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Is EU facing increasing export competition as a result of trade with low income countries?

Abstract

The concern raised in this paper is whether the cone of diversification for EU to its low income trading partners has become more similar over time, as this would imply a risk for a Stolper- Samuelson effect. In order to assess this risk, the methodology in this paper is designed to capture any rising similarities of EU to its trading partners since a Stolper-Samuleson effect infers that the goods in EU and low income countries are close substitutes and that specialization is incomplete. 117 countries have been included in this study and the countries have been grouped into four income classes according to GDP per capita and assessed as groups of income. In addition have the top 10 trading partners been evaluated individually. Three main approaches have been used to capture any increasing similarity by applying the export figures for EU and its trading partners for 2000-2010. Approach 1, gives a measure of the export overlap for the trading partners to EU in order to seize the export similarity as a share of total export. In approach 2, the unit values of each country relative to EU are calculated to get an indication of any within product variation. Approach 3, computes the technology- and sophistication- level of each county's export bundle in order to get an inference of a change in its comparative advantage. The findings in this research suggest that the EU cone of diversification is highly differentiated from its low income trading partners and that a Stolper- Samuelson effect can be rejected.

Key words; EU competition, Stolper- Samuelson effect, export, manufacturing

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1 Introduction

By the creation of the European Union, a new super economy was born. Some of the trade policy objectives of the union are to obtain open markets and to reinforce the EU competiveness in the world and at the same time have the best interest of the member countries and the world at mind. Globalization is generally supposed to be welfare improving in the economic literature, for example by the diffusion of modern technology and knowledge, the realization of economies of scale by increasing specialization and resulting in a higher degree of fragmentation of production. However, while openness can create efficiency gains, the distribution of these gains remains unclear in advance and there are no guarantees against losses for individual sectors or workers. The impact of trade liberalization on wages, employment and income inequality is an issue that has given rise to much controversy in many industrialized countries.

Following the Heckscher-Ohlin-Samuelson framework, a country that opens up to international trade is expected to experience a decline in the reward of the production factors that the country is relatively poorly endowed with. Many are the researchers that do not find much evidence in favor of a Stolper- Samuelson effect. Others argue that trade in intermediate inputs have been neglected in these studies, and by accounting for outsourcing, international trade can explain part of the increase in wage inequality. The impact of a Stolper- Samuelson effect has been heavily debated in empirical work done on the US and it is here of interest to see if the results from these studies could be generalized to EU.

The concern that is raised in this paper is whether the cone of diversification for EU to its low income trading partners has become more similar over time, which would imply a risk for a Stolper- Samuelson effect. The concern of a Stolper- Samuleson effect implies that the goods in EU and developing countries are close substitutes and that specialization is incomplete.

This paper is aiming to map any changes in similarity in the cones of diversification by focusing on the export overlap, within product variations and by comparing the technological- and sophistication structure, of EU export to its trading partners from 2000 till 2010. Recent empirical work by Edwards and Lawrence (2010) has been applied in this assessment.

The essay's disposition is as follows; Section 1 outlines the theoretical framework of the essay by summarizing the Stolper- Samuelson theorem and what impacts the theorem may have in practice. Section 2, details the data and the empirical methodology used in the research. Section 3, presents the results and summarizes the outcomes of the study. Section 4, gives a discussion of the findings. Section 5, concludes the paper.

1.1 A brief summary of the Stolper- Samuelson theorem

The Stolper- Samuelson (1941) Theorem, states that an increase in the relative price of a good will increase the real return to the factor used intensively in that good, and reduce the real return to the other factor. In order to explain this it is necessary to look at *the Factor Price Equalization Theorem*, which Samuelson developed in 1949. In the latter theorem an example is used for two countries engaged in free trade to show how it works. Two countries have identical technologies but different factor endowments. If both countries produce both goods and factor intensity reversals do not occur, then factor prices are equalized across the countries. The Factor Price Equalization Theorem states that trade in goods have the ability to equalize factor prices; trade in goods is a perfect substitute for trade in factors. Contrasting this result to one sector economies in both countries where equalization of product prices would not equalize factor prices; the labor abundant country would be paying a lower wage. How this is possible when there are two sectors is because according to theory, the labor abundant country can produce more of, and export the labor intensive good. In that way it can fully employ its labor while still paying the same wages as a capital- abundant country. This opportunity to disproportionately produce more of one good than the other, while exporting the amounts not consumed at home, is what allows factor price equalization to occur (Feenstra, 2004, pp 13-15).

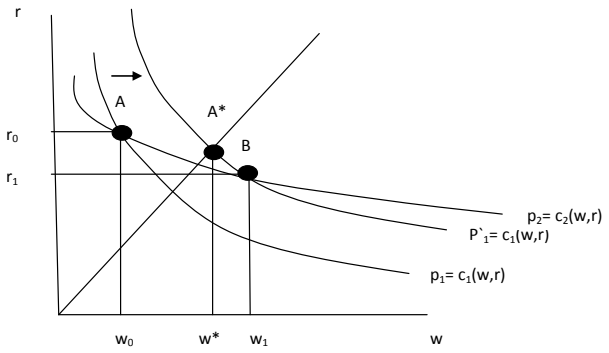
The effect on wages as a result of a change in product prices is referred to as the magnification effect, since the effect on wages will be greater than the change in product price (Jones, 1965). Figure 1 illustrates the magnification effect in respect to the Stolper-Samuelson theorem. Point A is the initial factor price equilibrium (w_0, r_0), where industry 1 is capital intensive. An increase in the product price of this industry will shift the iso-curve to the right where the new equilibrium will be at point B. At the new equilibrium the industry will experience higher wage and lower rental costs, (w_1, r_1). Comparing this result to the w and r that would have been obtained if the equilibrium was at point A*. The percentage change in p_1 is at A* exactly matched by a change in w and r, hence it is obvious that the wage have increased by more than the rental cost have declined at point B. This implies that p_i lies in between w and r.

$$\omega > p_1 > p_2 > r$$

In a two country, two good scenario, a price increase of skilled production in country X will increase the wages of skilled workers by more than the price increase of any of the two goods,

whereas wages of unskilled workers will increase by less than the price increase of either goods (Jones, 1971).

Figure 1. Illustration of the magnification effect with respect to Stolper- Samuelson

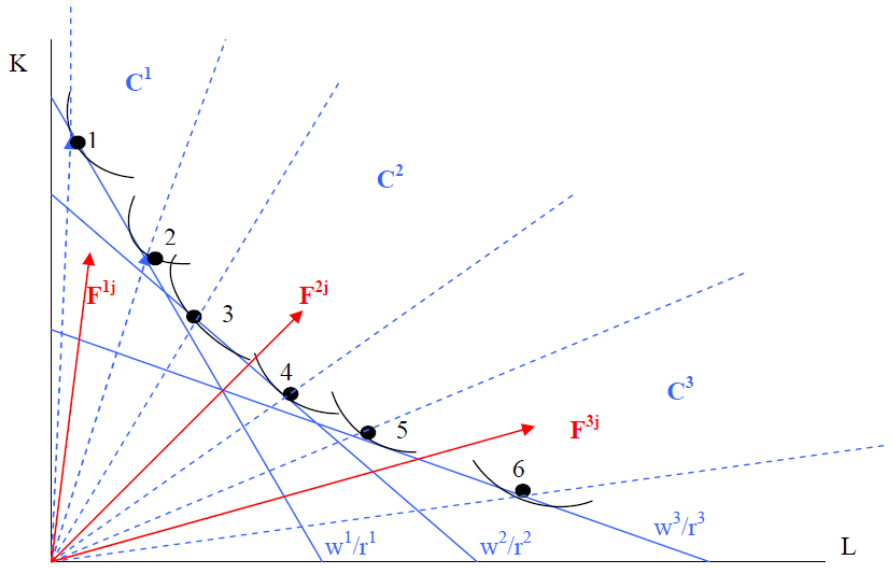


Source: Feenstra (2004, p. 16)

In figure 2, the work by Bernhofen (2007, p. 6) is used to illustrate the concept of different cones of diversification. Figure 2 depicts the case of six goods and two factors; labor and capital, and three countries. The countries isoquants, numbered from 1 to 6, represents the input combinations that gives the revenue of 1. Goods are ordered according to the degree of capital intensity, where good 1 is most capital intensive, and good 6 the least. The three lines connecting the origin to the tangencies, between the isoquants and the isocost lines, define the three cones of diversification; C^1, C^2, C^3. Since countries' factor endowments are assumed to be in different cones of diversification, the three countries will specialize in the production of different goods. Country 1, which is most capital abundant, produces and exports the most capital-intensive goods 1 and 2. Country 2, produces and export good 3 and 4 and country 3, which is most labor abundant produces and exports the most labor intensive gods 5 and 6.

Consequently, countries that by trade appear to share the same cone of diversification are facing increased competition and will experience a decrease in the price for those goods. As result of the Stolper- Samuelson theory there will be strong distributional income effects, making some people worse off and some better off. In particular if trade with unskilled labor abundant countries leads to a reduction in the relative price of unskilled labor intensive goods, this should, other things being equal, reduce the real wages of less educated workers, both relative to other workers and in absolute terms (Krugman, 2008).

Figure 2. Multi-cone diagram



Source: (Bernhofen, 2007, p. 6)

As outlined, the Stolper- Samuelson effect leans on the assumption that countries produce the same goods, which means that they are in the same cone of diversification. This implies that if countries are found to be in different cones of diversification, then the risk of the Stolper-Samuelson effect can be rejected. Hence it would be of interest to investigate whether EU and its low income trading partners are found to be in the same cone or not.

1.2 The Stolper- Samuelson effect in practice

The world trend has since the 80's been progressive trade liberalization among countries across the globe (Baccini, 2012, p. 457). It is found by Baccini (2012) that due to the uncertainty of the income effect as a result of trade liberalization, many countries choose preferential trade agreements that call for both trade openness and protectionism against competitors. It is found that democratizing developing countries are likely to form preferential trade agreements with richer countries, whereas there is little evidence that a low income country would form such trade agreement with another low income country. The findings by Baccini (2012) suggests that the general view put to practice confirms the Stolper- Samuelson theory that there will only be gains from trade when two countries have different comparative advantages.

It is important to consider that increased openness to trade may have different effects across industries, also within the same sector depending on the type of economic activity.

Polgar and Wörz (2010, p. 128) states that increased import penetration may lead to changes in specialization patterns followed by different wage reactions in individual economic sectors. For example increased import from low income countries may drive up the average wages in more skill intensive sectors, but exert a downward pressure on wages for low skilled production, since these tend to be replaced by imports. On the other hand, imported inputs could boost productivity and as a consequence the wages in an industry because they can be imported cheaper than producing them domestically and production becomes as a result more cost effective. Alternatively is the imported input of a higher quality than produced domestically which will enhance the output price. This implies that within the same sector, the effects of intra- industry and inter- industry trade can differ greatly (Polgar and Wörz, 2010, p.128).

Polgar and Wörz (2010, p. 134) have grouped industries into high- wage and low wage sectors. Financial services, utilities and the oil industry belong to the high wage sector, and agriculture, transportation, food, textiles, construction and the wood industry belong to the low wage group. Polgar and Wörz (2010, p. 136) find that in terms of growth rate in trade-to-value added ratios, the fastest rates of increase were recorded in the high wage group, a result that suggests increased inequality induced by trade.

Based on these findings it is of interest to investigate if EU is facing increased competition as a result of trade with low income countries. Increased competition would be revealed by a rising similarity in the cones of diversification for the low income trading partners compared to EU. An increase in similarity suggest that there is a risk of a Stolper- Samuelson effect and that EU may suffer from the income redistribution effects outlined, with increasing inequality as a result.

2 Data and Empirical Methodology

2.1 Data

To undertake the examination, data retrieved from the UN COMTRADE database have been used at 3-digit SITC rev.3 classification. At 3-digit SITC rev.3 classification level this gives 257 different product categories. All commodities at this level have been included. Data have been obtained for EU and its top 10 trading partners, as well as other countries which have been classified into four income groups according to GDP per capita at US dollar, 2010 prices. The four income groups are classified as high, high middle, low middle and low income according to World Bank Atlas method. The underlying countries, for all the income

groups combined, add up to a total of 117 countries. For a detailed overview of the countries included in the study and the classification scheme of the four different income groups, see table 7 and 8.

The data is based on the value of export trade, ignoring quantity unit differences trade reported by the countries to COMTRADE for all the 257 commodity categories. It is assumed that the export of each country to the world represents the goods manufactured for every individual country. In each similarity calculation the same set of data has been used.

Some limitations to COMTRADE data as reported by UN are that the values of the reported detailed commodity do not always sum up to the total value for a given country dataset. Due to confidentiality, countries may not report some of its detailed trade. This means that the more disaggregate data used, the more information may be left out and skew the results. Further, not all countries do necessarily report their trade statistics for each and every year. By arranging trade into groups of countries, as done in this paper, the trade of a country group may be understated when comparing results from year to year due to unavailability of data.

For the unit value similarity measure, the relative unit value for each country is calculated by dividing the reported value for each commodity by the reported quantity. Unfortunately many countries, in particular the low income countries which are of main interest, lack to report the quantity for many commodities.

Despite the mentioned disaggregation problem it would still have been preferred to have more disaggregated data in this analysis to get a better estimate of the similarity between EU and its trading partners. Unfortunately however, due to limitations of the COMTRADE database it was not possible to retrieve data at a more disaggregated level.

2.2 Empirical Methodology

The aim of this paper is to measure the similarity of EU to its trading partners over time since this will give an indication of each country's cone of diversification compared to EU.

The HO model underlying the Stolper- Samuelson theorem holds the presumption that the theorem will only be real if high- and low- income countries occupy similar cones of diversification. In order to have a benchmark to compare the similarity pattern of the low income countries to, high income trade partners are included in this study as well. Since EU is considered a high income country and if evidence is found that the cones of diversification for any of the low income trading partners are becoming increasingly more similar to the one of EU; this suggests a potential risk of a Stolper- Samuelson effect. Consequently, by measuring

the export similarity of EU to its trading partners, this gives an indication of the similarity of the cones of diversification since countries are assumed to export according to their comparative advantage. The reasoning rests on the logic of the two by two model by Heckscher- Ohlin model where the factor endowments of a country determine its cone of diversification. Accordingly, the methods to address this risk are designed to assess the similarity of the cones of diversification for the trading partners compared to EU over a ten year period.

The work by Edwards and Lawrence (2010) has been used as a guide for the empirical methodology throughout the essay. Some small changes have however been applied in order to improve the outcomes. Instead of using the import to EU as a reflection for each country's productivity as made by Edwards and Lawrence (2010), each country's export to the world is used. This approach will better embrace each country's product specialization.

To incorporate the statement made by Krugman (2008) that the Stolper-Samuelson effect may only be real in the long run, data have been used over a 10 year time period; 2000, 2005 and 2010.

Three different approaches have been undertaken in order to shed some light on the concern of a Stolper- Samuelson effect. The first approach of the paper investigates the export similarity by calculating the export overlap as a share of total export for each trading partner to EU. The second approach calculates the unit values of each trading partner relative to EU. In the third approach, the technological sophistication similarity is tested by comparing the shares of export within different technology segments. The three different approaches aim to work as complements in determining any changing patterns of specialization for the trading partners.

2.3 Export Overlap

The approach here is to see how similar EU and its trading partners' export to the world is, and by this get an indication of any convergence of the cones of diversification to the one of EU. To measure the overlap in export to the world for EU and its trading partners a similarity index is constructed by using data on commodity shares for 2000, 2005 and 2010. The index will assist in assessing to which degree the cone of diversification of EU is similar to high- and low- income countries, as well as how the similarity has changed for the countries over the 10 year period. It would be expected that if there is a risk of a Stolper- Samuelson effect at play the similarity between EU and its low income trading partners would be increasing over the test period.

The overlap is measured by using indices of similarity and is constructed based on the method outlined by Finger and Kreinin (1979). The index is constructed by measuring the similarity of two countries, or groups of countries to a third market, here the world. The proposed index of export similarity is defined by the formula;

$$s(ab,c) = \left\{\sum_i Minimum[Xi(ac), Xi(bc)]\right\}$$

The index measures the similarity of the export patterns of country *a* and *b* to market *c*. *Xi(ac)* is the share of commodity *i* in *a's* export to *c*. If the commodity distribution of *a's* and *b's* exports are identical (*Xi(ac) = Xi(bc)* for each *i*, the index will take on value 1. If *a's* and *b's* export patterns are totally dissimilar the index will take on value 0. By comparing each product as a share of that country's total export, any scale effect is removed. Following the rescaling it can be found what proportion of *a's* export is matched by exports of *b* in the same product category (Finger and Kreinin, 1979, p.906). One weakness however in this measure is that it is sensitive to the level of disaggregation. The disaggregation level used here is only at 3- digit level and hence, will it not for example capture the differences between pants and shirts if both countries are exporting cloths.

2.4 Unit Values

In order for all the sectors within EU to be better off by trade, it is required that EU is trading with countries enjoying different comparative advantages. The comparative advantage is reflected by each country's cone of diversification. To further assess the convergence of the cones of the trading partners to EU, the relative unit value of each commodity classification for each country compared to EU is calculated.

Schott (2004), states that countries can export the same goods but still have different comparative advantages. The reasoning behind can be explained by three patterns that Schott (2004, p. 1) identified in regards to unit values. First, unit values for product varieties exported by capital and skill abundant countries were found to be higher than those varieties originating from labor abundant countries. Second, unit values are positively associated with the capital intensity of the production technique exporters use to produce them. Third, countries that expand their technology knowledge experience an increase in unit values compared to countries that do not.

Schott (2004, p. 2) further suggests that the relationship between unit values, exporter endowments, and exporter production techniques supports the view that capital- and skill-

abundant countries use their endowment advantage to produce vertically superior varieties, for example products of a higher quality or more technologically advanced which will lead to higher price. Schott (2004, p. 3) argues that when a high wage country is exposed to competition in labor intensive exports by low income countries, high wage countries shift their production into industries where they can apply their comparative advantage.

If high and low income countries produce identical varieties, the workers in each country are in direct competition with each other (Schott, 2004, p. 3). The competition will force the price and consequently the wage down in all countries as suggested by the Stolper-Samuelson (1941) and Jones (1965). If instead high and low income countries specialize in different varieties the competition between the countries may not be as fierce and subsequently the affect on price and wage may not be as severe. Thus, by comparing the unit values across EU and its trading partners some of the comparative differences are revealed. This can also be referred to as the within value differences of each commodity classification.

According to the outlined theory, if EU and its trading partners are producing the same goods and if these lay in the same cone of diversification the unit value would be expected to be close to 1. Accordingly, the closer the relative unit value is to 1 for EU and its low income trading partners, the higher the risk of a Stolper- Samuelson effect to occur.

Unit values are calculated for each product in every country by finding the relative price for product *X* in country Y. The relative price is then compared to the relative price of the same product in EU export using annual EU export values as weights (Edwards and Lawrence, 2010, p. 10).

In order to test for the specialization within products, a regression is run to capture if there is a relationship between exporters within- product price variation and exporter GDPPC (GDP per Capita). This is done by using the variables of the weighted average unit value relative to the EU ($\ln(P/P^{EU})$) on the log of GDP per capita (per capita GDP at 2010 prices). Year dummies are included in the regression to rule out any time effect.

$$(\ln(P/P^{EU})) = \alpha_1 + \beta_1 \ln GDPPC + \alpha_2 D1 + \alpha_3 D2$$

The results for the regression are presented in table 4.

2.5 Product composition according to level of sophistication

It is raised in the research done by Edwards and Lawrence (2010) that there is a concern in the US for emerging economies not only becoming more similar to US exports in general, but

that the rising similarity has been driven by rapid increases in exports of the same sophisticated goods. It has already outlined in the discussion for unit values (Schott, 2004), the importance of measuring the technology level associated with a country's export bundle in order to assess the country's comparative advantage. It is further stated by Lall (2000, p. 1) that the sophistication of a country's export bundle has important implications for growth and development. Low technology products have the least beneficial and spillover effects and technology intensive products have the highest (Lall, 2000, p. 1).

Lall (2000) outlines; it has been observed that developing countries are experiencing variations in the success of turning the national production from low to high technology products. When the low income countries do however manage to change the structure of the production into a more growth enhancing line, its competition is also changing. With a more complex production the country is competing with the more advanced economies.

Lall (2000) is in his research challenging conventional trade theory that assumes that technology activity plays no role in the comparative advantage of developing countries, and that the determinants remain relative factor endowments. In conventional trade theory there is no difference made between capacity and capability, and comparative advantage then only depend on factor endowments. Lall (2000, p. 3) suggests that comparative advantage depends to a much larger extent on the national ability to master technologies than recognized by conventional trade theory.

The view by Lall (2000) is shared by Acemoglu and Zilibotti (2001) that state that even when all countries have access to the same technology there will be differences in the level of productivity. The reasoning is that although many technologies can be imported by low income countries, the economic conditions in low income countries will not allow for the utility of technology to be maximized. Technology designed in high income countries is generally constructed for operations requiring skilled workers. When unskilled workers in low income countries will employ this technology it is natural to assume that there will be productivity differences between high and low income countries as a result of technology-skill mismatch. The productivity of the low income country will hence be lower due to the mismatch. In this regard different export structures have different implications for growth and effects on domestic industrial development. The reasoning is supported by Lall (2000, p. 3) that argues that technology intensive structure offer better prospects for future growth because these products tend to grow faster in trade: they tend to be highly income elastic, create new demand and substitute faster for older products.

According to proposed theory, countries with high GDP per capita is expected to produce more high technology intense goods since these require more capital. Further, is it suggested that more high technological goods generate better economic growth. It is therefore of interest to measure the productivity level that is attached to a countries export basket.

2.6 Share structure of export by technology classification

As outlined in the section 'product composition according to level of sophistication', by assessing the technology level associated with a country's export bundle, this will give an indication of a country's comparative advantage in utilizing its endowments. A country that to a larger degree is endowed with capital and skilled workers will as suggested by theory produce more high technology goods. Accordingly, the technology level of the export bundle will demonstrate country's advantage in exploiting its given technology.

By examining the level of technology used in the production of the export bundle, this will again seize the similarity of the cones of diversification of EU to its trading partners. Through analyzing the level of technology used in each country's export bundle and how it is changing over time, this will give an indication of any changes in the country's cone of diversification. An increase in the technological level of a low income country's export bundle, suggests that there may be a contingency for a Stolper- Samuelson effect.

In order to give an indication of what is meant by sophistication, a technology classification scheme developed by Lall (2000) is used. The classifications of the commodities in the calculations are based on the technology activity in manufacturing as given by Lall (2000) and the author's judgment when assigning products to the different categories. Table 3 shows the scheme. The categories are as follows (Lall, 2000, p. 342);

- Resource based (RB) products tend to be simple and labor- intensive, but there are segments using capital-, scale-, and skill intensive technologies. Since the comparative advantage for these products generally arises as a result of the availability of these resources in a country, they do not raise important issues for competiveness. However, where capital-, scale-, and skill intensive technologies are present these segments raise important competitive issues. A distinction is made between RB1, agriculture- based products and RB2, others.
- Low technology (LT) products are assumed to have stable, well-diffused technologies. The technologies are generally incorporated in the capital equipment. The lower end of production has relative low skill requirements. Labor costs tend to

be the major element of cost in competiveness. Barriers to entry and scale economies are generally low. There is a distinction made between LT1; fashion cluster and LT2; other technology products.

- Medium technology (MT) products constitutes of skill- and scale intensive technologies in capital goods and intermediate gods. These are known to be the main production by mature economies. They have complex technologies, with moderately high levels of R&D, advanced skill needs and lengthy learning periods. MT is divided into three subgroups; MT1; automotive products, MT2; process industries, MT3; engineering products. The relocation of labor intensive processes to low wage areas tend to be low since the products are heavy and need advanced capabilities to reach the expected standard.
- High technology (HT) products are of advanced and fast-changing design. The products are results of high R&D. To reach the level of technology demanded by these products it requires sophisticated technology infrastructures. The assembly of many high technology products are however not very skill demanding and would be cost efficient to place in low- wage areas. The high technology products are divided in HT1 and HT2.

Based on the technology scheme outlined, the technology share structure of each country is calculated by dividing value of each technology group by total export value (Edwards and Lawrence, 2010, p. 13). The result is presented in table 5.

Shortcomings of the technological classification scheme are that it does not capture within product specialization, which however may be somewhat compensated for when assessing the results in the light of the results for the calculated unit values. For instance, highly advanced mobile phones would fall into the same category as simple plastic phone receivers. Nor does the scheme recognize the process involved in making a product in different locations; e.g. semiconductors may involve high- technology intensive processes in EU and simply assembly in China (Lall, 2000). In the scheme both these processes would fall into high technology.

2.7 Productivity level associated with traded goods

As already pointed out, a country's endowments of physical and human capital, labor, natural resources and the quality of its natural resources- determine the cone of diversification of a country (Hausmann, Hwang and Rodrik, 2007). Hausmann, Hwang and Rodrik (2007) as

well as Lall (2000) argue that not all goods are alike in terms of their consequences for economic performance. Specializing in some products will result in higher growth than others. This suggests that; everything being equal, countries that specialize in the types of goods that rich countries export are likely to grow faster than countries that specialize in other goods. Countries that have advanced to produce more rich country products become richer, while the countries that continue to produce poor-country goods remain poor. In other words, countries become what they produce (Hausmann, Hwang and Rodrik, 2007, p. 2). Based on this assumption it would be assumed that low income countries would want to latch on to the production of more high income country goods.

By calculating the productivity level associated with the exported goods for EU's trading partners this will serve as an interesting complement to the technological classification share of export. Since theory suggest that by increasing the production of high technology goods a country can latch on to increased economic growth, an increasing export share of high technology goods should be accompanied by an increase in productivity level. If it is found that any of EU's low income trading partners, are gaining a larger share of export in high technology goods that is accompanied by a rising productivity level, this suggest that the factor endowments of that country is changing. By changing factor endowments it means a changing cone of diversification. If the change of factor endowments indicates increased similarity to EU, it means that the cones of diversification are becoming more similar. If the findings show such patter, there would an increasing risk for a Stolper-Samuelson effect.

Hausmann, Hwang and Rodrik (2007) have in their work created a model that shows that productivity in the modern sector is driven by the number of investors, country size and human capital. This quantities index aims to capture the productivity level associated with a country's export. In order to rank traded goods according to their implied productivity for EU and its trading partners, the model named EXPY by Hausmann, Hwang and Rodrik (2007) has been applied.

To calculate EXPY, first an index of weighted average of the per capita GDPs of countries exporting a given product, and thus represents the income level associated with that product must be calculated. This index is referred to as PRODY. The weights reflect the revealed comparative advantage of each country in that product. Countries are indexed by *j* and the goods are indexed by *l*. Total export of country *j* equals;

$$X_j = _l \, x_{jl}$$

The per-capita GDP of country *j* is denoted Y_j. The productivity level associated with product *k*, $PRODY_k$, equals;

$$PRODY_K = \sum_J \frac{(x_{jk}/X_j)}{\sum_j (x_{jk}/X_j)} Y_j$$

The numerator of the weight (x_{jk}/X_j) is the value-share of the commodity in the country's overall export basket. The denominator of the weight, $\sum_j (x_{jk}/X_j)$, aggregates the value-shares across all countries exporting the good. As a result, the index represents a weighted average of per- capita GDPs, where the weights correspond to the revealed comparative advantage of each country in good *k*. The comparative advantage is used as a weight to ensure that country size does not distort the ranking of the goods (Hausmann, Hwang and Rodrik, 2007, p. 9).

Once the PRODY is constructed, the productivity level associated with country *i*'s export basket, EXPY, can be defined by calculating the export-weighted average of the PRODY for that country. EXPY is the measure of the productivity level associated with a country's specialization pattern. In the research done by Hausmann, Hwang and Rodrik (2007) it is found that EXPY is a strong a robust predictor of subsequent economic growth. $EXPY_i$, is defined by;

$$EXPY_i =_l \left(\frac{x_{il}}{X_i}\right) PRODY_l$$

This is the weighted average of the PRODY for that country, where the weights are the value shares of the products in the country's total exports.

3 Results

3.1 Export Overlap

From the results revealed by the export overlap calculations, it is noticeable that India is the country, that has by share, increased its similarity to the EU cone of diversification the most. The similarity has increased from being 0.37 in 2000 to 0.44 in 2010. Along with India, the low income group has increased its similarity to EU the most among the income groups, from 0.21 to 0.26, over the 10 year period. However, even if India and the low income group have increased its similarity to EU, the export overlap figures still suggest that the cones of diversifications to be rather differentiated.

The US, is the only country which show a very large export overlap with EU, indicating a rather similar cone of diversification to the one of EU, 0.73 in 2010. The latter result is however not very surprising since according to traditional trade theory, developed countries

are known to trade differentiated products within the same commodity groups and the differentiation may not be captured here due to the disaggregation level of data.

For the remaining countries and income groups, the results for export similarity suggest that the EU's cone of diversification is substantially different to its trading partners.

Table1. Export overlap, similarity indices

Export similarity with EU exports, 3- digit data

Country	2000	2005	2010	Change
USA	0,71	0,73	0,73	0,02
China	0,46	0,46	0,46	- 0,00
Russian Federation	0,27	0,24	0,22	- 0,05
Switzerland	0,56	0,56	0,52	- 0,04
Norway	0,27	0,26	0,28	0,01
Turkey	0,59	0,45	0,49	- 0,10
Japan	0,59	0,61	0,61	0,02
India	0,37	0,41	0,44	0,07
Brazil	0,47	0,47	0,37	- 0,10
Republic of Korea	0,51	0,52	0,51	- 0,00
High income	0,71	0,73	0,69	- 0,02
High middle income	0,56	0,55	0,55	- 0,02
Low middle income	0,42	0,45	0,43	0,01
Low income	0,21	0,22	0,26	0,04

Source: Authors calculations

3.2 Unit Values

Reported in table 2 are the results for the average unit values relative to EU export. These results will be used as a guide only since many of the commodity groups lacked information about the amount exported for each commodity, which may distort the reliability of the outcomes.

In order to remove any outliers, the 1 percentile of the data has been excluded from the calculations. Despite this action of caution, e.g. for the groups; high income in 2000 and high middle income in 2010, the results are most likely not reliable indicators. For example some of the data that are contributing to the remarkably high relative unit value for the high income group in 2000, are commodity; 885 (watches) relative unit value 25.51 in 2000 but only 4.64 in 2010, 744 (mechanical handling equipment) relative unit value 5.31 in 2000 but only 0.70 in 2010 and 726 (printing and book binding machinery) relative unit value 6.85 in 2000 and 1.09 in 2010. None of these commodity groups contain goods that would be expected to have changed that much over the 10 year period.

Again India is the only country that stands out from the results. However, India was also the country with the largest number of unreported quantity units for the export data and hence no conclusions will be drawn based on this result solely.

Another effect that needs to be taken into account is within industry specialization; this means that even if the data used are not very disaggregated some products would still not give its correct value to the consumer even with more disaggregated data. E.g. Computers; there is a clear division between the types of computers in Asia and developed countries. Asia mainly produces low end standardized computers (Krugman, 2008, p. 125).

To further analyze the possibility for within product specialization, a regression was run to test for the relationship between exporter incomes and within- product price variation. The results presented in table 4 reveal that the unit values are positively and significantly related to exporter's GDP. The coefficient for GDPPC implies that a 10 percent increase in a country's GDPPC is associated with a 3 percent increase in unit values. The results for the dummies indicate that there is no time effect within the data. The full regression results are presented in table 4.

Table 2. Unit values

Average unit values relative to EU export

	2000	2005	2010	Change
USA	0,90	0,80	0,79	- 0,11
China	0,45	0,50	0,46	0,02
Russia	0,49	0,48	0,65	0,17
Switzerland	0,96	1,83	1,94	0,98
Norway	0,93	1,02	1,30	0,37
Turkey	0,51	0,48	0,49	- 0,02
Japan	1,63	1,26	1,34	- 0,29
India	0,58	0,54	0,74	0,16
Brazil	0,56	0,48	0,62	0,05
Republic of Korea	0,67	0,60	0,68	0,01
High	1,25	0,76	0,75	- 0,50
High Middle	0,58	0,48	1,55	0,97
Low Middle	0,66	0,80	0,78	0,12
Low	0,65	0,40	0,68	0,03

Source: Authors calculations

Now, if interpreting the results for unit values with the shortcomings of the data at mind, there is no indication that the products exported by developing countries are of the same sophistication and quality as EU export. The findings from the unit value calculations and the

regression supports the view by Schott (2004) that unit values for product varieties exported by high income countries are expected to be higher than those varieties exported by low income countries. High income countries are assumed to be more capital and skill intensive than the low income countries and as a result of these endowments they are able to produce product varieties of more complex nature by fully utilizing its given technology.

3.3 Product composition according to level of sophistication

Looking at the share structure of exports by EU and its trading partners according to the technological classification developed by Lall (2000), table 5, it is noticeable that EU has its main export in medium and high technology manufactures. Comparing the export shares of EU to the other high income countries such as Japan, Republic of Korea, Switzerland and USA, as well as the group high income countries, they appear to be sharing the same export structure. As would be expected by traditional trade theory, the results show that the low income countries are exporting mainly primary goods and low technology manufactures, commodities that the high income countries have a very small export share in.

Norway however, despite being a high income country has its main export in primary and resource based manufactures. This somewhat puzzling result can be explained by Norway's abundant natural resources in oil and natural gas. These industries have already been established as high income sectors and although being classified as primary they will contribute to Norway's high GDPPC.

A result that on the other hand is striking is that China with its GDP per capita of $4354 in 2010, has an export share in the high technology sector equaling 40 percent compared to EU that only has 24 percent. More so, China's export share in the high technology sector has increased by 12 percent from 2000 till 2010. Export within the medium technology sector, even if it is not an as step increase as China is experiencing within the high technology sector, is also increasing. In 2000 China had 17 percent of its export in medium technology goods and by 2010 this share had increased to 22 percent. As already outlined, the medium technology sector is not as easily outsourced as the high technology sector proposing a potential real competition threat to EU.

Previous studies have retrieved similar findings and Baldwin (2006, p. 935) states EU exporters, together with those of US and to a lesser extent Japan, are starting to lose market share to China and other emerging markets in the competition of export in high technology products. It is further stated that EU has a higher percentage of exports going to the least dynamic, slowest growing markets compared to US or Japan export. This is however not

covered by this paper, although it is an interesting angle and would be suggested for future studies.

In the research by Hausmann, Hwang and Rodrik (2007) it is stated that by producing high income goods, this will boost economic growth. From the export sophistication measures calculated, the figures support this theory, where China's GDPPC has increased from $956 to $4354 over the examined 10 year period. If comparing China to the other high middle income countries, there is no other country that has increased its export share in high technology products by the same amount and simultaneously has enjoyed the same rate of GDPPC increase. Instead, the other countries that have experienced an increase in GDPPC seem to have been able to improve in the production of resource based manufactures. The findings of natural resources will naturally boost a country's economic growth and resource based manufactures have already been established as given based on the availability of the resources. Accordingly, the lack of an increase in resource based exports by China suggest that high technological trade is the success variable.

When calculating the production level, EXPY, for the trading partners its however noticeable that Chinas EXPY is still very low considering the large export share in the high technology segment, table 6. The EXPY becomes low due to the rather low GDP per capita (even if it has remarkably increased over the ten year period) which suggests that China's manufacture is vastly more advanced than would be expected considering its export bundle. An explanation could be country policies that subsidize the high technology sector, allowing China to specialize in goods that normally would be high income country manufactures. This assumption is supported by Dean, Fung and Wang (2011, p. 611) that assert that the Chinese government provides special incentives for enterprises engaged in processing trade, allowing them to import raw materials and other inputs duty free as long as these inputs are used to produce final goods or further processed inputs solely for exports.

When comparing the GDPPC of the trading partners to the calculated EXPY, there seem however to be a positive relationship between the variables, see figure 5.

From the findings of product sophistication it is clear that China is becoming more advanced in its export composition. It is noticeable that China's GDPPC is increasing and it could be due to the change into more high and medium technological production. All these findings with respect to China are indicators of changing endowments, which in turn means that Chinas cone of diversification is changing. If China will continue to increase its export in high technology and if it will continue to boost its GDPPC, theory suggests that EU is facing a competitive threat by China.

Table 6. Production level of export bundle for the top 10 trading partners, 2000-2010

Country	2000	2005	2010
USA	6 404,98	7897,866028	7 797,42
China	226,71	467,88	1 228,26
Russian Federation	643,51	1 828,36	3 470,07
Switzerland	12 853,95	20 348,85	30 516,58
Norway	16 925,76	27 763,83	35 135,00
Turkey	3 116,12	3 032,14	2 925,41
India	488,52	426,26	387,37
Japan	10 225,60	9 710,08	9 555,15
Brazil	3 653,26	4 211,15	4 575,02
Republic of Korea	5 115,06	5 164,87	5 543,26

Source: Author's calculations

3.4 Summary of Results

In order to assess the possibility that EU and its trading partners are increasingly becoming more similar in their cone of diversification, the results obtained from the export overlap, unit values and product sophistication need to be evaluated in conjunction. The three methods are all designed to capture the cone of diversification for each trading partner relative to EU, with each method considering slightly different variables in the assessment. By using more than one method in the estimation of each country's cone of diversification will give a more reliable conclusion if a pattern can be established across the three methods.

The export overlap concentrates solely on comparing the share of total export for every trading partner in each commodity held in common by EU. It does not consider within product specialization as a result of technology differences. The unit value approach however does. Comparing the result for the export over lap and the unit value, one pattern is noticeable. The high income countries, even when there is only a small similarity in export overlap, show relative average unit values close to 1 relative to EU export. The opposite relationship is found for the low- and low middle income countries; despite the export overlap indicating a rather similar export to EU, the relative average unit values are much lower than for the high income countries.

The identified relationship for export overlap and unit values indicates that although EU and a high income country appear to export different goods, the goods that they both do however export appear to be close substitutes. The opposite holds again for the low income countries; even if EU and a low income country according to the export overlap appears to be similar, the unit values relative to EU export are for most of the low income countries around

0.5 to 0.6, suggesting dissimilarities within products. The regression that tests the relationship between exporter income and within product price variation confirms the pattern suggested by the export overlap and unit values; high income countries are able to produce varieties that hold a higher unit value which implies the production of goods of more complex design.

These findings suggest that technology is a variable that needs to be considered when examining the comparative advantage of each country; in order to establish the cone of diversification.

Accepting that technology must be accounted for when determining the similarity of EU's cone of diversification to its trading partners, the findings for the product composition according to sophistication will bring some interesting results to the discussion.

Overall it is found that high income countries are exporting more high technological goods than the low income countries. China however, is delivering some striking results. China is over the 10 year period, increasing from a share in the export of high technological goods of 28 percent in 2000 to 40 percent in 2010. Over the same time period for EU, the export share in high technological goods was 27 percent in 2000 and had declined to 24 percent in 2010. EU has its main export in medium technology goods and the EU share of medium technology export did increase from 2000 to 2010, but so did China's, although not as rapidly as the observed increase for high technology goods. The rise should however still be noted since it appears that China is increasingly shifting its production towards high income production. A shifting production suggests a changing cone of diversification.

From the results for the production level associated with each country's export basket, EXPY, there appear to be a relationship between the technology export- and production-level. A high technology level of export seems to be accompanied by a high production level, EXPY. For China however, there appears to be a paradox between its technology level of export and the production level associated with it. Explanations for this contradiction in results are e.g. country policies that subsidize the high technology sector allowing China to specialize outside of its natural comparative advantage. However, even if China's changing cone of diversification may only be artificial due to governmental policies the change must still be considered reel. If the theory proposed by Lall (2000) holds, then China's increased production in high income manufactures will boost economic growth and the new cone of diversification may be sustainable.

4 Discussion

When comparing the results that were found for EU to the findings made by Edwards and Lawrence (2010) in the research for US it is noticeable that the outcomes are similar. For both EU and the US, the export overlap is broadly consistent with GDP per capita with exports from low-income countries displaying the least overlap with aggregate EU/ US export. The findings show that unit values of both EU and US exports are substantially higher than the unit values for low income countries and that there is a positive and statistically significant association between a country's GDPPC and its weighted average price. The product sophistication patter found in the calculations for EU's trading partners in 2000- 2010 is consistent with the findings in 1990- 2006 for US.

That the outcomes for EU and the US show corresponding results are perhaps not so surprising considering that all the calculations carried out in this research indicate that EU and the US share a similar cone of diversification. To what extent the two share the same trading partners is not covered but it can still be generalized that EU and US are facing a similar competition from their low income trading partners in high and medium technology export.

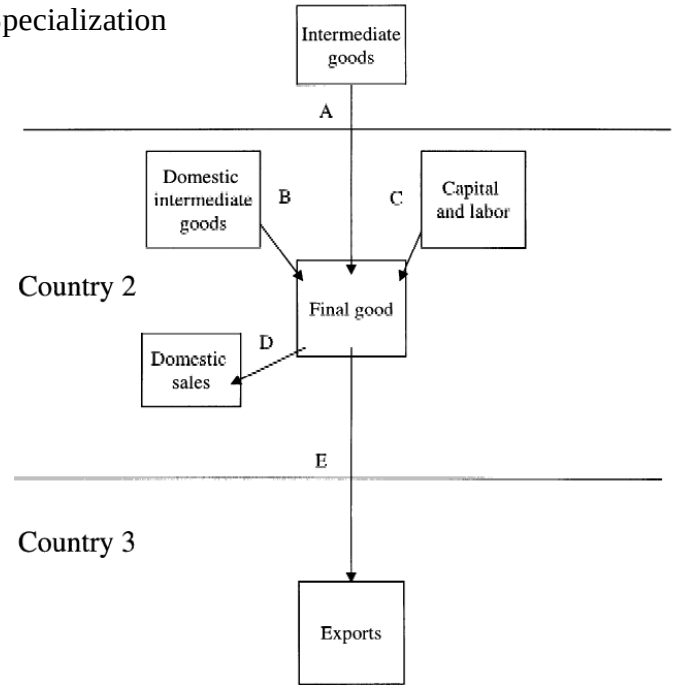
Before making any conclusions to whether EU is facing a risk of a Stolper- Samuelson effect as result of increased similarity in its cones of diversification to its low income trading partners, some alternative theories should be considered. Krugman (2008) among others argue, that despite a number of studies that were conducted during the 1990s which found no or only a modest inequality effect as a result of trade, the Stolper-Samuelson effect may still be real. Krugman (2008, p. 115) found from his research that there had been a substantial decline in the relative price of unskilled labor-intensive goods since the mid-1990s. Krugman (2008, p. 128), debates that the apparent sophistication of exports from developing countries are in large part a statistical illusion due to within and vertical industry specialization. Krugman (2008) highlights, that many propositions conclude that there is only a risk for a Stolper-Samuelson effect if countries lie in the same cone of diversification. Krugman on the other hand believes that what is happening is that there is a breakup of the value chain that allows developing countries to take over unskilled labor-intensive tasks of skill-intensive industries, implying a Stolper-Samuelson effect.

Support for the suggested increasing trade growth in vertical specialization is found in the research by Hummels, Ishii and Yi (2001, p. 76) that states that over the last several decades the nature of international trade has changed dramatically. One of the most important changes involves the increasing interconnectedness of production processes in a vertical trading chain

that stretches across many countries, with each country specializing in particular stages of a good's production sequence; referred to as vertical specialization but may be more know to the general public as outsourcing.

The concept of vertical specialization is described to occur when (Hummels, Ishii and Yi, 2001, p. 77); a good is produced in two or more sequential stages, two or more countries provide value-added during the production of the good, at least one country must use imported inputs in its stage of the production process, and some of the resulting output must be exported. This means that vertical specialization involves both an import and an export side. Figure 1 illustrates an example of a vertical specialization chain and how it can stretch over three countries. In this example country 1 produce the intermediate goods. Country 2 combines the imported intermediates with capital and labor, and domestically produced intermediates to produce a final good where some of the final good is exported to country 3.

Figure 1. Vertical Specialization



Source: Hummels, Ishii and Yi (2001, p. 78)

From the examination by Hummels, Ishii and Yi (2001, p. 83) it is found that over the time frame of the study, 1968 to 1990, the vertical specialization share grew for every country and aggregated over the sample the increase is about 22 percent. It is further found that vertical specialization trade is contributing substantially to the increase in export growth over the examined time period (Hummels, Ishii and Yi, 2001).

An interesting finding in regards to vertical specialization was made by Hummels, Ishii and Yi (2001) when testing the trade relationship in vertical specialization between OECD and all other countries. The results indicate that OECD imported inputs were transformed into export goods destined for other OECD countries, whereas vertical specialization trade links between non- OECD countries to other non- OECD countries were found to be very weak (Hummels, Ishii and Yi (2001, p. 92). It could be implied by these results that the more skill-intensive production process of a good is located in the high income country since OECD countries would be expected to demand more skill-intensive products than low income countries. In the light of the theory behind vertical specialization, it could potentially be considered the rationale behind China's remarkable results. In the research by Dean, Fund and Wang (2011, p. 1) it is stated that the value of China's export and import rose from 1995 to 2008 by 812 percent. It is claimed that over 50 percent of Chinese exports and about 40 percent of Chinese imports were classified as intermediates that are further processed solely for exports. Dean, Fund and Wang (2011, p. 1) finds that this trade is concentrated in fragments within seemingly relative high- tech products, and is carried out largely by foreign-invested enterprises which suggests outsourcing.

It is argued by Dean, Fund and Wang (2011, p. 2) that due to vertical specialization Chinese final good export appears much more high technological than might be predicted based on relative factor endowments. The parts of the process line produced in China are likely to be relatively low-skilled labor intensive.

In the work by Yrkkö, Rouvinen, Seppälä and Anttila (2011, p. 3) a study of the different value added components of a Nokia N95 is carried out. The findings from the study conjecture that even when taking into consideration both assembly locations and all countries of final sale, over the N95's life cycle 54 percent of the value added was captured by E27. Ali-Yrkkö, Rouvinen, Seppälä, and Ylä-Anttila (2011, p. 12) argues that even if final assembly is in China and final sale is in the US, EU27 is able to gain the majority of the value added as a result of EU27's dominance in branding, development, design and management.

It is stated that even if the final assembly country earns the "made in" label and would by most people be considered the production country, it gains only a few percent of the supply chain's overall value (Ali-Yrkkö, Rouvinen, Seppälä, and Ylä-Anttila , 2011, p. 14). It is suggested by these findings that the developed countries continuous to capture the larger part of the value added generated globally. In other words, in the case of Nokia N95 the returns to

the more skill- intensive process segments of the production appear to be higher than the less-skilled, which may propose a case of a Stolper- Samuelson effect.

However, if vertical specialization hides a Stolper- Samuelson effect as suggested by Krugman's proposal and the findings of Ali-Yrkkö, Rouvinen, Seppälä, and Ylä-Anttila, the assessment of one good only cannot be the base for a conclusion. A thorough evaluation can only be done by examining the prices for each and every component along the production chain. Nevertheless, despite the seemingly straight forward process, it will be very difficult to codify the transactions within a value chain for every final good. Moreover, firms would be expected to be reluctant in revealing the geographical location of their operations (Ali-Yrkkö, Rouvinen, Seppälä, and Ylä-Anttila, 2011).

Another side of the coin is the fact that statistics may make countries' export look more technological advanced than it really is due to vertical specialization. Consequently could EU and its trading partners actually be even more differentiated than found from the similarity calculations. Further, from this aspect vertical specialization may be considered a way for each country to specialize in accordance to its comparative advantage.

The possibility of a Stolper- Samuelson effect hiding within the vertical specialization chain should not be forgotten but the limitations of such an operation will exclude the study from this research. Consequently, despite the interesting arguments related to vertical specialization, it will be left for future studies. In order to make a perspicuous essay the research here was concentrated on estimating the similarity of the cones of diversification for EU to its trading partners, without differentiating between intermediate and final goods.

5 Conclusion

The results obtained for the export overlap and unit values in this research show no evidence of a rising similarity in the EU cone of diversification to its low income countries.

The findings in regards to the product sophistication suggest that only China is displaying a distinct pattern of change in its cone of diversification towards an increasing similarity to EU. For the other countries no such relationship is found. However, when considering the rise in product sophistication by China, to closer resemble EU export, it is noticeable that the goods exported by China are sold at a unit value that is approximately 0.45 of the EU unit value. This suggests that the cones of diversification for China and EU are still dissimilar despite the results obtained in the calculations of product sophistication. The large differences in unit values for EU to its low income trading partners are in fact highly indicative of a high degree

of specialization. Consequently, EU export will not be considered to be close substitutes for low income counties' exports.

Based solely on the results obtained here, there are no indications of EU facing a risk for a Stolper- Samuelson effect. However, with the concept of vertical specialization at mind this would be suggested as further research before ruling out the risk completely. If there is a Stolper- Samuelson effect due to vertical specialization this could perhaps explain the increasing unemployment rate in Europe where labor market rigidities may have prevented wage adjustments that have taken place in the US (Polgar and Wörz, 2010). Furthermore, even if no indications are found from the results that EU would be under any threat of increasing similarity to any of its trading partners these results should be interpreted with caution. Since it is clear that, no matter what is found here, that China is becoming a large and important market player. Support for such a statement is not only found from the results for product sophistication, but also from a vast number of research and world news. China will most likely give EU hardening competition that will probably only become fiercer over the years to come.

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Appendix

Table 3. The technological classification of exports

Primary		Fresh fruits, meat, rice, tea, coffee, wood, coal, crude petroleum, gas, metals
RB1	**Agro/ forest based products**	Prepared meats/ fruits, beverages, wood products, vegetable oils
RB2	**Minerals based products**	Ores and concentrates, petroleum/rubber products, cement, cut gems, glass
LT1	**Fashion clusted**	Textile fabrics, clothing, headgear, footwear, leather manufactures, travel goods
LT2	**Other low technology**	Pottery, simple metal parts/structures, furniture, jewelry, toys, plastic products
MT1	**Automotive products**	Passenger vehicles and parts, commercial vehicles, motorcycles and parts
MT2	**Process industries**	Synthetic fibers, chemicals and paints, fertilizers, plastics, iron, pipes/tubes
MT3	**Engineering industries**	Engines, motors, industrial machinery, pumps, switchgears, ships, watches
HT1	**Electronics and electrical products**	Office/data processing/telecommunications equipment, TVs, transistors, turbines, power generating equipment
HT2	**Other high technology**	Pharmaceuticals, aerospace, optical/ measuring instruments, cameras
Special Transactions		**Electricity, cinema film, printed matter, art, coins, pets, non- monetary gold**
RB	Resource based manufactures	
LT	Low technology manufactures	
MT	Medium technology manufactures	
HT	High technlogy manyfactures	

Source: Lall (2000)

Table 4. OLS regression result of exporter unit value on exporter GDPPC

Coefficients	*OLS*
Intercept	- 3,275
	(0,791)
ln GDP per capita	0,301
	(0,090)
Dummy 1	0,170
	(0,354)
Dummy 2	-0,187
	(0,348)
R-square	0,281
Observations	39

Source: Authors calculations

Table 5. Share structure of exports by EU and its trading partners

	Brazil	China	EU	India	Japan	Norway	Republic of Korea	Russian Federation	Switzerland	Turkey	USA	High	High middle	Low middle	Low
2000															
HT1	6%	25%	15%	2%	31%	3%	38%	1%	9%	8%	25%	23%	22%	17%	0%
HT2	8%	3%	12%	3%	7%	1%	2%	1%	19%	3%	13%	8%	3%	1%	1%
LT1	8%	29%	7%	31%	2%	1%	12%	1%	4%	39%	4%	7%	14%	18%	53%
LT2	8%	11%	7%	23%	5%	2%	6%	7%	12%	8%	4%	5%	7%	8%	4%
MT1	8%	3%	9%	2%	19%	1%	9%	1%	1%	6%	8%	7%	5%	1%	0%
MT2	8%	8%	12%	10%	9%	3%	10%	5%	17%	8%	11%	9%	7%	6%	3%
MT3	7%	6%	17%	3%	19%	5%	11%	6%	27%	5%	14%	10%	5%	2%	1%
Primary	14%	4%	2%	9%	0%	15%	1%	17%	0%	8%	5%	5%	9%	10%	22%
RB1	16%	7%	10%	9%	2%	58%	8%	38%	5%	8%	7%	17%	20%	30%	8%
RB2	14%	2%	2%	3%	2%	6%	2%	10%	3%	4%	3%	4%	5%	4%	3%
Special Transaction	3%	1%	7%	4%	4%	5%	1%	12%	3%	3%	5%	5%	3%	3%	6%

	Brazil	China	EU	India	Japan	Norway	Republic of Korea	Russian Federation	Switzerland	Turkey	USA	High	High middle	Low middle	Low
2005															
HT1	5%	37%	13%	3%	23%	2%	34%	1%	7%	9%	18%	20%	23%	13%	1%
HT2	4%	4%	13%	4%	7%	2%	4%	1%	25%	1%	14%	8%	3%	2%	1%
LT1	6%	21%	6%	20%	2%	1%	5%	1%	4%	28%	4%	4%	12%	17%	49%
LT2	9%	10%	7%	20%	6%	2%	6%	8%	10%	10%	5%	6%	8%	11%	3%
MT1	10%	3%	10%	3%	21%	1%	13%	1%	2%	13%	9%	9%	5%	2%	1%
MT2	7%	8%	12%	12%	11%	3%	12%	5%	17%	9%	13%	10%	7%	8%	5%
MT3	8%	7%	18%	5%	19%	5%	13%	2%	23%	7%	15%	11%	6%	3%	1%
Primary	17%	2%	2%	7%	0%	22%	1%	15%	1%	6%	5%	5%	8%	12%	17%
RB1	19%	5%	11%	15%	3%	53%	8%	51%	5%	10%	8%	17%	21%	24%	10%
RB2	12%	2%	3%	7%	3%	6%	2%	7%	2%	3%	4%	4%	5%	7%	6%
Special Transaction	2%	1%	6%	5%	5%	4%	0%	9%	5%	3%	5%	5%	3%	3%	7%

	Brazil	China	EU	India	Japan	Norway	Republic of Korea	Russian Federation	Switzerland	Turkey	USA	High	High middle	Low middle	Low
2010															
HT1	2%	36%	10%	4%	18%	3%	26%	1%	6%	8%	14%	8%	23%	9%	1%
HT2	3%	4%	14%	5%	7%	2%	9%	0%	31%	1%	9%	6%	3%	2%	1%
LT1	3%	19%	5%	14%	1%	1%	3%	0%	3%	21%	3%	3%	11%	12%	34%
LT2	6%	9%	7%	16%	7%	2%	6%	6%	10%	11%	6%	5%	7%	8%	6%
MT1	6%	3%	10%	4%	19%	1%	12%	1%	1%	12%	8%	9%	5%	2%	1%
MT2	7%	9%	12%	10%	11%	4%	12%	4%	14%	11%	13%	14%	8%	8%	5%
MT3	6%	10%	19%	6%	21%	6%	18%	2%	21%	8%	12%	11%	7%	4%	2%
Primary	22%	2%	2%	7%	0%	30%	1%	15%	1%	6%	6%	8%	8%	13%	25%
RB1	22%	5%	12%	20%	4%	42%	9%	53%	5%	12%	11%	26%	20%	31%	9%
RB2	21%	2%	3%	8%	4%	6%	3%	6%	2%	4%	5%	7%	6%	7%	7%
Special Transaction	1%	1%	6%	6%	6%	4%	1%	12%	7%	5%	11%	3%	3%	3%	10%

Table 7. EU top 10 trading partners

Country	Trading Value	GDP
USA	585 996 961 863,00	46 545,90
China	578 716 213 289,00	4 354,03
Russian Federation	414 253 512 028,00	10 351,44
Switzerland	283 425 573 869,00	68 880,22
Norway	188 950 699 639,00	84 588,70
Turkey	158 003 344 111,00	10 095,08
Japan	155 737 944 701,00	43 140,90
India	105 874 723 560,00	1 406,42
Brazil	97 800 797 130,00	10 715,59
Republic of Korea	91 245 830 943,00	21 052,17

Source: Authors calculations

Table 8. EU trading partners classified into four income groups

High Income

Country	Value of trade 2010	GDP 2010
Norway	188 950 699 639,00	84 588,70
Switzerland	283 425 573 869,00	68 880,22
Australia	55 005 794 399,00	57 118,89
China: Macao SAR	562 250 546,00	49 990,18
USA	585 996 961 863,00	46 545,90
Canada	68 903 844 676,00	46 360,91
Singapore	60 633 132 316,00	43 783,11
Japan	155 737 944 701,00	43 140,90
United Arab Emirates	53 499 498 988,00	39 624,70
Iceland	5 995 625 028,00	39 278,01
New Caledonia	1 797 801 628,00	35 319,49
New Zealand	8 825 804 104,00	32 372,07
China, Hong Kong SAR	52 273 346 391,00	31 823,74
Israel	38 865 955 111,00	29 311,58
French Polynesia	800 696 549,00	24 669,02
Aruba	332 426 231,00	22 851,45
Bahamas	1 105 498 326,00	22 461,61
Republic of Korea	91 245 830 943,00	21 052,17
Oman	4 848 563 445,00	20 790,97
Bahrain	3 229 313 770,00	18 184,07
Saudi Arabia	72 479 210 386,00	15 835,94
Trinidad and Tobago	3 190 838 540,00	15 205,09
Barbados	265 484 767,00	14 497,34
Croatia	22 310 497 210,00	13 819,50
Venezuela (Bolivarian Republic of)	11 858 110 829,00	13 502,73
Antigua and Barbuda	289 662 195,00	12 602,37

High middle income

Country	Value of trade 2010	GDP 2010
Chile	24 912 031 625,00	11 887,71
Brazil	97 800 797 130,00	10 715,59
Russian Federation	414 253 512 028,00	10 351,44
Turkey	158 003 344 111,00	10 095,08
Montserrat	2 860 271,00	9 342,73
Lebanon	7 224 127 664,00	9 283,69
Kazakhstan	39 286 357 882,00	9 166,66
Argentina	25 359 163 253,00	9 162,13
Mexico	52 718 562 580,00	9 100,66
Malaysia	44 337 062 323,00	8 372,84
Costa Rica	9 309 969 311,00	7 703,82
Panama	2 978 808 779,00	7 614,01
Mauritius	2 322 353 369,00	7 488,31
Botswana	4 248 238 523,00	7 402,93
South Africa	56 535 715 066,00	7 254,81
Dominica	38 659 047,00	7 020,76
Suriname	738 554 508,00	7 017,98
Montenegro	1 161 878 565,00	6 509,81
Colombia	15 905 419 721,00	6 222,85
Saint Vincent and the Grenadines	88 001 060,00	6 171,70
Belarus	15 012 121 433,00	5 701,96
Azerbaijan	24 270 067 168,00	5 637,60
Peru	12 446 515 658,00	5 410,69
Iran	35 990 091 309,00	5 227,14
Dominican Republic	2 322 780 543,00	5 195,38
Serbia	18 558 611 972,00	5 123,19
Jamaica	650 746 023,00	4 899,03
Maldives	208 807 977,00	4 684,51
Thailand	39 377 744 290,00	4 612,84
Belize	205 138 373,00	4 495,76
Bosnia and Herzegovina	7 809 392 835,00	4 477,70
Algeria	60 287 113 267,00	4 473,01
Jordan	4 549 451 071,00	4 445,29
China	578 716 213 289,00	4 354,03
Tunisia	27 547 427 741,00	4 222,12
Ecuador	5 076 561 846,00	4 072,65

Low middle income

Country	Value of trade 2010	GDP 2010
Albania	4 203 328 401,00	3 677,20
Fiji	170 067 916,00	3 545,71
Tonga	2 226 214,00	3 543,07

El Salvador	956 838 361,00	3 425,60
Samoa	7 936 409,00	3 343,33
Cape Verde	788 956 074,00	3 243,99
Ukraine	47 727 183 029,00	3 035,00
Armenia	1 254 006 148,00	3 030,71
Guyana	373 987 260,00	2 995,95
Indonesia	31 784 225 553,00	2 949,29
Syrian Arab Republic	8 087 929 881,00	2 931,49
Guatemala	1 543 083 611,00	2 882,30
Morocco	31 267 187 507,00	2 865,04
Paraguay	2 246 296 988,00	2 771,12
Georgia	2 859 632 306,00	2 680,26
Congo	4 245 682 295,00	2 665,11
Egypt	30 850 401 936,00	2 653,71
Sri Lanka	5 029 398 319,00	2 375,32
Philippines	12 133 281 380,00	2 140,14
Bhutan	36 514 280,00	2 047,24
Bolivia	984 195 609,00	1 977,91
Occupied Palestinian Territory	126 511 562,00	1 819,54
Yemen	1 653 051 542,00	1 437,25
India	105 874 723 560,00	1 406,42
Ghana	8 499 580 884,00	1 333,22
Sao Tome and Principe	78 049 018,00	1 283,27
Nigeria	49 359 022 885,00	1 239,78
Zambia	1 197 289 423,00	1 237,79
Cameroon	4 848 678 552,00	1 206,63
Viet Nam	24 416 270 989,00	1 182,74
Nicaragua	535 100 942,00	1 131,87
Mauritania	2 246 168 474,00	1 131,06
Senegal	4 017 343 292,00	1 032,73

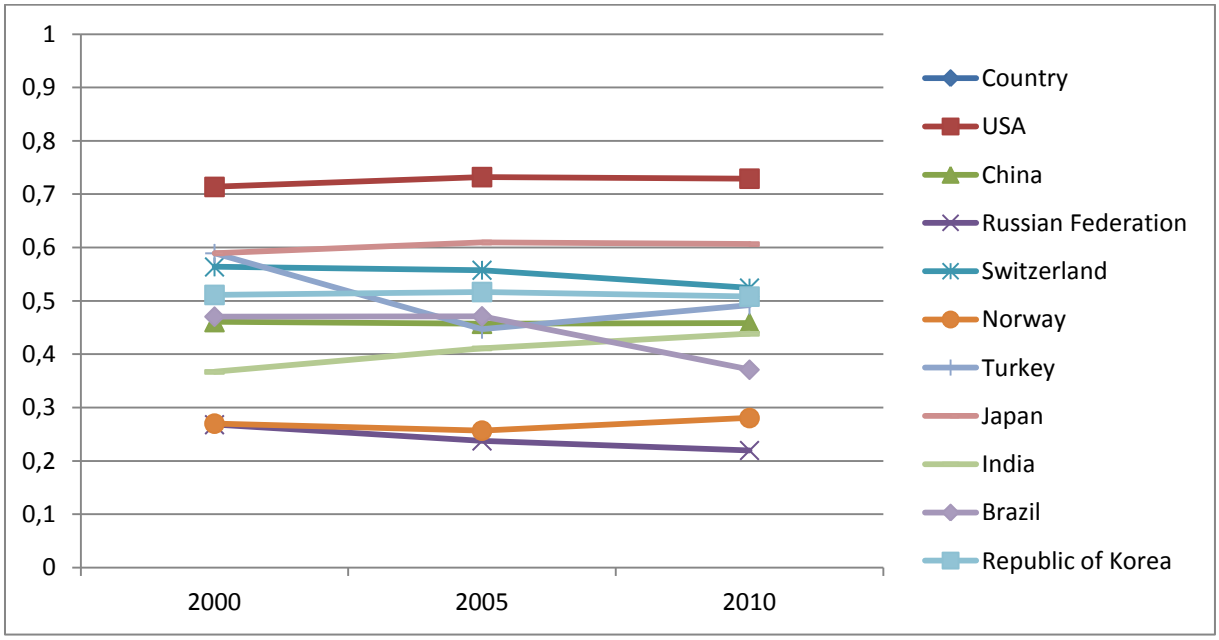
Low income

Country	Value of trade 2010	GDP 2010
Pakistan	11 087 511 630,00	1 003,21
Myanmar	422 198 849,00	876,23
Kyrgyzstan	589 723 631,00	865,38
Kenya	3 904 090 205,00	801,79
Cambodia	2 058 104 567,00	797,25
Benin	3 318 550 484,00	741,07
Mali	940 535 324,00	598,82
Gambia	192 134 328,00	579,09
Zimbabwe	910 029 350,00	573,07
Nepal	218 875 736,00	534,71
Rwanda	260 182 829,00	532,32
Togo	1 709 349 270,00	524,61

Burkina Faso	706 236 921,00	519,72
United Republic of Tanzania	2 085 580 421,00	516,24
Uganda	1 262 127 112,00	509,05
Afghanistan	1 195 936 459,00	499,03
Madagascar	1 317 314 477,00	421,9
Mozambique	2 584 155 087,00	407,55
Niger	860 477 244,00	357,71
Malawi	483 908 917,00	357,38
Ethiopia	2 167 828 828,00	324,63
Burundi	163 939 265,00	176,62

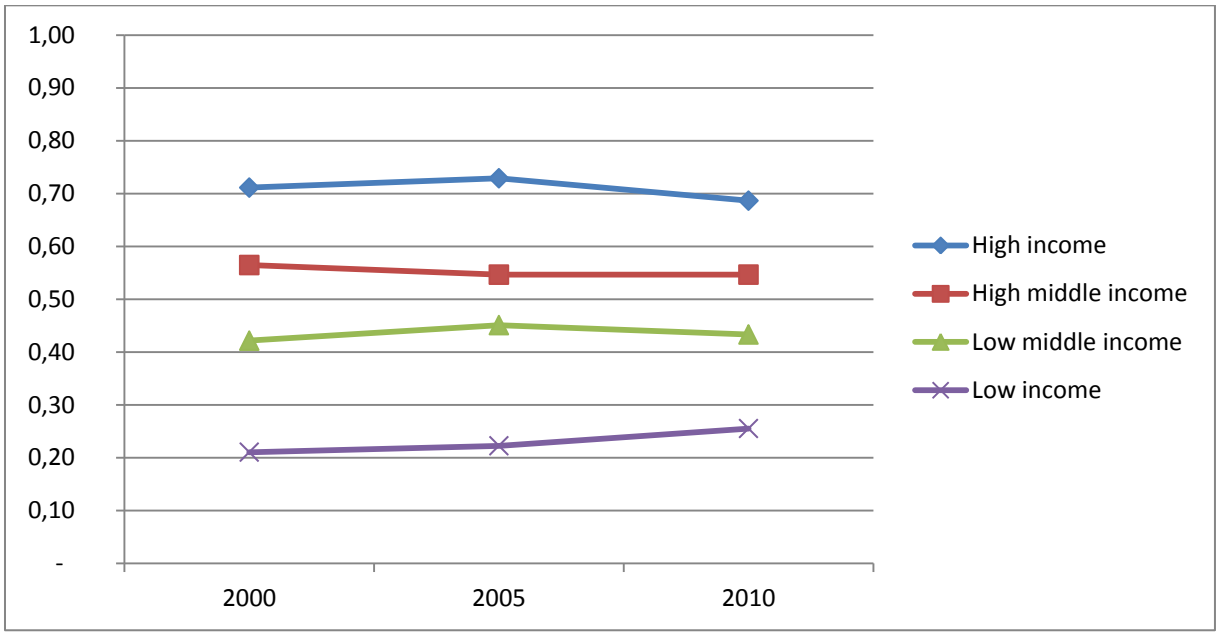
Source: COMTRADE data. The four income groups have been classified according to World Bank Atlas method. The groups are: low income, $1,025 or less; lower middle income, $1,026 - $4,035; upper middle income, $4,036 - $12,475; and high income, $12,476 or more (http://data.worldbank.org/about/country-classifications)

Figure 1. Export similarity for top 10 trading partners with EU exports



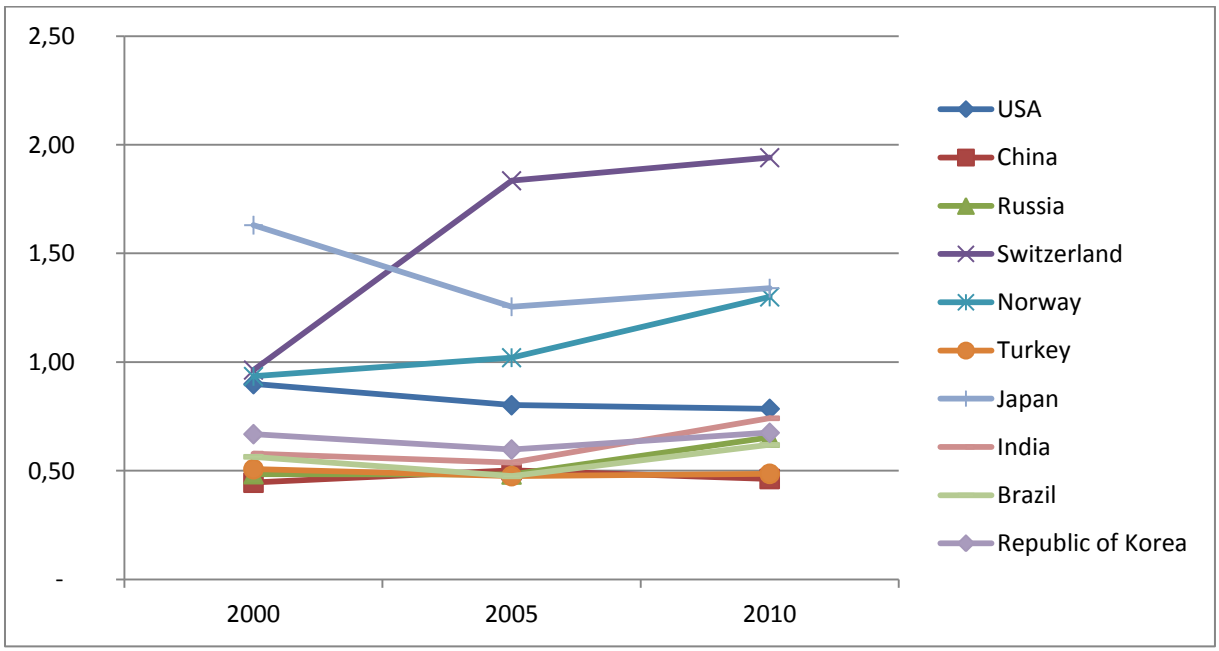
Source: Authors calculations

Figure 2. Export similarity for the four income groups with EU exports



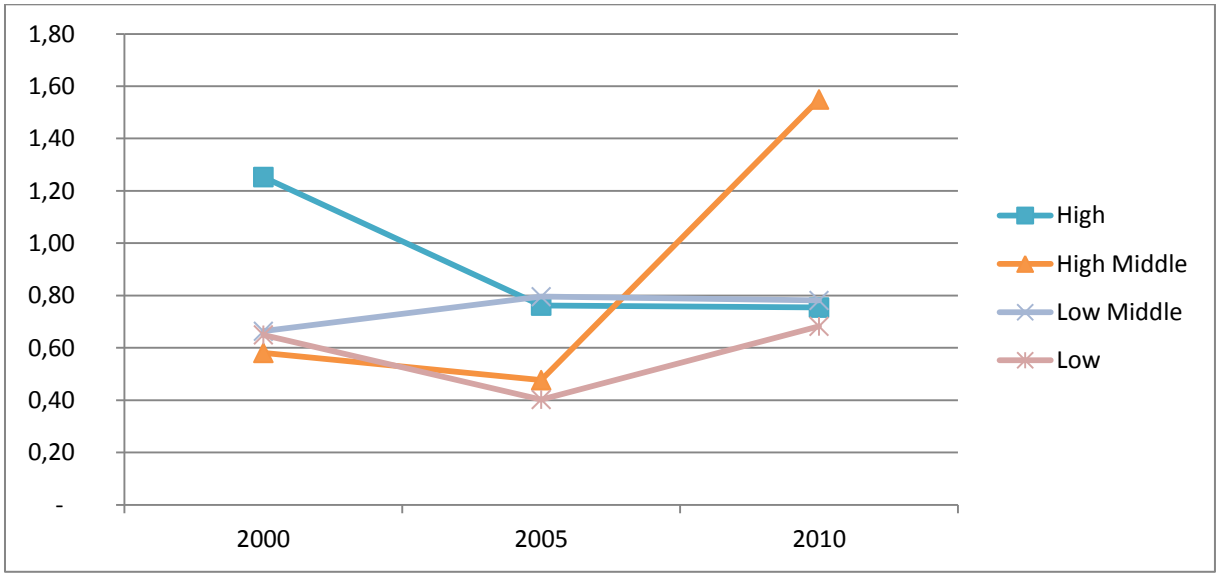
Source: Authors calculations

Figure 3. Weighted average unit values relative to EU exports for top 10 trading partners



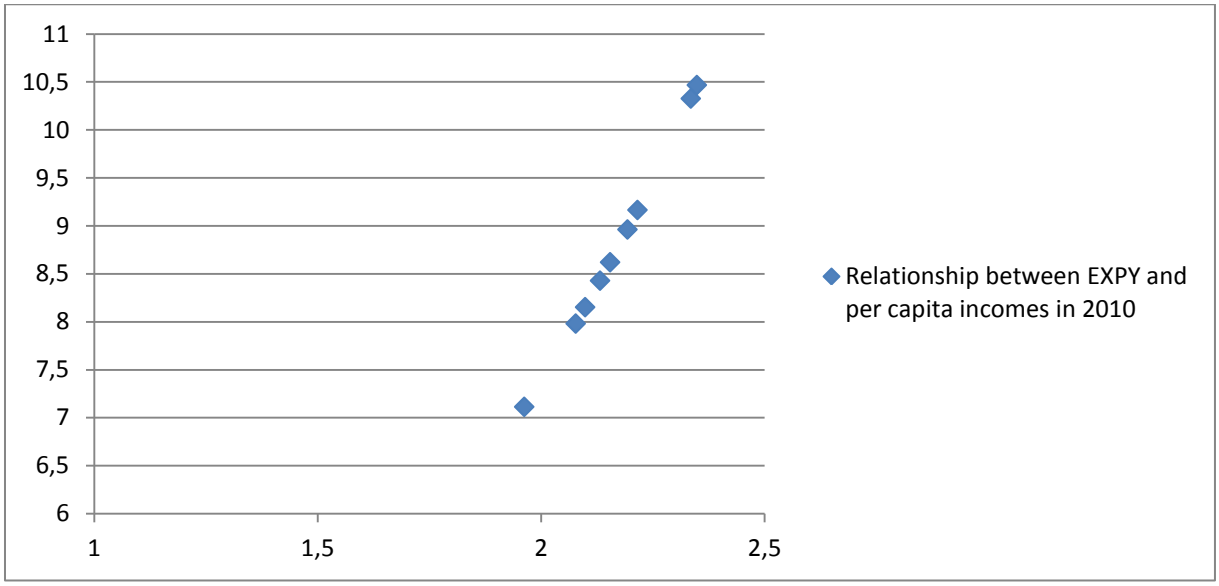
Source: Authors calculations

Figure 4. Weighted average unit values relative to EU exports for the four income groups



Source: Authors calculations

Figure 5. Relationship between manufacturing EXPY and per capita incomes in 2010



Source: Authors calculations