Destination and product structure of exports: Impact on the economic growth of Europe

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Abstract

From the late 70s onwards, the literature has produced numerous studies, mostly for developing countries, relating exports and economic growth. Since several European Union (EU) countries face strong recessions in the sequence of the economic crisis and the related fiscal consolidation measures, exports emerge as a meaningful source of growth for developed countries with domestic markets plagued by entropy.

In this context, we assess if and how the product and the destination structures of exports shape the growth dynamics for the EU countries. Using panel data estimation to 23 of the 27 EU members over the period 1995-2010, we find that economic growth is foster through export specialization in high value-added products, such as manufactures and high-technology. Moreover, there is an inverted U-shaped relation between growth and the partners' dispersion: the number of partners has a negative impact on growth but a higher concentration of exports among partners also impinges negatively on growth. Unambiguously, relative concentration of exports should be directed towards higher growth countries.

Keywords: Economic growth; Product structure of exports; Exports' destination; European Union; Panel data.

JEL classification codes: C23; F10; O40; O52.

Resumo

A partir do final dos anos 70, muitos foram os estudos que surgiram relacionando exportações e crescimento económico debruçando-se essencialmente sobre países em desenvolvimento. Uma vez que vários países da União Europeia (UE) enfrentam fortes recessões na sequência da recente crise económica e respetivas medidas de consolidação orçamental, as exportações surgem como uma fonte significativa de crescimento para os países desenvolvidos, com mercados domésticos saturados.

Neste contexto, importa avaliar se e como a estrutura de produto e de destino das exportações afetam a dinâmica de crescimento para os países da UE. Através de técnicas de estimação de dados em painel para 23 dos 27 membros da UE no período 1995-2010, verificamos que o crescimento económico é positivamente influenciado pela especialização em exportações de alto valor acrescentado, tais como bens manufaturados e de alta tecnologia. Além disso, existe evidência de uma relação em forma de "U invertido" entre crescimento económico e dispersão das exportações dentro dos parceiros comerciais: o número de parceiros tem um impacto negativo sobre o crescimento, mas uma maior concentração de exportações entre parceiros, incide também negativamente no crescimento. Inequivocamente, a concentração relativa das exportações deve ser direcionada para os países de crescimento mais elevadas.

Palavras-chave: crescimento económico; estrutura de produtos das exportações; destino de exportações; União Europeia; dados em painel.

Classificação JEL: C23, F10; O40; O52.

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Abbreviations

ELG – Export-led growth

EU – European Union

GDE – Growth-driven exports

GDP – Gross domestic product

GMM – Generalized method of moments

ILG – Import-led growth

p.p. – Percentage point

R & D – Research and development

Introduction

From the late 70s onwards, the literature on economic growth and development has produced several studies relating exports and economic growth, although with an unclear unique-direction causal relationship. In general, exports as an engine of growth are particularly important for small countries with a restricted domestic market. In the current context, and in particular for the European Union (EU) countries facing strong domestic recessions in the sequence of the economic and financial crisis and the related public debt correction measures, exports' growth emerges, once again, as a meaningful source of economic growth given the entropy exhibited by the domestic market.

Given that exports are a potential source of growth, a more refined analysis is in order: with a view to maximize the effects on growth, criteria on what and where to export may not be negligible. In this study, we aim at assessing if and how product and destination structure of exports shape the output growth dynamics for the EU countries.

Among the relevant literature, most studies focus on the Export-led growth (ELG) hypothesis, motivating and testing to what extent an increase in the volume of exports contributes to higher economic growth in the country of origin. In parallel, but to a rather small extent, there is some research that focuses, alternatively, on the product structure of exports (type of products and product concentration) or on the destination of exports (where to export and destination diversification) as determinants of economic growth or/and exports' growth.

In this context, our research contributes to the literature because, to our knowledge, this is the first study that tests, simultaneously, how the product structure of exports and their destination influence the economic growth in the country of origin. Moreover, we test for several dimensions of the product and the destination structure of exports. Additionally, and given the current environment constraints on the European growth prospects, our study relies on panel data estimation for the EU countries, whereas most of the collected literature on exports as a growth device applies to developing countries. Finally, and using the estimation results, we make an exploratory attempt to suggest export-supporting policy guidelines on where to and what should Portugal export.

The dissertation proceeds as follows. In section 1, we provide a review of the ELG hypothesis (briefly compared with the, alternative, "growth-driven exports" hypothesis) and an exhaustive review on how the product structure and destination shape economic growth and exports' growth. In section 2, we test for a causality relationship between exports and economic growth and analyze the structure and destination of EU exports. Section 3 presents data, methodology and the analysis of the estimation results. In section 4, we tentatively produce a note on export policy, given the current structure of Portuguese exports in terms of product and destination. Finally, we present the final remarks in section 5.

1. Export-led growth – a literature overview on the role of product structure and destination of exports

The link between exports and economic growth has been, for a long time now, an important and attractive area of research, widely explored in the literature (*e.g.*, Michaely, 1977, Balassa, 1978; Feder, 1983; Awokuse, 2008). Although the findings are not unanimous, a substantial amount of literature finds a positive relationship between these two variables, both on theoretical and empirical grounds.[1] In fact, most of the studies focus on the direction of causality between the variables: "Should a country promote exports in order to accelerate their economic growth or should, first, focus on economic growth that will generate exports?" (Kónya, 2006).

Consequently, two alternatives emerge in the literature: the export-led growth (ELG) and growth-driven exports (GDE) hypothesis. Since our aim is to explore the role of the structure of exports to the economic growth in Europe, we will focus on the mechanisms supporting the former hypothesis.

A first argument for the ELG is that "market size matters". Openness enlarges market dimension, and an increase in production and sales arises as a result of higher demand pressure (Ramos, 2001; McCann, 2007; Hesse, 2008; Andraz and Rodrigues, 2010; Soukiasis and Antunes, 2011). This mechanism refers to the foreign demand multiplier.

An expansion in exports may also promote specialization in the production of tradable goods, promoting a better reallocation of resources from (relatively) inefficient non-tradable sectors to higher productivity export-oriented sectors; thus, as exports enlarge, domestic production rises through productivity growth (Awokuse, 2008; Andraz and Rodrigues, 2010). Trade, *per se*, also enhances higher product specialization which, according to the comparative advantage principle, increases productivity and, thus, boosts growth (Soukiasis and Antunes, 2011; Lorde, 2011).

[1] An exception, for instance, is found in McCann (2007), where Prebisch (1950) and Singer (1950) argue that increasing competitiveness in developing countries hinder their industrialization effort. They found that a decline in the price of raw materials increases the gap between the developed countries against the developing ones since the latter, usually exporting natural resources, face reduced incentives to develop manufacturing industries. Thus, it would be necessary to impose some kind of trade barriers to protect infant industries in order to reinforce industrialization in developing countries.

Additionally, export effort involves facing stronger competitiveness which, on the one hand, favors the exploitation of economies of scale and, on the other hand, contributes to an acceleration of technical progress and a greater integration of production processes (Ramos, 2001; Awokuse, 2008; Andraz and Rodrigues, 2010). In this sense, international trade favors the so-called "spillover-effects" from technology transfers. Coe and Helpman (1995) have found evidence of transfer of R&D from industrialized countries to countries with the same, or lower, level of development. Overall, even in the absence of competition pressure, trade enhances technology and knowledge transfers (Soukiasis and Antunes, 2011): through trade, new ideas or original knowledge embedded in tradable goods are, even indirectly, transferred to the trading partner that ends up learning by induction (Kali *et al.*, 2007). For example, Keller (2004: 752) states that "in most countries, external sources of technology are responsible for about 90 percent of the growth of national productivity".

Another argument for the ELG hypothesis relates to the product and industry life-cycle hypothesis. This approach describes economic growth as a cycle that begins with exports of primary goods and, as time passes, economic growth and knowledge change the product structure of the domestic economy, including consumption, which propels more technology-intensive domestic industry to begin exporting. As domestic demand ebbs, economic growth arises from more technology- advanced exports (McCann, 2007; Giles and Williams, 2001a).

Export growth also plays an important role in the process of economic growth by relaxing the external financial constraint of the country. Exports increase the potential demand of the economy and, consequently, increase the ability to save more and to greater capital accumulation; at the same time, they also enable the country with larger capability to import. Export growth, through enlarging the ability to import intermediate capital goods, contributes to a potential increase in the production of an economy (Ramos, 2001; Awokuse, 2008). So, along these arguments, policies that favor exports seem to be in order (Siddiqui *et al.*, 2008).

As for the assumption that exports are underpinned by economic growth, growth-driven exports (GDE) postulate the opposite arguments based on the idea that growth, by itself, induces trade flows. In turn, the reverse of most of the above arguments apply:

economic growth boosts the creation of comparative advantages in certain areas which contributes to deepening specialization and to the exploitation of economies of scale, lower production costs and, thus, facilitates exports (Kónya, 2006). Bhagwati (1988) postulates that GDE is likely, unless antitrade bias results from the growth-induced supply and demand. Neoclassical trade theory supports this notion, as it suggests that other factors aside from exports are determinant of output growth (*e.g.*, primary input growth and/or factor productivity growth). A GDE orthodoxy is justified by, for instance, Lancaster (1980) and Krugman (1984); economic growth leads to enhancement of skills and technology, with this increased efficiency creating a comparative advantage for the country that facilitates exports.

It is also important to understand that these two hypotheses are not mutually exclusive and that there may be evidence of a reciprocal relationship between the two variables (Kónya, 2006).

In order to test the ELG hypothesis, the empirical literature is divided into three groups: a first one, which computes cross-country correlation coefficients between exports and growth; these were followed by regression applications (typically using least squares) that were usually based on cross-country samples; and a third, more recent, which applies various techniques using time series to assess the link between exports and economic growth (Giles and Williams, 2001a). Roughly two thirds of the papers belong to this third group, and more than seventy of these are based on the concept of Granger causality and on various tests for it.

In the first two groups of studies to test the ELG hypothesis, we include Michaely's (1977) and Balassa's (1978). Both authors find significant evidence of a positive relationship between exports and growth. However, Michaely (1977) goes further in arguing that it is necessary, first, for a country to attain a threshold of development for this effect to occur. Thus, countries at lower stages of development cannot use exports as an engine for economic growth and must, first, reach a certain level of development so this could be a valid strategy (Michaely, 1977). Feder (1983) also concludes on a positive relationship between exports and economic growth, arguing that this is due to higher productivity in the export sector, explained by a more efficient and more

innovative production due to exposure to international competition and to the exploitation of economies of scale arising from market expansion.

In the third group, the most prevalent causality approach is grounded in Granger's (1969) work, which builds on earlier research by Weiner (1956). The notion is one of predictability being synonymous with causality, and is based on the idea that a cause cannot come after an effect. Granger's approach is "atheoretical" in the sense that no attempt is made to incorporate economic theory to impose any *a priori* restrictions upon the relationships between the variables of interest to the researcher. We say that *y* causes *x* if relevant available past information allows us to predict *x* better than when past information, except *y*, is used.

On the basis of the Granger non-causality procedure by Toda and Yamamoto (1995), Hatemi and Irandoust (2000) conclude that export series and output series exhibit a causal relationship in the long run for Ireland and Mexico. They also reveal that the ELG hypothesis holds not only for a strongly outward-oriented economy such as Ireland, but also for a moderately inward-oriented country such as Mexico. Kónya (2006), also support the ELG hypothesis in Belgium, Denmark, Iceland, Ireland, Italy, New Zealand, Spain and Sweden.

More recently, Lorde (2011) presents evidence for the existence of a positive relationship between exports and growth in the short run for Mexico, but negative when considering a longer time period. A likely explanation is the increasing high import content while diminishing local content of exports that weakens the linkages with domestic suppliers, thus reducing possible spillover or multiplier benefits.

In contrast, Henriques and Sadorsky (1996) for the Canadian case and Oxley (1993) and Hatemi and Irandoust (2000) for Portugal do not support the ELG hypothesis by finding evidence that economic growth precedes exports, *i.e.*, supporting the GDE hypothesis. Also Kónya (2006) find one-way causality from Gross Domestic Product (GDP) to exports in Austria, France, Greece, Japan, Mexico, Norway and Portugal.

Finally, Grabowsky *et al*. (1990) and Serletis (1992) find no evidence of any relationship between exports and economic growth for the countries in their studies. Also Kónya (2006), in the case of Australia, Korea, Luxemburg, Switzerland, the UK

and the USA finds no evidence of causality in either direction but finds a two-way causality relationship between exports and growth in Canada, Finland and the Netherlands.

Table 1, relying on the literature reviewed, summarizes the evidence found in the literature on the exports-growth nexus. The data relies on the studies reviewed by Giles and Williams (2001a), mostly focusing on developing countries, as well as in more recent literature reviewed testing for the ELG hypothesis.

Table 1: Number of studies testing for ELG *vs.* GDE[2]

	Giles and Williams (2001a)	*Recent studies reviewed*	*% of total studies*
Simple correlation growth-exports	160	0	-
NO	74		46.3%
YES	86		53.8%
Causality nexus	655	33	-
ELG	146	10	22.7%
GDE	116	9	18.2%
Bi-directional	87	5	13.4%
No-causality	306	9	45.8%

Sources: Own calculations based on Giles (2001a) and authors' revision of more recent papers quoted in the References section, below.

Overall, studies assessing simple correlation between growth and exports find a positive statistical relationship between the variables in 53.8% of the cases. Among those testing for a causality nexus, mild evidence persists: for the 688 cases identified, 46% deliver no-causality, whether bi-directional causality is found in roughly 13% of the cases; evidence for ELG slightly dominates that for GDE, accounting for 23% and 18% of the cases, respectively.

[2] Using tables A1 and A2 in Giles and Williams (2001a) which summarize several studies, we have recorded, irrespectively of the empirical methodology, the per-country test results for or against a given relationship between growth and exports (simple correlation or different causality nexus). For studies in which the same conclusion was reached for a set of countries but where countries were not identified in Giles and Williams' tables, each study was identified as a single case.

Since we find significant theoretical and empirical support for exports to work as an engine of growth, a more refined analysis on the nature of this relationship requires a further review on detailed aspects of exports. The product structure and the destination of exports are often presented in the literature as non-neutral characteristics in driving economic growth.

1.1. Product structure of exports

In this subsection we propose to review the literature on the mechanisms and impacts of the product structure and diversification of exports on economic growth. In fact, a country cannot simply increase its exports to ensure economic growth since the composition and concentration of the exported goods are found to be also relevant factors (McCann, 2007 and Hausmann *et al.*, 2007, among others). The decision on what to export depends on production costs, specific costs of the product at the destination in question, market structure and consumer preferences and income (Amador and Opromolla, 2008); additionally, the pattern of product specialization is not independent of the level of development of the origin country (Spilimbergo, 2000).

The development, production and consumption of new goods (usually embedded with growth-delivering technology) are more likely to occur, first, in more advanced countries arising, only later, in less developed countries (Stokey, 1991). On the demand-side, this is explained, for example, through the theory of product life-cycle according to which the demand for certain types of consumption goods is higher in countries with higher income (Vernon, 1966). On the supply-side, Grossman and Helpman (1991) argue that advanced economies are endowed with technological advantages, particularly when it comes to R&D. These authors argue that innovations take place in the most developed economies, while for these goods to be produced in less developed regions knowledge has to be transmitted to these regions. Thus, the more developed regions, rich in skilled labor and superior technology, producing (and thus exporting) more sophisticated goods, the greater is the potential for technological progress and therefore to higher economic growth (Spilimbergo, 2000).

The export of more sophisticated goods, that allows transmission of knowledge and skills for the domestic economy through exposure to foreign competition, also leads to more efficient management practices while stimulating innovation and technological advance (McCann, 2007).

In this sense, it seems relevant to analyze exports taking into account their technological component. One of the recent studies on this issue, Guaresma and Worz (2005), tests the hypothesis that exports of high-tech industries have a greater potential for positive externalities and higher productivity (in terms of improved efficiency and economies of scale). They found evidence that there is a difference when considering exports disaggregated according to technological intensity: while technology-intensive exports have a significant positive effect on economic growth, exports of products with low technological intensity exhibit a negative effect on economic growth. The same study concludes that the better performance of high-tech exports is due to the difference in productivity relative to that in the domestic sector. According to these authors, developing countries benefit from a greater openness to foreign trade that leads to a better application of resources resulting from exposure to international competition. Thus, a more efficient use of resources contributes to increased productivity in the export sector, above the level of productivity in the domestic sector (Guaresma and Worz, 2005). However, conclusions are different for developed countries compared to developing countries. For the former the results are not significant, only accruing positive growth effects to developing countries. One explanation may be that for marginal increases in capital, labor or exports, the rate of economic growth is greater the lower the level of development is (Balassa-effect as in McCann, 2007).

In the same veil, some authors also disaggregate exports into commodities/natural resources and industrial and processed products. According to Herzer *et al.* (2004), there is evidence of a positive impact of manufacturing exports on economic growth, while exports of primary products exhibit negative impact on economic growth. Such findings can be interpreted as stemming from the effects of increased productivity associated with the industrial sector compared to those appending on primary goods (Herzer *et al.,* 2004). Countries that export goods with high levels of productivity benefit from faster economic growth (Hausmann *et al.,* 2007). It is also argued that,

based on endogenous growth theory, the diversification of exports towards export more technology-advanced products, at the expense of "commodities", can contribute to positive externalities in other sectors (Herzer and Nowak-Lehmann, 2006). Greenaway *et al.* (1999) also test the impact of exports on GDP growth by disaggregating them into fuel, food, metals, other commodities, textiles and other manufactured goods. In contrast, they conclude that exports of fuels, metals and textiles to reveal important engine of economic growth. This can be interpreted (according to the authors) given the relative weight of the textile sector in developing countries and because metals and fuels represent inputs of great importance to most developed countries. Ziramba (2011), by decomposing exports into merchandise exports, net gold exports, export of services and income receipts, finds that real merchandise exports lead growth and that there is evidence of reverse causality in the case of service exports and income receipts. For net gold exports there is no causal relationship in either direction.

Another important issue for this analysis relates to the relative importance of certain products in exports and, thus, its concentration in the exports portfolio. It will then be useful to know if it reveals more advantageous to specialize in certain products for export or whether it is more productive to diversify and invest in a wider variety of goods. There are several arguments used in this discussion.

On the one hand, concentration of exports in certain products may allow economies of scale and enable the firms to move along the learning curve (Bebczuk and Berrettoni, 2006). For instance, the decrease in transport costs can lead to a reduction in the number of products produced domestically, thus promoting specialization (Dornbusch *et al.*, 1977). Hausmann and Rodrik (2003) emphasize the role of the cost of new discoveries/diversification on influencing economic growth. This is because entrepreneurs face significant uncertainty about the costs in the production of new goods: if they are successful in developing these new products, the gains will be for the whole society (information spillovers) but, in case of failure, losses will accrue to the private sector (investor). Thus, investment possibilities are withdrawn.

On the other hand, a diversification strategy ensures the stability of profits, leading the company to invest in some sectors related to its current portfolio (Bebczuk and Berrettoni, 2006), and also contributing to the stabilization of export earnings in the

long run (Ghosh and Ostry, 1994). Moreover, it is also argued that diversification is an endogenous process that moves along with economic development: under certain assumptions, the Engel effects imply that higher income levels demand for greater economic diversity of consumption goods, forcing, consequently, producers to invest in a wider range of sectors (Acemoglu and Zilibotti, 1997). Additionally, one of the reasons most frequently mentioned in the defense of diversification of exports, points to the knowledge transfer of new production techniques, management or marketing to new industries (Hesse, 2008). The instability of exports is another factor that contributes to the diversification of exports. Diversification will prove beneficial for less developed economies as "commodities" are too volatile to price changes; countries dependent on these products might, thus, suffer negative consequences due to excessive oscillation once the elasticity of demand is too small (Hesse, 2008). A final argument used by apologists of export diversification is linked to the idea that developing countries must export goods for which world demand is increasing and that, regardless of a country producing more primary goods or manufactured, is the compatibility with the global demand that will determine the growth of its exports (Alexander and Warwick, 2007).

But export diversification prescription can differ in the context of more or less developed economies: the more developed countries tend to diversify their exports through innovate and invest in new technologies and not just by exporting a larger volume (Hummels and Klenow, 2005), while developing countries tend to imitate and to export the products where they have a greater advantage, namely those related to natural resource abundance and/or low cost of manpower (Hesse, 2008).

Among the empirical literature, Al-Marhubi (2000) and Lederman and Maloney (2003) conclude for the positive impact of diversification of exports on economic growth. Some studies have, though, different conclusions when considering developed countries or countries at delayed phases of development (Hesse, 2008; Imbs and Wacziarg, 2000; McCann, 2007; Bonaglia and Fukasanu, 2003). Hesse (2008) and Imbs and Wacziarg (2000) conclude that specialization is beneficial for countries in more advanced stages of development while diversification is a best strategy for developing countries. In this sense, McCann (2007) and Bonaglia and Fukasaku (2003) also conclude that diversification is more important for developing countries and, thus, defend the these

countries should be encouraged to diversify their exports to technologically more advanced sectors as to contribute to their economic growth. Note that this technological advance is recommended to occur in sectors where the country is already exporting before (product proximity), notably with regard to countries with abundant natural resources for example, forestry and mineral sectors have been proof of that, recording a significant development in terms of technologies used (Bonaglia and Fukasaku, 2003).

Despite the diversification of exports being pointed out by many authors as a determinant of economic growth (Bonaglia and Fukasaku, 2003; Herzer and Nowak-Lehmann, 2006; McCann, 2007; Hesse, 2008), there are some studies that find evidence that expertise in some sectors also may prove beneficial to economic growth, as is the case of specialization in the electronics sector (Amable, 2000) or in sectors with higher growth rates, generally more technologically advanced (Laursen, 2000; Guaresma and Worz, 2005). Peneder (2002) also concludes that specialization in services represents a burden for future growth, while more technologically intensive exports have positive effects on economic growth. In this sense, Hausmann *et al.* (2007) argue that countries specializing in goods that richer countries export exhibit faster growth than those specializing in the production of other goods. Since the specialization in certain products/sectors delivers different growth gains, government policy can play a key role through promoting incentives to the sectors which have major benefits for economic growth.

1.2. Destination of exports

The next point that we want to explore is the specific role of export destination on economic growth, an issue that the literature started to cover only recently and that still remains barely explored. Internationalization is of strategic importance since, for instance, the expansion into new markets is among the main decisions in the life of a company. This option is often related with cultural or social links with former colonies, the need for more trading partners (which are also, usually, former colonies) or the proximity to (large) external markets (Baliamoune-Lutz, 2011). Basically, the decision

to enter a new market proves to be as important as the decision to create a new company (Amador and Opromolla, 2008).

In the literature we find a broad set of conflicting arguments in favor of destination diversification or for destination concentration. Moreover, and in particular, the literature also focuses on the optimal characteristics trade partners should exhibit.

A first set of arguments for destination diversification is related to the mechanism of technology and knowledge spillovers emerging from trade. To the extent that a country produces knowledge through research or experience, some countries generate more knowledge than others. In this sense, for the same export volume, the larger the number of trading partners, the greater the possibility of positive externalities resulting, namely, in terms of technology and exposure to new/different ideas (De Loecker, 2007). The adoption of new technologies helps to increase productivity and contributes to higher economic growth (Coe and Helpman, 1995).

Moreover, countries that export to a wider range of markets benefit not only because they face an enlarged and more diversified market to sell their products, but also because firms come across with new consumer's tastes, government regulations and other business environments (Lederman and Maloney, 2003).

Also, an increasing number of trading partners, resulting from the expansion of potential markets, attracts local and foreign investment which is shown to play an important role in technology diffusion and innovation and, consequently, in economic growth (Grossman and Helpman, 1991).

At the same time, the greater the diversity of trading partners, the stronger is the need for permanent development of innovations as to remain in a given market. Since fierce competition requires a continuous search for productivity gains, it impinges positively on economic growth (Kali *et al.*, 2007).

Furthermore, the diversification of trading partners reveals positive because it minimizes the risk of relying on a small number of export markets and, thus, reduces the export-dependency in case of idiosyncratic shocks (Baliamoune-Lutz, 2011).

However there are also arguments in favor of export concentration on a smaller number of countries. Concentration can help minimize the costs associated with insufficient

commercial infrastructure such as ports, airports, diplomatic posts, among others (Kali *et al.*, 2007). Frankel *et al.* (1995), for example, point transportation costs as one of the main reasons for the emergence of specific trading blocks. Thus, when the infrastructure related to trade is not well developed, the concentration of trade destinies can help reducing transport costs (Kali *et al.*, 2007).

Besides the number of trading partners, the type of countries towards which exports are oriented to is also an important determinant for the role of exports in promoting economic growth. In this regard, the most obvious channel operates through external demand growth: the higher the average growth rate of the trading partners, the higher is their demand growth for imports, which directly contributes to a higher net exports growth of the country of origin (Arora and Vamvakidis, 2005).

Moreover, and since countries at different stages of development demand, on the one hand, for different products and, on the other hand, influence differently the country of origin through technological spillovers, the choice of where to export is not innocuous (Coe and Helpman, 1995). Additionally, and in this context, the choice of the menu of trading partners is rather limited: stating that "The G-7 countries accounted for about 84 percent of global spending on R&D in 1995", Keller (2004: 752) argues that knowledge is concentrated in a few countries.

Vacek (2010) finds that exports to more developed regions, which are pushing the world technological frontier forward, lead to higher productivity gains for the country of origin. On the one hand, exports to customers in more advanced countries requires a greater degree of attention to product quality and/or deliverance time, meaning that companies continually seek to improve their performance by introducing innovations - improved methods of packaging and transport, adaptations to attract foreign consumers, product innovations, among others - (Kali *et al.*, 2007). On the other hand, the most advanced countries are endowed with a greater learning potential, more sophisticated production techniques, marketing and management strategies, and better design of inputs (Vacek, 2010). In this sense, establishing trade relations with countries in a more advanced stage of development favors the exporting country as it has access to a greater amount of knowledge (Damijan *et al.*, 2004) and may also benefit from the expertise of their buyers (Clerides *et al.*, 1998). Conversely, exports to less developed markets may

lead to declining productivity, as an environment with fewer requirements for product quality and delivery timings would make exporters to become less efficient (Vacek, 2010).

However, the above results related to technology and other efficiencies spillovers are also sensible to the degree of development of the export-origin country. According to Kali *et al.* (2007), the marginal benefit of an additional trading partner is different for poor or rich economies. If, on the one hand, new technologies increase the productivity of older technologies, the effect of an additional trading partner on growth should be lower for a poor economy since it holds a smaller stock of knowledge to implement technological updates. On the other hand, the fact that the stock of knowledge is lower in poor countries, could imply that the contribution of an additional trading partner in terms of new knowledge (with impact on growth) is greater for developing economies. While these effects operate in opposite directions, both suggest asymmetric growth gains from trade accruing to rich and poor countries.

A final note is in order: Amador and Opromolla (2008) found that destination and product diversification of exports are both are determinants of growth. Their study relies on micro-data and an analysis is made for the dynamics of export structure of companies located in Portugal, during the period 1996-2005. The authors conclude that multi-product and multi-destination firms are crucial in explaining the level and growth rates of Portuguese exports; in particular, firms exporting four or more products and operating in four or more different markets are responsible for about two thirds of total exports. The authors also find evidence that growth in new markets is achieved mostly through the, simultaneous, introduction of new products in the firm's export portfolio.

Using a panel estimation based on a time series data of four decades for more than 100 countries, Arora and Vamvakidis (2005) show that trading partners' growth has a strong effect on domestic growth, even after controlling for the influence of common global and regional trends. The results are robust to instrumental variable estimation and other robustness tests. Trading partners' relative income levels are also positively correlated with growth, suggesting that the richer trading partners are, the stronger is conditional convergence. A general implication of the results is that countries benefit from trading with fast-growing and relatively more developed countries. Also, Baliamoune-Lutz

(2011) concludes that where a country exports matters for the exporting country's growth and development. Performing Arellano-Bond GMM estimations using panel data over the period 1995-2008 to explore the growth effects of Africa's trade with China, she find that there is no empirical evidence that exports to China enhance growth unconditionally but export concentration enhance the growth effects of exporting to China, implying that countries which export one major commodity to China benefit more (in terms of growth) than do countries that have more diversified exports.

2. Exports and growth in the European Union

In this section we aim at checking if there is a causality relationship from exports to economic growth in Europe. In particular, we will focus on 23 out of the 27 European Union (EU) countries – EU23.[3] Before disentangling and testing the role of the determinants of exports for the economic growth according to the mechanisms reviewed in the previous section, we also present a brief summary of the recent dynamics of European exports, namely on both dimensions of destination and product structure.

2.1. Is there a causality relationship?

Before exploring how the product structure and destination exports can influence the economic growth we start by testing if there is a causality relationship between exports and economic growth. Furthermore, and with reference to Table 1 in the previous section, we test for the nature of such relationship: ELG, GDE or bi-directional. As we saw before, there is a huge amount of literature exploring this causality nexus. However, the conclusions are ambiguous and the results may vary from country to country and/or for different moments of time.

In our specific case we focus on the EU23 sample, where only developed countries are considered. This is a new sample in the literature - which is mostly centered in empirical applications to developing countries – that allows to test if the exports-growth nexus holds for countries in a more mature stage of development and in Europe in particular. For this, we follow one of the approaches more used in the literature (see, for instance, Oxley, 1993; Ramos, 2001; Awokuse, 2008, among others): the Granger causality test. We check the nature of the causality nexus using annual data on the ***log Total Exports*** and the ***log Real GDP*** (constant 2000 US$). This data was extracted from World Development Indicators (WDI), accessed in July 2012 at

[3] Due to data restrictions for the exercises performed in the next section, we have stick to the sample below, including Austria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

http://data.worldbank.org/data-catalog/world-development-indicators. Using the Dickey -Fuller unit root test (DF) on these variables, they are clearly stationary (see Annex A).

For this propose, we use the *Eviews'* software which provides the *Granger Causality Test* (Granger, 1969) by running the following bivariate regressions:

$$\boldsymbol{Log\ Real\ GDP_t} =$$

$$\alpha_0 + \alpha_1 \boldsymbol{log\ Real\ GDP}_{t-1} + \cdots + \alpha_l \boldsymbol{log\ Real\ GDP}_{t-l} + \beta_1 \boldsymbol{log\ Total\ Exports}_{t-l} + \cdots + \beta_l \boldsymbol{log\ Total\ Exports}_{-l} + \epsilon_t \quad (2.1)$$

$$\boldsymbol{Log\ Total\ Exports_t} =$$

$$a_0 + a_1 \boldsymbol{log\ Total\ Exports}_{t-1} + \cdots + a_l \boldsymbol{log\ Total\ Exports}_{t-l} + b_1 \boldsymbol{log\ Real\ GDP}_{t-l} + \cdots + b_l \boldsymbol{log\ Real\ GDP}_{-l} + \epsilon_t \quad (2.2)$$

where l is the lag length that corresponds to reasonable beliefs about the longest time over which one of the variables could help predict the other.

For instance, the question of whether ***log Total Exports*** causes ***log Real GDP*** is answered through the estimation results of equation (2.1): ***log Real GDP*** is said to be Granger-caused by ***log Total Exports*** if the latter helps in the prediction of ***log Real GDP***, or equivalently if the coefficients on the lagged ***log Total Exports***' are statistically significant. The same applies for the reverse causality using (2.2).

Because "the direction of causality may depend critically on the number of lagged terms included" (Gujarati, 1995: 622), we use the *Akaike Information Criterion* to decide which lag length was more appropriated. We also consider the *Schwarz Criterion* although it imposes a larger penalty for additional coefficients. Running VAR for ***log Real GDP*** and ***log Total Exports*** with different lag intervals (results not reported[4]), the optimum choice for the lag length was three (3).

[4] All non-reported results are available on request.

Taking the chosen lag length, the results for the *Granger causality tests* from *Eviews* yield:

Table 2: Tests on the exports-growth causality nexus

Null Hypothesis	***Lags***	***Obs.***	***F-Statistic***	***Prob.***
log Real GDP does not *Granger* cause ***log Total Exports***	3	299	6.20129	0.0004
log Total Exports does not *Granger* cause ***log Real GDP***	3	299	4.12987	0.0069

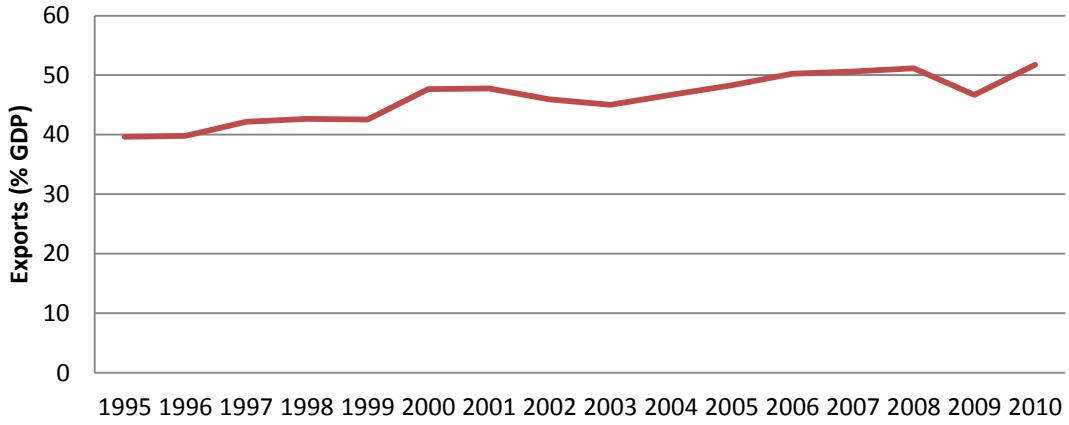
As shown in Table 2 , we conclude that Exports *Granger* causes Real GDP and that Real GDP also *Granger* causes Exports; thus a bidirectional relationship between these variables is found to hold in Europe.

2.2. Structure and destination of the EU exports

Since we have concluded for a (bilateral) causality relationship between exports and growth in Europe, and before testing which dimensions positively contribute to economic growth, we propose a brief description of the recent dynamics of exports, their product structure and destination, for the EU23 from 1995 to 2010.

As we can see in Figure 1, to the period 1995-2010 the exports' share on GDP registered a slight growth, accounting for 51.76% of GDP in 2010.

Figure 1: European exports, 1995-2010 (% GDP)



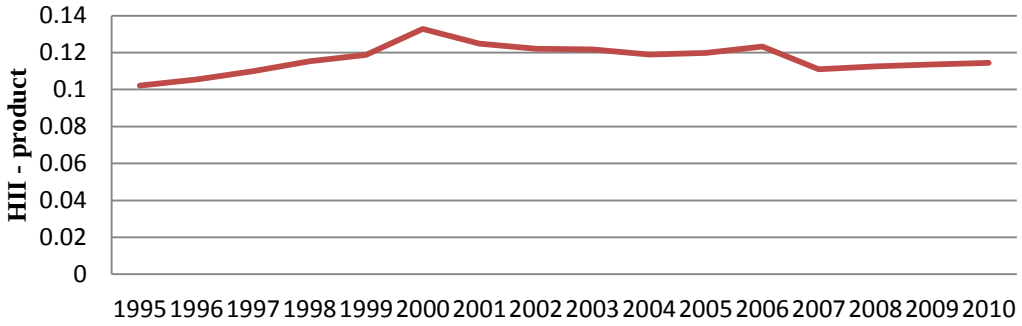
Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: 1) Exports of goods and services (% GDP);

2) Data refers to simple average across the EU23 countries.

Figure 2 shows the evolution of the product concentration of exports measured by the Herfindall index in UNCTADstat; the larger the value of the index, the larger is the product concentration of exports. On average, product concentration reached a maximum value of 0.13 in 2000, being currently around 0.11. Relatively to 1995, there is now a higher value for the index, representing a stronger concentration of exports in certain sectors/products - which conforms the comparative advantages' hypothesis - and the consequent exploitation of economies of scale.

Figure 2: Product concentration of exports, 1995-2010

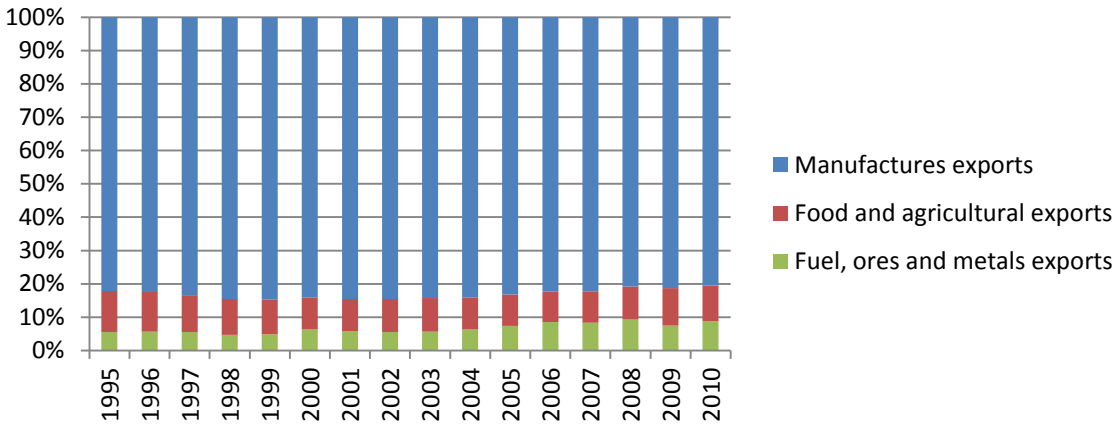


Source: UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Data refers to simple average across the EU23 countries.

Figure 3 evidences a clear difference between the exports of Manufactures and of Fuel, ores and metals and Food and agriculture exports with the first representing almost 80% of the European merchandise exports. The figure shows that, apparently, Manufactures is the sector of higher specialization in Europe, maintaining a stable trend in recent years.

Figure 3: Export structure by sector, 1995-2010

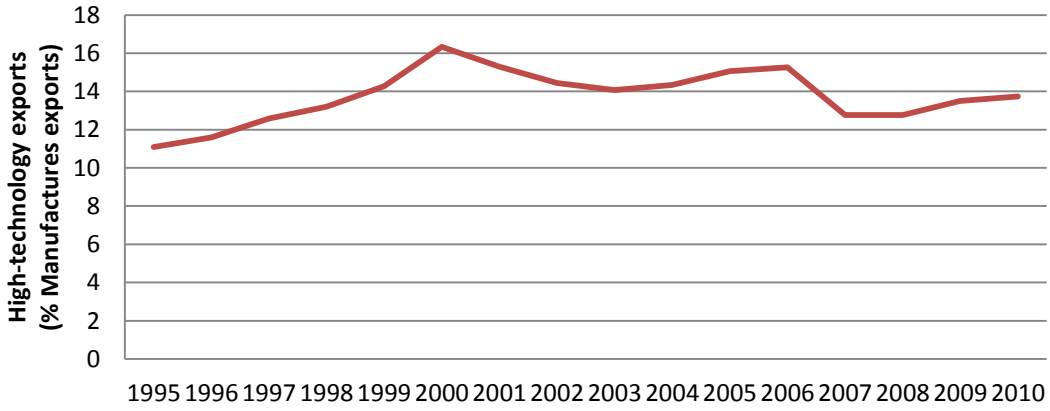


Source: Own calculations based on data from World Development Indicators, accessed on June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Note: Data refers to simple average across the EU23 countries.

In particular, within exports of Manufactures, the high-technology exports have reached the highest shares in 2000 and 2006 (respectively of around 16% and 15% of total exports of Manufactures), accounting for about 14% of Manufactures exports in 2010 – see Figure 4. Thus, apparently, the European export structure has biased towards low/medium-technology exports in recent years (from 2000s onwards).

Figure 4: High-technology exports, 1995-2010 (% of Manufactures exports)

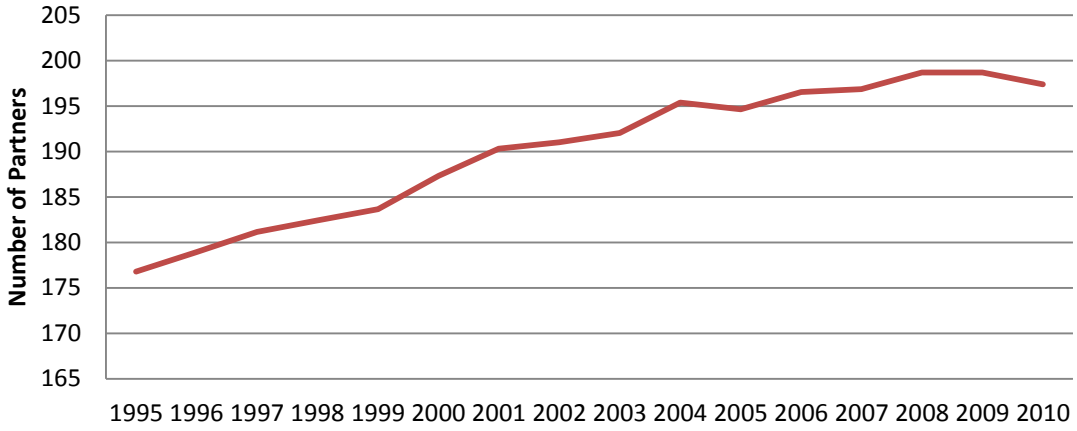


Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Note: Data refers to simple average across the EU23 countries.

As for the destination of European exports, Figure 5 shows that the average number of trading partners of the EU23 has increased from 177 in 1995 to 197 in 2010.

Figure 5: Number of trading partners, 1995-2010

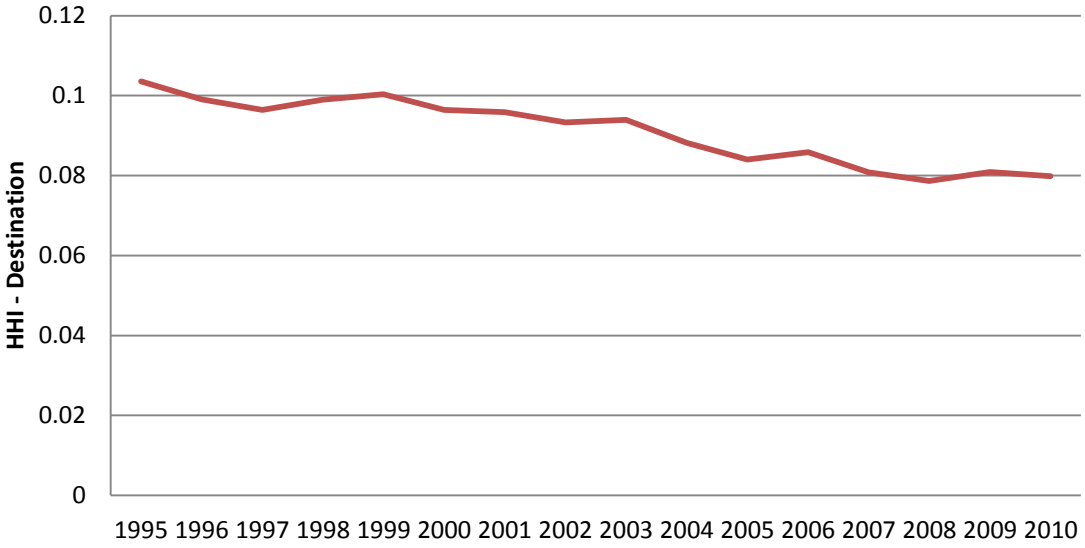


Source: Own calculations based on data from UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Data refers to simple average across the EU23 countries.

Besides the lager diversification of destination for exports, Europe has also diversified the volume of exports within trading partners. Figure 6 shows the evolution of the average HHI-destination for the EU23. This index measures the concentration of exports within the trading partners: the lower the value of the index, the lower is the concentration of exports among trading partners. According to the figure, this index has been falling since 1995, which means that there has been a diversification of exports within the various partners. Thus, taking into account the number of partners and the HHI for destination, we can conclude that for the average of the EU23 countries of our sample, Europe has been heading towards a larger diversification of export destination – either through new exporting markets or through reorganizing their export volumes across existing partners.

Figure 6: Destination concentration of exports, 1995-2010



Source: Own calculations based on data from UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Data refers to simple average across the EU23 countries.

3. The role of the structure of exports to the economic growth of the EU

3.1. Data and methodology

In this section, we estimate a simple export-augmented Solow-decomposition growth model in order to investigate the relationship between exports (including diversification of products and destinations) and real income *per capita* growth in the European Union.

The Solow-decomposition growth framework provides an intuitive and theory-based strategy for testing the relationship between export diversification and GDP *per capita* growth. Rather than immersing into the huge academic literature on cross-country regressions, which has often been criticized for its kitchen-sink approach by throwing in all kinds of possible explanatory factors of growth, we aim to keep the set of the fundamental explanatory variables small by relying on the standard predictions of the Solow growth model.

In the standard Solow growth model, the growth in output *per* worker is a function of initial capital *per* worker, the savings rate, initial level of technology, rate of technological progress, the rate of depreciation, and the growth rate of the workforce. In the model, higher savings will cause a higher growth of output *per* worker whereas an increasing growth rate of the labor force (adjusted for depreciation and technological process) has the opposite effect on growth. In several studies the Solow growth model is augmented by additional variables in order to explore the sources of total productivity growth, as is the case of variables capturing human capital.

Our empirical framework relies on the estimation of a panel growth regression using data for 23 EU countries from 1995 to 2010, following the standard panel-data specification in the literature:[5]

$$Real\ per\ capita\ GDP\ growth_{it} = \boldsymbol{C}_{it} + \boldsymbol{\beta X}_{it} + \boldsymbol{u}_{it},$$

$$for\ i = 1, \dots, 23\ and\ t = 1995, \dots, 2010 \qquad (3.1)$$

[5] *Idem*. The sample refers to the EU23, as defined above.

The dependent variable is the average real *per capita* GDP growth rate; $\boldsymbol{C}$ is the matrix of constant terms (including potential cross-section and time effects); $\boldsymbol{\beta}$ is the matrix of parameters to be estimated; and $\boldsymbol{u}$ is the vector of error terms. $\boldsymbol{X}$ is the matrix of independent variables that includes the variables of standard use in growth regressions:

- ***Population growth*** is measured by the growth rate of population, as percentage change on previous year;
- ***Gross capital formation*** (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories (measured as percentage of GDP);
- ***Inflation*** as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

In addition, $\boldsymbol{X}$ also includes some refined indicators of exports (*e.g.*, measuring diversification of products and destinations), motivated by the mechanisms explored above, in section 1:

- ***Number of partners*** is the total number of countries to where a country exports at each point in time.
- ***Partner's growth*** is a constructed index capturing a weighted average growth rate of the main trading partners of each country in our sample (i). Based on total exports by destination, we first calculate the share of exports for each country in the total exports of the origin country. Then, we select N representative partners (those receiving more than 1% of total exports from the origin country). After that, we calculate the relative weight of each trading partner on total exports for the N representative partners (w_j). The index is defined as:

$$Partners'\ growth_{\ i} = \sum_{j}^{N} w_j . real\ per\ capita\ GDP\ growth_j$$

$$i, j = 1, \dots, N,$$

and computed values are presented in Annex B.

Arora and Vamvakidis (2004, 2005) also consider the real *per capita* GDP growth rate of trading partners but as a simple average. We think that this indicator is much more appropriated since it weights GDP growth by the relative importance of each trade partner.

- ***HHI-destination*** measures the exports' concentration among the trading partners as in Kali *et al.* (2007), where a low number indicates low concentration. It consists of a Herfindahl-Hirschmann concentration index for exports from country *i* to partner *j*, constructed as follows:

$$HHI - destination_i = \sum_j^N \left(\frac{X_{i \to j}}{\sum_j^N X_{i \to j}} \right)^2$$

where N and $X_{i \to j}$ denote the total number of trading partners and the total value of exports between countries i and j, respectively. It should be noted that even though the HHI-destination index described above is a function of the number of trading partners, these two variables are not necessarily related and, *a priori*, there should be no multicolinearity problem for the regression analysis. The addition of a new trading partner could result in a higher, lower, or constant degree of trade concentration of destinations.

- ***HHI-product*** refers to the product market concentration index; it is also a Herfindahl-Hirschmann index. It is normalized to obtain values ranging from 0 to 1 (maximum concentration). The index is defined as:

$$HHI - product_i = \frac{\sqrt{\sum_{p=1}^{n} \left(\frac{x_p}{X} \right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

Where x_p represents the value of exports of product$p$, X is the sum of exports of all products and n represents the number of products (SITC Revision 3 at 3-digit group level) for the country i.

To measure the impact on growth of the different types of products that a country exports we have disaggregated exports into three categories and construct, as Guaresma and Worz (2005) and Kali *et al.* (2007), a weighted sector export growth rate:

$$Weighted\ exports_{is} = \frac{\Delta X_s}{X_s}\frac{X_s}{GDP_i}, i = 1, \dots, 23, \qquad s = 1, \dots, 3.$$

The three product-sector categories, *s*, respect to:

- ***Food and agricultural exports***
- ***Fuel, ores and metals exports***
- ***Manufactures exports***

Additionally, we have also included a more refined indicator of high value-added exports:

- ***High technology exports*** measures the exports of products embedded with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery, as percentage of manufactured exports.

Values of real *per capita* and level GDP growth rates, population, product concentration index, exports by destination - to compute the number of partners, the HHI-destination and partners' growth - were extracted from the UnctadStat (http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx, accessed in May-June 2012). Data regarding gross capital formation, inflation, high-technology exports and product discrimination of exports (Food and agricultural; Fuel, ores and metals; Manufactures) were extracted from World Development Indicators (WDI), accessed in May-June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators. General descriptive statistics for the sample are presented in Annex C.

The estimation approach relying in equation (3.1) where several export-related variables are included in order to explain per capita income growth is widely followed in the literature (see, among others, Kali *et al*., 2007; Kónya, 2006; Guaresma and Worz, 2005; Arora and Vamvakidis, 2004, 2005) and some studies reviewed in Gilles and Williams, 2001a,b). Our main innovations are the combination of both product and destination structure of exports as determinants of growth - namely through the inclusion of new variables - as well as its application to a group of developed countries, namely the European Union.

3.2. Estimation results

Since our cross-section units are not random drawings from a larger sample (our sample covers 23 out of the 27 members of the European Union), the fixed effects model seems more adequate than the random effects model (Gujarati, 2004). In order to estimate the model we use the software *Eviews* that provides built-in tools for testing fixed effects against random effects, and also for testing the joint significance of the fixed effects, cross-section or/and time series. Table 3 and Table 4 below, report the tests made to sustain this choice.

Table 3 shows the test for random effects using the "Hausman Test" for the two specifications chosen. The results strongly reject the null hypothesis that individual effects are uncorrelated with the other explanatory variables. Thus, the test points to the option for a fixed-effects model.

Table 3: Tests on cross-section random effects

Hausman Test	**Specification (I)**			**Specification (II)**		
	Chi-Sq. Statistic	*Chi-Sq. d.f.*	*Prob.*	*Chi-Sq. Statistic*	*Chi-Sq. d.f.*	*Prob.*
Cross-section random	42.790569	11	0.0000	48.491884	10	0.0000

Running the model under fixed-effects, the *Eviews* provides the test on the nature of the fixed effects (cross-section, period or both). Test results are presented in Table 4, below.

Table 4: Tests on cross-section and period fixed effects

	Specification (I)			Specification (II)		
Redundant Fixed Effects Tests	*Statistic*	*d.f.*	*Prob.*	*Statistic*	*d.f.*	*Prob.*
Cross-section F	**5.004684**	*(22,319)*	*0.0000*	**5.033668**	*(22,320)*	*0.0000*
Cross-section Chi-square	**109.114206**	*22*	*0.0000*	**109.364178**	*22*	*0.0000*
Period F	**2.791687**	*(15,319)*	*0.0004*	**2.887001**	*(15,320)*	*0.0003*
Period Chi-square	**45.389630**	*15*	*0.0001*	**46.707206**	*15*	*0.0000*
Cross-Section/ Period F	**4.207147**	*(37,319)*	*0.0000*	**4.360098**	*(37,320)*	*0.0000*
Cross-Section/ Period Chi-square	**146.249470**	*37*	*0.0000*	**150.224545**	*37*	*0.0000*

The first set consists of two tests ("Cross-section F" and "Cross-section Chi-square") that evaluate the joint significance of the cross-section effects using sums-of-squares (F-test) and the likelihood function (Chi-square test). The corresponding restricted specification is one in which there are period effects only. The two statistic values (5.00 and 109.11 for specification (*I*) and 5.03 and 109.36 for specification (*II*)) and the associated *p-values* strongly reject the null that the cross-section effects are redundant.

The next two tests evaluate the significance of the period dummies in the unrestricted model against a restricted specification in which there are cross-section effects only. Both *F* and *Chi-square* statistics strongly reject the null hypothesis of no period effects. The remaining results evaluate the joint significance of all of the effects. Both test statistics reject the restricted model in which there is only a single intercept.

Table 5 shows the model estimation results for the two specifications chosen (*I* and *II*).

Table 5: Estimation results

	Specifications	
	(I)	*(II)*
Gross capital formation	**0.256905***	**0.267095***
	(5.085197)	*(5.181998)*
Population growth	**-1.450010***	**-1.707803***
	(-3.149617)	*(-3.733583)*
Inflation	**-0.057358***	**-0.059466***
	(-3.937974)	*(-4.166287)*
Number of partners	**-0.065456***	**-0.061757***
	(-3.623746)	*(-3.365770)*
HHI-destination	**-17.03450****	**-18.39811****
	(-2.175492)	*(-2.297597)*
Partners' growth	**1.336077***	**1.329256***
	(6.239717)	*(6.167562)*
Food and agricultural exports	**0.141395**	**0.093528**
	(0.600801)	*(0.388479)*
Fuel, ores and metal exports	**0.181282**	**0.158297**
	(1.167119)	*(1.018077)*
Manufactures exports	**0.119837***	**0.136047***
	(2.812646)	*(3.099850)*
HHI-product	**7.964254**	**9.280098*****
	(1.612176)	*(1.848063)*
High-technology exports	**0.079187*****	
	(1.874670)	
No. Observations	*368*	*368*
Adjusted R Squared	*0.776569*	*0.774125*
F-Statistic	*27.57434*	*27.76157*
Prob. (redundant cross-section/period fixed effects)	*0*	*0*

Notes: (1) Significant at 1% (*), 5% (**) and 10% (***); *t-statistics* in parenthesis.

(2) Estimations made under white-diagonal standard error correction for valid statistic inference.

From the results we conclude that the model delivers a good fit, with the adjusted *R-squared* around 78% and a high overall significance of the independent variables (*F-statistics* close to 28). We can also see from the *t-statistics* (in specification *I*) that all variables are significant with the exception of ***Food and agricultural exports*** and ***fuel, ores and*** **metals (*HHI-product*** is significant at 10.8% level of significance**).** Moreover,

after controlling for ***High-technology exports***, and with the previous two exceptions, all the variables are significant.

Furthermore, with the exception of ***Number of partners,*** the signs of the coefficients associated with the independent variables are as expected from the literature. ***Gross capital formation*** and ***Population growth*** have the predicted effect on ***Real per capita GDP growth,*** with the first being positive and the second negative (Greenaway *et al.*, 1999; Arora and Vamvakidis, 2004; Arora and Vamvakidis, 2005; Kali *et al*., 2007; Hesse, 2008). As a measure of macroeconomic stability we use ***Inflation***, which have the predicted negative sign as Arora and Vamvakidis (2004, 2005) find. Higher inflation rates are associated with higher price volatility that causes difficulties to planning and, thus, depresses investment.

To analyze the impact of exports' destinations on economic growth we use three indicators: ***Number of partners, HHI-destination*** and ***Partners' growth.***

The results obtained for the ***Number of partners*** were the major surprise in this study, namely for the negative impact on growth, a result strongly robust across all the specifications tested. According to our estimation, an additional trading partner decreases by 6-7 basis points the ***Real per capita GDP growth*** rate, keeping other things constant. In fact, the empirical literature mostly points to a positive influence to growth from an increasing number of partners (see, for instance, Kali *et al*., 2007). This result for Europe apparently supports the view of meaningful transportation costs and or cultural/social barriers as European countries diversify to new markets.

We now turn the discussion of the effects that trade concentration (***HHI-destination***) has on economic growth. The estimated coefficients for this variable were negative and statistically significant. Kali *et al*. (2007) also use this indicator and find differences when they split their sample into a sub-sample of poor countries and one of rich countries. In their study this indicator was, for the most of the cases, considered positive and statistically relevant for both the total sample and the poor countries sub-sample. In contrast, for the rich countries sub-sample, the estimated coefficient was often insignificant and in some cases negative. As our sample is from the European Union, rich countries, the results seems to be consonant with *Kali et al.* (2007) because since the level of concentration increases as the ***HII-destination*** index increases, the results

imply that poor countries benefit from more concentrated trade while the evidence for the rich countries is mixed at best. Based on the coefficients' value we can conclude that a variation of 0.1 units in ***HHI-destination*** generates a decrease of 1.7 *p.p* in ***Real per capita GDP Growth*** rate, keeping other things constant.

Overall, we argue that the combined results related to the ***Number of partners*** and the export-concentration in partner countries apparently suggest an inverted U-shaped relation between growth and the partners' dispersion. The destination of exports should be diversified enough in order to prevent for asymmetric external shocks on domestic growth, but the number of partners should not be too large, as this increases costs of transportation, bureaucratic procedures, adjustment to different economic, social and institutional structures, among others. These costs are potentially larger as new trading partners are often and naturally more distant from the origin country.

Considering the indicator ***Partners' growth,*** the results are in accordance with the literature. We can conclude that a country benefits more from exporting to countries that experience higher real *per capita* growth rates. This result is expected because the higher the average growth rate of the trading partners, the higher is their demand growth for imports (Arora and Vamvakidis, 2005). The results show that a percentage point increase in ***Partners' growth*** increases by 1.34 *p.p*. the ***Real per capita GDP growth*** rate, keeping other things constant. Besides, establishing trade relations with countries in more advanced stages of development favors the exporting country as it has access to a greater amount of knowledge (Damijan *et al.*, 2004) and may also benefit from the expertise of their buyers (Clerides *et al.*, 1998). We have controlled for the average level of development of the trading partners (using the average GDP *per capita*) but results not reported showed that, across several specifications, this variable was highly insignificant and had a substantial negative impact on overall significance. Thus, at least for this group of countries, the level of development of the trading partners is not a relevant determinant of economic growth.

We now pay attention on the product structure of exports. To analyze the impact of different type of products exported, we have disaggregated merchandise exports into three categories: ***Food and agricultural***, ***Fuel, ores and metals*** and ***Manufactures.*** The results also seem to be reasonably in line with the literature. Although ***Food and***

agricultural and ***Fuel, ores and metals exports*** are not statistically significant, the signs are positive. Since the countries of our sample are not plenty of natural resources and demand for food tends to be income inelastic, it's not surprising that the coefficients on these fail to reach significance (Greenaway *et al.*, 1999). The results seems stronger and according to the literature (Greenaway *et al.*, 1999; Herzer *et al*., 2004) when we consider ***Manufactures,*** products with higher value-added. Results in Table 5 indicate that a percentage point increase in ***Manufactures exports*** significantly increases by 0.12 *p.p.* the ***Real per capita GDP Growth*** rate, keeping other things constant.

In order to better assess the impact of high value-added exports on economic growth, we add as an explanatory variable the ***High-technology exports,*** because many authors defend a positive impact of this on economic growth (see for instance McCann, 2007; Guaresma and Worz, 2005; Spilimbergo, 2000); high value-added exports mainly reflect a more complex product structure which, *per se*, have stronger effects on growth. Our conclusions reveal to be consistent with the literature indicating that, a 93% confidence interval, a one percent increase in the weight of ***High-technology exports*** on Manufactures, increases by 0.08 *p.p.* the ***Real per capita GDP Growth*** rate, keeping other things constant (specification *I*). According to Guaresma and Worz (2005) technology-intensive exports have a significant positive effect on economic growth and better performance of high-tech exports is due to the difference in productivity relative to that in the domestic sector.

Finally, regarding the overall product diversification, the HHI-product captures exports' concentration in terms of sector or product types. The results underlying the literature on this topic are ambiguous: some authors argue for concentration of exports while others refer that diversification benefits more the growth of the origin country. Our results suggest that, for Europe, exports' concentration has a positive impact on economic growth: an increase of 0.1in ***HHI-product*** increases by 0.796 *p.p.* the ***Real per capita GDP Growth*** rate, keeping other things constant. According to Bebczuk and Berrettoni (2006), "the development-export diversification nexus, though, appears to be governed by a U-shaped pattern, whereby diversification increases at low income levels and concentration prevails at high income levels", which seems consistent with our country sample. Also Hesse (2008) and Imbs and Wacziarg (2000) conclude that

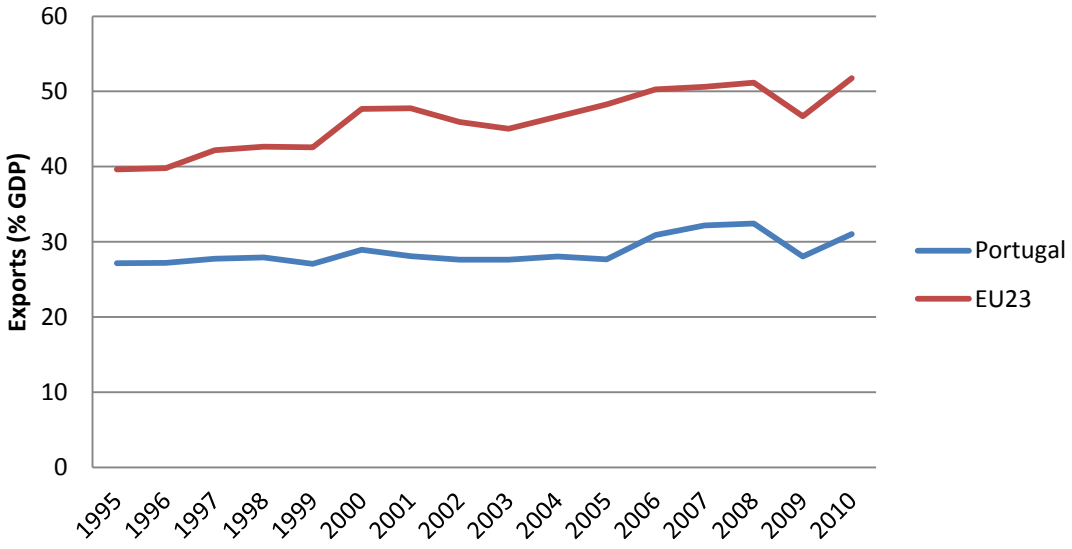
specialization is beneficial for countries in more advanced stages of development while diversification is a best strategy for developing countries.

4. The structure of Portuguese exports and policy implications – a note

After we conclude about the effects of the structure of product and destination of exports on the European Union economic growth, we intend to use the results of the former section on assessing how the recent evolution of the Portuguese exports may have contributed to the country's GDP growth. This section is only of an explorative nature, aiming to draw a note on export policy given the structure of Portuguese exports in terms of product and destination.

As shown in Figure 7, the evolution of the Portuguese exports (% GDP) is similar to that of the average of the EU23 countries of our sample, exhibiting, however, a more stable growth path.

Figure 7: Portuguese *vs.* European exports, 1995-2010 (% GDP)



Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

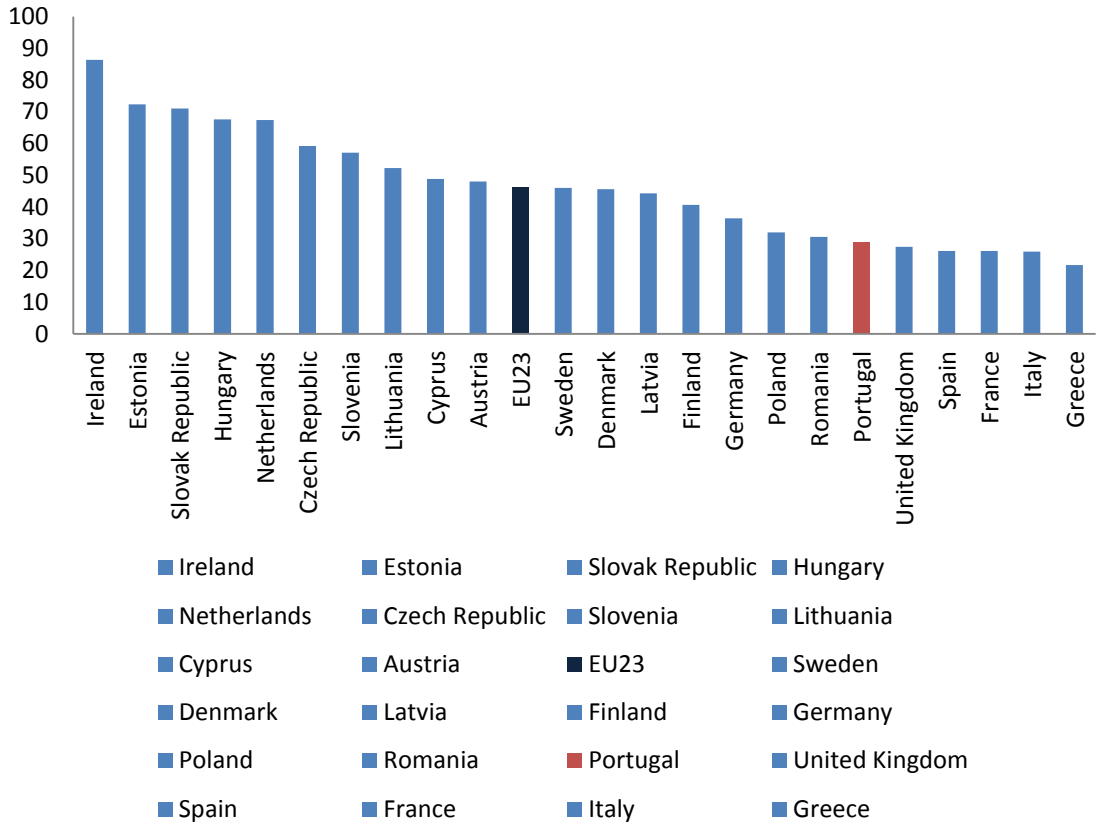
Notes: 1) Exports of goods and services (%GDP)

2) EU23 data refers to simple average across the EU23 countries.

However, the share of exports in the GDP is relatively small for Portugal when compared with the openness degree of the EU23. Considering the average from 1995 to 2010 (see Figure 8), while the Portuguese exports represent only 28.73% of the GDP,

the EU23 average is of 46.17%, well behind the leading countries as Ireland (86.31%), Estonia (72.30%) and Slovakia (70.98%).

Figure 8: EU23-Exports by country (% GDP), average 1995-2010



Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: 1) Exports of goods and services (% GDP)

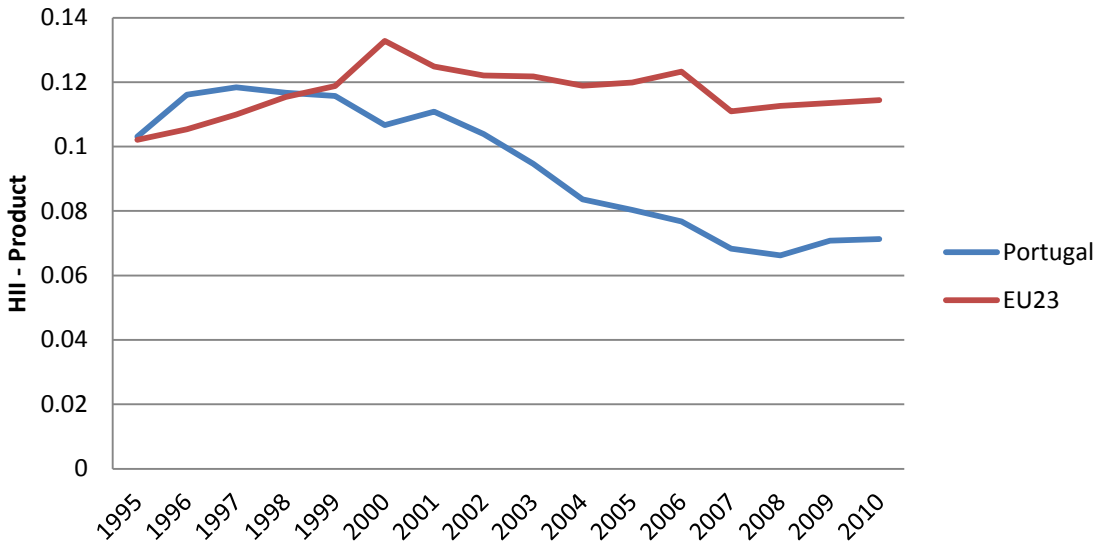
2) EU23 data refers to simple average across the EU23 countries.

Thus Portugal exhibits a smaller economic growth leverage from exports than most of the EU23 countries. In fact, Portugal is the 6th country with the lowest growth potencial from exports. Moreover, and relatively to EU23 average, exports growth (as % of GDP) has been fairly modest.

As for the product concentration of exports, the evolution of the HHI for product type in Portugal has a different evolution from that of the average of the EU23 (see Figure 9).

Starting with relatively similar values in 1995 (approximately 0.1) this index exhibited a donward trend for Portugal, reaching a value of 0.07 in 2010, while product concentration has remained rather stable for the EU23 group of countries (0.11 in 2010). Such decline in the index represents a move towards a more diversifying portfolio ofproducts exported. According to the results of our model, this is not the best option, since a greater concentration of exports are associated with higher rates of GDP growth. This is because a greater concentration of exports is usually associated with greater specialization in certain products that comes from the comparative advantages and is also associated with economies of scale. Thus, to achieve higher economic growth, Portugal should consider to specialize in sectors where it reveals larger comparative advantages, mainly exporting these products and reducing exports of products that do not have such advantages.

Figure 9: Portuguese *vs.* European product concentration of exports, 1995-2010



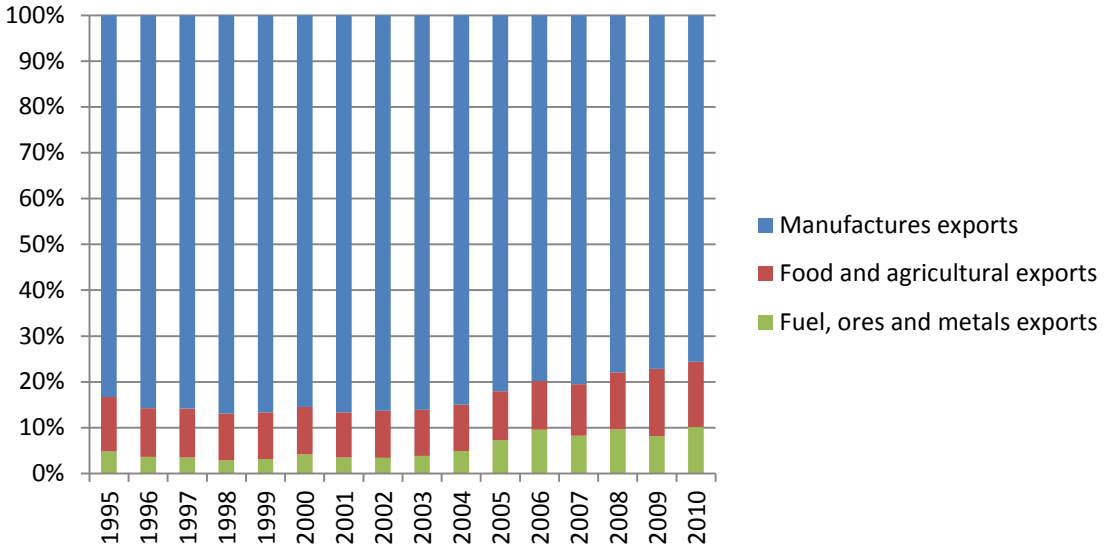
Source: UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Notes: 1) HII - Product as measured by the Herfindall index in UNCTADstat; the larger the value of the index, the larger is the product concentration of exports.

2) EU23 data refers to simple average across the EU23 countries.

Disaggregating Portuguese exports into Manufactures, Food and agriculture and Fuel, ores and metals (Figure 10), we can see a clear difference between the first sector and the others two. As shown in the figure, Manufactures exports represents about 80% of the merchandise exports, recorded small oscillations over the period in analysis, but exhibiting a declining trend in recent years due to increased exports of Fuel, ores and metals and in Food and agricultural exports. When comparing this structure with that of the EU23 shown in Figure 3, above, we can conclude that the product structure of the Portuguese exports is, on average, very similar to that presented by EU23, but has recently (since 2005) deviated from manufactured to non-manufactured exports – *i.e.*, towards a less growth-enhancing path.

Figure 10: Portuguese export structure by sector, 1995-2010

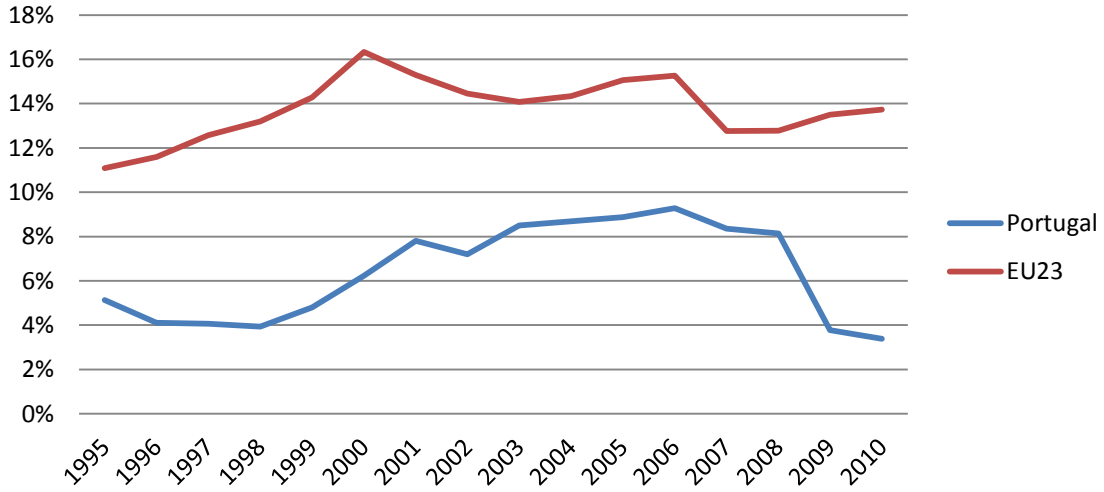


Source: Own calculations based on data from World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

As seen in the Figure 11, high technology exports (% manufactures exports) have yet a small relevance when compared to EU23. It is noted however that the upward trend until 2006, when it reached about 9.28% of manufactures exports, checking up since then a sharp decline culminating in 2010 with a value lower than 1995 (3.39% compared to 5.13 %).

According to the results of our model, the larger the growth/weight of manufactured exports and the larger the high-technology component of manufactured exports, the larger the economic growth. Thus, Portugal should consider increasing its exports in these sectors by focusing on products for which it has increased competence.

Figure 11: Portuguese *vs.* European high-technology exports (% manufactures exports), 1995-2010



Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

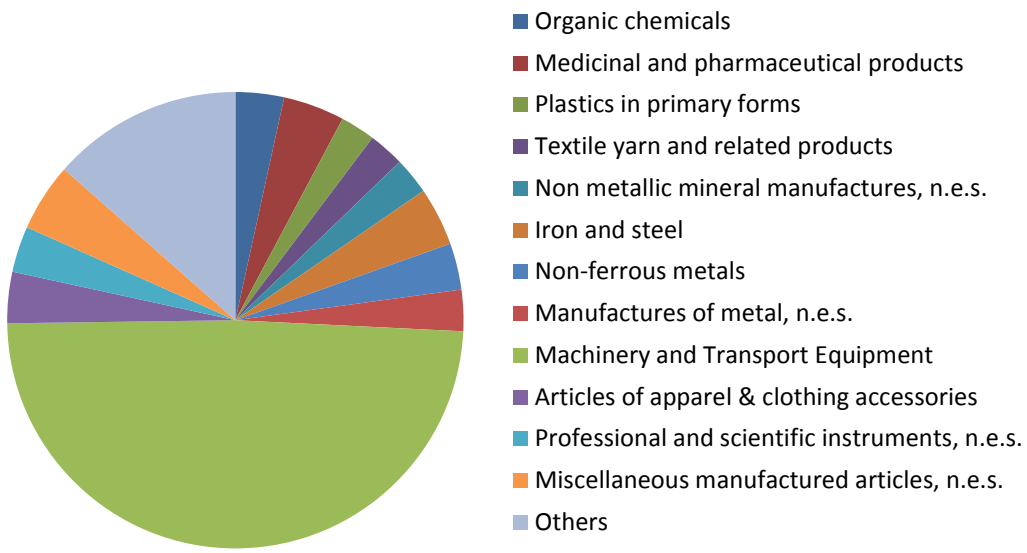
Note: EU23 data refers to simple average across the EU23 countries.

Disaggregating the Manufactured exports (Figure 12), we can confirm that in the case of Portugal, Machinery and transport equipment has the greatest weight in this group (about 50% of Manufactured exports), followed by the Miscellaneous manufactured item (4.83% of Manufactured exports), Medicinal and pharmaceutical products (4.35%), Iron and steel (4.15%), Articles of apparel & clothing accessories (3.63%).

As mentioned above, it is more advantageous for economic growth for Portugal to concentrate its exports in Manufactures exports. Since Machinery and transport equipment has the largest representation within this group, this must be the one where Portugal exhibits stronger comparative advantages and, thus, should be the motor

engine for exports growth, namely through technological reinforcement (recall the "product proximity" idea in Bonaglia and Fukasaku, 2003).

Figure 12: Structure of Portuguese manufactured exports, 2010

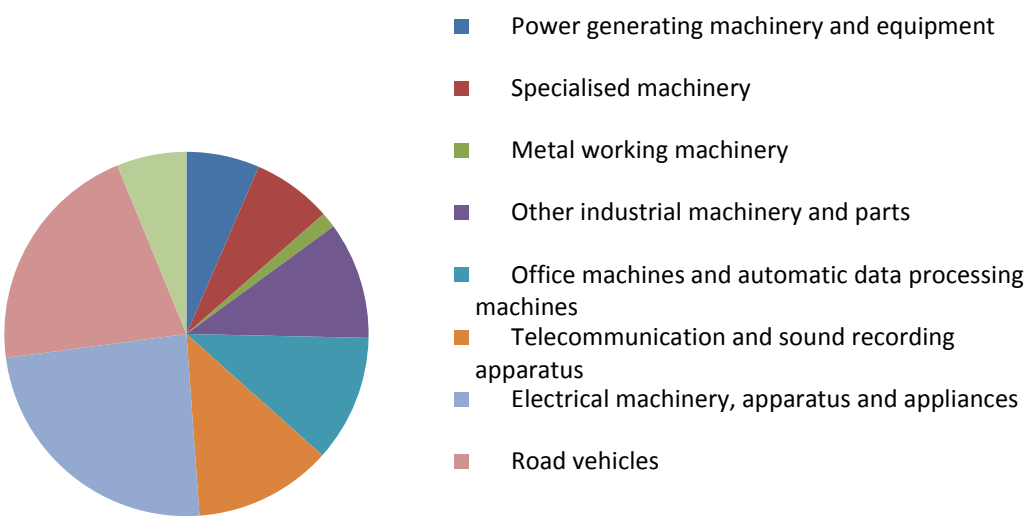


Source: UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Product classification based on SITC, Rev.3.

In particular, Machinery and transport equipment includes Electrical machinery, apparatus and appliances (11.8%), Road vehicles (10.2%), Telecommunication and sound recording apparatus (6%) and Office machines and automatic data processing machines (5.52%) – see Figure 13.

Figure 13: Structure of Portuguese machinery and transport equipment, 2010

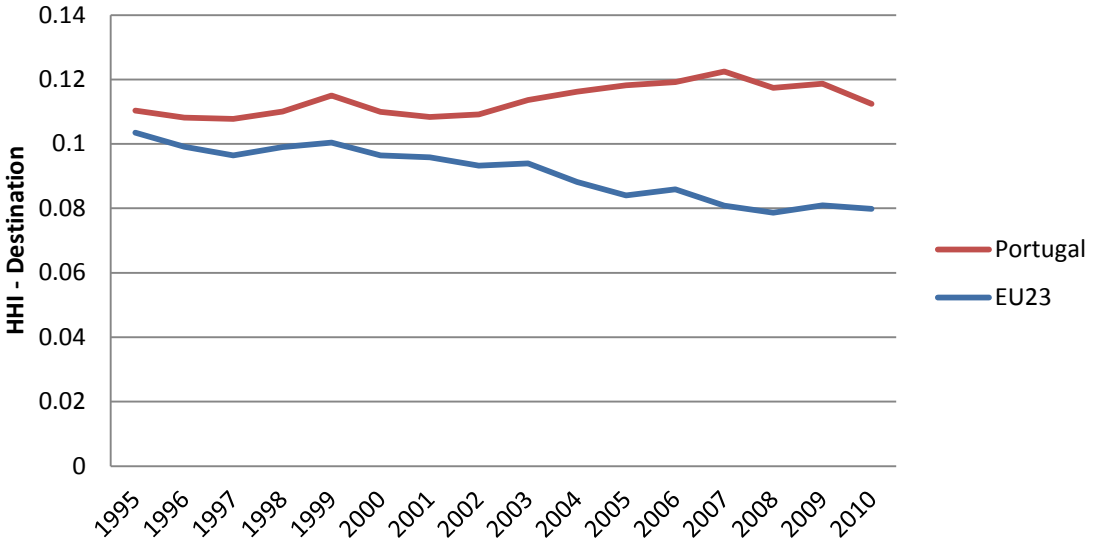


Source: UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Product classification based on SITC, Rev.3.

Regarding the HHI-destination for measuring export diversification across trading partners, we can observe from Figure 14 an opposite trend to that recorded by the average of the EU23 countries. Starting with relatively similar values in 1995 (about 0.11), the EU23 has experienced a decline of this indicator, currently hitting 0.08, while Portugal exhibits a slightly increase in this index. This trend suggests a general tendency to increase the concentration of exports in some of the trading partners. However, recently, the trend shifted: since 2007 onwards diversification within trading partners increased. Such pattern of evolution is in accordance with the Bank of Portugal (2012) which notes a recent intensification of geographic diversification into emerging markets and the EU countries with a traditionally limited expression as destination for Portuguese exports.

Figure 14: Destination concentration of Portuguese *vs.* European exports, 1995-2010



Source: Own calculations based on data from UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Notes: 1) HII - Destination as measured by the Herfindahl-Hirschman Index. This index measures the concentration of exports within the trading partners; the lower the value of the index, the lower is the concentration of exports among trading partners.

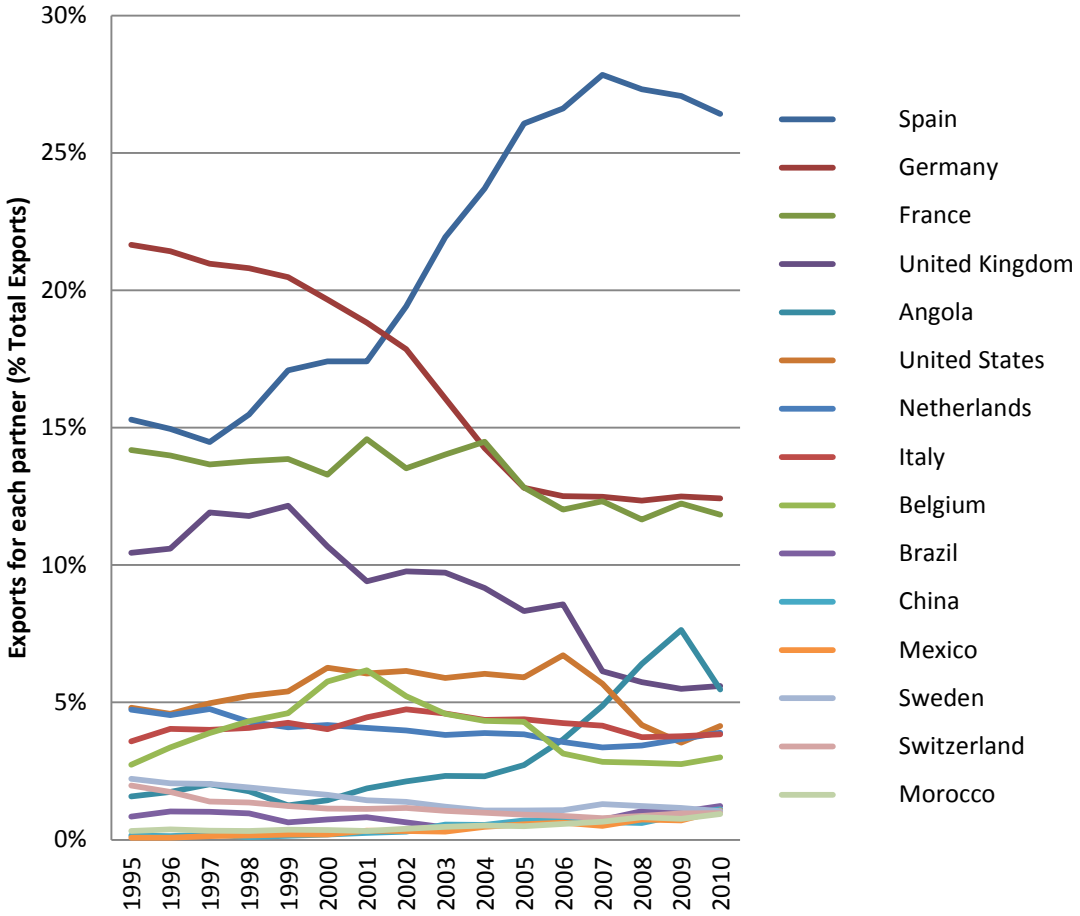
2) EU23 data refers to simple average across the EU23 countries.

As proof of this diversification strategy is the evolution of the growing importance of some trading partners. Figure 15 shows the evolution of the importance of each trading partner for Portugal (exports to each partner country relative to total exports). Thus, we can confirm the recent (2007 onwards) tendency to diversification of exports by reducing the weight of some of the major markets such as Spain, Germany, France and the UK while increasing the exports to countries like China, Mexico, Brazil and Morocco.

According to the conclusions of the model estimated in the previous section, the strategy of export diversification is very positive for economic growth in Portugal and it will be more beneficial if the country continue to increase the exports to emerging markets while decreasing the exports to major destinations, allowing for a dispersion of risks and uncertainties and, therefore, reducing the dependence of idiosyncratic shocks.

This strategy also translates into a significant change in capacity of Portuguese companies to explore business opportunities in markets with greater potential demand growth.

Figure 15: Relative importance of Portuguese trading partners, 1995-2010



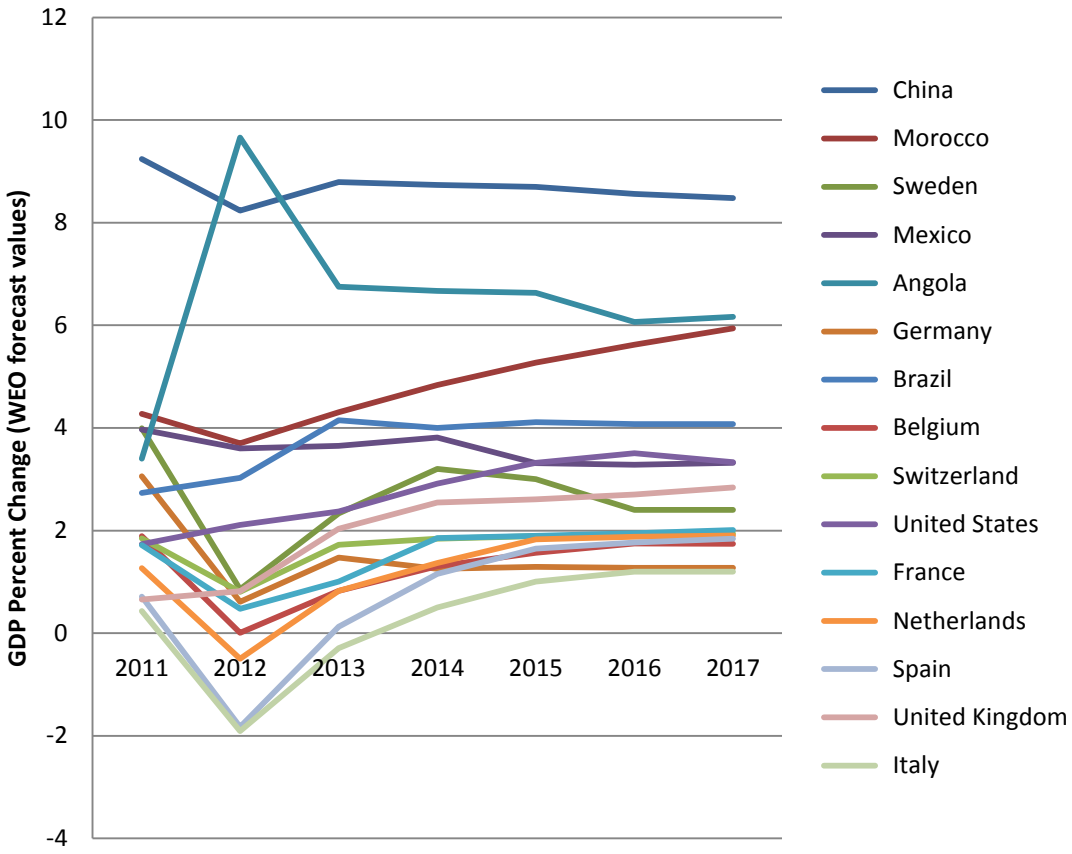
Source: UNCTADstat, accessed in June at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

In fact, the estimated model predicts that exports to countries with higher GDP growth rates have a positive impact on the economic growth in the country of origin. Considering the main partners of Portugal and taking into account the IMF projections (World Economic Outlook, accessed in July at http://www.econstats.com/weo/V002.htm) of the growth rates of GDP (Figure 16), the emerging markets exhibit the highest growth forecasts: China presents the highest

predicted growth rate of about 8.73% for 2014, Angola and Morocco also record high growth rates forecasts of 6.67% and 4.83%, respectively, in 2014.

Overall, Portugal should continue to invest in a strategy of diversification of exports reducing the weight of the main partners (Spain, Germany and France) and increasing exports to current lower importance markets which also exhibit higher potential demand growth such as China, Morocco, Angola, Brazil and Mexico.

Figure 16: GDP growth forecasts for main trading partners of Portugal, 2011-2017



Source: World Economic Outlook, WEO, accessed in July at http://www.econstats.com/weo/V002.htm

5. Conclusions

There are good *a priori* theoretical reasons for expecting a positive relationship between exports' growth and economic growth. In spite of the recent-past emergence of a large amount of empirical literature testing for such a relationship, the results are not wholly conclusive. After reviewing, both empirically and theoretically, the channels through which exports affect economic growth, especially through product structure and destination, we have assessed how these dimensions impinge on the economic growth of the EU.

We have estimated a Solow-decomposition growth model augmented with several dimensions capturing the literature-enlightened aspects of product structure and destination of exports. The model is estimated using annual data for a panel of 23 EU countries across 1995 to 2010. Relative to existing literature, our model improves on including, simultaneously, several dimensions of both product and destination structure of exports and also in focusing in the EU set of developed countries.

Our results report a rather well-specified and robust model which delivers a strong relationship between real exports' growth and real output growth. The results suggest that where to and what to export does matter for the EU growth dynamics. In particular, our results lend support to that rich/developed countries should export more value-added products, with special focus on high technology exports. Better economic growth performance is also enhanced if countries specialize rather than export a large set of products, a result in line with the comparative advantage hypothesis. As for the role of destination, the combined results related to the number of partners and the export-concentration in partner countries apparently suggest an inverted U-shaped relation between growth and the partners' dispersion: while the number of partners has a negative impact on economic growth (strongly robust across model specifications), a higher concentration of exports among the destination partners also impinges negatively on the EU countries' growth. Thus the destination of exports should be diversified enough in order to prevent for asymmetric external shocks on domestic growth, but the number of partners should not be too large, as this increases costs of transportation, bureaucratic procedures, adjustment to different economic and institutional structures, among others. Unambiguously, and as expected, relative concentration of exports

should be directed towards the trade partners that exhibit higher potential growth rates: the larger the weighted average growth rate of trading partners, the stronger the leverage effects to economic growth.

Given these conclusions, Portugal should support high technology exports, as they still represent a very modest part of manufactured exports when compared with the European Union average, and should reinforce the exports of *Machinery and Transport Equipment*, *Clothing* and *Iron and Steel*. Moreover, a move towards more diversification among trade partners is desirable, namely from the most representative in the export portfolio - Spain, Germany and France - to the less representative and with higher growth potential such as China, Mexico, Brazil and Morocco. However, the results obtained are not free from limitations. First of all, data collection proved to be complex and influenced the sample size in terms of both period and country selection. For instance, the breakdown of exports by product was only available from 1995 onwards and there were also other indicators without data for specific countries or years. Secondly, and in spite of the good overall fit of the model, there might be other economic growth determinants, *e.g.*, human capital, that crucially affect output estimation and that are absent from our model. Moreover, additional trade-related variables could also be considered: additional dimensions of export structure - namely, services - and destination or, even, others testing for the import-led growth hypothesis. Finally, we could test for export multipliers, using simultaneous-equation model. Since the causality tests have exhibited support for a bi-directional relationship between exports and growth, an alternative approach would be to consider a methodology allowing for feedback from output to exports. This would enable the computation of exports multipliers and the tracking alongside a given period of a shock to export structure and destination on output. However, limited, and on an annual-basis, data availability works as strong constraint to the use of such approach.

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Annex A - Dickey -Fuller unit root test (DF)

Variable	*Coefficient*	*t-Statistic*	*Prob*
log Total Exports (-1)	0.002377	14.00664	0.0000
log Real GDP (-1)	0.001038	13.20859	0.0000

Annex B - Partner's growth index (%)

Country / Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	1.94	1.31	2.31	2.28	2.37	3.49	1.82	1.07	1.03	2.38	1.95	3.68	3.43	1.22	-4.51	2.75
Cyprus	1.83	0.19	1.35	1.72	2.38	3.99	2.10	1.88	2.40	3.12	1.64	2.90	3.26	0.29	-3.78	0.48
Czech Republic	2.32	2.08	2.81	2.49	2.33	3.18	1.57	0.85	0.83	2.15	1.84	3.71	3.82	1.38	-4.25	2.78
Denmark	2.21	1.81	2.87	2.54	3.00	3.79	1.52	1.10	1.20	2.63	1.95	3.18	3.11	0.03	-4.40	2.79
Estonia	1.18	1.52	3.80	2.99	3.55	4.61	2.69	2.44	3.01	4.29	3.65	4.96	5.41	0.48	-8.02	2.83
Finland	2.22	1.78	3.26	2.55	3.19	4.36	1.92	1.64	2.23	3.46	2.76	4.09	3.78	0.77	-4.41	3.10
France	2.12	1.79	2.73	2.79	2.73	3.55	1.49	0.89	1.03	2.08	1.71	2.94	2.86	0.18	-4.04	2.46
Germany	2.34	2.01	2.89	2.75	3.03	3.73	1.41	1.24	1.53	2.83	2.37	3.27	3.19	0.65	-3.50	2.48
Greece	2.73	1.25	1.57	2.43	2.73	4.16	1.70	1.65	1.80	3.22	2.48	3.67	3.49	1.60	-4.24	1.93
Hungary	1.59	1.25	2.18	2.16	2.57	3.44	1.58	0.88	0.95	2.43	1.91	4.00	4.03	1.71	-4.90	2.31
Ireland	2.05	1.82	2.71	2.70	2.95	3.43	1.39	1.00	1.09	2.19	1.48	2.20	2.21	-0.60	-4.32	1.81
Italy	1.87	1.63	2.63	2.46	2.79	3.61	1.40	1.13	1.37	2.70	2.13	3.38	3.23	0.75	-3.74	2.35
Latvia	-0.35	0.33	3.54	2.59	2.89	4.55	2.93	2.48	3.30	4.25	4.22	5.83	5.96	1.06	-8.44	2.82
Lithuania	-1.60	0.12	3.93	2.03	3.14	5.08	3.45	2.92	3.15	4.64	4.41	6.06	5.80	1.15	-6.81	2.95
The Netherlands	1.90	1.25	2.49	2.49	2.73	3.40	1.32	0.69	0.55	1.92	1.21	2.68	2.54	0.05	-4.35	2.26
Poland	1.13	0.57	1.93	1.75	2.44	3.66	2.12	1.20	1.43	2.74	2.11	3.84	3.63	0.90	-5.40	2.50
Portugal	2.11	1.76	2.57	2.76	2.97	3.45	1.51	0.94	0.75	1.92	1.95	3.00	3.24	0.57	-4.14	0.87
Romania	1.75	1.12	2.43	2.06	1.94	3.80	1.41	1.02	0.99	2.60	2.10	3.33	2.76	0.70	-4.93	2.46
Slovakia	3.09	2.09	1.43	1.77	2.43	3.72	2.01	1.15	1.19	2.67	2.47	4.06	3.45	1.42	-4.60	2.31
Slovenia	2.59	3.52	3.88	2.63	2.35	3.60	1.72	1.39	1.43	2.58	2.10	3.65	3.41	1.24	-4.66	1.96
Spain	1.92	1.63	2.54	2.87	2.61	3.38	1.38	0.57	0.47	1.93	1.19	2.40	2.22	-0.19	-3.84	1.81
Sweden	2.35	2.31	3.26	2.69	2.87	3.57	1.45	1.00	1.21	2.57	1.96	2.87	2.95	0.23	-3.98	2.05
United Kingdom	2.43	2.11	3.22	2.52	3.35	3.75	1.16	0.91	1.03	2.35	1.81	2.67	2.44	-0.43	-4.14	2.09

Annex C - General descriptive statistics

	Average across countries	*Std. Dev. across countries*	*Max*	*Min*	*Obs.*
GDP growth	2.69	3.72	13.06	-17.37	368
Gross capital formation	22.74	4.63	40.39	10.61	368
Population growth	0.28	0.62	2.18	-1.79	368
Inflation	5.12	10.5	154.76	-4.48	368
Number of partners	190.12	24.42	218	91	368
Partners' growth	1.87	2.05	6.06	-8.44	368
HHI - product	0.12	0.05	0.29	0.04	368
High technology exports	10.07	7.7	41.84	0.36	368
Manufactures exports	75.24	11.91	90.27	44.56	368
Food and agricultural exports	0.31	0.95	10.75	-2.43	368
Fuel, ores and metals exports	0.31	1.04	7.67	-7.01	368
HHI - destination	0.09	0.03	0.2	0.04	368