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TRADE COMPETITION AND EXPORT SPECIALIZATION PATTERNS

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Today's economic landscape is under continuous change mainly due to technological progress that has facilitated international trade and the dynamic of exports. Modern infrastructure, more favourable trade regulations and cheaper transportation have made the volume of global trade to grow vertiginously. With these changes alongside globalization we are witnessing the rise of new power countries and in general very open and interdependent economies. These changes facilitate the increase in competition among countries. Taking these into consideration I directed my attention towards elaborating a thesis about countries export patterns and the measurement of trade competition in international trade.

The general objective of the thesis is the study of modern international trade, the initial research was focused on identifying the most important factors that influence trade and explaining the dynamic, the structure and the geographic orientation of contemporary international trade. Once further research was done it became clearer that such a vast quantity of information could not be included in a single doctoral thesis. Therefore the following phase of the study was to summarize and group the key trends in international trade and the specialization determinants. Analysing and outlining these trends and specialization determinants has made up for the contribution of the specialty literature as the foundation of the thesis. Globalization, regionalization, international agreements and the emergence of new power poles are the main trends that are found in existing literature related to international trade. Each of these trends represents a subchapter containing analysis and interpretations towards how the economic science shaped the evolution of global trade. Specialization determinants were the most difficult to systematize and structure as there are hundreds of general determinants and thousands of particular versions that characterize modern international trade. After a rigorous study of the vast existing literature I grouped these determinants in four main categories and later on I added a new category in the wake of the worldwide economic changes brought by the Sars-Cov 2 pandemic. In our opinion the main categories of specialization determinants are: changes in demography, investment, new technologies, natural resources and energy, challenges faced by the global economy after 2020. Transportation costs are one of the main factors that influence trade, investment and advance in technology sectors. The dynamic and the influence of transportation costs have been analysed both as a component of investment and as a result of the worldwide advance in technology.

After completing the literature review section of the thesis I focused my preoccupations on the measurement of trade competition. In this sense I pursued to identify a more complex

index for the measurement of trade competition. In chapter two I have presented a number of indexes that resulted to be efficient and that have been used in various studies. After an extensive analysis of such indexes, based on the accessible data and the results obtained I have formulated my findings. Subsequently considering all these indexes I concluded that the Krugman index would be the most adaptable and complex to use for my research. Even more so, the chosen index would be applicable for the measurement of competition between countries, with the inclusion of a large panel of data. Following this line of research I also used the studies by researchers Nuno Crespo and Nadia Simoes[1] who had proposed a modified version of the Krugman index that focuses on exports between countries and includes a series of interesting developments. An element that caught my attention from their work was the fact that they managed to contour six types of competition: competition in a block of countries; competition between two countries in all markets; competition that a country faces in a specific destination market from all the others; competition that a country faces in all markets; competition in a given market among all the countries and competition between all countries in all markets. Thorough the second chapter I studied the specific characteristics of these types of competition and indexes that could be used for the competition measurement. The final part of the second chapter contains an empirical example, applied on small panel of countries. In this example we measure all six types of competition considering a block of European countries and certain emblematic non-European export destination countries. The purpose of this example is to outline the versatility of the index and its potential to being applied on a larger panel of countries that could offer interesting results.

Trade competition measurement with a basis of calculations of country exports had previously been studied and it would not have brought many new elements by its own for a PHD thesis. Once settling the most adaptable index for such research, I followed the steps of Paul Krugman and agreed that a view on this topic can only be complete with the inclusion of the geographic spectre.

Ultimately, in the most important chapter of my research I detailed and developed the main topic of the study. The greatest challenge was to include the measurement of the geographic element in an index that successfully measures trade competition between countries. I

[1] ISCTE – Instituto Universitario Lisboa

benefited from a scholarship at ISCTE University in Lisbon[2] where I was able to develop my research during one year. This version of the index allows multiple aspects to be approached by researchers including the ones found to be most compelling in the third chapter.

The first part of this chapter is a description of the index and its composition, while the following section is an empirical applied example for a better comprehension of the novelty brought by the new modified index. The following parts of this chapter represent the original calculations and conclusions. An inclusion of a large panel of countries was necessary; for pertinent results therefore 124 countries were included. The whole concept was the measurement of competition between the 28 European countries and the most relevant destination countries of exports from around the globe. The choice of destination countries was based on level of exports and available data on Eurostat. After the preparation of the data extracted from the database 378 country pairs were formed. Upon the application of the new index and obtaining values in the study I managed to create a ranking of these country pairs, from highest competition level to lowest. Subsequently I extracted the bilateral distances between these country pairs and created a new table where one can observe comparatively, the values and ranking based on trade competition and the distances in kilometres. The country pairs were ranked based on distance thus identifying the closest country pairs. The second table was created in order to capture the connexion between them and geographic proximity. Lastly I concluded that the best way to appreciate the most relevant results was to create maps based on competition level for the five highest ranking country pairs. These maps propose a suggestive representation of the importance of destination countries and offer surprising results. These country pairs were used in order to substantiate the structural and geographical similarities. The third chapter of the thesis is mainly formed of a collection of empirical studies and the results obtained.

The aim of the first chapter is to describe and explain: (i) the major trends that characterize international trade over the last decades; and (ii) to identify the main determinants of trade specialization. Concerning the first dimension, the following key trends are analysed: globalization, regionalization, international agreements, and the emergence of new economic poles. Afterwards, this chapter includes a detailed overview regarding six groups of determinants factors of specialization that have a key relevance in the literature dedicated to

[2] where both Nuno Crespo and Nadia Simoes are based

studying this issue. This is a very important topic since countries vary significantly in terms of the goods they produce and export. Several factors affect these choices and some of them suffer changes over time. The channels through which the determinants of specialization operate will be explored in this chapter.

Over the last 50 years, we have witnessed an increase in the degree of openness of the different domestic markets, much wider than ever before. This means that, in this period, the external dimension has become very important. This fact can be observed at two different levels: (i) at the macroeconomic level, regarding the relations between countries; and (ii) at microeconomic level, taking into consideration firms as unit of analysis. In economic science, globalization is undoubtedly one the most researched topics by the academic community. The International Monetary Fund (2002) highlights that globalization is "the process through which an increasingly free flow of ideas, people, goods, services, and capital leads to the integration of economies and societies" and represents "a political choice in favor of international economic integration". For the measurement of globalization, the most commonly used indicators are exports and imports, namely the country's international trade ratio to GDP or GNP. The New Globalization Index (Vujakovic, 2009) includes the perspective of distance between countries and nine indicators being one of the most used indexes in specific literature. All in all, globalization is a force in continuous evolution that has produced important influences for all types of countries and their industries. In most recent years, specialized literature has tried to explore the importance that globalization has on the evolution of certain fields: tourism, water supplies (Smith, 2003), agriculture, wine, the health sector, among many others.

Scientific studies generally view regional integration as occurring with the purpose of increasing their level of interaction in economy, politics, security, social and cultural matters between countries. The most important functions of regional integration are: (i) strengthening trade integration in the region; (ii) creating an environment that stimulates the private sector; (iii) improving infrastructures that support economic growth and regional integration; (iv) developing public sector institutions; (v) reducing social exclusion and promoting an inclusive civil society; (vi) contributing to peace and security in the region; and (vii) strengthening the region's interaction with other regions of the world. The effects of regionalization and globalization include an increase in production and commodity chains flow, therefore creating regionalized regimes of wealth accumulation. In a modern age where trade blocks exist hand in hand with free trade areas and regional trading agreements, we

have witnessed the creation of significant groups: the European Economic Community in 1957, the North American Free Trade Agreement (NAFTA), Mercosur, and the Association of Southeast Asian Nations (ASEAN).

One of the main tools to facilitate international trade is constituted by international agreements that focus on the general conditions associated with the process of importing and exporting goods and services across countries. Trade agreements regulate international trade between two or more nations. The most important general trade agreement is the General Agreement on Tariffs and Trade (GATT) that later on transformed into The World Trade Organization (WTO).

The openness of markets towards the global economy, privatization and deregulation transformed the modern international landscape into a multipolar world system. Alongside some consecrated dominant economies we also observe the presence of new power economic poles. Based on the World Bank Report (WorldBank, 2011) conclusions the world economy will be dominated by emerging economies by the year 2025. The report also places China and India at the top of the list alongside with Brazil, Indonesia, Russian Federation and the Republic of Korea.

Some of the elements that are nowadays perceived as having great importance in the dynamic of international trade were presented in this thesis. While these elements are not new determinant factors in this field, their evolution in the last decades demands a closer approach.

The global demographic transition has presented important ramifications that have brought changes to the global economic landscape. These demographic changes have restructured populations and we are witnessing a highly populated planet, with an easy access to migration, an aging population, less children born, lower fertility rates and a prolonged life expectancy for people.

Investments are also an element that positively influences the participation of a country in international trade. Foreign direct investment has proven to be essential in the development of global supply chains by trade in intermediate goods. Investment has also proven relevant to obtaining the comparative advantage by some countries and through spillovers from multinational firms may facilitate the transfer of technology.

The level of technological development differs from country to country and influences trade and the income levels of the trading partners. Development in technology is also an important factor that shapes trade and produces differences in income levels between countries (Easterly and Levine, 2001, Prescott, 1998). Even more so, technology has been responsible for the fast growth of the last two centuries by progress achieve concerning electricity, telephones, combustion engine, speed internet, among other factors. Advances in technology and innovation have influenced trade patterns through the emergence of new economic poles, the process of technological transference, the decrease in trade costs, and the increase in the share of services in world trade.

The amount of natural resources that a country possesses and that can be exploited is clearly an important element for the specialization of a country. Economic research has typically considered the amount of land, water and natural resources that can be utilized in diverse production functions within a country. In conclusion, countries that possess exhaustible natural resources presently have a competitive advantage but must be more preoccupied of alternatives for the future, such as clean energies, if they wish to maintain their position.

In continuance I tried to identify the key trends in modern international trade. Several factors shape the economic behaviour of the countries, leading them to specialize in different or similar sectors.

Globalization is one of the most analysed topics in the last decades of research and influences almost every country and economic sector. The phenomenon of globalization has reached every country on the globe but not in the same way. Studies presented in the thesis show us that developed countries are the ones that benefited the most from globalization. Globalization has facilitated the movement of technology, people, goods and services all over the globe and created unexpected opportunities for all parties involved. It has facilitated economic relations between countries and greatly contributed to the increase in the volume of trade.

Globalization goes hand in hand with regional integration. Countries that decide to increase their level of interchange regarding several fields such as economics, politics, social, cultural and security find themselves at the inception of the process of regional integration. Through regional integration, countries manage to establish a higher level of trade, encourage their private sectors towards engaging in trade, develop the public institutions and support economic growth.

In turn, regional integration goes hand in hand with international trade agreements and they have both helped to create powerful economic groups such as the European Union, Mercosur, NAFTA, ASEAN, etc.

Elements such as globalization, regional integration and trade agreements have created unique opportunities for countries to engage in various types of trade. These key trends helped in the emergence of new economic poles at global level. The following 25 countries present the highest GDP at the end of 2020 (Silver, 2020): United States, China, Japan, Germany, India, United Kingdom, France, Italy, Brazil, Canada, Russia, South Korea, Australia, Spain, Mexico, Indonesia, Netherlands, Saudi Arabia, Turkey, Switzerland, Poland, Thailand, Sweden, Belgium and Nigeria. This list gives us a small idea of the new poles emerging in the global arena. Analysing the situation of these top countries a few decades ago we could observe the essential change in economic forces at global scale.

All the key trends discussed in this chapter - globalization, regional integration, trade agreements and the emergence of new economic poles have determined the rapid increase in the level of trade between countries.

Alongside the general increase in trade, countries have specialized in different fields influenced by a myriad of determinant factors. The demography of a country is a crucial element for each country as it shows the volume and composition of an essential resource for the development and existence of workforce. Countries have been going through a demographic transition that brought about elements such as an ageing population, change in the composition of demand, evolution of different work related skills, higher female participation in workforce and migration. All these elements have changed the composition of the labour force and present different elements of comparative advantage for countries regarding the current phase of demographic transition that they are finding themselves. Investment is an important element that influences the potential of a country when engaging in trade. Countries either invest from domestic resources or manage to attract foreign direct investment towards increasing their comparative advantage. Investment in infrastructure and technology is the most common and helps countries to become more competitive. Energy and natural resources are unevenly distributed from a geographic point of view. This fact has divided the countries of the world in two main categories: countries that are resource abundant and countries with low levels of resources. The resource abundant countries are the ones that export natural resources and can influence the prices at global level. By contrast, the

countries that have insufficient resources are importers and have industries that suffer great shocks upon price changes. Oil is the most traded resource at global level but, as it has been proven, resource abundant countries also have to improve their technology in order to maintain their comparative advantage. Technology in today's automatized world plays a key role and innovations in technology can change the economic position of any country. The advance in technology registered in the last decades has changed the whole dynamic of international trade. Technological innovations such as electricity, telephones, and combustion engine or speed internet have facilitated such an advance and increased the level of trade. Changes in technology have also facilitated the rise of new economic poles and considerably reduced trade costs.

Over the past decades, new countries emerged as top player. Among these countries, we can highlight China, India, Malaysia, Thailand, Brazil, Mexico, Hong-Kong, Singapore, Taiwan, South Korea, among others. This process raised concerns regarding the position of the most developed economies but also on the effects that would arise for other developing countries. The questions that scientists from different research fields launched were related not only to trade volume but also to changes in the specialization patterns. The aim of the second chapter is to contribute to the concept and measurement of trade competition. Several indexes that have been used in previous studies and that have proven to be relevant have been presented in the research. After the presentation of several methodological options that are relevant for the assessment of the degree of trade competition, an empirical example has been approached. For a better understanding of this framework, the indexes presented for all types of competition have been applied on a small group of countries. I analysed the trade competition among eight economies that, according to PricewaterhouseCoopers (2017), are predicted to be the most important world economies in 2050: China (CH), India (IN), United States of America (US), Indonesia (ID), Brazil (BR), Russia (RU), Mexico (MX), and Japan (JP). As destination markets we chose the four most powerful European economies: Germany (DE), France (FR), the United Kingdom (GB), and Italy (IT). Trade data (in value and volume) is drawn from Eurostat using the Harmonized Commodity Description and Coding System (HS nomenclature). The largest level of sectoral disaggregation is HS6. Additionally, for incorporating inter-sectoral similarity, exports data (in value) classified in terms of HS2 and HS4 are also considered. Data was extracted for the year of 2017.

Aiming to provide a short debate of the analysis conducted in the second chapter, we can say that there is a wide range of indexes that can be used to measure competition but not all are as

relevant when measuring trade competition. One critical property when choosing the index to be further used in the measurement of all types of competition was the adaptability to be modified. None of the initially presented indexes provides inter-industry linkages, therefore creating the need for a modified version of the most applicable index that is relevant to this study. The Krugman index was modified in order to measure all the types of competition, covering the competition between two countries in a certain market up to global competition and has provided relevant results. For a wider perspective on trade competition, both structural similarity and geographical similarity should be considered therefore, the geographical spectre was included in the third chapter.

The aim of the third chapter is to analyse a modality for trade competition measurement that incorporates both the structural (or sectoral) similarity and geographical similarity; and to illustrate how this measure can be calculated and to provide detailed evidence for the case of the European countries (which together represent one of the most important trade partners in the international arena). The index used for the calculations from the 3rd chapter takes into consideration the structural similarity and also the geographical similarity feature (Crespo et al., 2020) and is the following:

$$Q_{ab} = \sum_{\substack{m=1 \\ m \neq a,b}}^{M} SSI_{abm}\left(1 - \omega\left|\frac{\delta_{am} - \delta_{bm}}{\delta_{am} + \delta_{bm}}\right|\right)\delta_{abm} + SSI_{a-b}\left(1 - \omega\left|\frac{\delta_{ba} - \delta_{ab}}{\delta_{ba} + \delta_{ab}}\right|\right)\left(1 - \sum_{\substack{m=1 \\ m \neq a,b}}^{M} \delta_{abm}\right)$$

The SSI_{abm} is a structural similarity index of countries a and b to market m and ω is a parameter that takes values between 0 and 1 ($0 \leq \omega \leq 1$) and aims to adjust the degree of importance given to geographical similarity in the overall measure. The overall measure Q_{ab} varies between 0 (representing minimum trade competition) and 1 (maximum trade competition). Maximum similarity means that the weight of each sector to each destination market is the same for the two countries and that each destination market has the same relative importance for the two countries.

For the purpose of an empirical testing to be as relevant as possible a wide range of data was included. In this direction the data was extracted from the Eurostat database (Eurostat, 2018) for the reference year 2015. The extraction of data started in September 2018 and lasted for a few months, due to the high number of countries considered and the large volume of products included. For this research the origin countries of exports taken into consideration were all of the 28 European markets. As destination countries of exports a number of 124 markets were

included in the study, with the inclusion of the European countries. The destination market countries (including the European countries) were the countries with the highest values of exports for the European market.

The exports included in this study are expressed in product categories (HS6) and value in Euros €, as they were extracted from Eurostat. Countries that wish to export certain goods use this six-digit code classification in order to have a common ground for customs procedures.

For this study the data extracted was for all of the product categories, therefore the entire 5300 groups of products that are divided in 99 categories. The main categories of products for HS2 level are: animal and animal products; vegetable products; foodstuffs; mineral products; chemical and allied industries; plastics and rubbers; raw hides, skins, leathers, furs; wood and wood products; textiles; footwear and headgear; stone and glass; metals; machinery and electrical; transportation and miscellaneous.

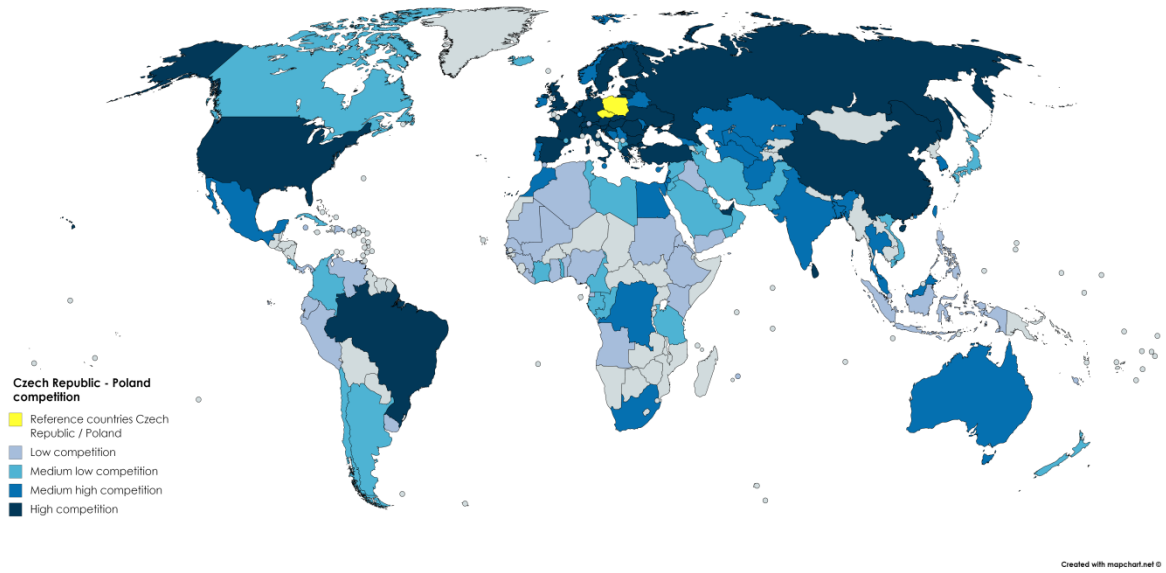
Appling the index Q_{ab} to the 28 European markets means that a total number of 378 country pairs can be established. For each of these pairs we compute the structural similarity indexes for the $(M-1)$ destination markets, which in this case corresponds to 123 markets. Even if only one structural similarity indicator (SSI) would be computed for every destination market of the 378 country pairs, this would represent calculating 46,494 individual indicators.

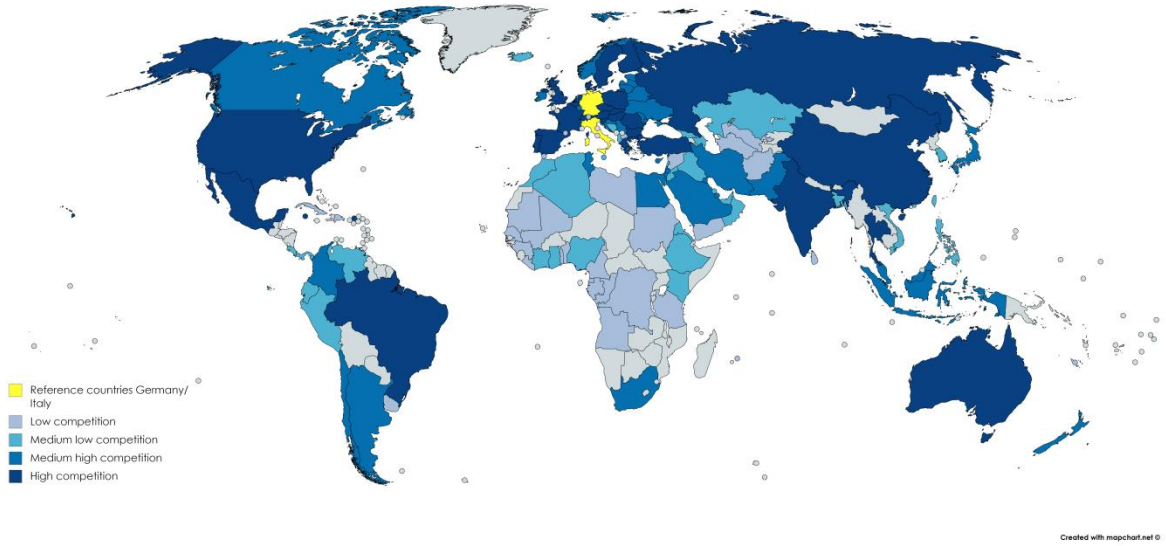
These combinations of country pairs are ranked according to the three values given for ω (0, 0.5 and 1). The European country pairs have been first ordered alphabetically. We can observe all the combinations in the table, their respective values obtained after applying the index for the three values and the ranking of the country pair in each of these combinations.

Each country pair can only be found once in the table. For example, the country pair Austria-Belgium is at the beginning of the table and therefore it will not appear a second time at the Belgium sector of country pairs. The same rule has been used when ordering the country pairs in the table and this would explain why at the end of the table Slovenia appears only with Slovakia and the respective values, as it has been listed separately with all of the other European countries. Exploring the evidence from these calculations the country pairs in the top 5 positions are: Germany-Italy, Czech Republic-Poland, Belgium-Netherlands, France-Italy, and Germany-France. It is important to stress that Germany, Italy and France appear twice as ranked in this top 5. These three countries have long historic ties. It is interesting to see their evolution together beginning from the foundation of the European Economic Community (nowadays European Union). The founding member countries of the European Economic Community were Germany, France, Italy, Belgium, Luxembourg, and the

Netherlands. Interestingly, another country pair that is also in top 5 is Belgium-Netherlands. For a true inclusion of the geographic factor, I further tried to relate the evidence obtained previously with the bilateral distances between the origin and destination countries. To this extent the distances between the county pairs calculated in kilometres have been extracted from CEPII database. I used the same country pairs that were considered in the initial part of the study, the data is arranged alphabetically instead of filtered according to highest similarity. In a combined table one can observe the 378 country pairs, the values obtained for Q_{ab} with $\omega = 1$, and the corresponding rankings for both variables. From the results we observe that all the five country pairs are at a relatively close distance, higher for Czech Republic-Poland and Germany-France but not entirely far for Germany-Italy or France-Italy. The most remarkable distance is between Belgium and Netherlands with only 173 km, this being the smallest distance between Belgium and any of the other countries. After these two tables were created in order to present the results obtained from the calculations, a more profound research was done in order to observe the structural and geographical similarities between the top five most competitive country pairs. Five maps were created and each map includes a table concerning destination countries and categorisation based on resulted competition from calculations. Each country pair has a number of 122 destination markets where their level of competition has been measured. In order to be able to build the maps, a threshold was outlined that was applied in all cases. The range of colours used is the same for all country pairs and the values of the countries where the competition is measured have been sorted by the same method. The reference country pair is represented with yellow in all five maps. The 122 destination countries have been sorted in four categories based on values obtained and depicted on the maps in different shades of blue. Categories 2,3 and 4 all contain 31 countries while category 1 only contains 29 countries. Category 1 is comprised by the 29 countries that represent the highest level of competition for the country pair therefore countries where the highest values were obtained and are depicted in the maps with the darkest shade of blue. Category 2 represents the countries with a medium high competition level and is formed by the following 31 highest values obtained, thus being coloured in a dark blue shade. Category 3 represents the countries with a medium low competition level and is coloured with a lighter shade of blue. Finally category 4 comprises the 31 countries that represent the lowest competition level for the considered country pair and subsequently the lowest values obtained; these countries being coloured in the lightest shade of blue. The countries that have been coloured in grey represent the economies that have not been included in this study.

Each map has a legend where the used colours are presented and the countries for which they have been used.





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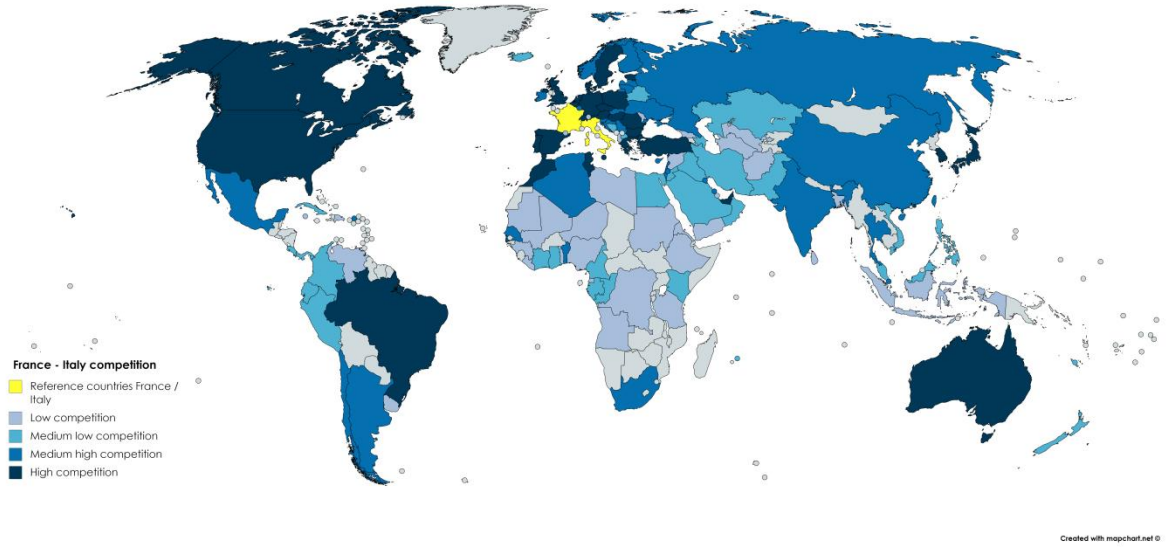

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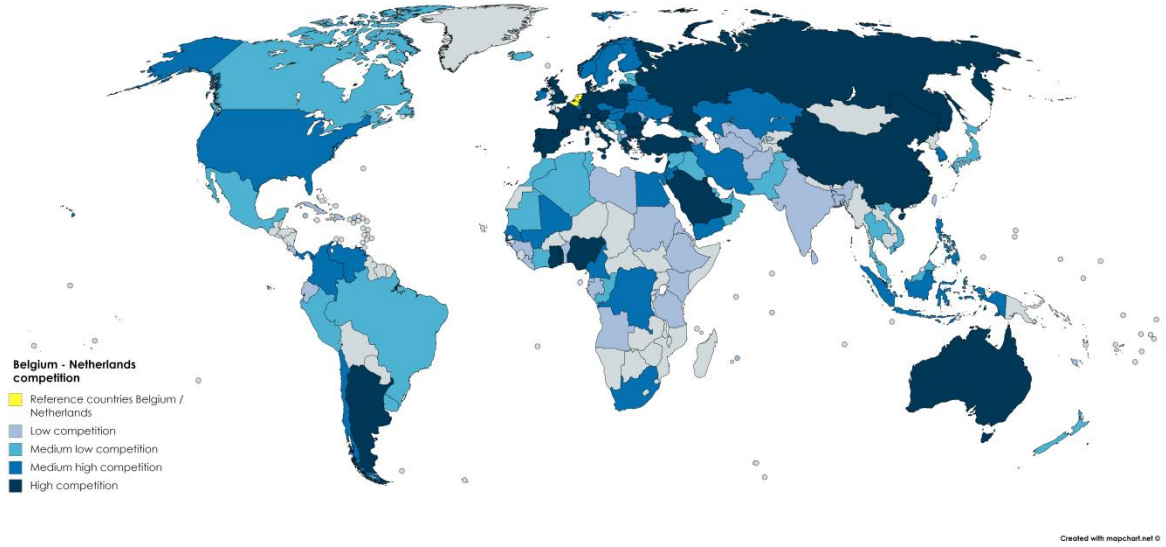

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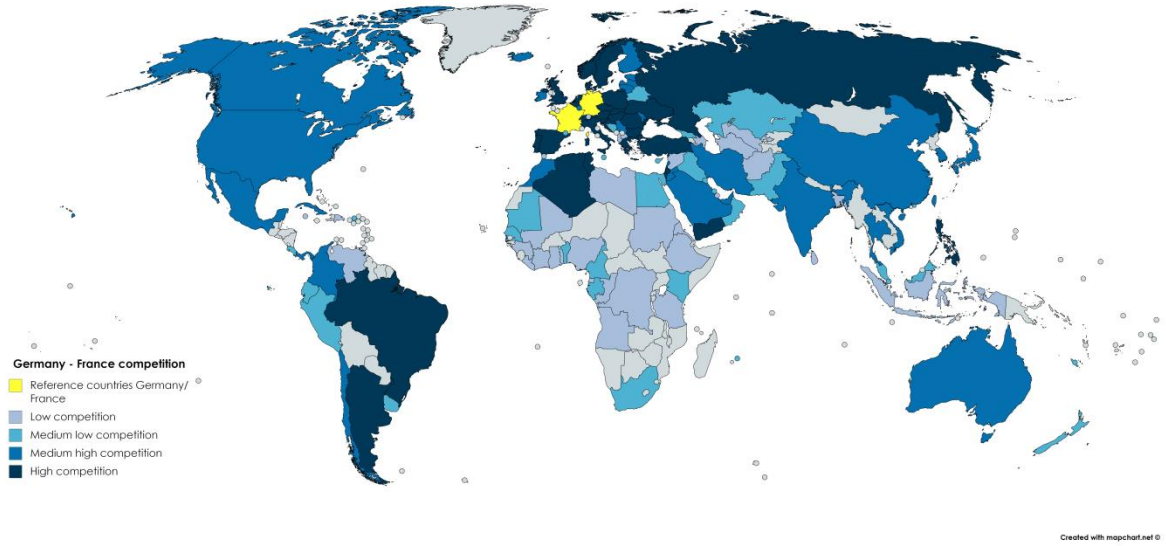

Throughout this thesis some of the meaningful elements of international trade have been studied, such as: key determinants of specialization, main trends in trade, trade competition, measurement of competition among countries and inclusion of the geographic element.

In these concluding remarks I would like to outline some of the most relevant results that were obtained from this research.

Literature review in any given research topic is the foundation for a thesis and the findings related to international trade were no exception in this case. The greatest challenge for our study was to select from the vast amount of studies available in order to outline the most important elements that can contribute to the topic. When considering further documentation on the measurement of trade competition a good starting point was finding the elements that shape international trade. After examining different options for structuring these elements the optimal choice was to have two groups: one group containing major trends in international trade and another comprised by the specialization determinants.

Topics such as globalization provide more than two million scholarly articles upon a simple click on any given search engine, therefore it can be categorised as the most important trend in international trade. After an in depth research it can been noticed that globalization has significant implications at both microeconomic and macroeconomic level, firstly through firms as units of analysis and through the relations between countries. Globalization being an

on-going process it keeps transforming from a time period to another. This phenomenon has augmented the circulation of people, goods, services, technology and money thus facilitating the global markets to be more and more open. Regarding globalization measurement, global trade volume and openness to trade have been included in most studies as they provide a substantial dimension of data. Often used indicators in research are exports and imports, and more specifically between the country's international trade ratio to GDP or GNP.

Regional integration is another key trend in international trade as it implies an interaction and construction of new organization forms between different territorial structures. In practice regionalization can be characteristic for the countries who intend to raise their level of collaboration in fields such as economics, security, politics and culture. The entrance of autonomous states into an association of more states through regional integration can provide positive outcomes such as: stronger trade integration, favourable environment for the private sector, improved infrastructure for the reinforcement of economic growth and regional integration, development of public institutions, lessening of social exclusion, contribution to peace and security and stronger interaction between the region and other regions worldwide.

Trade agreements contribute greatly to the facilitation of exports and imports therefore having a strong positive impact on international trade, thus becoming another key trend. Trade agreements exist in order to manage international trade between two or more countries through regulations regarding wide-ranging taxes, tariffs and trade settlements with the purpose of obtaining favourable outcomes for all participant parties.

Related specialty literature considers trade agreements alongside globalization and regionalization as main factors that influence the countries behaviour and their trade patterns. In our opinion these three elements created a global economic context where new economic poles emerged. Today's economic landscape is dominated by the group of most influential countries: USA, China, India, Japan, Germany, Russia, Brazil, Indonesia, United Kingdom and France, as per (PWC, 2017). The existence of new economic poles has led to the formation of a multipolar global economy as a key trend in the evolution of international trade.

A holistic view on the topic is presented with the inclusion of the most important theories regarding trade. The countries trade behaviour has been a topic that attracted the attention of some of the greatest personalities in the field, starting with Adam Smith who introduced the theory of absolute advantage and demonstrated its importance in trade between countries and

David Ricardo who was one of the most influential economists who developed his comparative advantage theory and argued in favour of the positive implications on economy, on specialization and free trade. Economists Eli Heckscher and Bertil Ohlin developed the Heckscher–Ohlin model based on David Ricardo's comparative advantage model. The Heckscher–Ohlin model foreshows patterns of commerce and production taking into consideration factor endowments of each trading region. Other economists have been included who have applied the H-O model in their empirical studies and obtained important results, such as: Tadeusz Rybczynski with the Rybczynski theorem and Wassily Leontief with the Leontief paradox. Economists Michael Posner and Raymond Vernon have developed original theories based on international differences in technological development. Another category of researchers developed international specialization models. The neo-Marxism theory was introduced by Jacques Mistral and illustrated that a country that possesses capital accumulations has the possibility to set new production standards and further achieve a leading position internationally. Several theories were presented and having the following authors: Robert Boyer, Michel Aglietta, Gerard Lafay and Michael Porter; that study competitiveness poles. Michael Porter also developed important work related to competitive strategy and cluster mapping (Porter, 1998). His theory demonstrates that through aiding clusters and regions to increase their economic performance, the competitiveness of a country can also be increased. He finds that a connection exists between the presence of innovative clusters of related industries and high economic performance in certain regions, such as Silicon Valley in the USA (Porter, 1990).

Paul Krugman developed in the new trade theory, the theory regarding heterogeneous firms and the new economic geography. The latest theories on international trade show that competition among two or more countries can fully be examined only if the cultural, historical, economic, geographic aspects are also included.

Countries may have numerous reasons to specialize in a certain field; however some major determinants have a greater influence. In this thesis the specialization determinants have been grouped in the following way: demographic variations, investment, technological advance, natural resources and latest changes influencing economy in 2020.

Changes in global demography are an essential element that influences practically every country in the world. The studied literature shows that the global population is at a very high level and in a continuous increase therefore making a future world food crisis inevitable. Not

all of the countries find themselves in the same phase of a demographic transition, this results in the fact that some countries have an aging population and low birth rates while others have a growing population and high birth rates. Literature suggests that developed countries like majority of the European countries and advanced Asian nations have high life expectancy rates and low birth rates. Developing countries have a continuous growth in population but not very high life expectancy. Migration is another principal phenomenon that touches almost all economies, whether considering the departure country of the migrators or the destination country. Countries receiving immigrants will have an increase in work force but will face issues regarding their integration. The departure country of immigrants will have a decrease in workforce and will not be able to take advantage of the education and benefits invested in those people. Female participation to higher education and to the work force has increased greatly in the last decades. General increase in global population, aging population, higher female labour participation, increase in skilled workforce and increase in global migration have completely changed the composition of the workforce and have significant effects on countries behaviour regarding trade.

Investments made in certain branches of an economy can produce effects that create competitive advantage for that country. National investments are most commonly directed towards public infrastructure, information and telecommunication technology and human capital. Such investments may come from domestic savings or foreign direct investment with the intention to enhance the international trade changes of a country. Capital attracted from foreign countries demonstrated to be all-important in the development of global supply chains. Investment in human capital provided more skilled workforce, investments in infrastructure have increased the countries competitiveness regarding transportation of all types and investment in technology has further facilitated trade; overall producing great comparative advantages that influence trade patterns.

The level of technological development of a country is often regarded as a good indicator towards its level of development and income level. Technological development greatly influences the countries future prospects for engaging in trade and also its exports and imports. Main technological breakthroughs and inventions (from electricity to fast internet) have facilitated the very fast growth of international trade. Technological transfers between countries happen through technology spillovers that have proven to be beneficial to all partners. Innovation in technology demonstrated the possibility of the emergence of new powerful economies, and decreases in transportation costs and trade costs, and the extension

of technological transfers have influenced the emergence of new specialization and trade models.

The possession of natural resources by a country can by its own produce a great comparative advantage. Unfortunately the distribution of natural resources among the countries throughout the globe is uneven and some natural resources have the property of being limited or cannot be augmented; therefore worldwide economies have developed options for the production of renewable energy based on sunlight, wind, rain, tides, waves and geothermal heat. Presently countries that possess great quantities of natural resources have a certain advantage from economic standpoint but should examine new perspectives for the future. Countries have shaped their specialization based on their resource abundance or lack of resources and further influenced trade patterns.

Finally demographic variations, investments, development in technology and the efficient use of natural resources are main specialization determinants and subsequently have a contribution on the competition among countries.

Challenges presented in the latest Trade Report by WTO (2020) give an insight regarding the future of international trade. The report demonstrates that government policies are more important than ever, as they can promote innovation if they adjust to the digital era. International cooperation is of utmost importance in the field of innovation policies. A reflexion on recent years presents the following concerns: (i) agriculture, namely food insecurity for poor countries and over production of food; (ii) underrepresentation of women in certain fields; (iii) the negative outputs of heavy industries on the planet and (iv) effects of the Coronavirus global outbreak.

Trade competition can be measured in various methods and the main indexes used in studies have been presented in the first part of the second chapter. The index that resulted to be the most used in existing research and that was the base for this thesis was the Krugman index. In the present research trade competition was measured through sectoral shares and other dimensions of structural similarity were also explored such as the intra-sectoral dimension and the inter-sectoral dimension. The basic perspective used for trade competition measurement was the one of countries pairs competing in a given destination market. Research shows that the other relevant perspectives are: competition in a block of countries, competition between two countries in all markets, competition that a country faces in a specific destination market from all the others, competition that a country faces in all

markets, competition in a given market among all the countries and competition between all countries in all markets. All these elements help develop a more complete view on structural similarity measurement. In chapter two all the perspectives of competition were thoroughly analysed with indexes, explanations and visual tools. An example based on the exports between some European countries to a few of the most important destination markets provides the applicability of the index in all of the competition perspectives. Through this empirical example some research questions were answered: the degree of competition between United States, India, and China in the German market was measured; the degree of competition between the United States, India, and China in the group of destination markets including Germany, France, Italy, and the United Kingdom was measured; the degree of competition faced by China in the German market by all the remaining exporting countries in this example was measured; the degree of competition faced by China in the four most important European markets (Germany, France, Italy, and the United Kingdom) by the other exporting countries was measured; the degree of competition in Germany that exists among China, India, United States, Indonesia, Brazil, Russia, Mexico and Japan was measured; and finally the degree of competition in the group of the European countries considering China, India, United States, Indonesia, Brazil, Russia, Mexico and Japan was measured.

The final chapter represents the empirical contribution of our study and assures the measurement of trade competition with the inclusion of the geographical perspective. In this sense it was mandatory to evaluate the importance of different destination markets for the exporting countries. In this sense, the degree of geographical similarity was calculated so as to measure how great the relative importance is for each destination market in the overall exports of each country. The third chapter covered two objectives: the perspective of trade competition measurement that incorporates both the structural (or sectoral) similarity and geographical similarity and the illustration of this measurement with the detailed explanations regarding the example of the European countries. A modified version of the Krugman index was presented that also includes the geographical aspect alongside a short example that proves its applicability. This version of the index was the base for all the calculations in chapter 3.

A large panel of data was included in this final chapter in order to provide a complete and relevant set of results and conclusions. All 28 European countries were considered and 96 non-European markets that provided 378 country pairs used in calculations. The values in Euros regarding exports were extracted from Eurostat, at HS6 level with the inclusion of all

product categories for all 124 countries. After the application of the index for all 378 country pairs a very interesting ranking resulted. For a better understanding of the geographical aspect of competition, the bilateral distances were extracted in km and combined in a joint table to indicate the findings side by side. The country pairs that resulted to have the highest degree of competition are: Germany-Italy, Czech Republic-Poland, Belgium-Netherlands, France-Italy, and Germany-France. These country pairs were the ones with the highest ranking upon applying the modified index that includes both geographical similarity and structural similarity (that is accomplished by using the exports of each pair of countries in all the included destination markets). However the countries with the smallest distance in kilometers between them are: Austria-Slovakia, Estonia-Finland, Hungary-Slovakia, Belgium-Netherlands and Belgium-Luxembourg. The five country pairs that have the highest degree of trade competition based on the index were further researched and evidence was brought supporting the similarity level. The most competitive country pairs resulted to be similar in the following components: culture, history, shared boarders, geographical proximity, currency, level of development, technological advance, trade agreements, membership to regional groups (the European Union), education level and categories of products exported. All these similarities strengthen the findings resulted by applying the modified Krugman index.

Year 2020 was majorly marked by the outbreak of the COVID 19 virus that transformed into a pandemic, as declared by the World Health Organization in March (WHO, 2020). The fast spread of the virus forced governments all around the globe to resort to nation-wide lockdowns. The IMF (2020) is predicting a worse financial crisis then the one from 2008-2009. Due to lockdowns at global level the most affected economic sectors have been: transportation, entertainment, car manufacturing, hotels, restaurants and tourism therefore forcing companies to reduce or suspend their activity and let their employees go (Fernandes, 2020). Finally, the Coronavirus pandemic may produce negative effects for globalization on a short term, therefore the world will be going through a process of de-globalization (Shukla, 2020). Global economy is going through a momentous phase, with a decreased level of international trade, high levels of unemployment, a global health threat and numerous other challenges that most probably only international collaboration will be able to aid.

In conclusion, this thesis has managed to bring improvements to the Krugman index and to provide a more complete view on the measurement of structural similarity. Throughout the thesis we have studied some strategies regarding specialization and the strategies regarding

trade integration and the benefits of international trade agreements. The role of international organizations such as the WTO is of great importance in order to successfully coordinate and support global trade. We demonstrated that a better measurement of trade competition can be obtained by using elements such as structural similarity between countries and geographic proximity. Finally, national economies, regional economies, global economy and companies engaging in trade may benefit from the findings of this study. A better understanding of the competition can bring perspective for a country, in order to know its top competitors and the markets they face the highest competition in. This information can influence the future national strategies regarding specialization and trade, or can consider destination markets with low competition as future opportunities in all the development and application phases of the international economic trade strategies. For companies the information regarding competition can be useful both prior and after engaging in international trade. Information concerning top competitors can give insight and be useful when developing projects and specialization strategies. Knowing this information about the highest competition regarding industrial sectors, total values of exports and groups of countries and products can develop company strategies related specialization in production and exports. Before companies engage in international trade they can use this index to study the main competitors in the field they are operating at the moment of the research. The branches where low competition is detected can be perceived as future opportunities for development and help in potential restructuring of the firms. Therefore, companies, holdings, national economies and regional groups can benefit from the information provided in this research. The present study shows that international trade is a complex field of research that needs the inclusion of multiple factors in order to obtain a more complete view. The modified Krugman index presented includes both the geographical similarity and the sectoral similarity, it allows for a large number of countries to be included in the panel that have provided a great amount of information. Such results help economies in determining possible advantages or disadvantages in increasing their trade volume.

For future research the geographic spectrum can be studied even more in depth by including continents, the level of development of countries, categories of transport or types of goods. This could be obtained through the modification of the index by adding these particularities.

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