pricing power, while China's welfare is worsened off.

In what ways have recent changes in EU-China trade relations influenced the export strategies of Finnish machinery companies?

China's demand for advanced, environmentally friendly machinery products to meet its ambition on urbanisation, large-scale construction projects, and the carbon neutralisation

aligns well with Finnish machinery products, which Finland has advantages and expertise on. This creates a significant opportunity for Finnish machinery firms to shift their production to serve this 1.4 billion people market. Moreover, the CAI between the EU and China opens a wider door which assures a more reliant business environment in China's market, for Finnish firms to scale their operations in the Chinese market through FDI. These positive factors signal Finnish machinery firms to expand their operation towards China's larger pooled market. Accessing the market through FDI allows Finnish firms to bypass the restriction imposed by trade barriers. This promotes Finnish machinery firms' position in the Chinese market. Also, this expansion strategy allows Finnish firms to reduce cost and operate more efficiency by sourcing locally.

On the other hand, the potential trade war between the EU and China, due to the likely retaliation of China imposes on the EU's recent significant increase in tariffs charged on China-based EVs, demands Finnish machinery firms to prepare for potential disruptions in their operations if trade relations deteriorate further. Because machinery products are very likely the first target for any retaliation from our Chinese counterpart. This impacts significantly on small- and medium-sized firms. Because those firms are usually limited in their financial resources to undertake huge project strategy like such FDI. The intense of EU-China relations may indicates those firms to seek new other markets than China. This shift in targeted strategy may affect their original supply chains if those involve Chinese's suppliers.

How do EU-China tariffs impact the Finnish machinery industry at the firm level?

The Finnish machinery industry is significantly shaped by the trade policies and tariff structures between the EU and China. While the dynamics vary across firms, the insights drawn from the KONE case study provide a generalised understanding applicable to most Finnish machinery companies.

In terms of EU and China tariff structures, the EU impose low tariffs on machinery imports, typically between 2%-5%, along with some specific exemptions for products like elevators and escalators. However, additional other complex measures, such as tariff-rate quotas (TRQs) on raw materials like steel, create a tiered cost structure in which complicating cost management and production planning. These challenges may lead to the adjustment of sourcing strategies in each firm. On the other hand, China levies an average of 7% tariff on imported machinery products. This directly impacts Finnish firms exporting to China by increasing marginal costs and restricting pricing capabilities, which in turns lead to the squeezing of profit margins.

Finnish machinery firms relying on imports of components face cost increases due to tariffs. These additional costs reduce competitiveness in both EU and Chinese markets. When exporting to China, tariffs further compound the cost burden, especially for firs already operating on narrow margins. This limits their ability to compete with local Chinese producers or other international players operating tariff-free within China.

Many Finnish firms adopt foreign direct investment as a strategic response. By establishing production facilities in China, firms can bypass tariffs, while at the same time firms can also save costs by sourcing materials locally and better serve the Chinese market. KONE's investment in two factories in mainland China is a prime example of this approach. Moreover, localisation strategies also allow firms to take advantage of China's extensive supplier networks, reducing reliance on imports and enhancing supply chain resilience. These strategies are increasingly necessary for firms to navigate the complexities of global trade policies.

Furthermore, in the presence of intra-industry trade, the Finnish machinery industry and China have engaged in substantial volume of trade. Finland exports high-value finished machinery while imports low-value components from China. This trade pattern determines the complementary strengths of the two economies and the mutual benefits derived from specialisation. Firms involved in intra-industry trade can adjust their supply chains dynamically, at the same time, leveraging local production capabilities to mitigate tariffs and other trade barriers.

Rising geopolitical tensions and potential trade wars, such as the EU's recent tariffs on China-based electric vehicles, introduce uncertainty. Retaliation targeting machinery exports may severe the impact on Finnish firms' operations and market accessing in China. However, China's demand for advanced environmentally friendly machinery proposes opportunities for Finnish firms that can capitalise on this rising demand.

Ultimately, given such effects and challenges imposed by tariffs and other trade policies, the industry's ability to adapt the evolving geopolitical uncertainties will determine its competitiveness and sustainability in the global market. The KONE example highlights the importance of strategic flexibility, diversified production locations, and adaptive supply chains as critical factors for navigating the complex landscape of EU-China trade relations.

4.2 Ethics, Reliability and Validity

The research relies on secondary data which avoids the use of primary data involving human participants. This ensures there are no ethical concerns related to informed consent,

privacy, or confidentiality. Citation properly of all sources throughout the thesis ensures intellectual property rights and adherence to academic standards. Moreover, the methodologies and assumptions used in analysing KONE's case and generalising findings for the Finnish machinery industry are explicitly introduced and stated. There is no manipulation or misrepresentation of data to fit preconceived conclusions. As mentioned in the introduction chapter, the study aims to present a balanced view of EU-China trade policies and their impacts on Finnish firms, while avoiding bias towards any particular country or policy stance.

Data used in the thesis is drawn from credible sources, including academic literature, industry reports, government publications, and verified statistical databases. The use of KONE, a globally recognised Finnish machinery firm, provides a robust case study grounded in real-world operations. All annual reports of KONE are publicly. Theoretical frameworks are utilised to analyse and understand the impact of tariffs. The research methodology is also structured and introduced clearly so that future studies could replicate the analysis to enhance reliability and justify the result.

Regarding the validity of the research, the research design minimises the complexity of variables by focusing on tariffs specifically, while other trade policies are only briefly discussed if they are relevant to understanding the impact of tariffs. The assumption made are grounded in established economic theories and prior research. Moreover, the findings are generalised for the Finnish machinery industry, the reliance on KONE as a single case study limits generalisability to firms with different scales, market structures, or international strategies. As mentioned in the limitation part, the study acknowledges this limitation and carefully elaborates insights to other Finnish machinery firms with similar characteristics.

4.3 Suggestions for Further Research

While the thesis focuses on KONE as a case study, future research could explore the impact of EU-China tariffs on other Finnish machinery firms, including small- and medium-sized enterprises. This would provide a more comprehensive understanding of the industry's challenges and strategies. Moreover, the analysis of the case study in this thesis is simplified by theoretical grounded assumptions. Thus, conducting an econometric analysis to quantify the precise effect of tariffs on Finnish machinery exports, production costs, and profit margins would validate and extend the findings of this study.

A cross-sector analysis comparing the machinery industry with other high-tech or capital-intensive sectors in Finland, such as telecommunications or energy, will reveal whether the strategies and impacts observed in the machinery sector are unique or widely applicable.

Finally, since the main focus of the thesis is about tariffs, future studies could delve into the effects of non-tariff measures on the machinery industry. Particular attention to the potential implications of escalating trade tensions or new trade agreements will also be highly suggested. These studies could evaluate the benefits and challenges that shape long-term trade and investment strategies.

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Appendix A. KONE's Performance

		2021	2022	2023
Order Received	M EUR	8 852,80 €	9 131,30 €	8 577,70 €
Units		196 000	172 000	164 000
Average Unit Price[1]	EUR	45 167 €	53 089 €	52 303 €
China's Units Ordered			53 320	42 640
Sales	M EUR	10 514,10 €	10 906,70 €	10 952,30 €
Units Sold		232 781	205 442	209 401
Operating Profit	M EUR	1 242,80 €	986,20 €	1 150,10 €
Costs	M EUR	9 271,30 €	9 920,50 €	9 802,20 €
Variable Costs	M EUR	5 086,90 €	5 305,30 €	5 054,30 €
Fixed Costs	M EUR	4 184,40 €	4 615,20 €	4 747,90 €
Average Unit Cost	EUR	39 828 €	48 289 €	46 811 €
Marginal Revenue[2]	EUR		- 14 360 €	11 519 €
Marginal Cost[3]	EUR		- 27 050 €	14 787 €

[1] Average Unit Price is calculated by dividing Order Received in Value by that in Units. Because Order Received indicates the actual new demand occurred in a year, in which its value is already set prices in the contract.

[2] Marginal Revenue is determined by the proportion of changes in year-to-year revenue over changes in the number of year-to-year units sold.

[3] Marginal Cost is determined by the proportion of changes in year-to-year total cost over changes in the number of year-to-year units sold.

Appendix B. Descriptive Table on Trade Dynamics between Finland and China

Row Labels	Exports to China Sum of Value (EUR)	Average of Average Value per Unit	Imports from China Sum of Value (EUR)	Average of Average Value per Unit
2020	**1 220 168 475 €**	**93 572 €**	**2 976 490 522 €**	**25 880 €**
Q1	304 621 498 €	101 795 €	642 206 928 €	26 595 €
Q2	289 695 339 €	88 442 €	749 542 430 €	25 145 €
Q3	268 994 359 €	96 572 €	770 541 149 €	23 639 €
Q4	356 857 279 €	87 481 €	814 200 015 €	28 141 €
2021	**1 336 533 141 €**	**84 886 €**	**3 656 676 405 €**	**25 595 €**
Q1	360 824 170 €	84 107 €	768 170 321 €	24 791 €
Q2	332 714 416 €	82 478 €	842 332 533 €	24 845 €
Q3	316 024 410 €	80 399 €	922 747 788 €	25 553 €
Q4	326 970 145 €	92 562 €	1 123 425 763 €	27 191 €
2022	**1 414 077 107 €**	**108 047 €**	**4 676 149 248 €**	**27 168 €**
Q1	316 125 821 €	111 135 €	1 075 549 753 €	25 481 €
Q2	321 460 949 €	93 536 €	1 064 905 498 €	25 500 €
Q3	398 944 817 €	116 401 €	1 360 940 429 €	26 289 €
Q4	377 545 520 €	111 115 €	1 174 753 568 €	31 401 €
2023	**1 328 261 453 €**	**101 382 €**	**4 075 070 496 €**	**30 945 €**
Q1	333 659 371 €	121 539 €	1 000 559 987 €	32 067 €
Q2	364 429 426 €	87 937 €	1 065 179 991 €	28 544 €
Q3	333 439 908 €	95 372 €	939 192 898 €	29 440 €
Q4	296 732 748 €	100 679 €	1 070 137 620 €	33 727 €
Grand Total	**5 299 040 176 €**	**96 972 €**	**15 384 386 671 €**	**27 397 €**