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The Portuguese Textile and Clothing Exports - A gravity model analysis

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Abstract

Portuguese textile and clothing industries are internationally recognized and valued for their quality, innovation, and creativity; therefore, they have already secured a significant share in the foreign market. Over the years, textile and clothing exports have been steadily increasing, benefiting our economy from this ongoing evolution. However, the economic literature related to these sectors is quite insufficient. This study examines the key determinants of Portuguese textiles and clothing exports, as well as the differences among them, using an augmented gravity model. Panel data and fixed-effects models were employed for the analysis, considering the top 50 countries to which Portugal exported both textiles and clothing between 2000 and 2019. The study empirically assessed a wide range of variables, such as market size, income, distance, shared borders, common language, and the existence of trade agreements described in previous studies, and identified statistically significant determinants of Portuguese textile and clothing exports. The results and conclusions of this research align with similar studies. However, we highlight the significant positive impact on textile and clothing exports associated with a shared border with Spain and, specifically on clothing exports, the presence of a fashion capital in the destination market. The study provides valuable empirical insights for policymakers and industry professionals to make informed decisions, whether in trade policy, encouraging the internationalization of companies, or forecasting trends in the Portuguese textile and apparel trade flow.

JEL Classification: C33, F14, L67

Keywords: International Trade, Gravity Model, Textile and Clothing, Exports.

Resumo

As indústrias têxteis e de vestuário portuguesas são reconhecidas e valorizadas internacionalmente pela sua qualidade, inovação e criatividade, pelo que já conquistaram uma quota importante no mercado estrangeiro. Ao longo dos anos, as exportações de têxteis e vestuário têm vindo a aumentar progressivamente e a nossa economia tem beneficiado desta evolução contínua. No entanto, a literatura económica referente a estes sectores é bastante insuficiente. Este estudo analisa os principais determinantes das exportações portuguesas de têxteis e vestuário, bem como as diferenças entre eles, utilizando um modelo gravitacional aumentado. Foram usados dados em painel e modelos de efeitos fixos. Para a análise, foram considerados os 50 principais países para os quais Portugal exportou tanto têxteis como vestuário entre 2000 e 2019. O estudo avaliou empiricamente uma grande variedade de variáveis, como a dimensão dos mercados, o rendimento, a distância, a fronteira partilhada, a língua comum e a existência de acordos comerciais descritos em estudos anteriores e verificou os determinantes estatisticamente significativos das exportações portuguesas de vestuário e têxteis. Os resultados e conclusões desta investigação estão em linha com os estudos idênticos. Contudo, salientamos o grande impacto positivo sobre as exportações de têxteis, e de vestuário, associado à partilha de fronteira com Espanha, e sobre as exportações de vestuário associado à presença de uma capital da moda no mercado de destino. O estudo fornece factos empíricos úteis para decisores políticos e profissionais da indústria de modo a tomarem melhores decisões seja de política comercial, ou de incentivo à internacionalização das empresas, ou mesmo na previsão tendências no fluxo comercial português de têxteis e vestuário.

Classificação JEL: C33, F14, L67

Palavras-chave: Comércio Internacional, Modelo Gravitacional, Têxtil e Vestuário, Exportações.

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List of Abbreviations

AFTA – North American Free Trade Agreement

AICEP - The Portuguese Agency for Investment and External Trade

ANIVEC – National Association of Clothing and Apparel Industries

APEC - The Asia-Pacific Economic Cooperation

ASEAN - Association of Southeast Asian Nations

ATC - Agreement on Textiles and Clothing

ATP - the Textile and Clothing Association of Portugal

CENIT – Associative Centre of Textile Intelligence

CITEVE - Technological Centre for Textile Industries

CPLP - Community of Portuguese-Speaking Countryf

EU – European Union

EURATEX - The European Apparel and Textile Confederation

FTA - Free Trade Agreement

GDP - Gross Domestic Product

GM – Gravity model

IAPMEI - Institute of Support to Small and Medium Enterprises and Innovation (of Portugal)

INE - National Institute of Statistics (of Portugal)

ITV - Textile and Clothing Industries

NAFTA - North American Free Trade Agreement

SAFTA - South Asian Free Trade Area

SMEs - Small and medium-sized enterprises

T&A- Textile and Apparel

T&C – Textile and Clothing

WTO - World Trade Organizat

1. Introduction

Whenever a company decides to initiate its internationalization, it must conduct a series of market analyses to choose the one that better suits its strategy and company goals. However, there are a variety of determinants that influence the performance of exports and, as reported by Sousa et al. (2008) review, those determinants may be classified as internal or external factors, depending on whether they refer to exporting marketing approach, business and management attributes or domestic market characteristics. The literature on bilateral trade flow displays a varied set of determinants. Studies have researched a large variety of factors affecting international trade in products and services across numerous industries, either at a sectorial level or at multiple industries. Constructing the optimal combination of gravity model variables is required to identify the significant aspects and categorize them meaningfully (Chu et al., 2019).

The clothing sector has an important weight and role in the national economy. The national textile and clothing industries are highly regarded and recognized industries both nationally and internationally. Based on the data released recently by the National Institute of Statistics (INE), the Textile and Clothing Association of Portugal (ATP) states that, in July 2018, the sector's exports totaled 553 million euros. IAPMEI[1] projects an ambitious scenario stating that in 2025 the Textile sector will have more than 4,000 active companies generating 8 billion euros in turnover, 6 billion euros in exports, more than one billion euros in net balance payments, and more than 110,000 direct workers.

Many studies on international trade in textiles and clothing are based on the gravity model, either for world trade or trade in specific blocks. However, to the best of my knowledge, there are none for Portugal. As a result, this paper's purpose is to fill the research gap. Therefore, this research intends to answer the following question: What are the determinants of Portuguese clothing and textile exports to the world based on the gravity model? Furthermore, we will analyze if there are any differences between the determinants of Portuguese clothing exports and Portuguese textile exports, as these are

[1] Source: IAPMEI - Instituto de Apoio às Pequenas e Médias Empresas e à Inovação https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Industria-e-Sustentabilidade/Informacao-Setorial/DOCS_InfSetorial/Ficha_SetorTextileVestuario.aspx

two distinct industries. In addition, the available literature about the influential determinants of bilateral trade, including macro (aggregate) and micro (sector level), within the gravity model will be reviewed. To accomplish the study goal, the key factors of the research about global cross-industry trade and specific textile and clothing trade were identified and categorized based on the studies on international bilateral trade flows accomplished between 2000 and 2022. This period was selected so that we could have an evolution of sectors' last two decades. The last three years were not considered since they were very atypical due to the COVID-19 pandemic.

This study will allow us to understand the critical factors affecting Portuguese clothing and textile exports, which are relevant to both industries, their associations, and firms. The results may help them better understand these critical factors, providing analysis for future research on the clothing trade. This will enable the simulation of the evolution of exports to a given country and help implement new strategies. Furthermore, the study can be a tool for better formulating public policies and may contribute to spreading knowledge on international business and trade.

This dissertation seeks to identify the main determinants and issues regarding Portuguese Textile and Clothing exports worldwide. This is relevant for Portuguese textile and clothing firms to expand their export activities, as well as for the design of better public policies in this area. With this objective, the study is organized into five different sections. Section two presents the literature review on the textile and clothing industries and their general framework in Portugal and the European Union. The gravity model and the determinants of exports are also explored. Section three describes the main trends in Portuguese exports of Clothing The methodology is presented in Section four, where the gravity model is adapted, and the export equation is specified. Section five of this work presents analyses and discusses the main results. Finally, the last section will give a summary and the main conclusions.

2. Literature review

The literature review is segmented into three main parts; in the first part, we contextualized the textiles and clothing industries worldwide and at European and Portuguese scales. The second part will present the gravity model with the main determinants. This is followed by a selection of literature on textiles and clothing exports which uses the gravity model and its applications concerning the textiles and clothing industries worldwide.

2.1 An Overview of the World Textile and Clothing Trade

The textile and clothing industries (T&C industries) are highly diversified. The products consumed by private households and businesses include raw materials, natural and artificial fibers, and semi-finished/finished products. Industrial textiles are present in almost every industrial sector, hence their importance. The T&C industry relies on the agricultural sector since it requires natural fibers, for instance, wool or cotton, and on the chemicals industry to produce artificial fibers, mainly nylon or polyester (Stengg, 2001).

Globalization has significantly impacted the T&C industries, as it has had on many other industries. Many developing nations, as well as the least developed ones, have become extremely competitive in T&C due to combining lower labor costs (mostly in clothing production) plus textiles of high-quality equipment and the know-how acquired from more industrialized nations (Stengg, 2001).

One of the most widely distributed economic sectors is the T&C industries. Several factors contribute to its importance, namely, the fact that it provides fundamental consumer goods, which are crucial for every country and region, and is labor-demanding, especially for clothes. Finally, it is simple to implement. This sector represents one of the earliest stages of economic development or diversification for many countries, allowing them to move away from dependence on fundamental necessities (Scheffer, 2012).

2.1.1 Textile and Clothing Industries in Europe

The textile and clothing industries are one of the EU's most important and largest industrial sectors. In 2001, these industries already employed more than 2 million people

in Europe, making them a vital element of the industrial economy. Its significance for social and economic cohesiveness is heightened because it is mostly represented by many small and medium-sized businesses, many of which are located in specific areas and contribute significantly to the local economy and cultural legacy (Stengg, 2001).

Due to a combination of technical advances, the introduction of significant foreign competition, the evolution of production costs, and the abolition of import restrictions in 2004, the industry has seen a series of important shifts in recent decades.[2] The textile and clothing business is amongst the most globalized, with the global market accounting for 38% of EU sales in 2019. Free trade agreements provide market possibilities for the ecosystem. The European Commission aims to guarantee that international trade is conducted on a fair playing field. It accomplishes this internationally by implementing World Trade Organization accords and on a bilateral level by implementing Free Trade Agreements. Textiles and clothing have demonstrated strong export performance, with a 58% increase in exports to global markets, from 2010 to 2019, compared to a 43% increase in imports.

Regarding employment, according to the 2018 annual report of The European Apparel and Textile Confederation (EURATEX), in the whole EU manufacturing sector, this industry represents 5% of the workforce and 9% of the enterprises, with over 4% of total goods exports. Four nations account for more than half of EU employment. Italy is home to a high number of businesses, and other high-employing countries include Romania, Poland, and Portugal (Napierala et al., 2018).

According to the European Commission, the top producers in 2019 were Italy, France, Germany, Spain, and Portugal. They represented almost three-quarters of EU production. Northern countries like Germany, the Netherlands, Belgium, and Austria contributed more significantly to textile production, particularly technical textiles. In contrast, Southern European Union countries contributed more to total clothing manufacturing.

Regarding international trade, Italy is the country that exports the most to non-EU members, the leading extra-EU clothing exporter, with a percentage of 34% of total extra-

[2] Source: Official website of the European Union- https://ec.europa.eu/growth/sectors/fashion/textiles-and-clothing-industries/textiles-and-clothing-eu_en

EU exports of clothes by value. Germany, Spain, France, and the Netherlands follow Italy. Germany is the top EU importer of clothing from non-EU nations, with 23 percent of total extra-EU imports of clothes by value. It is followed by Spain, France, the Netherlands, and Italy, respectively. China led non-EU clothing imports with 29% of total extra-EU clothing, followed by Bangladesh, Turkey, the United Kingdom, India, Cambodia, and Vietnam.

According to Euratext (2019), in 2018, the EU was the world's second-largest exporter of textiles and clothing, accounting for 23% and 28% of world exports, respectively. The Euratext report indicates that Intra-EU exports were 73 percent of EU trade. This is explained by the fact that T&C companies in Europe typically have a small size, which is why they mostly deal inside the EU (Napierala et al., 2018). Since 2009, the value of EU Member States' intra-EU exports has increased by 68 percent[3].

According to EUROSTAT, in 2019, the EU Member States imported clothes totaling €154 billion, 52% originating from non-EU Member States, that is, more than €80 billion. Since 2009, the value of clothing imports by the EU Member States has increased by 62%.

Overall, the European textile and clothing industries are facing several challenges; however, they remain a significant contributor to the region's economy. These companies can thrive in an increasingly competitive global marketplace by embracing sustainability and digital technologies and adapting to changing consumer preferences.

2.1.2 The textile and clothing industries in Portugal

The textile and clothing industries have long played a significant role in the economy of Portugal. According to data from the National Statistics Institute of Portugal, the textile and clothing sector accounted for approximately 4% of the country's total industrial production in 2019. In the same year, the sector employed around 70 000 people, making it a significant source of employment in the country (Statistics Portugal, 2021).

Amador (2009) discusses the structure of the textiles and clothing sectors in Portugal, highlighting that most firms are small to medium-sized enterprises. Additionally, his

[3] Source: EUROSTAT - European Statistics https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20200424-1

analysis notes that the percentage of firms that export is relatively small and that the average export intensity is moderate.

In Portugal, these sectors have a long history of participation and competition in international markets, starting with their accession to the European Free Trade Association in 1960 (Amador & Opromolla, 2009). The liberalization resulting from this accession helped to expand the textiles and clothing sectors in Portugal, which had a relatively labor-intensive nature, matching the country's abundant labor supply (CITEVE, 2012). Portugal's accession to the European Economic Community (EEC) in 1986 and the implementation of the European Single Market in 1993 increased the level of liberalization in these sectors.

The EEC market was protected by import quotas imposed under the Multi-Fibre Arrangement (MFA), which gave Portuguese exporters a competitive advantage in the European market. However, eliminating these quantitative restrictions under the Agreement on Textiles and Clothing (ATC), phased from 1995 until 2005, had consequences for the global and European markets (Amador & Opromolla, 2009).

These changes were particularly beneficial for large-scale quota-constrained producers, notably China, which joined the World Trade Organization in 2001 after 15 years of negotiations (Amador & Opromolla, 2009). The enlargement of the European Union in 2007 to include Romania and Bulgaria, countries with relatively lower labor costs and significant textiles and clothing sectors, posed further challenges to Portuguese exporters concerning the relocation of production (CITEVE, 2012).

Therefore, the end of the Multi-Fibre Arrangement, the entry of China into the WTO, and the entrance of Romania and Bulgaria into the European Union represented significant challenges faced by the Portuguese textiles and clothing industries. In fact, despite their historical experience in these sectors and their earlier advantages, data shows a significant loss of Portuguese market share in textiles and clothing between 1997 and 2006.

Consequently, the Portuguese textile and clothing companies have had to focus on specialization and innovation, investing in new technologies and designs to differentiate themselves from competitors (CITEVE, 2012). Moreover, there has been a great

investment in new distribution channels, the development of new products, market diversification, certification, and the improvement of services.

One of the key factors driving the success of the textile and clothing industries in Portugal is the country's strong tradition of craftsmanship and high-quality production. Portuguese textile and clothing companies are known for their attention to detail and commitment to producing top-quality products. This reputation has helped the country to establish itself as a leading supplier of high-end fashion and luxury goods to international markets (Miranda, 2014). Regarding the high international recognition and the strong export capacity, the Portuguese products of this sector are already in several foreign markets, such as Spain, France, Italy, Germany, Netherlands, the United Kingdom, and the United States of America. Moreover, due to its capacity to create wealth and employment, these industries are highly valuable for the Portuguese economy (AICEP, 2018).

Overall, Portugal's textile and clothing industries are a vital part of the country's economy, providing employment and contributing to the country's reputation for producing high-quality products. Although the sectors have faced some challenges, they have demonstrated a strong ability to adapt and evolve in the face of changing market conditions, positioning themselves well for future success.

2.2 The Gravity Model

To ensure firms' continuity and development, it is crucial to identify the determinants that influence trade performance (Sousa et al., 2008). The gravity model is largely used to analyze international trade and understand the determinants of exports (Rahman et al., 2019). All the studies reviewed concentrated on econometric analysis and applied this model to choose the determinants for bilateral trade (Chu et al., 2019).

The Gravity Model (GM) is an econometric model based on ex-post data analysis (Nascimento & Pregardier Júnior, 2013). Since the effectiveness of this method has been proven in the study of trade relations, GM has been widely used to assess the various issues related to trade relations and policies (Gonçalves, 2014). This model has been extensively used largely due to the relevance of the results obtained through it, i.e., the results fit and represent reality (Ho et al., 2020). Moreover, the data required to develop

the model is relatively easy to access, and there are also established standards to develop the GM that allow for an easy understanding of the model and its manipulation (Gonçalves, 2014).

The GM originated in Newton's Gravitational Theory (Sohn, 2005). According to the physicist Newton (1687), the physical gravitational force that attracts two objects in any region of the Universe rises with the mass of two bodies and declines with the physical distance between them. The economic gravity equation tells us that bilateral trade (T_{ij}) is positively related to the economic size of two countries ($Y_i \times Y_j$), measured by the GDP, and negatively related to the distance (D) between them (Deardorff, 1998). This simplistic version of the gravity model is represented by Equation 1, where A represents the proportionality constant, and i and j stand for each country.

$$T_{ij} = A \times \frac{Y_i^{\alpha} \times Y_j^{\beta}}{D_{ij}} \quad (1)$$

It's important to point out that this basic gravity framework has been expanding throughout time by adding new variables capable of having a substantial impact on international trade flows as a result of the changes in the world economy and globalization (Walsh, 2011). Therefore, the gravity model was extremely relevant to developing the CAGE framework. The CAGE model uses trade gravity studies to identify the main determinants of trade in terms of their cultural, administrative, geographical, and economic nature (Chi & Kilduff, 2010). Differences in language, ethnicity, religion, race, and social norms are cultural distance dimensions. Some studies have identified linguistic similarities as one of the most important factors influencing international trade. Linguistic similarities can boost international trade, while language differences might stymie it (Ghemawat,2001).

Regarding administrative or political factors that influence exports, a shared regional commercial bloc and a shared currency, historical linkages (like colonial relations), government policies, and institutional quality are all essential factors that enhance trade flows (Ho et al., 2020). Many studies show that integration in a trading bloc, like ASEAN,

NAFTA, or EU, favors bilateral trade flows between member nations. Other aspects, such as having a shared border, topography, a lack of sea or river access, variances in temperature, or poor transportation and communication linkages, should be considered when assessing geographic distance beyond the distance between the country's capital. Distance is predicted to negatively influence trade flows (Abbas & Bhutto, 2022). Regarding economic determinants of trade, GDP, disparities in per capita income, and exchange rate are considered economic variables that influence trade patterns. Some authors consider a consumer's wealth or income the most significant economic quality developing distance between nations (Ghemawat, 2001).

Some of the variables mentioned above and included in the gravity model are variables that either boost or restrict trade between countries and refer to specific linkages involving the two trading nations, like a shared membership in a trade bloc, a common native language, geographical closeness, a past colonial relationship, and cultural affinities (Chan & Au, 2007). These linkages are revealed to influence trade intensity between trading partners.

2.3 Studies on T&C exports using the Gravity Model

The gravity model has been widely used in the literature on sectoral trade to analyze bilateral textile and clothing trade. In Table 1, one can find a list of gravity trade research papers focusing on studies employing econometric methods. The aim is to identify the most used determinants of bilateral trade in the textile and clothing industries, as well as other determinants. The country and the period of study are also presented. Table 1 also includes a compilation of all used variables that influence the exports of T&C on the selected review. Through this table, it is possible to have an overview of the economic, geographical, cultural, and administrative determinants.

The research was conducted at Scopus, Web of Science, and Google Scholar in February 2023 to arrive at this literature selection. This dissertation focuses on more recent studies, with one of the filters being from 2005 to the present day. The keywords used to find the selected studies were "textile," "clothing," "gravity model," "Textile and clothing industries," "EU," "Portuguese textile industry," "clothing trade," and "textile trade." Note that a larger number of papers used the gravity model to study the determinants of exports.

Still, those not specifically on textile exports, clothing exports, or both were excluded. We also excluded studies not conducted in English or Portuguese and several articles due to duplication or irrelevance.

Table 1. List of studies that use the gravity model to study trade in textiles and/or clothing

Authors & Year	Country of study	Industrial Sector	Period of study	Used variables on T&C
Chan and Au (2007)	China	Textiles	1985-2004	GDP, GDP per capita, distance, population growth, real exchange rate, ASEAN, EU, NAFTA, WTO
Chan et al. (2008)	India	Textiles	1985-2005	GDP, GDP per capita, distance, population growth, real exchange rate, EURO, WTO
Tsang and Au (2008)	South and Southeast (S&SE) Asian developing countries	Textile & Clothing	1990-2005	Total production T&A, total apparent consumption of T&A, labour cost, distance, NAFTA
Chi and Kilduff (2010)	US	Apparel	1995-2006	GDP, GDP per capita, distance, population, population growth, infrastructure degree, common adjacency, common language, literacy, tariffs, APEC, CBI, NAFTA, WTO
Lau and Bilgin (2010)	China	Textile	1989-2009	the unit price of apparel cotton, GDP per capita
Lee et al. (2014)	OECD countries	Apparel	2005-2007	Apparel supply, potential apparel demand, fashion capital
Orkan Özer (2014)	Turkey	Textiles	2007-2012	GNP per capita, population, distance, real exchange rate, EU, Muslim countries, custom tariff towards the textile products of countries being bigger than the 6.6%
Marcanas (2015)	ASEAN	Textile & Clothing	2000-2012	GDP, population, distance, absolute value of per capita differential between exporter and importer, contiguity, landlocked, island, common official language, a common language is spoken at least 9%, common colonizer, time difference, colonized by the other, common religion, AFTA, common AFTA membership
(Chen et al., 2017)	Asian Countries	Textile & Apparel	1988-2004	GDP, distance, common border, common language, non-trade barrier, landlock, simple average of applied tariffs on imports, simple average import tariffs for most favored nations, weighted average import tariffs for most favored nations

Lau et al. (2017)	China	Textile & Clothing	1990-2005	Exports of T&C, GDP, GDP per capita, distance, population, exchange rate, labor costs, female, value-added amount in T&C industries, EU, US, effects of China's accession to the WTO since 2001
(Rahman et al., 2019)	Bangladesh	Textile & Clothing	1990-2017	GDP, GDP per capita, Value of absolute differences in per capita GDP, distance, exchange rate, WTO, EU, BRICS, NAFTA, ASEAN, Middle East
Ho et al. (2020)	US, Asia	Clothing	1998-2018	GDP, distance, exchange rate, landlock, WTO, BRI
(Abbas & Bhutto, 2022)	Pakistan	Textile & Clothing	2003-2019	GDP, distance, relative prices between Pakistan and trading partners, common language, common border, SAFTA, Pakistan's FTA with China, Pakistan–Sri Lanka FTA, FTA with Malaysia, Pakistan–Iran preferential trade agreement, Pakistan–Indonesia Preferential trade agreement, Pakistan–Mauritius FTA, Generalized Scheme Preference Plus status granted by European countries, e-Trade and Investment Agreement with the USA

Additionally, we will make a detailed analysis of the review of the determinants of export performance employed in the existing literature regarding the textile and clothing industries.

Table 2 below presents the determinants of T&C exports, their frequency of use, and their impact on exports (positive/negative).

Table 2. Determinants of T&C exports

Determinants of T&C exports	Correlation	Frequency of use
Distance	-	11
GDP	+	9
GDP pc	+	6
Exchange rate	-	6
WTO	+	6
NAFTA	+	4
Population	+/-	4
EU	+	4
Common border	+	4
Common language	+	4
Population growth	+/-	3
Landlock	-	3
Labor costs	-	2

As we can observe, the most consensual determinants among the authors are *distance, GDP, GDP per capita, exchange rate*, and belonging to the World Trade Organization. All research papers mentioned in Table 1 used the distance in their gravitational equation except Lee et al. (2014) and Lau and Bilgin (2010). Those authors also did not use *GDP* in their equation, alongside Tsang and Au (2008) and Orkan Özer (2014).

In terms of economic factors, *GDP, GDP per capita*, and *exchange rate* were the most studied variables in past studies. Regarding the geographical variables, which included elements such as distance, population size or growth, time, and shared border, distance was the most researched aspect in this area. It is worth mentioning that several studies,

namely studies such as Chi and Kilduff (2010), Marcanas (2015), and Lau et al. (2017), used a variety of common dummy variables to assess sociocultural similarities between commercial partners such as shared language and historical linkages, such as colonialism. Dummy variables for the administrative dimension, namely trade organizations or Trade Agreements members, like WTO, or the EU and NAFTA, were also used in those research papers.

According to prior studies, distance (DIS) is considered since it frequently plays a critical role in bilateral trade. As previously established, geographic distance influences textile and clothing exports negatively (Chi & Kilduff, 2010). The farther away exporting and importing nations are, the bigger the logistical costs and, as a result, the smaller the textile and clothing commerce between these nations. This supports the generally held idea that the distance between bilateral trading sites acts as a trade barrier (Chan et al., 2008).

GDP is related to a country's economic size. An exporting country's GDP indicates its production capacity, while an importing country's GDP measures its purchasing power or absorptive capacity (Chu et al., 2019). A higher GDP in importing nations means a higher demand for imports, whereas a higher GDP in exporting countries means a higher production capacity and a higher supply of exports (Chi & Kilduff, 2010). GDP has a positive impact on exports since a greater GDP generates a higher demand for textile and clothing imports and a greater supply of exports.

GDP per capita reflects the degree of economic development and measures capital or labor-intensive commerce (Chu et al., 2019). Generally, a rise in per capita income stimulates exports, whereas rising per capita income in the importing nation increases demand for high-quality imports. (Chen et al., 2017).

The exchange rate was among the most studied variables in past research and had an impact on exports. Anytime a foreign currency depreciates or appreciates against the euro, there would be a rise or reduction in T&C exports (Chan & Au, 2007). A weaker domestic currency, in general, boosts exports and weakens imports (Ho et al., 2020).

The population is used to determine the size of a nation. Orkan Özer (2014), Marcanas (2015), and Lau et al. (2017) included this determinant in their gravity equations.

According to these authors, a large country might export less since it already has a high number of domestic consumers, and the absorptive effect is observed. Nonetheless, a large country could export more than a small country due to economies of scale. The importing country faces the same uncertainty (Macanas, 2015). According to the existing literature, it is expected that the population of importers has a positive effect on textile exports and a negative effect in the case of clothing. This discrepancy is explained in Marcana's research (2015). Textiles present a positive effect, possibly because of economies of scale, while clothing has a negative impact, probably due to the absorptive effect.

The population growth rate is applied to measure demand in the importing nation. It is assumed that the bigger the population growth rate, the greater the trade value (Chi & Kilduff, 2010). Importer population increase has a strong relationship with the consumption of manufactured goods (Chan et al., 2008). Hence, due to a greater knowledge of this influence on T&C exports, importer population growth was considered in past studies, namely in Chan and Au (2007), Chan et al. (2008), and Chi & Kilduff (2010).

It is important to note that trade has several implied costs, namely transportation and information costs. Several variables often represent these two expenses. Previous studies applied variable dummies like landlocks, common borders, and islands to reflect transportation costs (Chi & Kilduff, 2010). Transport costs are likely to be bigger for distant countries, islands, or landlocked ones but cheaper for neighboring countries (Macanas, 2015). It is easy to understand how countries that lack direct sea access, meaning the landlocked countries, have higher transportation costs. These countries typically have to rely on the transport infrastructure of their transit neighbors to get access to overseas markets. This challenge is increased when shipments involving external trade must pass via adjacent seaports (Ho et al., 2020). The variable Landlock is predicted to have a negative impact.

To capture information costs, dummy variables like shared language, common colonizer, or other significant cultural factors are employed. Countries that exhibit those characteristics are likely to be more aware of each other consumers' preferences and understand each other trading practices better than other countries (Macanas, 2015).

Following Marcana's research (2015), the common official language is expected to have a bigger impact on clothing than textiles.

Dummy variables are used for common membership for preferential trade agreements or participation in a trade organization. They assess the impact of specific privileges for trade membership and the potential disadvantages of non-members, namely EU, WTO, and NAFTA. It is anticipated that the common membership has a favorable influence on trade volume, as is frequently stated in the literature (Chan & Au, 2007). WTO membership is important for the expansion of Portuguese T&C exports since all quota restrictions on T&C goods between WTO members were eliminated by 2005, as stated in the WTO's Textiles and Clothing Agreement (ATC) (Ho et al., 2020).

Labor costs are referred to as the average salary per employee in the T&C industries over a year. A country with a higher labor cost is less likely to be a supplier of T&C products as the latter is a labor-intensive industry. As a result, this variable should negatively influence exports (Tsang & Au, 2008).

Note that most workers in the global textile and clothing industries are female. Therefore, some studies included a dummy variable for female workers (Chen et al., 2017). Regarding this dummy female variable, some authors state that a rise in female workers in the exporting countries leads to an increase in textile and clothing exports. As mentioned, these industries rely heavily on labor to enhance production capacity. (Chen et al., 2017).

3. Trends of Portuguese Textile and Clothing exports between 2000 and 2019

This section will discuss the main trends in the evolution of Portuguese textile and clothing exports, emphasizing the countries where Portugal exports the most, both for textiles and clothing.

Firstly, we will conduct an internal analysis, commencing with examining the evolution of Portuguese textile and clothing exports between 2000 and 2019. Subsequently, we will delve into comprehending the top 10 destinations of Portuguese exports within these industries and investigate the progression of exports to their key destinations.

In the second phase, we will assess the significance of these two sectors in Portugal's overall exports. Lastly, we will examine Portugal's role and share in the global textile and clothing market. These analyses will elucidate the role and significance of Portuguese textile and clothing exports, both domestically and worldwide.

Figure 1 illustrates the evolution of Portuguese textile exports to the rest of the world at constant prices from 2000 to 2019, in thousands of US$. Over this period, textile exports increased yearly by 11.48% on average, rising from 520.48 thousand in 2000 to 4571.56 thousand in 2019.

It should be noted that Portuguese textile exports increased exponentially in both 2015 and 2019, with annual growth rates of 235.75% and 72.29%, respectively.

Looking at the data more closely, we can see that the growth rate decreased slightly in 2009 and 2012, with negative values of -21.30% in 2009 and -18.68% in 2012. These decreases are explained by the global crisis, which began in late 2008 and impacted the final consumer's purchasing power, reducing demand. More specifically, we can see that the average growth rate between 2014 and 2019 was 39.54%, much higher than the 20-year average, because it involved the two periods with exponential growth (2015 and 2019), and no negative growth rate was recorded during these six years.

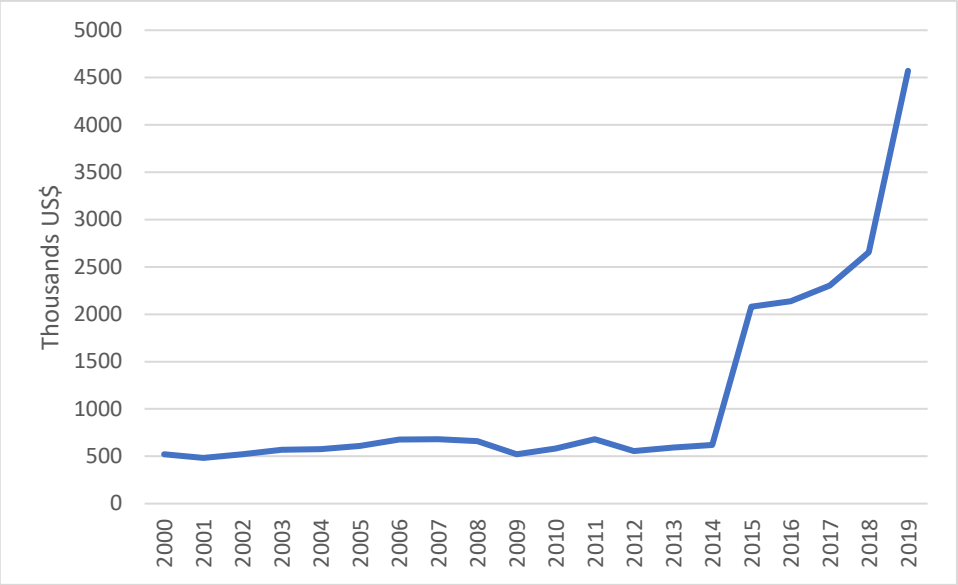

Figure 1. *Total Portuguese textile exports from 2000 to 2019*

Source: UN Comtrade.

Moreover, in thousands of US dollars, the evolution of Portuguese clothing exports to the world at constant prices from 2000 to 2019 is demonstrated in Figure 2. Note that the evolution of Portuguese clothing exports presents a behavior very similar to that of Portuguese textile exports, as can be seen when comparing both figures.

Through the last two decades, clothing exports have increased by 12,19% on average, rising from 2805.75 thousand in 2000 to 28016.76 thousand in 2019. Similarly, Portuguese clothing exports also grew exponentially in 2015 and 2019, reaching annual growth rates of 244.85% and 71.27%, respectively.

In 2009 and 2012, the growth rates of clothing exports fell slightly, showing values of -17.65% in 2009 and -7.06% in 2012. As explained in the evolution of textile exports, this decrease in clothing exports is explained by the global recession that started in late 2008.

Note that the period from 2014 to 2019 reflects the effects of the two exponential growth periods (2015 and 2019). Therefore, the average growth rate is 40.17%, much superior to the average of the twenty years, specifically, a 27.98-percentage points difference.

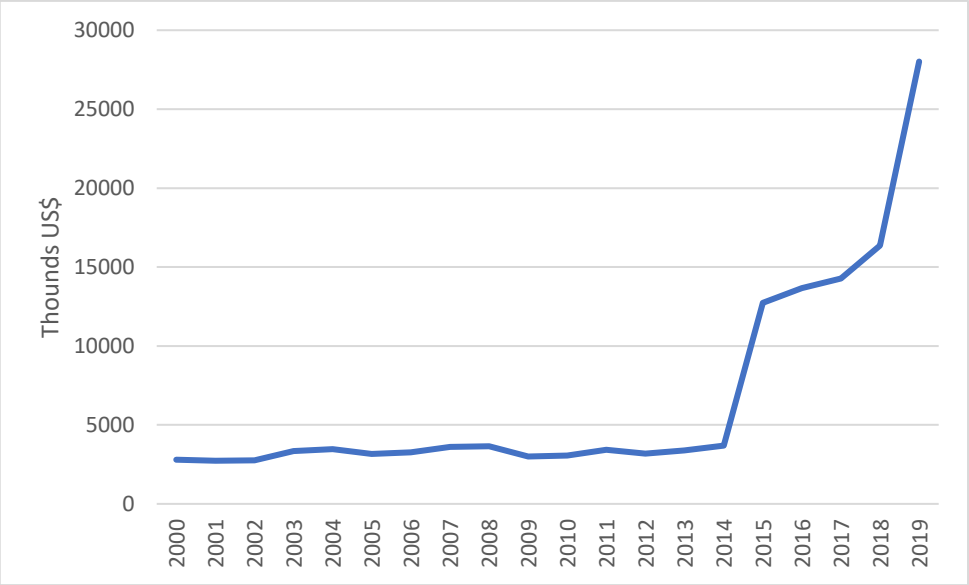

Figure 2. *Total Portuguese clothing exports from 2000 to 2019*

Source: UN Comtrade.

Subsequently, the leading destination markets of Portuguese textile exports are analyzed in Table 3.

Table 3. Top 10 Portuguese textile importers from 2000 to 2019

	2000		2009		2019		Total 20 years	
Country	Quota	Rank	Quota	Rank	Quota	Rank	Quota	Rank
Spain	13.60%	3	19.72%	1	21.49%	1	20.47%	1
Germany	17.14%	1	11.38%	2	10.39%	2	10.48%	2
Italy	8.05%	5	11.17%	3	8.98%	3	10.02%	3
France	8.38%	4	7.83%	4	8.40%	4	7.95%	4
UK	15.08%	2	6.24%	5	7.42%	5	7.21%	5
USA	3.88%	6	6.13%	6	5.61%	6	6.12%	6
Morocco	2.98%	7	3.88%	7	2.39%	8	3.15%	7
Turkey	2.08%	10	2.90%	8	3.15%	7	2.36%	8
Romania	0.30%	31	1.41%	14	2.15%	9	2.11%	9
Belgium	1.80%	12	2.27%	9	2.01%	10	2.09%	10

Source: UN Comtrade.

Regarding the main destination markets of Portuguese textile exports, we can see in Table 3 that the top 10 countries where Portugal exported the most textiles from 2000 to 2019 were Spain, Germany, France, United Kingdom, USA, Morocco, Turkey, Romania, and Belgium.

Observe that the top 10 countries in the rank in 2019 are similar to the ones in the total 20 years of the study. However, 2000 and 2009 had different ranks. For instance, in 2000, Sweden and Brazil were in the 8th and 9th positions, respectively, but they lost their share over time, and during the 20 years of this study, they changed to the 18th and 13th places of the rank, respectively. Furthermore, in 2009, Angola was in the tenth position of the rank with a share of 1.87%, but ten years later, it fell to the 20th position, with a share of 0.92%.

China was in the 34th place of the rank with a share of only 0.21% in 2000. Then, in 2019 occupied the 11th place of the rank, with a share of 1.63%. Therefore, in the 20 years of the study, China has risen 23 places in the top Portuguese textile exports ranking.

It can be concluded that during this study, Spain, Germany, and Italy were the major textile importing markets of Portuguese textiles. The top 6 countries: Spain, Germany, Italy, France, the UK, USA, are the destination countries for 62.25% of the last 20 years' textile exports.

Moreover, Figure 3 shows the evolution of Portuguese textile exports to the main clothing trade partners from 2000 to 2019. The main partners over this period were Spain, Italy, and Germany. Together these three countries are responsible for 40.97% of Portuguese textile exports.

It is important to recognize that, regardless of the constant evolution and growth of Portuguese exports to Germany, as seen in Figure 3, the country is losing significant market share while remaining in the top 2 over time. This is made clear by Spain's behavior, which has enhanced its representativeness.

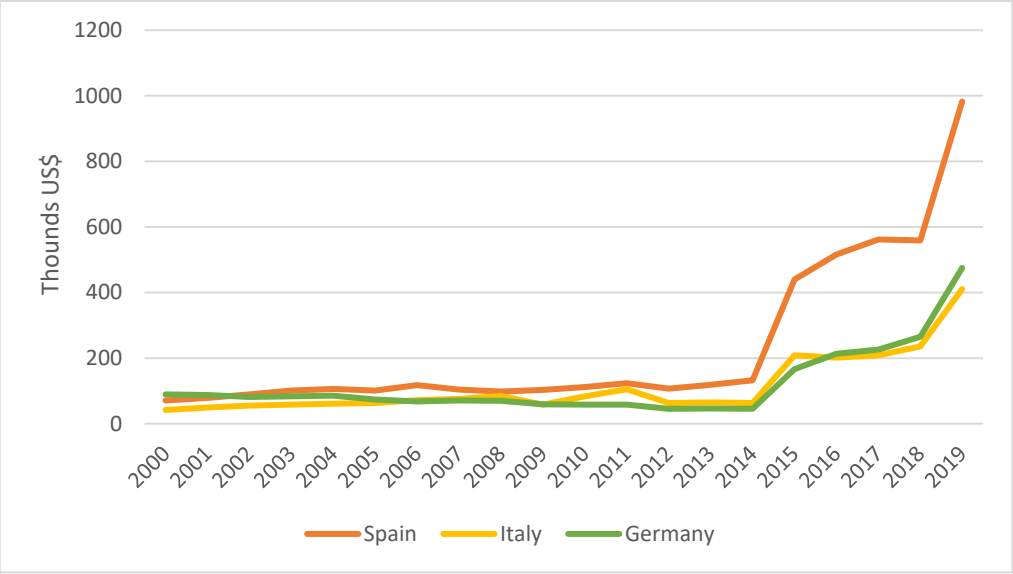

Figure 3. *Portuguese textile exports to main textile trade partners from 2000 to 2019*

Source: UN Comtrade.

Table 4 lists the top destinations from 2000 to 2019 for Portuguese clothing exports, along with their share and rank. Table 4 shows that the top ten countries where Portugal exported the most clothes from 2000 to 2019 were: Spain, France, the United Kingdom, Germany, Italy, the Netherlands, the United States of America, Sweden, and Belgium.

Regarding market share distribution, the four largest global importers of Portuguese clothing have maintained their positions over the last two decades (2000-2019): Spain, France, the UK, and Germany. It is verifiable that Spain holds the prominent position, always representing a share of more than 15%, which has been increasing over time, from 15.88% in 2000 to 39.20% in 2019.

Table 4. Top 10 Portuguese clothing importers from 2000 to 2019

	2000		2009		2019		Total 20 years	
Country	Quota	Rank	Quota	Rank	Quota	Rank	Quota	Rank
Spain	15.88%	3	36.81%	1	39.20%	1	37.75%	1
France	16.82%	2	15.05%	2	13.60%	2	14.03%	2
UK	15.56%	4	9.49%	4	8.04%	4	10.16%	3
Germany	17.81%	1	11.57%	3	8.05%	3	9.50%	4
Italy	4.05%	6	4.84%	5	7.27%	5	5.33%	5
Netherlands	6.03%	5	3.60%	6	5.47%	6	4.58%	6
USA	2.59%	11	0.92%	13	3.92%	7	2.74%	7
Sweden	3.88%	7	2.68%	8	2.38%	8	2.49%	8
Belgium	2.76%	10	2.69%	7	1.71%	9	2.13%	9
Denmark	3.61%	8	1.67%	10	1.63%	10	1.80%	10

Source: UN Comtrade.

Table 4 shows that over the 20 years under review, Spain, France, the UK, and Germany are responsible for 71.44% of Portuguese clothing exports. Figure 4 shows the evolution of Portuguese clothing exports to these main clothing trade partners from 2000 to 2019. Spain, France, the UK, and Germany were the main partners over this period.

Spain has the biggest evolution, increasing its share from 15.88% in 2000 to 39.20% in 2019. France is in second place, it has always represented a share of more than approximately 13%, but it has been declining - from 16.82% in 2000 to 13.60% in 2019. In third place is the United Kingdom, with a share of between 8.57% and 10.32%. Next comes Germany, which has been losing market share.

Notice that despite their constant growth and evolution, over the years of study, France, the UK, and Germany have lost market share substantially; they have yet maintained their position in the top four over time. This is explained by the behavior of Spain, which has been increasing its representativeness.

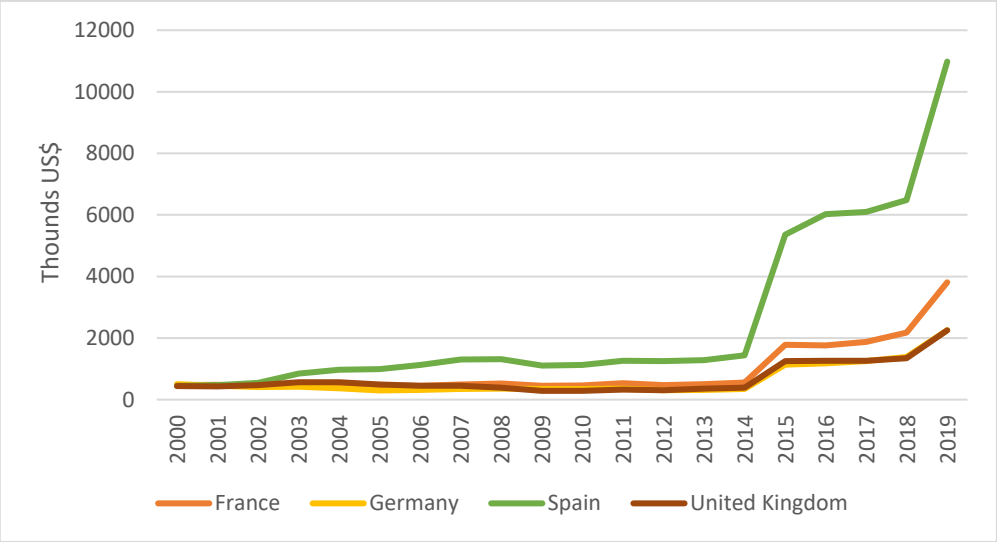

Figure 4. *Portuguese Clothing exports to main clothing trade partners from 2000 to 2019*

Source: UN Comtrade.

Having delved into the evolutions of Portuguese textile and clothing exports, we now transition to investigate the impact of these exports within the entirety of Portuguese trade. In Table 5, we will examine the total Portuguese exports of goods by type to better understand the relevance of textiles and clothing on the overall exports of the nation.

Table 5. Portuguese exports of goods: total and by type

	2000		2009		2019		20 years total	
	Quota	Rank	Quota	Rank	Quota	Rank	Quota	Rank
Agri-food	7.24%	7	12.61%	3	12.18%	5	11.12%	6
Chemicals, rubbers	7.61%	6	11.20%	6	12.62%	4	11.49%	5
Wood, cork, and paper	10.15%	5	8.82%	7	7.39%	7	8.34%	7
Fur, leather, and textiles	18.94%	2	11.34%	5	9.23%	6	11.53%	4
Clothing and footwear	6.11%	8	4.12%	9	3.19%	9	4.03%	9
Minerals and metals	12.54%	4	18.80%	1	18.30%	1	18.89%	1
Machinery	19.82%	1	16.31%	2	13.91%	3	16.40%	2
Transport equipment	14.50%	3	11.74%	4	16.36%	2	13.08%	3
Others	3.09%	9	5.05%	8	6.82%	8	5.11%	8

Source: INE.

The various types of goods were divided into nine categories, including “others," which incorporates a wide range of goods. The category that reflects the weight of textiles is “fur, leather, and textiles," and the category that reflects the weight of clothing is “clothing and footwear."

Table 5 shows that fur, leather, and textiles were the second most exported Portuguese products in 2000, accounting for 18.94% of total exports, trailing only machinery. Fur, leather, and textiles lost some importance in 2009, accounting for 11.34% of Portuguese exports. And in 2019, with a weight of less than 10%, it fell one more place in the ranking. Nonetheless, the importance of fur, leather, and textile exports in the last 20 years is 11.54%, placing textiles fourth among top exported products.

Clothing and footwear account for a smaller proportion of Portuguese exports than fur, leather, and textiles, but they are still significant. They accounted for 6.11% of all exported goods in 2000. In 2019 despite an increase in exports, as shown in Figure 2, the weight of footwear and clothing in Portuguese exported products is 3.19% in 2019, and its weight over the twenty years is 4.03%.

After analyzing Table 5, it is possible to understand the importance of textiles and clothing in overall Portuguese exports.

Finally, we will conduct an external analysis of Portuguese textile and clothing exports, examining Portugal's role and quotas in the global textile and clothing markets. In terms of global textile market share, Table 6 illustrates the position of the top ten textile exporters over the last 20 years.

Table 6 shows that Portugal is not among the top 10 global textile exporters in the three years under analysis. Nevertheless, Portugal maintains a favorable position in the worldwide ranking during this period. In 2000, Portugal was positioned at 22nd position in the ranking out of 164 countries, with a market share of 0.97% of the world's textile exports. In 2009, Portugal dropped one place in the ranking compared to 2000, with a market share of 0.78% of global textile exports. In 2019, Portugal held a market share of 0.68%, securing 26th place in the ranking out of 160 countries. While Portugal's absence from the top ten may be noted, its consistent positioning and relatively stable market

position affirm the nation's role in the global textile trade. Yet, despite its growing exports it is noticed a slower decline in this relative position over the studied period.

Note that "Other Asian, nes" refers to "Other Asia, not elsewhere specified," such as Taiwan.

In 2000, the countries that comprised the top 10 global textile exporters were China, the USA, Hong Kong, the Republic of Korea, Other Asian nes, Italy, Germany, Japan, France, and Belgium. In 2009 and 2019, the top 10 global textile exporters remained very similar, differing in only 2 countries. In 2009, Hong Kong and Japan also made it into the top 10 ranking.

It is worth noticing that the leading destinations for Portuguese textile exports are Italy and Germany, two countries that feature in the ranking during the three years under analysis.

Table 6. World textile market share from 2000 to 2019

	2000		2009		2019	
Country	Quota	Rank	Quota	Rank	Quota	Rank
China	9.53%	1	25.25%	1	35.53%	1
USA	7.72%	2	6.16%	2	6.08%	2
India	3.17%	11	4.40%	5	5.59%	3
Germany	6.80%	7	5.94%	3	4.22%	4
Turkey	2.16%	13	3.36%	9	3.64%	5
Italy	6.84%	6	5.12%	4	3.55%	6
Rep. of Korea	7.59%	4	4.22%	6	3.12%	8
Vietnam	0.17%	49	0.87%	22	2.73%	7
Other Asian, nes	7.02%	5	3.58%	8	2.53%	9
Pakistan	No data	No data	2.80%	11	2.28%	10

Source: UN Comtrade.

Table 7 presents the weight and position of the top ten clothing exporters in terms of global clothing market share over the last 20 years.

Through the examination of Table 7, we can observe that Portugal is not among the top 10 largest apparel-exporting countries worldwide. However, Portugal holds a favorable position in the global ranking in the years in study. In 2000, Portugal ranked in the top 16

largest clothing exporters globally out of 160 countries, with a market share of 1.51%. In 2009 and 2019, Portugal occupied the 21st position in the ranking of the largest clothing-exporting countries worldwide out of 165 nations. In 2009, Portugal accounted for 0.95% of global clothing exports, and in 2019, it had a market share of 0.82% of global clothing exports. Portugal's consistent position over the years and relatively stable market share emphasize its persistent contribution to the global clothing export trade.

In 2000, the top 10 clothing-exporting countries worldwide were: China, Hong Kong, Italy, Mexico, the USA, Germany, Turkey, India, France, and Indonesia. It's worth mentioning that Mexico, the USA, and Indonesia did not feature in the top 10 in 2009 and 2019. In 2009, Bangladesh and Belgium also joined the top global clothing exporters, occupying the 5th and 10th positions, respectively.

By analyzing Table 7, we can further confirm that in 2019, the largest clothing-exporting countries worldwide were: China, Vietnam, Germany, Italy, India, Turkey, Spain, France, Hong Kong, and the Netherlands. In 2019 these ten countries accounted for 70.20% of global clothing exports.

Table 7. World clothing market share from 2000 to 2019

	2000		2009		2019	
Country	Quota	Rank	Quota	Rank	Quota	Rank
China	17.42%	1	31.86%	1	32.50%	1
Vietnam	0.97%	29	2.64%	9	7.07%	2
Germany	3.48%	6	5.29%	4	5.75%	3
Italy	6.74%	3	5.87%	3	5.69%	4
India	2.95%	8	3.59%	6	3.82%	5
Turkey	3.36%	7	3.56%	7	3.78%	6
Spain	1.05%	25	2.35%	11	3.36%	8
France	2.71%	9	2.95%	8	2.83%	7
HongKong	12.25%	2	6.91%	2	2.75%	9
Netherlands	1.22%	22	1.78%	13	2.63%	10

Source: UN Comtrade.

It is worth noting that the main export markets for T&C products align with the main export destinations for all Portuguese exports, which include Spain, Germany, France, the UK, and the US (Amador & Opromolla, 2009).

Note that since exports are so concentrated in such close markets, namely, Spain, France, Germany, Italy, and the UK, it is confirmed that the shorter the distance, the higher the trade flow, as was mentioned in the studied literature.

To conclude, Portugal has a strong representation abroad in textile and clothing exports, and this sector is also crucial within the country itself. Given that, the textiles and clothing industry contributes significantly to Portuguese market share, labor force, and overall economic growth.

4. Methodology

This chapter outlines the methodology used in this study to assess the determinant factors of Portuguese textiles and clothing exports between 2000 and 2019. Furthermore, we will investigate if there are variations in the determinants of exports between these two categories of products. In terms of methodology, this research employs a gravity export model based on some of the explanatory variables, specifically the ones that are most widely agreed upon. This chapter is split into three sections. The first one concerns the econometric model, where the specification of the export gravity equation is presented. The second section shows the sample characterization. It describes the variables and data sources. The last section makes the descriptive data analysis of the dependent and independent variables.

4.1 Specification of the gravity model

To estimate the gravity model, we will follow the typical approach of studies that focused on a specific country's exports, such as Chan and Au, (2007), Chan et al. (2008), Lau and Bilgin (2010), and Rahman et al. (2019). Almost all studies used the variables *GDP, GDP per capita*, and distance. The baseline explanatory variables of the gravitational model used in all the analyzed literature are GDP and distance, except for Lee et al. (2014). Tsang and Au (2008) and Orkan Ozer (2014) did not include *GDP* and *GDP per capita*. Chen et al. (2017), Ho et al. (2020), and Abbas & Bhutto (2022) did not include *GDP per capita*.

In addition, we will also include a shared border and a common language. They were added to the studies of Chi and Kilduff (2010), Marcanas (2015), Chen et al. (2017), and Abbas and Bhutto (2022). It was proven that they have significantly impacted the countries' trade. Therefore, we have included them to test their relevance in the present case. Some other dummies were added to compare where the bulk of exports is directed. The chosen dummies for this purpose were: *O_WTO, EUNEURO,* and *EURO*, namely, countries that belong to the World Trade Organization except for European Union nations, countries that belong to the European Union except for nations within the Eurozone, and countries that share the Euro currency. These specific trade agreements and organizations

were considered because they are the most commonly studied trading partnerships for Portugal and, according to Chi and Kilduff (2010), would test the common and non-membership impacts on T&C trade flows between Portugal and its key trade partners (Chi & Kilduff, 2010). Moreover, it will be necessary to compare if the main partners belong to Europe or the rest of the world.

Additionally, we will incorporate a dummy variable in the clothing equation regarding the existence of fashion capital (*FC*) in the importing country. This variable was included in the study of Lee et al. (2014), and according to the author, there are five fashion capitals: Paris, Milan, London, New York, and Tokyo. A fashion capital refers to a city characterized by a concentration of fashion-related enterprises covering the clothing business from design to retail, including clothing assembly and textile manufacturing situated nearby (Lee et al., 2014).

We selected the top 50 countries where Portugal exported the most textiles and clothing in the last 20 years. This study will use a panel data analysis with a sample of importers representing most of the trade from 2000 to 2019. This type of data, along with other benefits, enables us to conduct our research over a more extended period, increasing the efficiency of econometric estimations and avoiding the risk of selecting an unrepresentative year (Hsiao, 2007).

In the econometrics literature, three appropriate models are considered for the panel data: pooled OLS model, fixed effects model, and random effects model. The pooled OLS does not consider the heterogeneity of the countries or the period, accepting that they are homogeneous. The fixed effects model assumption is that the individual effects are correlated with the explanatory variables. For random effects, the assumption is that the individual unobserved heterogeneity is uncorrelated with the explanatory variables If the random effects assumption holds, the random effects estimator is more efficient than the fixed effects estimator (Hsiao, 2007). In our model, we preferred to use period-fixed to country-fixed effects so that we could consider all the explanatory variables, namely those variables that have constant value over time such as distance.

We wanted to adopt a model that presented more reliable results. Therefore, we started by using the Breush-Pagan test to detect whether a random effects model was more

appropriate than a pooled OLS model. Subsequently, a redundant fixed effects test was conducted in order to verify if fixed effects were required over the pooled OLS model. The results recommended that fixed effects were needed since a p-value of 0.000 was obtained. Moreover, we tried the Hausman test to determine if we should use the random effects model over fixed effects. A p-value of 0.000 was once again obtained, which made us discard the null hypothesis, concluding that the best model for our data set was the fixed effects model.

The extended adapted gravity model with fixed effects used in this investigation for the textiles (Equation 2) and clothing (Equation 3) equation is as follows:

Equation 2

$$\ln(XT_{ijt}) = \alpha + \gamma_t + \beta_1 \ln(GDP_{jt}) + \beta_2 DIS_{ij} + \beta_3 \ln(GDPpc_{jt}) + \beta_4 LANG_{ij} + \beta_5 O\_WTO_{jt} + \beta_6 EU_{jt} + \beta_7 BORDER_{ij} + u_{ijt}$$

and

Equation 3

$$\ln(XC_{ijt}) = \delta + \delta_t + \theta_1 \ln(GDP_{jt}) + \theta_2 DIS_{ij} + \theta_3 \ln(GDPpc_{jt}) + \theta_4 LANG_{ij} + \theta_5 O\_WTO_{jt} + \theta_6 EU_{jt} + \theta_7 BORDER_{ij} + \theta_8 FC_{jt} + v_{ijt}$$

where:

t	time (years) from 2000 to 2019; t = 1, 2…, 20
i	represents the exporting country – Portugal
j	represents the trading partners of Portugal - the importing economy
γ_t and δ_t	represents period-fixed effects
$\ln(XT_{ijt})$	natural logarithm Portuguese textile exports to country j at time t
$\ln(XC_{ijt})$	natural logarithm Portuguese clothing exports to country j at time t
$\ln(GDP_{jt})$	natural logarithm GDP of country j at time t
DIS_{ij}	the geographical distance between the capitals of countries i and j
$\ln(GDPpc_{jt})$	natural logarithm GDP per capita of country j at time t
$LANG$	dummy variable with a value of 1 if the importer country shares a common official language, otherwise 0

O_WTO	dummy variable with a value of 1 if the importer country is a member of the World Trade Organisation and not a member of the EU, otherwise 0
EU	dummy variable with a value of 1 if an importer country is a member of the European Union, otherwise 0
BORDER	dummy variable with a value of 1 if the importer country shares a common land border, otherwise 0
FC	dummy variable with a value of 1 if the importer country has a fashion capital, otherwise 0
u and *v*	the error terms.

To enhance the analysis, it was determined to lay out an alternative equation to the textile and clothing equations by dividing the European Union effects into two types: the trade partners who are members of the Eurozone and those who are not.

EUNEURO	dummy variable with a value of 1 if the importer country is a member of the European Union and not a member of the Eurozone, otherwise 0
EURO	dummy variable with a value of 1 if the importer is a member of the Eurozone, otherwise 0

4.2 Characterization of variables and data sources

The Portuguese textile and clothing data is gathered from different recognized databases, such as Comtrade and World Bank. The data collection occurred between February 2022 and April 2022. It is important to note that we did not proceed further than 2019 because of the coronavirus pandemic, which affected all sectors.

The values of the Portuguese clothing and textile exports to its 50 major trading partners between 2000 and 2019 were collected from the United Nations (UN) Comtrade database. As for textiles, the subsections under the Harmonized System (HS) were the commodity codes 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, and 63. While the subsections considered on clothing were 61 and 62.

The World Bank provided GDP and GDP per capita. The information regarding the

common border and language was gathered through CEPPI. Lastly, the common membership of a trading bloc or organization and its details are available on the public websites of each organization, such as the European Union and the World Trade Organization.

Regarding the selected countries and to achieve a sample that closely resembles the population, 50 countries were chosen as destinations for Portuguese textile exports, as these 50 countries collectively accounted for approximately 97% of Portuguese textile exports from 2000 to 2019. Similarly, 50 countries were selected for Portuguese apparel exports, encompassing nearly 100% of the destinations for Portuguese apparel exports. It is noteworthy that this analysis covers 63 distinct nations, with 37 countries falling within both groups. The selected countries are displayed in Tables 9 and 10 on annexes.

While proceeding to the analysis of the model's findings and defining the variables and equations that will be employed, a quick descriptive analysis of the dependent and independent variables chosen for our research is required without natural logarithms.

Table 8 compiles all the variables that will be applied in the gravity model to establish the determinants of Portuguese clothing and textiles exports worldwide. Their proxies used to evaluate the estimated impact on Portuguese T&C exports and the data sources will also be displayed.

Table 8. Description of the independent variables

Variable	Proxies	Expected effect	Unit	Data source
GDP	Annual Gross Domestic Product at constant prices of 2015	+	Million USD	World Bank
DIS	Geographical distance between the countries' capitals	-	Kilometers	CEPII
GDPpc	Annual Gross Domestic Product per capita at constant prices of 2015	+	Thousand USD	World Bank
LANG	Dummy variable common language = 1; no shared language = 0	+	1/0 Dummy	CEPII
BORDER	Dummy variable common border = 1; no shared border = 0	+	1/0 Dummy	CEPII
O_WTO	Dummy variable: World Trade Organization membership without being part of the EU = 1; no WTO membership = 0	+	1/0 Dummy	WTO
EU	Dummy variable: European Union membership = 1; no EU membership = 0	+	1/0 Dummy	European Union
EUNEURO	Dummy variable: European Union membership without belonging to the Monetary Union = 1; otherwise = 0	+	1/0 Dummy	European Union
EURO	Dummy variable: Monetary Union membership = 1; otherwise = 0	+	1/0 Dummy	European Union
FC	Dummy variable Existence of fashion capital=1; no fashion capital= 0	+	1/0 Dummy	Based on a paper by Lee et al., 2014

Concerning the selected countries, as displayed in Tables 16 and 17, in annexes, there is a list of the countries used as samples in this study. Table 16 is related to the top 50

countries where Portugal exports the most textiles, and Table 17 presents the top 50 countries where Portugal exports the most clothing. The countries were considered according to their groups.

Through the visualization of Table 16, we can conclude that in 50 of the countries where Portugal exports the most textiles, 48 belong to the WTO. Algeria and Syria are the only countries not belonging to WTO and still have a high textile trade with Portugal. It is important to note that China, Cape Verde, and Vietnam did not belong to the WTO in the first year this study was analyzed. However, after these countries joined in, their trade with Portugal grew. It is also noticeable that of a sample of 50 countries, 19 belong to the European Union. Therefore, we can truly see the impact that joining the European Union has on textile trade. At the beginning of this study, we considered including other dummy variables, such as ASEAN or NAFTA, given their importance in similar research papers. However, it is noticeable that these trade blocs have little importance relating to the textile trade of Portugal.

In Table 17, most of the 50 countries where Portugal exports the most textiles belong to the WTO. Similarly, to the cases mentioned above, Cape Verde and China did not belong to the WTO at the beginning of the study. However, after they joined, their exports of clothing also improved. The Russian Federation and Saudi Arabia also joined during the analyzed period, and the exports more than doubled in the following years. Lebano, São Tomé and Príncipe are the only countries not belonging to the WTO but still have high clothing imports from Portugal.

4.3 Descriptive data analyses

In this section, a brief descriptive data analysis of the series used in the study will be presented before estimating Equations 2 and 3. Both the dependent and independent variables are described without using natural logarithms. The dummy variables are also presented.

4.3.1 Descriptive analyses of the dependent variables

To analyze the two dependent variables, we must examine the two data series: Portuguese textile exports (*MT*) and Portuguese clothing exports (*MC*). Table 9 shows the descriptive analyses for these variables.

Table 9. Descriptive analyses of the dependent variables

Variable	Average	Maximum	Minimum	Standard deviation	Observations
MT	22291.43	982612.6	0.007000	60831.61	980
MC	133308.1	10981515	21.99200	585079.0	997

Upon reviewing the Table, it is possible to conclude that there is a significant difference between the maximum and minimum values registered in the two variables. Regarding maximum values, *MC* has a higher value than textile (*MT*), with 10981515 thousand US$ registered by Spain in 2019. Spain also registered the maximum value of *MT* in 2019 with 982612 thousand US$. Concerning minimum values, the minimum value of the *MC* variable was recorded by Qatar in 2001, and Nicaragua registered the minimum value of the *MT* variable in 2004.

Regarding the number of observations, the textile exports are lower than the clothing equation since Nicaragua, Syria, Bangladesh, and Pakistan do not have values for the entire period.

Through analyzing Figures 5 and 6, we can observe year by year how the exports to each of the countries stood against the 20-year average.

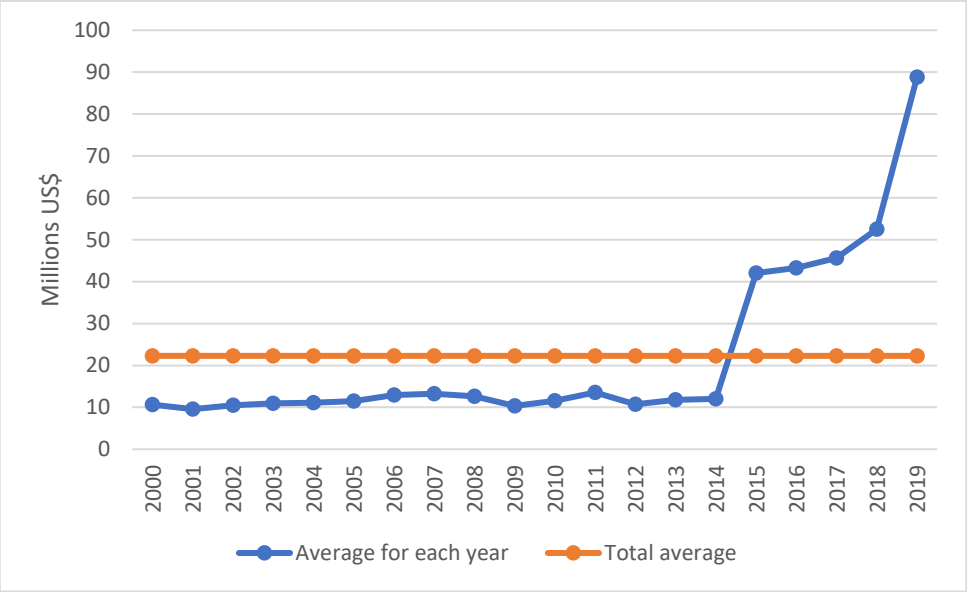

Figure 5. *Average of Portuguese textile exports from 2000 to 2019 (in millions of US$)*

From the beginning of the study until 2015, Portuguese textile exports increased. However, they continued to be below the twenty-year average. After 2015, exports stabilized above the twenty-year average, with no decrease until 2019.

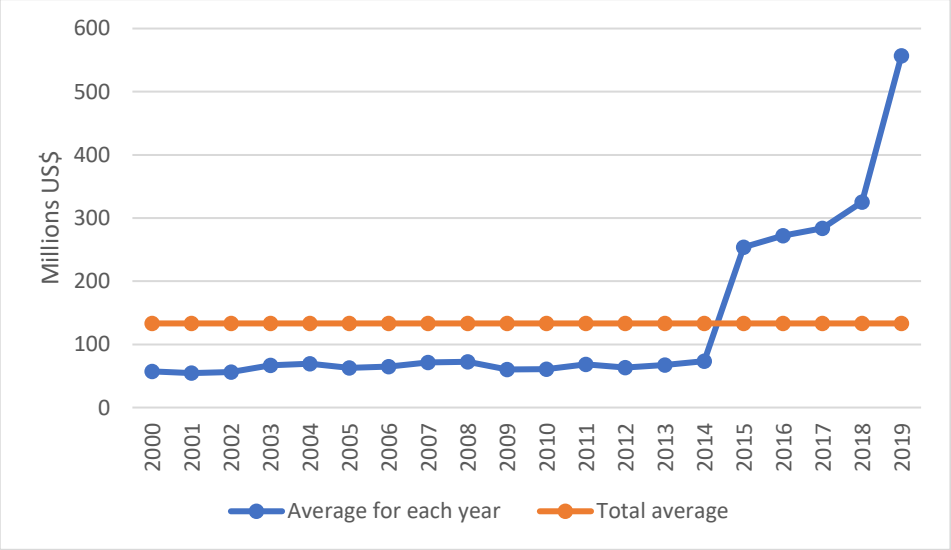

Figure 6. *Average of Portuguese clothing exports from 2000 to 2019 (in millions of US$)*

Similarly, to textile exports, Portuguese clothing exports were only above the 20-year average in 2015 and remained so until 2019. That is, for 15 years, they were below average.

Furthermore, to evaluate the 20-year average value of exports for each of the 50 countries for textiles and clothing, Tables 18 and 19 were produced. Tables are in the annexes, and the values are presented in thousands of US$.

According to Table 18, the countries in the top 10 of each country's 20-year average are the same as the top 10 textile exporters from 2009 to 2019. These are Spain, Germany, Italy, France, United Kingdom, USA, Morocco, Turkey, Romania, and Belgium, so we can verify that these countries have a higher volume of exports.

As previously mentioned, exports to China had exponential growth. In the average of the 20 years of the study, China is the 11th country in rank.

Similarly, in textiles, and as seen in Table 19, the countries in the top 10 of the 20-year average for each country are the same as the top 10 clothing exporters from 2009 to 2019. These are Spain, France, United Kingdom, Germany, Italy, Netherlands, USA, Sweden, Belgium and Denmark. These are the countries to which our exports have been most significant.

4.3.2 Descriptive analyses of the explanatory variables

Regarding the explanatory variables used in the study, the variables used are as follows: *GDP,* distance, and *GDP per capita*.

Table 10. Descriptive analyses of the textile explanatory variables

Variable	Average	Maximum	Minimum	Standard deviation	Observations
GDP	1137865	19974534	693.74	2663454	980
DIS	4.82	18.07	0.50	3.66	980
GDPpc	21229.82	88413.19	425.74	21396.67	980

The maximum value registered in the *GDP* variable is the same for textiles and clothing. The value refers to the United States of America in 2019, with 19974.53 billion US$. The minimum amount reported for textiles in the *GDP* variable is the value for Hong Kong in 2000, which was 693.74 million US$. Regarding *GDP per capita*, the highest value registered in the textile data refers to Switzerland in 2019, with a value of 88413.19 thousand US$. The lowest amount of *GDP per capita* for textiles was Madagascar in 2002, with a value of 425.74 thousand US$.

Regarding distance, the maximum and minimum values are equal in the data collected from textiles and clothing. Moreover, as expected, the shortest physical distance is between Lisbon and Madrid, Spain's capital. Furthermore, the longest is between Lisbon and Sydney, with an average distance of 4.82 million kilometers for textiles and 4.38 million kilometers for clothing.

Concerning clothing, the lowest amount recorded in the *GDP* variable referring to clothing is the value of São Tomé and Príncipe in 2001, when it assumed a value of 156.54 million US$. Regarding *GDP per capita*, Luxembourg has the highest value, recorded in 2019, with 112372.7 thousand US$. Mozambique had the lowest *GDP per capita* in 2000, with a value of 249.65 thousand US$.

Table 11. Descriptive analyses of the clothing explanatory variables

Variable	Average	Maximum	Minimum	Standard deviation	Observations
GDP	1099445	19974534	156.54	2647058	997
DIS	4.38	18.07	0.50	3.34	997
GDPpc	28086.18	112372.70	294.65	23467.40	997

4.3.3 Descriptive analyses of dummy variables

The dummy variables used in the study are different for textiles and clothing. The dummy variables used in the textile equation are *BORDER, LANG, EURO, UENEURO, O_WTO,* and *FC*, with 980 observations. The dummy variables used in the clothing equation are *BORDER, LANG, EURO, UENEURO, O_WTO* and *FC*, totaling 997 observations.

Firstly, the *LANG* variable assumes value 1 if there is a common official language, in this case, Portuguese. The countries that take this value are Cape Verde, Angola, and Brazil, representing 6.12% of the sample.

For the *EURO* variable, it was found that 12 countries use the euro as their national currency, assuming value 1, the following: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Netherlands, Slovakia, and Spain. From Table 12, it can be concluded that 21.94% of the used sample corresponds to countries belonging to the Eurozone.

The variable *UENEURO* refers to the *EU* countries that do not belong to the Eurozone. They are Bulgaria, Czechia, Denmark, Hungary, Poland, Romania, and Sweden. According to Table 12, 13.37% of the used sample corresponds to countries that are EU members but not Eurozone members.

Subsequently, the *O_WTO* variable was analyzed, corresponding to the countries that are part of the *WTO*, excluding the *EU* countries. Based on Table 12, 59.39% of the countries in the sample are *WTO* members that do not belong to the European Union members.

Since Portugal only shares a border with Spain, we can conclude that the *BORDER* variable corresponds to 2.04% of the sample (as shown in Table 12). Therefore, besides the *BORDER* dummy demonstrating the effect of the border, it also gives us the effect of the trading partner Spain, which, as we have already seen in Section 3, is the trading partner with the biggest quota.

Table 12. Descriptive analyses of the textile explanatory dummy variables

Variable	Frequency	%
LANG	60	6.12
O_WTO	582	59.39
EUNEURO	131	13.37
EURO	215	21.94
BORDER	20	2.04

Regarding the *LANG* variable in Table 17, which denotes the existence of a common official language with Portugal, countries such as São Tomé and Príncipe, Guinea-Bissau, Cape Verde, Mozambique, Angola, and Brazil were assigned a value of 1, while the remaining countries assumed a value of 0. Within the sample, approximately 11.94% of the observations corresponded to countries sharing an official language with Portugal.

For the *EURO* variable, it was identified that 15 countries employing the euro as their national currency were assigned a value of 1, including Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Slovakia, Slovenia, and Spain. Conversely, the remaining countries assumed a value of 0. Based on Table 13, it can be inferred that 26.48% of the sample comprised countries within the Eurozone.

The variable *UENEURO* pertains to EU countries outside the Eurozone, encompassing Bulgaria, Czechia, Denmark, Poland, Romania, and Sweden. As indicated in Table 13, approximately 11.84% of the sample corresponded to EU member countries not belonging to the Eurozone.

Subsequently, the *O_WTO* variable was examined, representing countries that are members of the WTO but not part of the EU. According to Table 13, 55.07% of the countries in the sample were WTO members that did not belong to the European Union.

About Fashion capital (*FC*), the number of observations for the variable which refers to countries with a fashion capital (they assume the value 1, others 0) was 100 because five countries take the value 1, namely France, due to Paris, Italy because of Milan, Japan thanks to Tokyo, the United Kingdom due to London and the United States due to New York City.

Focusing on the *BORDER* variable, which indicates the presence of a shared border, representing 2.01% of the sample (as shown in Table 17), also captures the effect of Spain as a trading partner.

Table 13. Descriptive analyses of the clothing explanatory dummy variables

Variable	Frequency	%
LANG	119	11.94
O_WTO	549	55.07
EUNEURO	118	11.84
EURO	264	26.48
BORDER	20	2.01
FC	100	10.03

5. Results

In this chapter, we will present the results of the gravity model estimation, as defined in Equations 2 and 3 and other alternative specifications, as well as its empirical results and interpretation, comparing the findings to those expected according to earlier research.

This chapter is divided into three sections. Section 5.1 presents and discusses the obtained results for exporting Portuguese textiles. Section 5.2 discusses and evaluates the results obtained for Portuguese clothing exports. The last part, Section 5.3, compares the results of the previous sections.

5.1 Textiles Exports from Portugal

In Table 14, we present four fitted models with time-fixed effects. The fitted model A is based on the baseline gravity model. As for the fitted model B, we introduced the other relevant variables to explain the Portuguese textile exports such as GDP per capita, common language and common border. Furthermore, the fitted model C encompasses the trade agreement variables, and subsequently, this model is dissected to identify the effects of trade agreements in the EU, giving rise to fitted model D.

The existence of these four models over the length of the study allows us to conduct fitted model improvement tests that aid in selecting the appropriate fitted model to order to analyze the estimated impact of the explanatory variables on exports. Between fitted models A and B, the observed value of the test statistic revealed an enhancement in the fit quality due to the introduction of the natural logarithm of importers' GDP per capita, and the dummy variables for language and shared border, at a significance level of 5%. Concerning Fitted Model C and D in relation to A and B, there is also an improvement in the quality of the fitted model, at a significance level of 1%. As a result, the outcomes derived from fitted model C and D bear significant interpretive value, providing a distinct perspective on the impact, particularly within the context of the European Union, due to the coding of the dummy variable.

First, we will examine the findings from fitted model C. The model is significant overall at 1%, and all the explanatory variables are significant at 1% except ln(*GDPpc*), *O_WTO*,

and *EU*, which are significant at 5%. According to Table 14, an estimated increase of 1% in the importer's *GDP* corresponds to a 0.25% increase in Portuguese textile exports to that partner, *ceteris paribus*. Similarly, a 1% estimated increase in the trade partner's *GDP per capita* leads to a 0.15% increase in textile exports. Specifically, the estimated textile exports elasticity in relationship to *GDP* is 0.25, and the estimated *GDP per capita* elasticity is 0.15, *ceteris paribus*. The first elasticity indicates an inelastic relationship because the value falls between 0 and 1. The value of the other elasticity shows that textile is a necessary good. Both variables positively impact exports, consistent with the existing literature in Section 2.3. It should be noted that the estimated effect of *GDP* is higher than *GDP per capita*.

In terms of distance, it is estimated that a 1000 km increase in the distance between Lisbon and the capital of the importing country will result in a 12.60% decrease in textile exports to the destination market, *ceteris paribus*. That is, as expected the shorter the distance, the higher the exports. This is proven since exports are much more concentrated in such close markets. These findings are consistent with previous research and support the research of Orkan Ozer (2014) and Tsang and Au (2008).

The estimated value of textile exports to Portuguese-speaking countries is 95.77% higher than with similar countries but with an official language other than Portuguese, as translated by the variable *LANG*. This estimated value aligns with the economic literature following studies by Chi and Kilduff (2010) and Abbas and Bhutto (2022), among others.

The variables relating to trade agreements from fitted model C, *EU*, and *O_WTO* positively affect Portuguese exports of textiles. The variable *O_WTO*, which corresponds to the countries that are part of the WTO, excluding the European Union countries, has a greater influence on Portuguese textile exports than the variable *EU*. It is estimated that the value of exports to countries that are part of the WTO, excluding the EU countries, is 166.95% higher when compared to similar countries that do not have a trade agreement, or that do not belong to the EU or the WTO. Nevertheless, it is estimated that the value of exports to EU member countries is 99.63% higher than exports to countries that do not belong to the European Union or the WTO. It follows the literature reviewed in Chapter 2.3. The greater impact of countries belonging to WTO could be explained by the fact that textile products include intermediate goods used by the clothing industry which is

located outside the EU. Additionally, some of the biggest markets for the famous Portuguese home textiles are outside the EU.

Table 14. Estimated results for Portuguese textile exports

	Dependent Variable – ln(*MT*)			
Explanatory variables	**Period (yearly) fixed effects**			
	Fitted model A	**Fitted model B**	**Fitted model C**	**Fitted model D**
ln(*GDP*)	0.3894*** (0.038)	0.3338*** (0.044)	0.2495*** (0.046)	0.2487*** (0.046)
DIS	-0.1566*** (0.015)	-0.1286*** (0.016)	-0.126*** (0.0169)	-0.1259*** (0.017)
ln(*GDPpc*)		0.1308** (0.048)	0.1545** (0.057)	0.1501** (0.058)
LANG		1.0037*** (0.138)	0.9577*** (0.144)	0.9555*** (0.144)
O_WTO			0.9819** (0.272)	0.9859** (0.272)
EU			0.6913** (0.287)	
EURO				0.7713** (0.302)
EUNEURO				0.6213** (0.286)
BORDER		2.4060*** (0.117)	2.7445*** (0.125)	2.6787*** (0.134)
Sample size	980	980	980	980
Adjusted R^2	0.3684	0.4107	0.4562	0.4560
Wald-F test	68.6349 (0.000)	501.3045 (0.000)	384.0852 (0.000)	348.3553 (0.000)
Period fixed effects F test	12.8737 (0.000)	13.5907 (0.000)	14.6472 (0.000)	14.6626 (0.000)

Notes: (i) In parentheses, we report the estimated robust standard deviation for each cluster of partner trade; (ii) ***, **, and * indicate the individual significance of the explanatory variable for 1%, 5% and 10% significance levels, respectively; (iii) R2 corresponds to the coefficient of determination; (iv) The Wald-F test corresponds to the overall significance test of the regression, with the respective p-value in parentheses and below the observed value of the test statistic; (v) In the F Fixed Effects test for the period, the p-value is indicated between parentheses; (vi) dummy variables were used for Germany and Italy to control for the major partners

The dummy variable *BORDER*, representing the textile exports to Spain, the only country in the sample sharing a border with Portugal, indicates a significant increase of 1455.68% compared to countries that do not share a border with Portugal, *ceteris paribus*. This finding aligns with the existing literature as the study by Chen et al. (2017), among others.

In terms of the fitted model D, the overall model is significant at 1%, and all the variables are statistically significant at 1% except for the income and the variables related to trade agreements, which are significant at 5%. The estimated *GDP* and *GDP per capita* elasticities of exports in fitted model D are similar to those derived from fitted model C. The estimated impact of distance on textile exports is approximately -12.59%, mirroring the results observed in fitted model C. Likewise, the estimated value of *LANG* is roughly equivalent to the value derived from fitted model C, this being 95.55%

Concerning trade agreements, we have the variables *O_WTO, EUNEURO,* and *EURO.* The variable *O_WTO* has a greater influence on textile exports than the variable *EUNEURO.* It is estimated that *ceteris paribus,* the value of Portuguese textile exports to countries that belong to WTO (and do not belong to the *EU)* is greater by 168.02% than for countries without a trade agreement. If we examine the estimated value of the exports to the countries that belong to the Eurozone, we can verify that it is greater by 116.26% than for other countries without a trade agreement, *ceteris paribus*. However, if we take into consideration the *EU* countries that do not belong to the Eurozone, the estimated effect is merely greater by 86.13% than for other countries without a trade agreement, *ceteris paribus*. In conclusion, it is estimated that the effect on the exports to the countries that belong to the Eurozone is higher by approximately 30 percentage points when compared to the countries that belong to the EU but not to the Eurozone. All the dummy variables concerning trade agreements have an estimated positive impact on Portuguese textile exports as stated above.

Lastly, the estimated value of the variable *BORDER* in fitted model D is similar to the one derived from the fitted model C. Therefore, it is estimated that Portuguese textile exports to Spain, which it shares a border with, are higher by 1356.61% than for the other countries considered in the study, *ceteris paribus*. Note that this value is lower in the fitted model D.

5.2 Clothing exports from Portugal

Next, we will analyse the proposed gravity trade exporter equation results for clothing. Using the methodology presented in Section 5.1.

Table 19 displays four fitted models with fixed effects for the specified period. As a result, we can carry out fitted model improvement tests that allow us to choose which fitted models to select in order to analyse the estimated impact of the explanatory variables on exports. The observed value of the test statistic obtained between fitted models A and B reveals that there is a fitted model improvement with the introduction of the natural logarithm of GDP per capita of importer countries and the dummy variables language and common border, for a significance level of 5%. Regarding the fitted models C and D in relation to B, a noticeable improvement in the model fit is also evident at a significance level of 1%. Therefore, the results obtained from fitted models C and D will be interpreted, since they allow the impact to be seen differently in the EU, due to the coding of the dummy variable.

The initial takeaway that can be drawn from the Table 19 analysis is that all the explanatory variables in the four fitted models are statistically significant for a level of significance of 1%, aside from *O_WTO* in fitted models C and D, which is significant at 5%.

First and foremost, we will look at the results of fitted model C. The model is significant at 1% overall, and all explanatory variables are significant at 1% except for *O_WTO,* which is significant at 5%.

By analyzing the results obtained in Fitted model C, we can conclude that it is estimated that a 1% increase in the *GDP* of the importer implies a 0.31% increase in Portuguese exports to that same partner and a 1% increase in the *GDP per capita* of the trade partner suggests a 0.24% increase in Portuguese clothing exports. More specifically, the estimated clothing exports elasticity relative to the *GDP* is 0.31, and the estimated elasticity relative to the *GDP* per capita is 0.24. This relationship is considered inelastic because both values are between 0 and 1. Both positively impact Portuguese clothing exports, confirming the studied literature covered in Section 2.3. But the effect of *GDP*

is bigger than *GDP per capita* meaning that an increase in market dimension has a bigger impact on Portuguese clothing exports than an increase in per capita income.

Table 15. Estimated results for Portuguese clothing exports

	Dependent Variable – ln(*MC*)			
explanatory variables	**Fixed effects for the period**			
	Fitted model A	**Fitted model B**	**Fitted model C**	**Fitted model D**
ln(*GDP*)	0.5120*** (0.023)	0.3626*** (0.042)	0.3108*** (0.029)	0.3227*** (0.029)
DIS	-0.2191*** (0.016)	-0.1705*** (0.019)	-0.0752*** (0.016)	-0.075*** (0.016)
ln(*GDPpc*)		0.2974*** (0.060)	0.2407*** (0.049)	0.2070*** (0.049)
LANG		1.2275*** (0.297)	1.3899*** (0.174)	1.3533*** (0.173)
O_WTO			0.4827** (0.193)	0.4840** (0.191)
EU			1.4200*** (0.207)	
EUNEURO				1.0587*** (0.225)
EURO				1.6660*** (0.215)
BORDER		4.0972*** (0.142)	4.0761*** (0.319)	3.8291*** (0.324)
FC		1.7450*** (0.181)	1.1789*** (0.198)	1.0856*** (0.199)
Sample size	997	997	997	997
Adjusted R^2	0.4673	0.5816	0.6546	0.6580
Wald-F test	310.6274 (0.000)	164.5590 (0.000)	138.2157 (0.000)	129.5750 (0.000)
Period fixed effects F test	12.9428 (0.000)	16.6200 (0.000)	18.6450 (0.000)	18.3829 (0.000)

Notes: (i) In parentheses, we report the estimated robust standard deviation for each cluster of partner trade; (ii) ***, **, and * indicate the individual significance of the explanatory variable for 1%, 5% and 10% significance levels, respectively; (iii) R2 corresponds to the coefficient of determination; (iv) The Wald-F test corresponds to the overall significance test of the regression, with the respective p-value in parentheses and below the observed value of the test statistic; (v) In the F Fixed Effects test for the period, the p-value is indicated between parentheses; vi) dummy variables were used for France, Germany and UK to control for the major partners.

Regarding distance, it is possible to conclude that a 1,000 km increase in distance between Lisbon and the importer's capital is estimated to result in a 7.52% decrease in clothing exports to the importer, *ceteris paribus*. These results are consistent with previous research and support the findings of Ho et al. (2020), among others.

Regarding the dummy variable *LANG*, the estimated effect is 301.44% while keeping everything else constant, which means that the value of clothing exports to countries that speak Portuguese is estimated to be 301.44% higher than to similar countries with other official languages. This outcome confirms the significance and the expected signal discussed in Section 2.3, supporting the analysis presented by Chen et al. (2017) among others.

Trade agreement variables from fitted model C, *EU,* and *O_WTO* positively affect Portuguese clothing exports. The importers belonging to the European Union, represented by the variable EU, have a greater impact on clothing exports than those belonging to the WTO (variable O_WTO). It is estimated that *ceteris paribus*, clothing exports to WTO members, excluding EU members, is 62.04% higher than to countries without a trade agreement. Exports to EU member countries are estimated to be 313.71% higher when compared to countries that do not have a trade agreement, ceteris paribus. These findings are consistent with previous research discussed in Section 2.3. The major impact of the EU is explained by the fact that clothing is an industry subject to strong competition and therefore having tariff-free access to EU markets is a major advantage for Portuguese clothing exporters.

Since the variable *BORDER* captures the effect of the border and the effects of Spain, the largest consumer of Portuguese clothing exports, the estimated effect on clothing exports to Spain, the only country in the sample that shares a border with Portugal, is 5791.53% higher than exports to countries that do not share a border with Portugal, *ceteris paribus.* This result confirms the expected signal discussed in Section 2.3 and demonstrates that Spain has a major impact on Portuguese clothing exports – this may be explained by the fact that our clothing industry is outsourced by strong Spanish Fashion Brands such as Zara, Massimo Dutti, and others.

The estimated value of Portuguese clothing exports to countries hosting fashion capitals, represented by the variable FC, surpasses those without such capitals by a remarkable

225.08%. These findings align cohesively with existing literature, corroborating the study by Lee et al. (2014). This is an interesting result because it is well known that the Portuguese clothing industry supplies many Fashion Brands located in such countries.

About the fitted model D, the overall model is significant at 1%, and all variables are statistically significant at 1%, except for the countries that are part of the *WTO*, excluding the *EU* countries, represented by the variable *O_WTO*, which is significant at 5%.

Distance is estimated to have a -7.50% impact on clothing exports in fitted model D, resembling the results observed in fitted model C. In fitted model D, the estimated clothing export elasticities relative to the *GDP* and to the *GDP per capita* are also roughly similar to those derived from Fitted model C. However, it should be noted that the *GDP* elasticity in fitted model D is higher when compared to the *GDP* elasticity in fitted model C. Conversely, the *GDP per capita* elasticity is smaller in the fitted model D.

Regarding the dummy variable *LANG*, similarly, the estimated value of *LANG* is 287.01%, which is approximated to the value derived from fitted model C, which is smaller. This means that clothing exports to countries that speak Portuguese are estimated to be 287.01% higher than exports to countries that speak other official languages, *ceteris paribus.*

All dummy variables, *EURO, UENEURO,* and *O_WTO*, have a positive estimated effect on Portuguese clothing exports. Nevertheless, while the *O_WTO* variable fails to achieve statistical significance at a significance level of 1%, the *EURO* variable exhibits a strong impact. The estimation suggests that Portuguese exports to countries within the Eurozone are approximately 429.10% higher than those that do not share the euro currency, *ceteris paribus*. In comparison, the estimated value of exports to countries within the European Union but not in the Eurozone is about 188.26% higher than to countries that do not belong to the EU, compared with countries that do not have trade agreements, *ceteris paribus*. These results make sense, as the clothing industry operates under extreme competition pressures selling to markets with a common currency reduces transaction costs, therefore Eurozone impact reflects this preference. The estimated value for the *O_WTO* is very similar to the fitted model C (around 62%).

Finally, the estimated value of the variable *BORDER* in fitted model D is similar to that obtained from fitted model C. Nevertheless, the value in fitted model D is lower. It is estimated that a geographical border with Spain increases Portuguese clothing exports by approximately 4502.11% compared to what would occur in the absence of this border, *ceteris paribus*.

The estimated value of Portuguese clothing exports to countries featuring fashion capitals closely parallels the values derived from Fitted Model C.

5.3 Textile and Clothing Comparison

After estimating the textile and clothing gravity equations, it is possible to compare the impact of explanatory variables in each commodity's exports. It is important to acknowledge that we are dealing with distinct realities in our analysis as we explore various countries and equations encompassing different variables for textiles and clothing. Consequently, direct comparisons of their respective values may not be feasible or appropriate.

The findings reveal that unique trade ties between Portugal and its trading partners are critical and have boosted Portuguese T&C exports. Looking at the fitted model D, all the estimated values are bigger for clothing than textiles, except for the *DIS* and *O_WTO* values. Note that the main trade partners are different regarding textiles and clothing, so those were not compared.

The effect of the *GDP* and *GDP per capita* elasticity estimation is bigger in clothing, while distance has a smaller negative impact on clothing than it does on textiles. These results make sense – textile products respond more to basic needs such as home textile goods or as intermediate goods for the clothing industry or other industries, therefore the lower elasticity.

When comparing the dummy variables, we can conclude that the effect of *LANG* has a much bigger impact on clothing exports in all the fitted models. This may be interpreted that clothing exports are more sensitive to cultural proximity than textile exports. This makes sense since textiles include products that are incorporated into new production

processes, whereas clothing refers mostly to final products. So cultural proximity impacts the consumer behaviour which in turn reflects in clothing exports.

Regarding dummy variables that represent trade agreements, it should be noted that, in the textiles fitted model D, the trade agreement variable that has a major influence is the *O_WTO*, while on clothing, the *EUNEURO* and *EURO* variables have a much bigger impact than the *O_WTO*. The China effect may explain this – this country became a WTO member with a huge impact on Portuguese exports. However, it may be easier to export textiles to China as a business-to-business activity than clothing, which requires access to distribution channels to reach final consumers, another big market for Portuguese textiles is the USA.

The dummy variable border has a much larger effect on the clothing equation while still substantially impacting the textile equation. One explanation is that, as mentioned before, the Portuguese clothing industry participates in the production chains of several major Spanish fashion brands. As for textiles, that is not the case, and these are also intermediate goods for the clothing industry and other industries. Given the distinctiveness of the leading trade partners and their respective numbers concerning textile and clothing exports, direct comparisons between the two shall be abstained.

6. Conclusion

The textile and clothing sectors are fundamental for Portugal's economy since they are two of the main Portuguese industries in terms of turnover and market share. These sectors are still very important contributors to the trade balance, and their exports have developed dynamically in recent years. Therefore, this research uses an augmented gravity model to examine the main determinants of textile and clothing exports and the differences between them. The analysis considered the top 50 countries/markets where Portugal exported textiles and clothing from 2000 to 2019.

This research contributes to the empirical literature on Portuguese exports as well as to global commerce under the gravity model. The study empirically evaluated various explanatory variables described in earlier studies and verified the statistically significant determinants of Portuguese clothing and textile exports. The results and findings of this research demonstrate that the gravity model can effectively measure the influence of different factors on Portuguese clothing and textile exports.

The following export determinants were considered: GDP, GDP per capita, distance, sharing a common language, sharing a common border, the existence of trade agreements, and the largest trading partners. The clothing equation considered the presence of a fashion capital in the destination country.

The period fixed effects models were used, and the results were statistically significant. It should be noted that all results were consistent with the economic theory presented in Section 2.3. As a result, the GDP, GDP per capita, the shared language, and the dummy variables related to trade agreements positively impacted textile and clothing exports. In contrast, distance had a negative impact on these same exports. The existence of a fashion capital in the importing country, only presented in the clothing equation, also positively impacted such Portuguese exports.

In textiles and clothing, the variable which had a greater impact on exports is the border (which also captures the effect of Spain). This reveals the high level of integration of both industries within the Spanish economy. It deserves notice that the presence of a fashion capital in the destination country (market) has an important enhancement on clothing

exports. Additionally, it is worth noting the small effects associated to the GDP and GDP per capita variables. However, it had a greater impact on clothing than on textiles.

Cultural proximity, as represented by the *LANG* variable, emerges as more impactful on clothing exports, reflecting its greater sensitivity to cultural ties. As for the negative impact of distance it is less pronounced for clothing than textiles. Concerning trade agreements, the effects vary, with the prominence of variables like *O_WTO* for textiles and *EUNEURO* and *EURO* for clothing. These outcomes align with the understanding that textiles serve basic and intermediate needs, while clothing pertains to finished products.

In other words, the issue concerning the border is crucial, as are the relationships with our main trading partners, where exports are much higher when compared to the other countries. As a result, it is critical to be concerned about preserving the Spanish, German, Italian, French, and UK markets, as well as the Japanese and American ones, since Tokyo and New York are fashion capitals. These significant markets account for a large quota of Portuguese T&C exports.

By using the findings from this study, future research can design appropriate strategies that will facilitate the decision-making process regarding potential markets for our exports. The study also provides empirical facts for government officials and industry practitioners to make trade policy decisions and forecast probable trends in the Portuguese textile and clothing trade flow with variations in specific economic and political factors. It may also assist in making decisions regarding which international textile and clothing fairs Portuguese industries should attend.

The research covers a study gap since there is no major work regarding the determinants of Portuguese T&C using the trade gravity model. By using a gravity model framework, this study serves as a jumping-off point for examining Portuguese textile and clothing exports. Additional elements may be incorporated into the proposed gravity equation to better account for the fluctuation in Portuguese textile and clothing exports. One of the limitations encountered was a lack of statistical data concerning some nations, which reduced the sample size. Future studies might improve the suggested model to incorporate distinctive trade agreements or clauses, as well as certain limits (e.g., tariff rates) between exporting and importing nations, thus increasing the model's explanatory ability. Other

variables could be explored in future studies such as the 'basket of prices from major textile exporters,' 'the existence of international fairs in the destination countries where Portugal participated', and 'the number of visitors at the international T&C fairs in the destination countries'.

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8. Annexes

Table 16. List of Countries used as the sample for the textile econometric model

Group	Country Name	Number of Country
EURO	Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Netherlands, Slovakia, Spain	12
EU	Austria, Belgium, Bulgaria, Czechia, Denmark, Finland,-France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Romania, Slovakia, Spain, Sweden	19
WTO	Angola, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Cape Verde, Canada, China, China, Hong Kong SAR, Czechia, Denmark, Egypt, El Salvador, Finland, France, Germany, Greece, Hungary, India, Ireland, Italy, Japan, Kenya, Lithuania, Madagascar, Mexico, Morocco, Netherlands, Nicaragua, Nigeria, Norway, Pakistan, Poland, Rep. Of Korea, Romania, Slovakia, South Africa, Spain, Sweden, Switzerland, Tunisia, Turkey, United Kingdom, USA, Viet Nam	48
NAFTA	Canada, Mexico, USA	3
ASEAN	Vietnam	1
Middle East	Syria, Pakistan	2
CPLP	Angola, Brazil, Cape Verde	3
Others	Algeria	1
Total countries presented		50

Table 17. List of Countries used as the sample for the clothing econometric model

Group	Country Name	Number of Country
EURO	Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Slovakia, Slovenia, Spain	15
EU	Austria, Belgium, Bulgaria, Czechia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden	21
WTO	Angola, Australia, Austria, Belgium, Brazil, Bulgaria, Cape Verde, Canada, China, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Guinea-Bissau, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Luxembourg, Mexico, Morocco, Mozambique, Netherlands, Norway, Poland, Qatar, Rep. of Korea, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tunisia, Turkey, United Arab Emirates, United Kingdom, USA	47
NAFTA	Canada, Mexico, USA	3
ASEAN	-	0
Middle East	Cyprus, Israel, Kuwait, Lebanon, Saudi Arabia, Qatar, United Arab Emirates	7
CPLP	Angola, Brazil, Cape Verde, Mozambique, São Tomé and Príncipe	5
Others	-	0
Total of countries presented		50

Table 18. Average textile exports to each of the countries from 2000 to 2019 (in thousands of US$)

1	Spain	US$231 173.03	26	Lithuania	US$6 625.50
2	Germany	US$118 380.92	27	Switzerland	US$6 444.86
3	Italy	US$113 151.33	28	South Africa	US$5 838.66
4	France	US$89 741.30	29	Argentina	US$5 806.43
5	United Kingdom	US$81 464.56	30	Vietnam	US$5 377.85
6	USA	US$69 172.52	31	Algeria	US$5 321.85
7	Morocco	US$35 569.69	32	Finland	US$5 274.15
8	Turkey	US$26 629.18	33	Egypt	US$5 262.60
9	Romania	US$23 811.63	34	Japan	US$5 193.86
10	Belgium	US$23 597.40	35	India	US$4 953.60
11	China	US$21 442.00	36	Kenya	US$4 731.14
12	Tunisia	US$16 644.22	37	Czechia	US$4 479.92
13	Brazil	US$15 227.17	38	Cape Verde	US$4 079.58
14	El Salvador	US$13 686.44	39	Nicaragua	US$3 983.27
15	Mexico	US$13 667.20	40	Hungary	US$3 733.15
16	Netherlands	US$12 231.05	41	Ireland	US$3 341.48
17	Pakistan	US$11 613.26	42	Nigeria	US$3 283.32
18	Angola	US$11 315.17	43	Rep. of Korea	US$3 178.68
19	Sweden	US$11 285.26	44	Bangladesh	US$3 136.69
20	Hong Kong	US$10 289.52	45	Greece	US$2 673.29
21	Canada	US$10 061.77	46	Madagascar	US$2 349.56
22	Poland	US$9 725.06	47	Syria	US$2 197.04
23	Denmark	US$8 910.77	48	Slovakia	US$1 943.28
24	Bulgaria	US$7 494.31	49	Norway	US$1 811.39
25	Austria	US$6 972.01	50	Australia	US$1 800.81

Table 19. Average clothing exports to each of the countries from 2000 to 2019 (in thousands of US$)

1	Spain	US$2 521 527.69	26	Poland	US$8 972.85
2	France	US$937 394.68	27	Israel	US$7 620.24
3	United Kingdom	US$678 571.05	28	Romania	US$7 371.54
4	Germany	US$634 542.51	29	Saudi Arabia	US$7 078.23
5	Italy	US$355 668.50	30	Brazil	US$6 742.06
6	Netherlands	US$306 180.04	31	Australia	US$6 176.50
7	USA	US$182 943.94	32	Czechia	US$5 986.28
8	Sweden	US$166 564.50	33	Cape Verde	US$5 926.09
9	Belgium	US$142 569.37	34	Rep. of Korea	US$5 751.37
10	Denmark	US$120 307.77	35	Mozambique	US$4 995.33
11	Austria	US$94 247.32	36	Qatar	US$4 762.47
12	Switzerland	US$92 042.07	37	Russian Federation	US$4 569.61
13	Angola	US$54 011.60	38	Lebanon	US$3 851.60
14	Finland	US$39 115.06	39	Morocco	US$3 785.54
15	Ireland	US$37 287.60	40	Iceland	US$3 222.09
16	Norway	US$31 377.33	41	Kuwait	US$2 998.75
17	Tunisia	US$28 597.20	42	South Africa	US$2 807.65
18	Hong Kong	US$22 075.99	43	Slovakia	US$2 690.58
19	Canada	US$17 939.24	44	Slovenia	US$2 353.11
20	United Arab Emirates	US$15 689.92	45	Bulgaria	US$2 291.76
21	China	US$13 291.08	46	Turkey	US$2 214.21
22	Greece	US$12 810.32	47	Estonia	US$1 969.69
23	Japan	US$12 658.93	48	Cyprus	US$1 878.31
24	Luxembourg	US$10 295.86	49	São Tomé and Príncipe	US$1 057.95
25	Mexico	US$10 187.30	50	Guinea-Bissau	US$921.50