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Sector Sensitivity to Exchange Rate Fluctuations

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ABSTRACT

The present study focuses on the impact of the euro/dollar fluctuations on the European manufacturing industries. It tries to classify European sectors according to the exposure to competition from the dollar zone and to their sensitivity to exchange rate fluctuations. Combining the results of the two classifications, sectors which may be highly affected by the euro/dollar fluctuations are identified.

Exposure to the dollar zone is measured in a way that takes into account both competition by imports in the Single European Market, as well as competition to exports in the dollar zone and in third markets. The study shows strong asymmetries among European countries.

To estimate sectors' sensitivity to exchange rate fluctuations, the regression relates trade volumes to exchange rate, cost and market structure variables. The estimation results evidence that cost considerations and exchange rates are important determinants of trade. The impact of exchange rate changes on trade varies across sectors. They are explained by concentration on the supply side and dynamics on the demand side.

JEL *Classification*: F4, F14, F31

Key words: Exchange rates, euro, dollar, manufacturing sector production and trade.

RÉSUMÉ

Cette étude se concentre sur l'impact des fluctuations de l'euro par rapport au dollar pour l'industrie manufacturière européenne. Elle met en lumière les différences d'exposition des secteurs à la concurrence des pays de la zone dollar ainsi que leur sensibilité aux fluctuations monétaires. En combinant les résultats des deux approches, les secteurs les plus affectés par les variations du dollar sont identifiés.

L'exposition à la zone dollar est mesurée par un indicateur tenant compte de la concurrence à l'importation sur le marché unique et à l'exportation tant vers la zone dollar que vers les pays tiers. L'étude révèle des asymétries fortes entre les pays européens.

La sensibilité sectorielle aux variations du dollar est mesurée en régressant les volumes du commerce sur des variables de change, de coût et de structure de marché. Les résultats des estimations montrent que les différences observées entre les secteurs s'expliquent essentiellement par la concentration de l'offre et la dynamique de la demande.

Classification JEL : F4, F14, F31

Mots clés : Taux de change, euro, dollar, industries manufacturières.

SUMMARY

The adoption of the euro in 1999 eliminated exchange rate variability between eleven European currencies[1]. This may be beneficial to intra-European trade because most of the economic literature had shown that exchange rate variability tend to reduce the volume of trade. The adoption of the euro will not, however, make the European economy immune to all types of exchange rate variability (chapter 1). Indeed, about one third of European Union (EU) trade involves partners outside the euro area. Outside Europe, and except in Africa most currencies are linked to the US dollar. Hence, the exchange rate variability, particularly the euro/dollar variability, is still an important determinant of European trade performance vis-à-vis the dollar zone.

The present study focuses on the likely impact of the **euro/dollar fluctuations** on the European Union manufacturing. Leaning on previous theoretical and empirical research which emphasises the difference in sensitivity to exchange rate fluctuations across sectors, the study tries to classify European sectors according to the exposure to competition from the dollar zone and to the extent of their sensitivity to exchange rate fluctuations. The study also investigates the extent to which market structure influences such a sensitivity. Combining the results of the two classifications, sectors which may be highly affected by the euro/dollar fluctuations are identified.

We have constructed an exposure indicator (chapter 2) which takes into account the fact that the **dollar zone** (i.e. the zone of currencies which fluctuates more or less in conjunction with the dollar) is larger than just the US economy. In particular, most Asian emerging countries belong to the dollar zone, as do countries in Latin America. Present exchange rate stabilisation rounds, in the wake of the monetary and financial crises which began in 1997, point to some come back to the dollar as an anchor currency, even if such links are now less rigid. In Asia, China and Hong-Kong, which escape the currency turmoil by keeping their monetary unit linked to the dollar, have reinforced these trends, and act as a sort of pivot for the region.

Exposure to the dollar zone is thus measured (chapter 3) in a way that takes into account both competition by imports in the Single European Market, as well as competition to exports in the dollar zone and in third markets (see table 5). For European Union imports of manufactured products, the share of goods coming from the dollar zone is equivalent to 5.8 % of the European final demand. This market share is weighted by the supply of goods provided by European producers (86.7 %). The exposure index of European producers to

[1] Ten only if we consider that the Belgium's Franc and the Luxembourg's Franc were in practice already a single currency but which in principle was not the case.

competition from the dollar zone on the import side is thus the product of the former two indices, i.e. 5 %. On the export side, indices of competition within the dollar zone (7.1%) and in third markets (0.3 %) are computed the same way by weighting the market share of the dollar zone in its own market and in third markets respectively by the supply of European producers. Aggregated, the three indices result into an average exposure index of European producers to competition from the dollar zone of 12.4 %. The greater the value of this indicator, the greater the level of competition. The analysis shows that nine sectors out of 27 of the EU-15 face a greater than average competition from the dollar zone, namely computers, leather, transport except cars, other products, professional goods, electrical machinery, wearing apparel and machinery equipment. Competition concerns both the European and foreign markets except for machinery and equipment where competition is more important in foreign markets.

We then conducted an econometric analysis to assess sectors **sensitivity** (chapter 4) to exchange rate fluctuations. Two additional questions were addressed: Is there a difference across sectors with respect to the sensitiveness of their trade to exchange rate fluctuations? To what extent market structure and goods characteristics determine such a difference? To estimate sectors' sensitivity to exchange rate fluctuations the regression related trade volumes to exchange rate variables, cost variables and market structure variables. The analysis focused on bilateral imports and exports of 11 declaring countries (Belgium-Luxembourg, Denmark, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom) from or to seventeen partners countries (the 11 declaring countries plus Austria, Finland, Sweden, the United States, Canada and Japan). Fourteen sectors' were considered according to the NACE revision 1 nomenclature. Exchange rate variables include volatility, exchange rate changes and expectations of future exchange rate changes. As a proxy for costs, producer price indexes in ECU for each country and each sector are used. Finally, four market structure indicators are considered: concentration, segmentation, differentiation, and scale economies.

The estimation results (chapter 5) show that cost considerations and exchange rates are important determinants of trade. Exchange rate volatility has an adverse effect on imports. Such a conclusion seems robust to various specifications of imports equations though the literature has never reached a consensus in this respect. The impact of exchange rate changes on trade varies across sectors. The variations are explained by **concentration on the supply side and dynamics on the demand side**. The more concentrated is a sector, the less exchange rate changes will affect its trade. For goods submitted to hysteresis either on the supply or the demand side, the more temporary exchange rate changes are, the less trade will be affected. The most sensitive sectors to exchange rate fluctuations are energy, food, paper products, machinery, electrical products for imports and energy, machinery and transport equipment for exports.

Combining the above results from these different approaches, a sectoral classification emerges where the most sensitive and the most exposed sectors to the dollar are: machinery and equipment, electrical and optical products and transport equipment. These sectors are important and represent together about one third of European output. Textiles and leather (weak sensitivity-high exposure) are of little importance in the economy. Except for basic metals, the low sensitivity-low exposed sectors (wood and wood products, rubber and plastic products, other non-metallic mineral products and basic metals and fabricated metal products) represent a small part of the European total value-added. On the opposite, among the remaining sectors, energy, food and paper (high sensitivity-low exposure) are important to the European economy.

A detailed assessment of the effect of a 10 % dollar depreciation on the market share of each sector was also conducted without taking into account the so-called pass through effect[2]. On the imports side, the most affected sectors are energy and electrical products. The dollar zone market shares in the European market increase by 0.74 and 1.45 percentage points respectively. For exports, the largest impacts concern machinery and transport equipment. The depreciation will decrease the European market share in the dollar zone by 1 percentage point i.e. from 9.1 to 8.1 % and from 4.1 to 3.1 % respectively.

While the sectoral exposure to euro/dollar fluctuations was examined on the basis of the exposure indicator and the exchange rate coefficients, one should bear in mind that for a similar exposure the sensitivity will be different, depending on barriers to trade and on **market structure**. Protectionism, which limits access to the Single Market, would reduce sensitivity to dollar depreciation. The most protected sectors are food & agriculture, textiles and iron & steel. A more-or-less strong degree of product differentiation is associated with a more-or-less high level of price elasticity of demand. From this point of view, textiles are very sensitive to price competitiveness, with iron & steel in an intermediate position and pharmaceuticals iq amongst the less sensitive sectors.

Furthermore, the study shows a strong **asymmetry among** European countries concerning the exposure to the dollar (chapter 6). Among the large European countries, the United Kingdom is the most exposed, with a global indicator of 16 %, whereas France is the least exposed, with an indicator of less than 11 %. If we consider all the members of EU-15, we find that Ireland is the most exposed to the dollar zone (20.2 %) and Portugal is the least exposed (6.5 %). Nevertheless, the UK is the most similar to EU 15 in terms of industrial exposure and Portugal the least. It was also shown that the over-exposed sectors in EU-15 are often the most exposed for individual countries, the most sensitive to exchange rate

[2]US export prices to EU are considered to be fully passed on to dollar prices, i.e. the pass through effect is 100% . On the contrary, we might expect that European export prices in € are more prone to adapt, but nevertheless much less than the Japanese ones which often register a 50% pass through effect.

fluctuations and the most likely to be affected in terms of value added, employment and exports.

RESUME LONG

L'introduction de l'euro en janvier 1999 a permis d'éliminer les variations de change entre les monnaies de onze pays. Cela devrait favoriser les échanges intra européens, dans la mesure où, selon la littérature économique, les fluctuations de change tendent à réduire le commerce. Cependant, cela ne signifie pas que la zone euro soit immunisée contre toute fluctuation de change. En effet, un tiers du commerce européen concerne des partenaires non- membres de l'union monétaire européenne. Hors de l'Europe et hormis l'Afrique subsaharienne, la plupart des monnaies sont liées au dollar américain. C'est pourquoi les variations de change du dollar ont encore une grande importance pour l'Europe.

Cette étude se concentre sur l'impact vraisemblable des fluctuations de l'euro par rapport au dollar pour l'industrie manufacturière européenne. L'étude met en lumière les différences d'exposition des secteurs à ces fluctuations ainsi que leur sensibilité. Nous avons construit un indicateur d'exposition à la zone dollar (chapitre 2) qui prend en compte le fait que la zone dollar est plus large que la "zone" Etats-Unis. La plupart des pays d'Asie et d'Amérique Latine faisaient partie de la zone dollar et en font toujours partie malgré la crise des pays émergents 1997-1998. Seul le Japon fait exception.

L'exposition à la zone dollar est (chapitre 3) mesurée. Elle prend en compte la concurrence à l'importation et à l'exportation tant vers la zone dollar que vers les pays tiers. La pénétration des produits de la zone dollar sur le marché européen se limite à 5,8 % tandis que l'exposition totale y compris à l'exportation se monte à 12,4 %. Parmi les produits les plus concernés, on notera que 9 produits montrent une exposition supérieure à la moyenne : les ordinateurs, les produits du cuir, les moyens de transport autres que l'automobile, les produits divers (jouets, instruments de musique), les biens professionnels, les machines électriques, les vêtements et les machines mécaniques.

Nous avons ensuite évalué la sensibilité des secteurs (chapitre 4) en mettant en évidence les différences sectorielles et nous avons cherché dans quelle mesure on pouvait expliquer ces différences par les structures de marché ou les caractéristiques des produits.

Les résultats des estimations montrent que les considérations de coût et de taux de change demeurent des variables importantes. Les différences observées entre les secteurs s'expliquent par la concentration de l'offre et la dynamique de la demande. Les secteurs les plus sensibles aux variations de change sont à l'importation: l'énergie, l'alimentation, les produits du papier, les machines, les produits électriques, d'une part, les machines et

l'aéronautique à l'exportation d'autre part. Des simulations ont été ensuite réalisées (chapitre 5).

Enfin, l'étude révèle des asymétries fortes entre les pays européens (chapitre 6). Le Royaume-Uni est le pays le plus exposé (16 % selon notre indice) des "grands" pays, la France le moins (11 %). Parmi les petits pays, l'Irlande est le plus exposé (20,2 %) tandis que le Portugal est le moins, (6,5 %). Par rapport à la moyenne européenne cependant, le Royaume Uni ne se distingue pas particulièrement.

SECTOR SENSITIVITY TO EXCHANGE RATE FLUCTUATIONS

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INTRODUCTION

The adoption of the euro in 1999 eliminated exchange rate variability between eleven[4] European currencies. This may be beneficial to intra-European trade because most of the economic literature had shown that exchange rate variability tend to reduce the volume of trade. The adoption of the euro will not, however, make the European economy immune to all types of exchange rate variability. Indeed, about one third of European Union (EU) trade involves partners outside the euro area. Outside Europe, the dollar is generally the main currency used for international trade. Hence, exchange rate variability, particularly euro/dollar variability, is still an important determinant of European trade performance.

The present study focuses on the likely impact of the **euro/dollar fluctuations** on the European Union manufacturing. Leaning on previous theoretical and empirical research which emphasises the difference in sensitivity to exchange rate fluctuations across sectors, the study tries to classify European sectors according to the exposure to competition from the dollar zone and to the extent of their sensitivity to exchange rate fluctuations. Exposure is measured by an original indicator developed by the CEPII: first it takes into account the fact that many countries outside the USA have chosen to link *de facto* their currency to the dollar, second that competition is not only measured in the export markets but also in the domestic market as well as in third country markets. results show also that there are sectoral asymmetries between European countries.

The study also investigates the extent to which market structure influences, for a given exposure, the sensitivity to currency fluctuations. Combining the results of the two classifications, sectors which may be highly affected by the euro/dollar fluctuations are identified.

The exposure indicator takes into account the fact that the **dollar zone** (i.e. the zone of currencies which fluctuates more or less in conjunction with the dollar) is larger than just the United States. In particular, most Asian emerging countries belong to the dollar zone, as do countries in Latin America. Exposure to the dollar zone is thus measured in a way that takes

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[4] Ten only if we consider that in practice the Belgium's Franc and the Luxembourg's Franc were already a single currency.

into account both competition by imports in the Single European Market, as well as competition to exports in the dollar zone and in third markets. For imports of manufactured products, the share of goods coming from the dollar zone is equivalent to 5.8 % of final demand in the Single Market, with 86.7 % of goods provided by European producers. The exposure index of European producers to competition in the dollar zone is thus the product of the first two indices, or 5 %. To this should be added competition for exports to the dollar zone (7.1%) and in third markets (0.3 %), calculated for each country. Overall, the average exposure index of European producers to competition from the dollar zone is thus 12.4 %. The greater the value of this indicator, the greater the intensity of competition. The analysis shows that textile products, leather products, machinery and equipment, electrical optical equipment and transport equipment and, to a lesser extent, chemicals are the sectors facing the maximum of competition from the dollar zone. Competition concerns both the European and foreign markets except for the machinery and equipment and the chemical sectors where competition is more important in foreign markets.

We then conducted an econometric analysis to assess sectors **sensitivity** to exchange rate fluctuations. Two additional questions were addressed: is there a difference across sectors with respect to the sensitiveness of their trade to exchange rate fluctuations? To what extent market structure and goods characteristics determine such a difference? To estimate sectors' sensitivity to exchange rate fluctuations, the regression relates trade volumes to exchange rate variables, cost variables and market structure variables. The analysis focuses on bilateral imports and exports of 11 countries (Belgium-Luxembourg, Denmark, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom) from or to seventeen partners countries (the 11 countries plus Austria, Finland, Sweden, the United States, Canada and Japan). Fourteen sectors are considered according to the NACE revision 1 nomenclature. Exchange rate variables include volatility, exchange rate changes and expectations of future exchange rate changes. As a proxy for costs, producer price indices in ECU for each country and each sector are used. Finally, four market structure indicators are considered: concentration, segmentation, differentiation, and scale economies.

The estimation results show that cost considerations and exchange rates are important determinants of trade. Exchange rate volatility has an adverse effect on imports. Such a conclusion seems robust to various specifications of imports equations though the literature has never reached a consensus in this respect. The impact of exchange rate changes on trade varies across sectors. The variations are explained by **concentration and dynamics**. The more concentrated is a sector, the less exchange rate changes will affect its trade. For goods subject to hysteresis either on the supply or the demand side, the more temporary exchange rate changes are, the less trade will be affected. The most sensitive

sectors to exchange rate fluctuations are energy, food, paper products, machinery, electrical products for imports and energy, machinery and transport equipment for exports.

Combining the above results, a sectoral classification emerges where the most sensitive and the most exposed sectors to the dollar are: machinery and equipment, electrical and optical products and transport equipment. These sectors are important and represent together about one third of European output. Textiles and leather (weak sensitivity-high exposure) are of little importance in the economy. Except for basic metals, the low sensitivity-low exposed sectors (wood and wood products, rubber and plastic products, other non-metallic mineral products and basic metals and fabricated metal products) do not account for much total value added in Europe. On the opposite, among the remaining sectors, energy, food and paper (high sensitivity-low exposure) are important to the European economy.

A detailed assessment of the effect of a 10 % dollar depreciation on the market share of each sector is also conducted. On the imports side, the most affected sectors are energy and electrical products. The dollar zone market shares in the European market increase by 0.74 and 1.45 percentage points respectively. For exports, the largest impacts concern machinery and transport equipment. The depreciation will decrease the European market share in the dollar zone by 1 percentage point i.e. from 9.1 to 8.1 % and from 4.1 to 3.1 % respectively.

While the sectoral exposure to euro/dollar fluctuations is examined on the basis of the exposure indicator and the exchange rate coefficients, one should bear in mind that for a similar exposure the sensitivity will be different, depending on barriers to trade and on **market structure**. Protectionism, which limits access to the Single Market, would reduce sensitivity to a dollar depreciation, in particular if trade barriers are quantitative. The most protected sectors are food & agriculture, textiles and iron & steel. A more-or-less strong degree of product differentiation is associated with a more-or-less high level of price elasticity of demand. From this point of view, the food & agriculture sector would appear to be little sensitive to prices, whereas textiles are very sensitive, with iron & steel in an intermediate position.

Furthermore, the study shows a strong **asymmetry among** European countries concerning the exposure to the dollar. Among the large European countries, the United Kingdom is the most exposed, with an overall indicator of 16 %, whereas France is the least exposed, with an indicator of less than 11 %. If we consider all the members of EU-15, we find that Ireland is the most exposed to the dollar zone (i.e. 20.2 %) and Portugal is the least exposed (i.e. 6.5 %). Nevertheless, the UK is the country which sectoral exposure resembles most to that of the EU as a whole, whereas Portugal's sectoral exposure is the most different. It was also shown that the over-exposed sectors in EU-15 are often the most exposed for individual countries, the most sensitive to exchange rates fluctuations and the most likely to be affected in terms of value added, employment and exports.

1. DO FLUCTUATIONS OF THE DOLLAR STILL MATTER FOR EUROPE

1.1. Europe's Sensitivity to Dollar Fluctuations Since the Creation of the Euro

The creation of the single currency, and correspondingly the zone of monetary stability of the eleven euroland countries, has completed the single market trajectory. The establishment of EMU was motivated by several reasons. Firstly, it has ruled out a form of unfair competition by EU countries that devaluate their currency vis-à-vis other member countries. This was for example the case in the 1992 crisis with the devaluation of the escudo, lira, peseta and pound sterling which was considered as unfair by countries with "strong" currencies. Secondly, the introduction of a single currency should substantially reduce the exposure of euroland to international monetary instability. The share of Extra-euroland trade in the GDP of the 11 euro zone countries is only 12 per cent, compared to 21 per cent for all international trade including intra-euroland trade.

The reduced external vulnerability does not mean that euroland has become indifferent with regard to exchange rate fluctuations or to the rest of the world or in particular to the US dollar. Actually, euroland continues to be exposed to competition from the United States, and other countries which have linked their currency to the US dollar, in its home market, in the dollar zone, and in third countries. The trade performance of euroland depends largely on its price-competitiveness which in turn largely depends on exchange rate fluctuations, inflation rates, and trade barriers.

As illustrated in Graph 2, the exchange rate is by far a more important determinant of short-run price-competitiveness than differences in domestic inflation rates. The left-hand side compares trends in unit labour costs (ULC) in domestic currencies and the right-hand side shows the same tendencies in US dollar. Over the seven-year period, the deviation in the evolution of ULC in national currencies was 25 per cent. When measured in a common currency, the spread increases to one hundred per cent (in an even shorter time period).

Another determinant of price competitiveness is trade barriers. They change relatively slowly. Trade negotiations within the WTO framework and between countries within a free trade zone or customs union, have substantially reduced barriers to trade. Tariff barriers for external EU trade are about five per cent; non-tariff barriers may account for another 8 to 9 per cent in terms of tariff equivalents. Tariff and non-tariff barriers are mostly stable, except for anti-dumping and other urgent measures for sanitary protection, and their trends are foreseeable.

In the context of stable trade regimes and converging inflation rates to low levels, exchange rate fluctuations are thus the main determinant of price competition in the short-run. Since its introduction, the euro has lost 27.7 per cent (falling from 1 US dollar = 0.86 euro to 1.10) in nominal terms relative to the dollar (Graph 3). The instability of exchange rates, i.e. the speed at which a phase of depreciation is followed by one of appreciation) also tempers the growth of international trade.

Are all goods and services traded equally dependent on short-run price competitiveness? New international trade theory highlights the role of product differentiation and suggests that price competition is relatively unimportant. Since 1957, when Balassa (1966) published one of his major articles, most of the increase in international trade has been performed between countries with similar levels of development and consists for a large part in similar products (intra-industry trade instead of inter-industry trade). Yet, Abd El Rahman (1986) showed that intra-industry trade itself may be decomposed into two types: horizontally with the exchange of similar products of varieties and vertically with the exchange of similar products of different qualities. Fontagné and Freudenberg (1997), and Freudenberg (1998) give an acute definition of the different kinds of trade.

In fact, an earlier study by CEPII (Bismut and Oliveira-Martins, 1986) showed that in the short run price elasticities are low while in the long term they are rather high. Microeconomic evidence also shows that high quality goods can also be made in low-cost countries in order to maximise profits.

The evolution of intra-EU trade testifies that although inter-industry trade still dominated in 1980, its importance has sharply decreased over time (Graph 1). On the contrary, quality intra-industry trade (related to vertically differentiated products) has strongly increased and now represents the main share of trade (Fontagné, Freudenberg, Kesenci-Ünal, 1996).

Table 1 provides a breakdown of EU trade according to three types of products and trading partners, and shows that 59 per cent of intra-European trade is of an intra-industry type, whereas extra-European trade is 73.4 per cent of the inter-industry type. Within the European Union, 30 per cent of all intra-industry trade is in horizontally differentiated products and 70 per cent is in vertically differentiated goods, for which price competition is in general less important.

Outside Europe, the United States is the only country whose trade with the European Union contains a large share (42.3 per cent) of vertically differentiated, mostly high-tech products. Trade with China, in contrast, is 91.5 per cent inter-industry (one way trade).

The introduction of the euro has created a monetary zone of countries which mainly trade similar products (intra-industry trade). In particular, bilateral trade between the core-countries of the EMU, e.g. France, Germany and the Benelux countries, is almost entirely made up of intra-industry trade. In contrast, euroland's external trade, especially with low-income countries, is essentially of an inter-industry type. When countries trade mostly little-differentiated products, price competition plays an essential role.

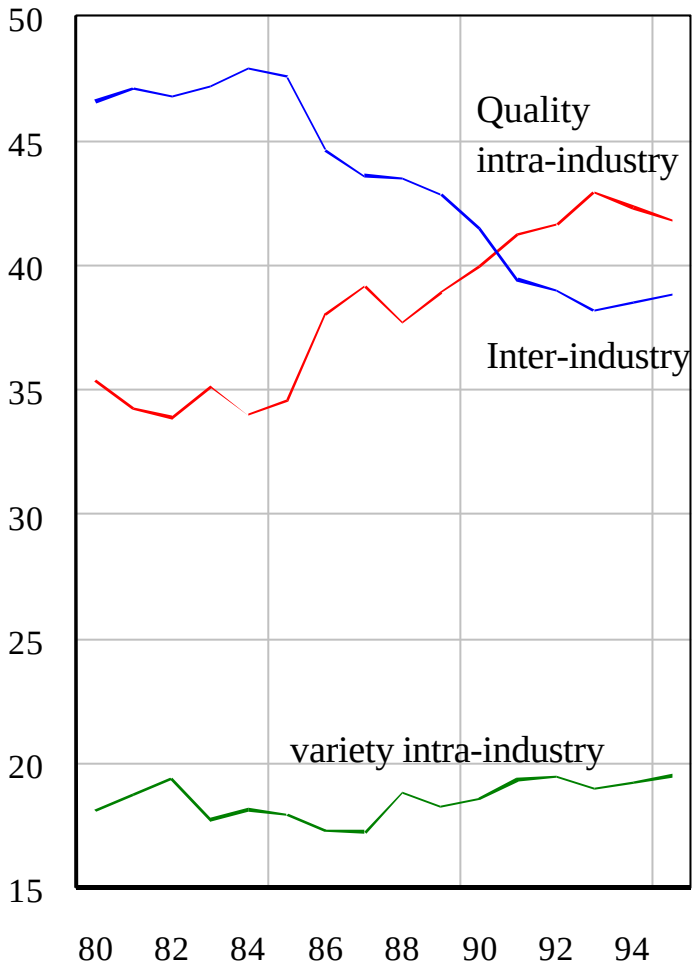
Table 1- EU - 15 The nature of intra- and extra-EU trade (1996)

	% Total trade		% Intra-industry trade	
Partners	*Inter-industry*	*Intra-industry*	*variety*	*quality*
World	52.7	47.3	28.0	72.0
Intra-EU	40.9	59.1	29.6	70.4
Extra-EU	73.4	26.6	21.5	78.5
Of which:				
Switzerland	*45.0*	*55.0*	*19.2*	*80.8*
United States	*47.1*	*52.9*	*20.1*	*79.9*
Czech Republic	*54.5*	*45.5*	*19.4*	*80.6*
Hungary	*62.5*	*37.5*	*18.4*	*81.6*
Israel	*66.5*	*33.5*	*61.8*	*38.2*
Japan	*68.7*	*31.3*	*14.3*	*85.7*
China	*91.5*	*8.5*	*8.6*	*91.4*

Note : Countries are sorted by decreasing order according to total intra-industry trade. Variety stands for two-way trade in similar products and quality stands for two-way trade in vertically differentiated products.

Source : CEPII (1998), chapter 6, table 6.9.

Graph 1– EU-12: The nature of intra-EU trade (1980-1995)

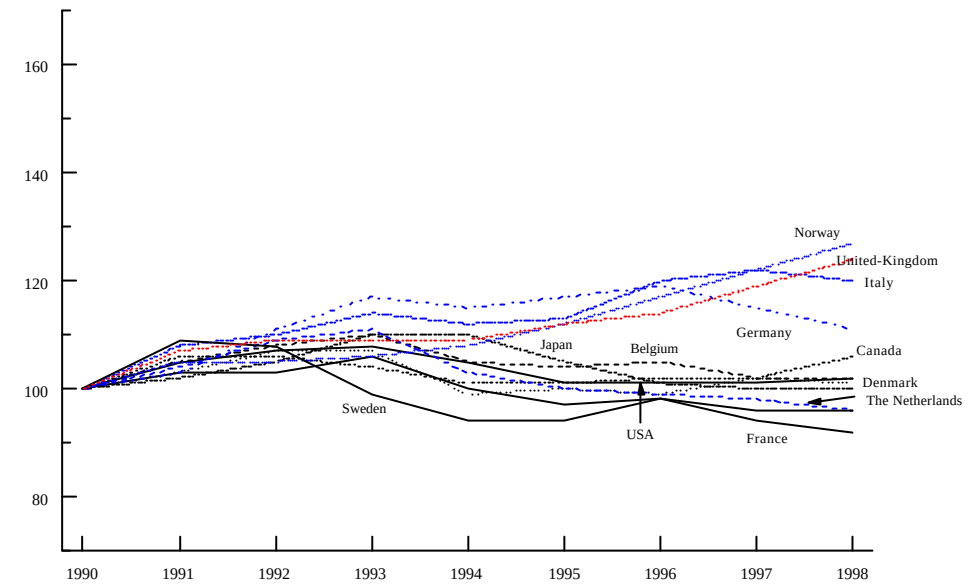


Note: Variety stands for two-way trade in similar products and quality stands for two-way trade in vertically differentiated products. The estimations refer to the twelve countries of the EU before the enlargement with Austria, Finland and Sweden.

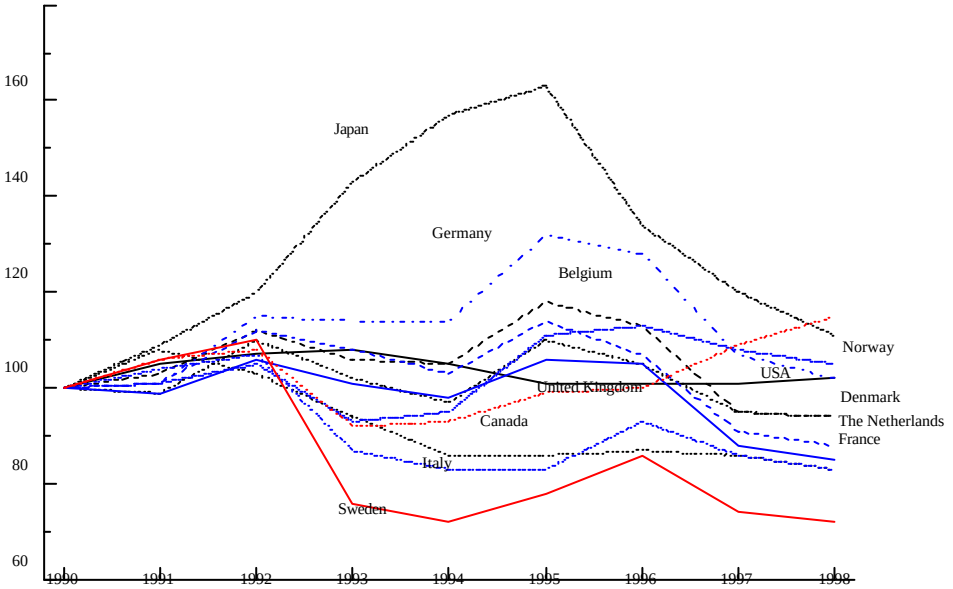
Source : CEPII (1998), chapter 6, graph 6.7.

Graph 2 – Unit Labour Costs in Manufacturing (1990=100)

In National Currencies



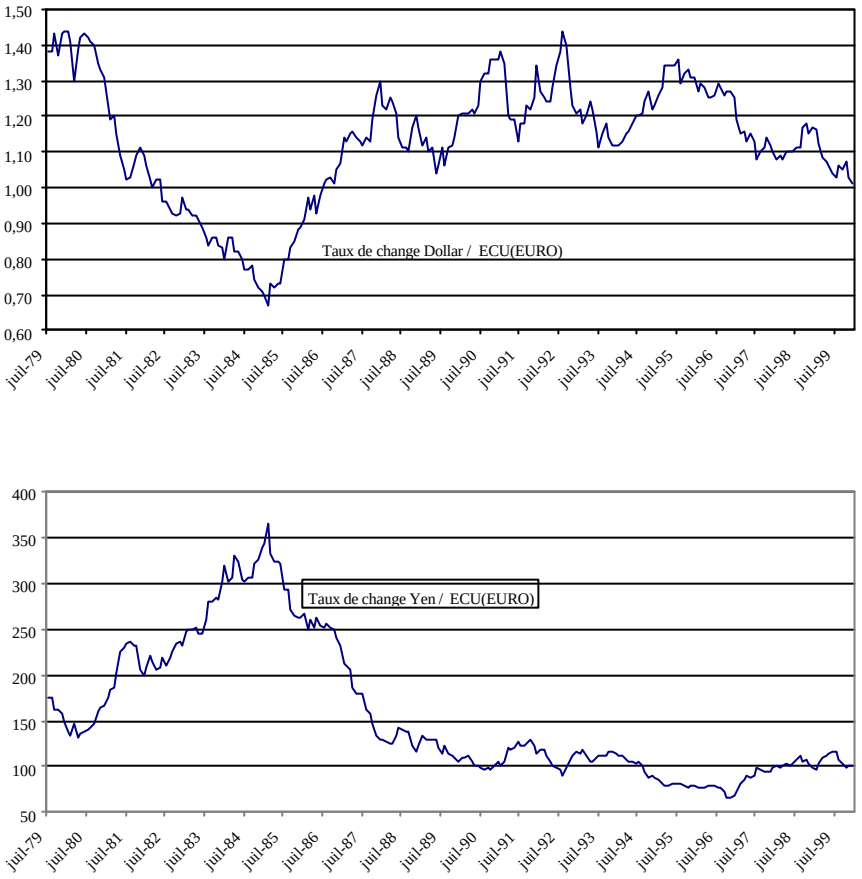
In US dollars



Note: For Belgium, Denmark, Italy, the Netherlands and the United Kingdom, only employees are considered.

Sources: U.S. Bureau of Labour Statistics, *"International Comparisons of Manufacturing Productivity and Unit Labour Costs Trends*, 1998", News, 27 August 1999.

Graph 3 – US dollar/euro and yen/euro exchange rates, 1979-1999



Sources: IMF, International Financial Statistics, Washington DC.

1.2. Industrial Asymmetries within the Euro Zone

With the establishment of a single market and a single currency, many economists questioned its sustainability. In particular, they questioned the convergence of the member countries. Integration is sustainable in the long run if and only if there is a general tendency to convergence, that is to say, if there are both a reduction of inequalities in income and efficiency. Beyond the short term and macroeconomic issues, there are microeconomic conditions of sustainability which are probably as important as macro economic conditions of convergence.

The microeconomic issues usually addressed are: what are the effects of a single currency on countries with different industrial structures? Most macro economic studies (in particular the paper by Frankel and Rose (2000)) find in general a positive effect on trade and efficiency due to an increase in the volume of trade, in transparency in transactions and in competition within European countries. However, few studies take into account the effect on industrial structure. Krugman (1991a&b) expected an increase in the concentration ratios (agglomeration effects), equivalent to an increase in inter-industry specialisation, in that case there should be an increase in asymmetries and an increased need for a European policy dedicated to reduce the negative effects of an increase in asymmetries. On the contrary, others like Balassa, (1986) expected an increase in intra-industry specialisation.

In this paper, we focus our analysis on the issue of industrial asymmetries *vis-à-vis* the dollar zone and on the degree to which dollar fluctuations have a distinctive impact on each European country.

2. HOW TO MEASURE EUROPEAN INDUSTRY EXPOSURE TO US DOLLAR FLUCTUATIONS

2.1. Openness

2.1.1. US dollar fluctuations effects on monetary policy

Up to the creation of the euro in January 1999, FOREX tensions were supposed to have a strong impact on monetary policy, as European currencies, which were part of the Foreign Exchange Rate Mechanism, had to remain within more or less narrow bands of fluctuations. This had been notably the case from 1991 to 1998, when the coexistence within the same system of "strong" currencies (Deutsche Mark, Guilder, etc.) with "weak" currencies (£, Italian Lira, Spanish Peso, Escudo, etc.) led to the currency crisis of September 1992. The creation of the euro zone freed its members of that kind of pressure.

Besides, the ECB does not have any explicit target for the euro/dollar exchange rate, as it views price stability within euroland as its main responsibility. As a consequence, euro fluctuations can be considered as "pure" floating, and have in principle no direct effect on monetary policy. The same can be said for the yen fluctuations, both vis-à-vis euro and the dollar. Thus, between the three poles of the world economy, we have a clear regime of "pure" floatation. So simulations of an impact of dollar fluctuations can be considered as a "pure" effect of exchange rates fluctuations. Then, we have to measure only exposure and sector sensitivity.

2.1.2. How is openness usually measured

- Traditional measures[5]

A comprehensive measure compares domestic production and domestic sales to imports and to exports. The most straightforward indices are:

– On the import side, the penetration index relates imports to final domestic demand: M/(Q+M-X) or M/D.

– On the export side, exports are linked to production: X/Q. This is the share of production sold on foreign markets.

Currency fluctuations play a role on both the export and import sides.

- The INSEE-OECD measure

The measure used by INSEE or OECD (see Coppel and Durand, 1999) is interesting, because it is a synthesis of the two previous measures:

IOECD=X/Q+(1-X/Q)*M/D.

- The Campa and Goldberg measure

In a paper dedicated to the "External Orientation "of the US Economy, Campa and Golberg (1997) state that "given the growing internationalisation of production and trade processes, there is no single measure which can take into account the whole impact of the world economy on a given industry". They criticise one of the most popular indices used to measure the openness of an industry in a given country, which is the ratio for that industry of total exports and imports relative to the value of its production. They remark that this ratio does not take into account the imported inputs used by the industry. To correct this default they calculate two new indices: the index of imported inputs (MI/Q) on the one hand, and the net exposure to international competition on the other hand X/Q-MI/Q. In another article, Campa and Goldberg (1998) consider this latter index as a composite index of openness.

[5] Authors often measure openness by the ratio of total exports of goods and services to GDP. This is misleading as they compare a value added to a sales concept. Moreover, they include non tradable (mostly services) goods whose prices react very differently to exchange rate fluctuations.

The idea behind this index is to carry out a cost/benefit analysis by industry of the impact of a given dollar fluctuation. In the case of a dollar appreciation, the impact on American manufacturing depends on the share of production exported (X/Q is a good measure). But in the case of imports, US industry benefits through the lower cost of its imported inputs measured by the index of imported inputs. The difference between the two indices is the Net External Orientation. Our interpretation of the final index is that its shows the potential impact on profits of a dollar fluctuation, other things being equal.

We believe this indicator is unsuitable to measure the impact of currency fluctuations for two reasons:

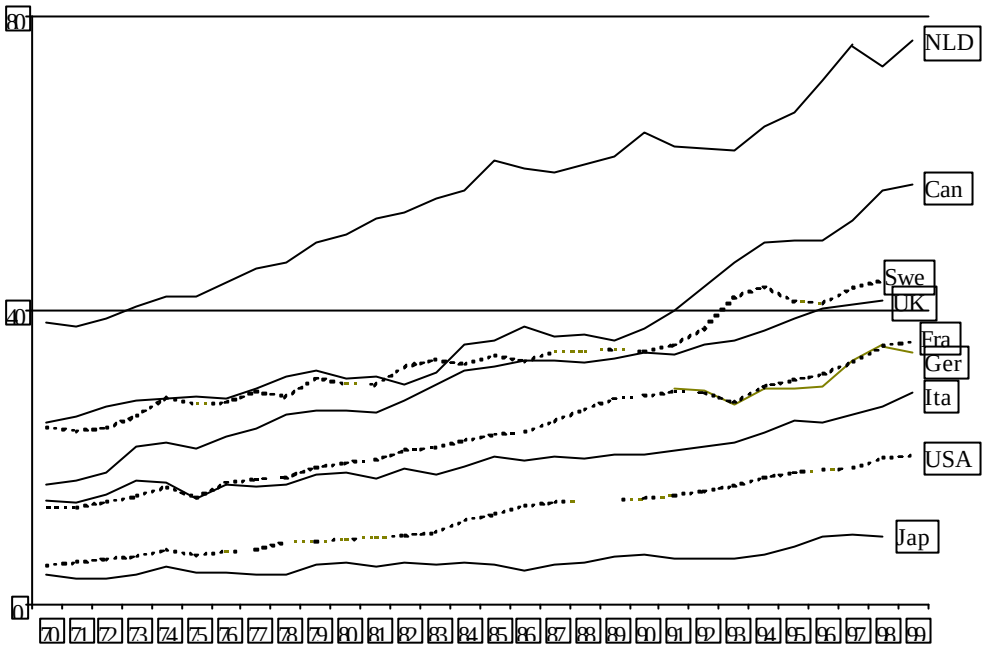
– focusing on the costs of imported inputs, it does not take into account the effect on the final demand for imports (consumer goods and capital equipment) which represent the major share of total imports.

– the index does not take into account the geographical breakdown of the origin of the products. It considers the external world as homogenous *vis-à-vis* the dollar which is certainly not so the case. Many developing countries have linked their currency to the US dollar and as such they are part of the dollar zone.

Estimates were made for two indicators: the penetration ratio and the openness ratio used by INSEE and OECD (Graph 4 and 5).They are estimated for manufacturing products and for the largest OECD countries. Both graphs show a large increase in internationalisation. The US market, which is the largest, registered the largest increase in the penetration rate, from a rather low ratio of 5.3 % in 1970 to 20.3 % in 1999. The openness ratio shows an increase from 10.4 % to 32.5 %. In comparing the two indices, we can conclude that openness was more important on the import side than on the export side. Another characteristic of the phenomenon is that the process is very regular over time: however large are the fluctuations of the US dollar, the rise in the penetration rate is almost constant showing only a slight acceleration during the phase of strong appreciation of the US dollar. In contrast, the ratio of exports to domestic production registered wide fluctuations correlated to US dollar fluctuations.

The four largest European economies similarly registered strong increases for both ratios. Starting at similar levels of openness for Italy (28.4 %), France (25.4 %) and the United Kingdom (31.0 %) they show slightly different patterns over time: achieving a ratio of 51.7 % for Italy, 59.7 % for France, 60.9 % for unified Germany and 63.5 % for the United Kingdom! The diverging patterns occurred mainly during the last phase of the period, from 1993 to 1996, which was a period of high growth in the United Kingdom and of low growth in other countries, particularly in Germany and in France.

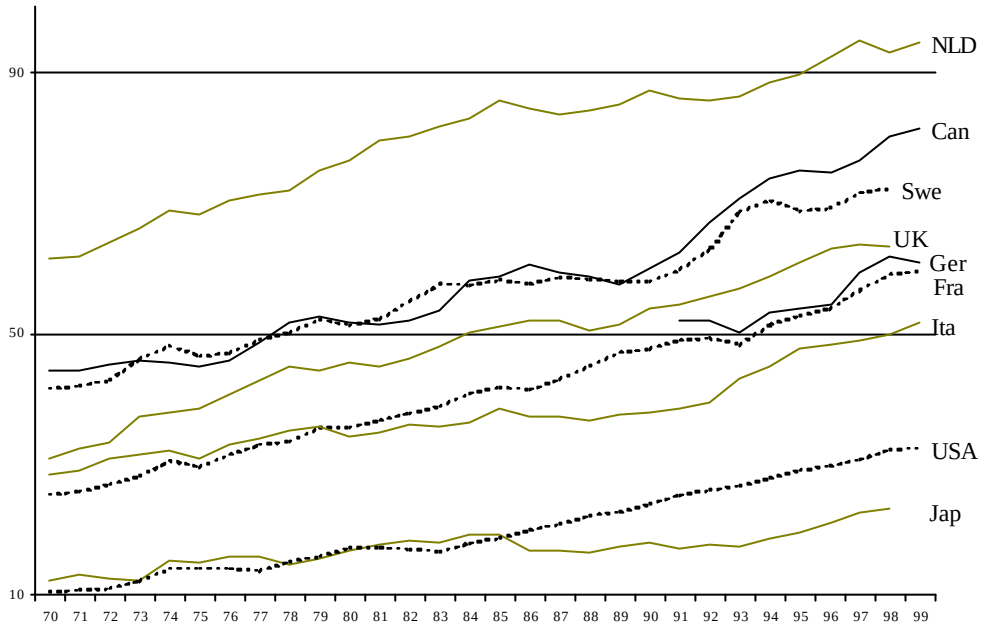
Graph 4– Market penetration (M/D), Manufacturing sector, 1970-1999



Note : Market penetration ratio=M/D; see also note in graph 5.

Source : OECD, STAN database.

Graph 5 – Openness as measured by the INSEE OECD ratio, manufacturing sector, 1970-1999



Note : Openness: X/Q+(1-X/Q)*M/D with X the exports, M the imports, Q the gross production at current prices, D the domestic demand.

Source : OECD, STAN database.

According to both ratios, Japan appears to be very closed, as, given the size of the country, it should have ratios above those of the USA. Up to the 1980s, they had similar ratios, but since 1985 there is a strong diverging trend between the two countries with some reduction in the export ratio of Japanese companies. The share of Japanese production exported declined from 14.4 % in 1985 to 11.6 % in 1991, after which it remained stable. The reasons for this are twofold: the first one is the price setting behaviour of Japanese firms, which chose to maintain their prices constant in dollars ("pass-through effect"), although the yen was appreciating very fast. This resulted in stagnating export values expressed in yen, compared to the value of production directed toward the domestic market. The second explanation is the delocalisation effect: Japanese firms delocalised the mass production in some of their export markets (cars in the US, electronics in Asia).

Most economies also registered strong increases in international trade openness starting from already very high levels. This shows that the internationalisation phenomenon has large opportunities to develop in the future, but it also shows that large countries can

maintain relatively low exposure to external shocks and can retain some economic autonomy. For example, the US economy can remain for a long period with prices diverging from world prices. It also confirms that the small economy hypotheses – i.e. no impact on world prices and domestic prices close to world prices – are realistic. What about a country strongly integrated in a currency zone? Is it possible to view a small economy as a share, a region, of a large country (the Union) and be also considered as a large economy. The euro zone is collectively a large economy, and to some extent it has the same advantage as that of the US as it can, to some extent, ignore pressures from the outside world.

2.1.4. The CEPII'S indicator of exposure to the dollar zone

To take into account the different shortcomings of the prevailing indices we propose another indicator based on a multinational framework (without using a multinational model). First, we assume that the world is divided into three currency zones, and second we take into account competition between the different zones on a bilateral basis (for example, the direct confrontation of euro zone against the dollar zone). Subsequently, we take into account the confrontation of the two zones with third zones, which are neither included in the dollar zone nor in the euro zone. The exposure indicator is described in Tables A to C in Box 1. For simplicity, we divided the world into three zones: the dollar zone, the euro zone and the Rest of the World zone.

The indicator used is the following:

$$S_k = \left(\frac{Q_{EU,k} - X_{EU,.,k}}{Q_{EU,k}} * \frac{X_{\$,EU,k}}{D_{EU,k}} \right) + \left(\frac{X_{EU,\$,k}}{Q_{EU,k}} * \frac{Q_{\$,k} - X_{\$,.,k}}{D_{\$,k}} \right) + \sum_j \left(\frac{X_{EU,j,k}}{Q_{EU,k}} * \frac{X_{\$,j,k}}{D_{j,k}} \right)$$

with

$$\frac{Q_{EU,k} - X_{EU,.,k}}{Q_{EU,k}} + \frac{X_{EU,\$,k}}{Q_{EU,k}} + \sum_j \frac{X_{EU,j,k}}{Q_{EU,k}} = 1 .$$

Q: production, X: exports, D: domestic demand, EU: European Union, $: dollar zone, j: rest of the world, k: sector. $X_{EU.k}$: total exports of EU in sector k; Q and D are different from 0. This indicator can fluctuate between 0 and 50 %. Intra-zone trade was removed from EU trade.

Box 1. Trade and production matrix

Q stands for production or sales, M stands for Imports, X stands for Exports, D stands for the final demand, EU for European Union (depending on the test, EU refers to the euro-zone made up of 11 countries or of the 15 members of the EU).
On the "diagonal", the value of the production sold in the domestic market is displayed. In the other cells of the matrix, the value of trade between the exporting zone indicated in row to the importing zone in column is shown. The row sum equals to the production value and the column sum equals to the demand value of the zone.

Table A –Production and Trade Matrix

	EU15	**$ zone**	**Rest of world**	**Total**
EU 15	Q_{EU}-X_{EU}	$X_{EU,\$}$	$X_{EU,1/3}$	Q_{EU}
$ zone	$X_{\$,EU}$	$Q_{\$}$-$X_{\$}$	$X_{\$,1/3}$	$Q_{\$}$
Rest of world	$X_{1/3,EU}$	$X_{1/3,\$}$	$Q_{1/3}$-$X_{1/3}$	$Q_{1/3}$
Total	D_{EU}	$D_{\$}$	$D_{1/3}$	$Q_w = D_w$

Given the matrix above we can calculate two ratios. By rows, we find the shares of world sales or demand by region (the destination share point of view) as shown in table B; By columns, the market share matrix can be computed as done in table C.

Table B – Destination of Production Matrix

	EU15	**$ zone**	**Rest of world**	**Total**
EU15	$\frac{Q_{EU} - X_{EU}}{Q_{EU}}$	$\frac{X_{EU,\$}}{Q_{EU}}$	$\frac{X_{EU,1/3}}{Q_{EU}}$	1
$ zone	$\frac{X_{\$,EU}}{Q_{\$}}$	$\frac{Q_{\$} - X_{\$}}{Q_{\$}}$	$\frac{X_{\$,1/3}}{Q_{\$}}$	1
Rest of world	$\frac{X_{1/3,EU}}{Q_{1/3}}$	$\frac{X_{1/3,\$}}{Q_{1/3}}$	$\frac{Q_{1/3} - X_{1/3}}{Q_{1/3}}$	1

Finally, with the two matrices, the exposure of the European industry to the dollar zone competition can be calculated, by multiplying the first line of table B by the second line of table C. That is to say, the weighted average of exposure of European producers in the different markets to the dollar zone is calculated.

Table C – Market Share Matrix

	EU15	**$ zone**	**Rest of world**
EU15	$\frac{Q_{EU} - X_{EU}}{D_{EU}}$	$\frac{X_{EU,\$}}{D_{\$}}$	$\frac{X_{EU,1/3}}{D_{1/3}}$
$ zone	$\frac{X_{\$,EU}}{D_{EU}}$	$\frac{Q_{\$} - X_{\$}}{D_{\$}}$	$\frac{X_{\$,1/3}}{D_{1/3}}$
Rest of world	$\frac{X_{1/3,EU}}{D_{EU}}$	$\frac{X_{1/3,\$}}{D_{\$}}$	$\frac{Q_{1/3} - X_{1/3}}{D_{1/3}}$

Total	1	1	1

2.1.5. Currency zone definition

When we try to define a currency zone, we can refer to the currency used in international transactions. If the price of a good or service is denominated in dollars, then the corresponding transaction is in general in the same currency.

But we can also assume that the producers of one country tend to set their prices by referring to their local conditions, so that they transfer the whole impact of the external value of their currency entirely on foreign customers.

- Currency Transactions

There are few international currencies; the US dollar, the euro since 1999 and the yen are the major ones (the Swiss franc and pound sterling are rather minor currencies in international trade transactions). Various sources (quoted in the US "Report to the President 1999" page 301), indicate that the US dollar was used in 48 % of international transactions; and that close to 40 % of currencies are linked to the US dollar. 60 % of official reserves in the world are made up of US dollars, 78 % of liquidity held in other currencies than the local currency are in US dollars.

No currency is linked to the yen, but it is used as an official reserve currency for 5 % of world reserves, for 8 % of international capital movements and for 10 % of foreign exchange transactions.

Based on data on the deutschemark and other currencies participating in the euro we can estimate that around 40 % of currencies are linked to the euro (French franc zone included), which represents 20 % of world reserves, 25 % of Forex transactions, and that the euro is probably used in 31 % in international trade. Over time, the role of the euro as an international currency will probably increase.

Table 2– International trade by currency: some estimates (in %)

IMPORTS	Japan			USA			Euro-11			Asia			World		
	Y	$	€	Y	$	€	Y	$	€	Y	$	€	Y	$	€
EXPORTS															
Japan	-	-	-	16	84	00	35	13	52	48	49	3	36	51	13
USA	17	83	00												
Euro-11	44	14	42												
Asia	27	72	1												
World	22	72	7										5	48	31

Sources: for Japanese data MITI, and for the world, *Report to the President*, 1999, US department of Commerce.

In order to define the currency zone, we need to have bilateral data on the use of the currency. Japan is one of the few countries that publish such data. Japan uses the US dollar for 51 % of its exports and 72 % for its imports (a large part is made up of primary products, whose prices are generally expressed in US dollar), the yen for 36 % of its exports (48 % towards Asia) and 22 % of its imports. The remaining 13 % and 7 % are respectively probably mostly made up of euro.

For France, we have data on current transactions: 50 % were made in French francs, 27 % of its exports were in US dollar, and 22 % of its imports. We predict that 70 % of French transactions will be carried out in euro in the coming years. Similar figures apply to all the transactions of the euro zone.

What effect do the patterns of currencies in international transactions have on prices? We expect that producers selling their products within the limits of their currency zone do not have any reasons to modify their prices, whatever the fluctuations of other currency. In contrast, we assume that when a producer exports to another currency zone, it will try to maintain or to increase its market share, i.e. if the producer belongs to an area of which the currency appreciates, he will probably reduce his margin and maintain his prices in the foreign currency constant ("pass through" effect).

Whatever the problems are, the main limit to this approach is the lack of data on the euro zone.

- Currency-linked zones

There are different possible currency regimes: floating, fixed peg or crawling peg around another currency, generally the US dollar or a basket of currencies. There are also countries which state that they have not an explicit exchange rate policy, even though in practice they adopt one particular regime. Therefore, we used an empirical approach to find out to what system a particular currency belongs. We used and adapted an indicator (Agnès Bénassy-Quéré, 1996), which measures the volatility of a currency *vis-à-vis* another currency. Here the reference currencies are the US dollar and the ECU, in order to define a dollar zone as well as a euro zone (the reference to ECU is due to the fact that the period of estimation was before the birth of the euro). The method is described in Box 2.

Our estimates (Table 3.1 and Table 3.2) were made with a sample of 54 currencies out of which 25 were found to be linked to the US dollar. For the euro zone, we could have chosen an extended set of currencies related to the ECU, although they are not members of the Monetary Union. Countries such as Norway, Switzerland, Morocco or Tunisia have *de facto* linked their currency to the euro over the long run. East European countries, such as Hungary, the Czech Republic or Poland are converging to a euro peg.

The subject of this study being the analysis of EU industries' sensitivity to the dollar, an institutional definition of the euroland was finally used. Euroland is made up of the countries which have chosen to join the monetary Union. At the time of the study, we had a zone with eleven countries. Greece will become the twelfth member of the Union in January 2001. Finally, two definitions of the euro zone are adopted: the 15 member countries of EU, although the United Kingdom has a diverging currency, and the 11 countries which chose to adopt the euro as their official currency.

The other countries are *de facto* classified in the Rest of the World zone, which is very heterogeneous.

Box 2. Relative volatility Index

A currency's Relative Volatility vis-à-vis the US dollar or the ECU, λ_{ij}, defines the link of a currency to a nominal monetary zone. The Index compares the volatility of the currency with the US dollar (or the ECU) to the total volatility of the currency towards both the US dollar and the ECU. If the index is low, it means that the currency tends to vary in accordance to the reference currency, the US dollar (or the ECU). In this case, the currency belongs to the US dollar (or the ECU) zone.

$$\lambda_{ij} = \frac{\sigma_{ij}}{(\sigma_{i\$} + \sigma_{iEcu})}$$

With i the country currency, j the US dollar or euro, and sigma which is the deviation of the log of nominal quarterly exchange rates. Estimates are made alternatively vis-à-vis the US dollar and the ECU, for two periods: from the 1st Quarter of 1978 to the 4th Quarter of 1998, and for a sub-period from the 1st Quarter of 1996 to the 4th Quarter of 1998, to take into account the effect of the financial crisis of 1997-1998.

If the index is lower or equal to 0.45 when *j* = US dollar, then the currency of country *i* is linked to the dollar and the country is classified as belonging to the dollar zone; the same applies to the ECU. Otherwise, the country is classified as belonging to the Rest of the World zone.

Table 3.1– Currencies' relative volatility to the dollar or to the ECU

From 1978: Q1 to 1998: Q4											
	Aust.	**Austria**	**Belg.**	**Can.**	**Den.**	**Fin.**	**Fra.**	**Ger.**	**Gr.**	**Ire.**	**Italy**
i/$	0.41	0.83	0.81	0.25	0.80	0.66	0.80	0.83	0.60	0.75	0.71
i/Ecu	0.59	0.17	0.19	0.75	0.20	0.34	0.20	0.17	0.40	0.25	0.29
Currency zone	$	Ecu	ECU	$	ECU	ECU	ECU	ECU	ECU	ECU	ECU
Sub period 1996: Q1 to 1998: Q4											
i/$	0.43	0.85	0.85	0.26	0.86	0.76	0.84	0.83	0.65	0.61	0.68
i/ECU	0.57	0.15	0.15	0.74	0.14	0.24	0.16	0.17	0.35	0.39	0.32
Currency zone	$	ECU	ECU	$	ECU	ECU	ECU	ECU	ECU	ECU	ECU

From 1978: Q1 to 1998: Q4											
	Jap.	**Lux.**	**Neth.**	**N-Z.**	**Nor.**	**Por.**	**RSA**	**Spain**	**Swed.**	**Swiss**	**Turk.**	**UK**
i/$	0.53	0.81	0.82	0.49	0.70	0.66	0.51	0.68	0.61	0.70	0.49	0.61
i/ECU	0.47	0.19	0.18	0.51	0.30	0.34	0.49	0.32	0.39	0.30	0.51	0.39
Currency zone	none	ECU	ECU	none	ECU	ECU	none	ECU	ECU	ECU	none	ECU
Sub period 1996: Q1 to 1998: Q4												
i/$	0.52	0.85	0.85	0.45	0.60	0.85	0.47	0.82	0.57	0.67	0.63	0.43
i/ECU	0.48	0.15	0.15	0.55	0.40	0.15	0.53	0.18	0.43	0.33	0.37	0.57
Currency zone	none	ECU	ECU	$	ECU	ECU	none	ECU	ECU	ECU	ECU	$

From 1978: Q1 to 1998: Q4											
	China	**H-K.**	**India**	**Indo.**	**S.Kore.**	**Malay.**	**Pak.**	**Phil.**	**Sing.**	**Taiwan**	**Thail.**
i/$	0.45	0.30	0.42	0.48	0.44	0.43	0.34	0.43	0.36	0.33	0.45
i/ECU	0.55	0.70	0.58	0.52	0.56	0.57	0.66	0.57	0.64	0.67	0.55
Currency zone	$	$	$	none	$	$	$	$	$	$	$
Sub period 1996: Q1 to 1998: Q4											
i/$	0.03	0.02	0.33	0.50	0.50	0.48	0.37	0.48	0.44	0.43	0.51
i/ECU	0.97	0.98	0.67	0.50	0.50	0.52	0.63	0.52	0.56	0.57	0.49
Currency zone	$	$	$	none	none	none	$	none	$	$	none

Note: Exchange rates are quarterly averages.

Sources: IFS (IMF) and WEFA for Taiwan.

Table 3.2– Currencies' relative volatility to the dollar or to the ECU

From 1978: Q1 to 1998: Q4								
	Arg.	**Braz.**	**Chile**	**Colomb.**	**Ecuad.**	**Mex.**	**Peru**	**Venez.**
i/$	0.49	0.50	0.43	0.33	0.43	0.46	0.49	0.48
i/ECU	0.51	0.50	0.57	0.67	0.57	0.54	0.51	0.52
Currency zone	none	none	$	$	$	none	none	none
Sub period 1996: Q1 to 1998: Q4								
i/$	0.00	0.09	0.32	0.41	0.37	0.33	0.24	0.51
i/ECU	1.00	0.91	0.68	0.59	0.63	0.67	0.76	0.49
Currency zone	$	$	$	$	$	$	$	none

From 1978: Q1 to 1998: Q4						
	Algeria	**Morocco**	**Tunisia**	**Egypt**	**Israel**	**Saudi-Ar.**
i/$	0.47	0.63	0.63	0.47	0.51	0.10
i/ECU	0.53	0.37	0.37	0.53	0.49	0.90
Currency zone	none	ECU	ECU	none	none	$
Sub period 1996: Q1 to 1998: Q4						
i/$	0.39	0.78	0.75	0.00	0.43	0.00
i/ECU	0.61	0.22	0.25	1.00	0.57	1.00
Currency zone	$	ECU	ECU	$	$	$

From 1978: Q1 to 1998: Q4					
	Czech Rep	**Hungary**	**Poland**	**Romania**	**Russia**
i/$	0.65	0.49	0.49	0.49	0.49
i/ECU	0.35	0.51	0.51	0.51	0.51
Currency zone	ECU	none	none	none	none
Sub period 1996: Q1 to 1998: Q4					
i/$	0.64	0.66	0.61	0.52	0.47
i/ECU	0.36	0.34	0.39	0.48	0.53
Currency zone	ECU	ECU	ECU	none	none

Note: Exchange rates are quarterly averages.

Sources: IFS (IMF) and WEFA for Taiwan.

2.2. Sensitivity to Exchange Rate Fluctuations : A Theoretical Approach

A number of papers have shown that the sensitivity to exchange rate fluctuations is not the same across sectors. In a seminal paper, Dornbush (1987) used industrial organisation models to examine the impact of market structure on the sector sensitivity to exchange rate changes. Extending the analysis in a dynamic perspective, Baldwin and Krugman (1989) and Sapir and Sekkat (1995) showed that the sensitivity to exchange rate fluctuations also depends on the type of the traded goods. The predictions of these models received empirical support. Various authors tested and find a significant difference between sectors regarding their sensitivity to exchange rate fluctuations (for instance Feinberg 1986,

Martson 1990, Feenstra 1989, Menon 1995,...). However, except for Feinberg (1986)[6], none of these authors tried to identify to which extent market structure affects the sector sensitivity to exchange rate changes. Such an identification has not only an academic interest but is also useful for economic policy purpose: knowing which factor makes a sector more or less sensitive to exchange rate fluctuations help to better target economic policy.

The intuition behind the relation between sector sensitivity to exchange rate changes and market structure can be illustrated using the following simple model of exporter behaviour. Consider that the demand function perceived by the exporter *i* is:

$$P_i = f(Q_i) \qquad (1)$$

where P_i and Q_i denotes the price (in the importing country's currency) and quantities respectively and $f' \leq 0$. Consider also a constant marginal cost of production *c*. There is no production of a comparable good in the importing country. Basic microeconomic theory shows that the exporter decision should satisfy the following condition:

$$e(P_i + Q_i f') = c \qquad (2)$$

where *e* is the exchange rate (the units of the exporter's currency for one unit of importer's currency). An increase in *e* implies a depreciation of exporter's currency.

In a perfectly competitive environment $f' = 0$ and (2) reduces to $eP_i = c$. Hence, any increase in *e* will be compensated by an equal decrease of P_i. A depreciation of the currencies of exporters with respect to the Deutsche Mark (DM) for instance implies that the German price of the exported good, to Germany, will decrease. Due to perfect competition between exporters, there will be free entry, exit of producers and price competition which will drive profit to zero. Exports to Germany will increase. In an imperfectly competitive environment $f' < 0$. Hence an increase in *e* will be matched by both a decrease in P_i and the induced increase in Q_i. The German price of the exported good will fall less than in the perfectly competitive case. Hence, Q_i will also grow more slowly. The fact that $f' < 0$ gives the exporter more "freedom" to adjust to a depreciation. He can keep price above marginal cost and not match a depreciation one for one without losing all of his sales. It follows that export volume will react less to an exchange rate change for imperfectly competitive sectors than for perfectly competitive sectors.

[6] Feinberg (1986) tested the impact of market structure on the relative price of traded to non traded goods in Germany.

Dornbush (1987) went beyond the simple model above in order to examine the relationship between trade variables and exchange rate changes. He showed that with homogeneous products and Cournot competition, a depreciation of exporters' currencies with respect to the DM will reduce the German prices of exports to Germany less than with perfect competition. With differentiated products, the extent of the decline will depend on the degree of differentiation and on the number of home and foreign firms. The imperfect competition explanations to the difference in sector sensitivity to exchange rate changes, although relevant, seems incomplete because of its static nature. A permanent DM depreciation would have the same impact on exports to Germany as a depreciation followed by an appreciation. The behaviour of the US trade deficit in relation to the depreciation of the dollar after 1985 motivated an extension of the analysis to a dynamic framework.

The notion of hysteresis incorporates the role of dynamics. It is based on the cost of reversing changes in foreign market shares. Two types of dynamic imperfect competition models have been used to show that exchange rate changes may not be passed through into trade prices, due to concerns about market share. Supply-side models by Baldwin and Krugman (1989) and Dixit (1989) postulate that firms face non-recoverable fixed costs (sunk costs) of entry into foreign markets. An exporter of cars wishing to expand sales on the German market, following a DM appreciation, should enlarge the dealer network, launch an advertising campaign, and so on. In order for these non-recoverable expenses to be profitable, the appreciation of the DM should continue to hold in the future. Otherwise, the exporter would not incur such costs. Demand-side models, introduced by Froot and Klemperer (1989), assume that due to consumer switching costs (network externalities, learning effects, etc.), firms' future demands depend on current market shares. In this context, a DM depreciation will not lead to an increase in export price unless it is perceived as permanent. The exporter may prefer holding its export price in foreign currency constant if depreciation is temporary in order to preserve its market share.

The empirically testable hypothesis implied by the above theories is that the price of the exported good in the importer currency will react less to exchange rate changes the less perfectly competitive is the market and the less permanent are exchange rate changes. Export volumes will also react less in imperfectly competitive markets and in face of temporary exchange rate changes. Most papers testing these implications were on Germany, Japan and the USA.

A first test by Feinberg (1986) was conducted on the German data. He tried to identify the determinants of pass-through. The dependent variable is the ratio of producer prices to the GNP deflator (i.e. the ratio of tradable to non-tradable goods prices). The study uses annual data (1977-83) for 41 industries of the 3 and 4 digit ISIC classification. The analysis

was conducted in two stages: first estimating pass-through for each industry and second explaining pass-through using a Herfindahl concentration index. The author found a pass-through of about 24 % in real terms i.e. an 8.4 % depreciation of the DM increases German producer prices by 2 % relative to the GNP deflator. Increased market concentration reduced pass-through.

Two other papers by Feinberg in 1989 and 1991 conducted similar analyses for the USA. The samples included annual data (1974-87) for 84 industries at a four-digit level of desegregation. On average pass-through equalled 16 % in real terms. It was close to one for industries heavily reliant on imported inputs and producing highly substitutable goods. It was much lower for concentrated or protected (barriers to entry) industries. Mann (1986) examined the pass-though issue for seven US imported goods and nine US exported goods using quarterly data between 1977 and 1985. She found exporters to the US squeezing profit margins in response to the dollar depreciation. She also identified an asymmetry in pass-through during depreciation and appreciation. Feenstra (1989) concentrated on three specific products (motor cars, compact truck and heavy motor cycles) imported by the USA from Japan. He found differences in pass-through but no asymmetry.

For Japan, Ohno (1989) analyses quarterly data (1977-87) for seven 2-digit industries and found a pass-through of around 80 %. Martson (1990) used actual export prices on a quarterly basis (1980-88) for 17 products belonging to transport equipment and electrical machinery categories. He found evidence of incomplete and asymmetric pass-through. Athukorala and Menon (1995) examined the Japanese exports. They used quarterly data (1980-92) for total exports and seven 2-digit industries. They found an incomplete pass-through in all cases.

Finally, the issue of dynamics was addressed empirically by Froot and Klemperer (1989) for the USA and by Sapir and Sekkat (1995) for Europe. Both studies concentrated on import prices. The study for the USA used a data set for 65 industries over the period 1981-86. It was found that appreciation regarded as temporary leads to a lower pass-through and hence that both present and expected future market shares affects the degree of pass-through. The study for Europe analysed prices of bilateral flows for six industries (chemical products, metal products, textile and clothing, office machines, electrical goods and motor vehicles) over the period 1980-87. The authors found strong evidence in favour of the impact of the perception about exchange rate changes on pass-through.

As illustrated above, almost all empirical studies in the field only tested for the difference of price responses to exchange rate changes across sectors. The impact on trade volume has never been considered. Moreover, except for Feinberg (1986), the extent to which these differences are due to market structure was never explicitly examined. In the sections 4 and

5 we will both identify differences in sector sensitivity and test the extent to which market structure indicators account for these differences. We will concentrate on volumes and use a broader set of indicators than Feinberg (1986).

3. SECTOR EXPOSURE FOR EU 15 AND EU 11

The statistical analysis which follows starts with the measure of exposure of European industries to the competition from the dollar zone. We choose to compare two definitions of EU: EU 15 which includes the UK as well as EU 11 which corresponds to the monetary union at the time of the study. In section 4 we address the question of national differences.

As stated previously, the keener the competition between the European Union countries and the dollar zone, the larger the magnitudes of an exchange rate shock feedback on the trade of the tradable sector. If all European countries suffer in the same way from the dollar zone competition, a shock will be symmetrical and any response to the shock will apply to all countries.

The first set of questions relating to the issue of competition between the euro zone and the dollar zone deals with the euro zone countries under review. As the integration of the United Kingdom is open to question, the alternative EU-15 and EMU-11 will be considered, and the impact of competition on both zones will be compared.

The second step consists in investigating the asymmetry across European countries stemming from different degrees of competitive pressure from the dollar zone. The three major European countries, Germany, France and the United Kingdom were then included in our comparison in order to differentiate competition from the dollar zone. In the third step, individual results for the remaining eleven countries will be displayed.

3.1. The Market Share Distribution

As far as the sharing of the world economy in three monetary zones is concerned, differences between degrees of openness are rather small, and the weight of the different zones in the different markets relatively similar. The degree of openness lies between 9.5 % for the dollar zone, 10.3 % in Europe and 12.6 % for third countries (Table 4). Furthermore, the breakdown of each market across the different partners is rather balanced, in a bracket from 4.5 % (market share of third countries in the European market) to 6.7 % (market share of EU-15 in the third countries).

This could provide a distorted picture of reality, in so far as the degree of the zones' homogeneity and integration is very different. The European zone is the most integrated in

the wake of forty years of effort, while the dollar zone – dominated by the United States – includes numerous countries of Latin America and Asia which are not integrated in the American economy (Canada and Mexico may be excepted), and which do not share the same level of welfare. This is all the more so for third countries, which constitute a heterogeneous zone. Nonetheless, the world economy is at present tripolar, with America, Europe and Japan (and in the future China). Table 2, which shows the use of currencies, testifies to the pre-eminence of the two former zones.

As for Europe, once intra-zone trade is removed, the degree of openness is a little more than 10 % of domestic demand for manufactured products. Yet, a very important dispersion around the average degree of openness can be observed across sectors.

The most open sectors with respect to international competition, for which the penetration ratio is greater than 30 %, are computers, wearing apparel, leather and shoes, professional goods and industries n.e.c.. Except for professional goods and computers, these sectors are dominated by exports from Asian countries, the CEECs and North Africa. In the computer industry, the emerging countries from Asia prevail with a market share of 17.8 %, followed by the United States (9.6 %), and Japan (5.6 %).

The most closed sectors to international competition are those with degrees of openness below 5 %: publishing and printing, tobacco, beverages, glass products, refined petroleum, food, steel and wood.

3.2. The Indicator of Exposure to Competition for EU-15

The previous analysis only allowed for the penetration of foreign products, and only from the dollar zone in the different markets. In this section, European exports are compared to the dollar zone exports. The exposure to the dollar zone alone amounts to 12.4 % (Table 5).

Graph 6 shows that the exposure of EU-15 to competition with the dollar zone relative to the average of the manufacturing sector –measured by the length of the arrows– arises in both European and foreign markets for the following sectors: computers, leather, toys, transport, wearing apparel, professional goods and electrical machinery. Textiles and non-ferrous metals experience competition in the European market alone, while machinery and equipment, chemicals and ceramics are open to competition for both Europe and the dollar zone only in the foreign markets.

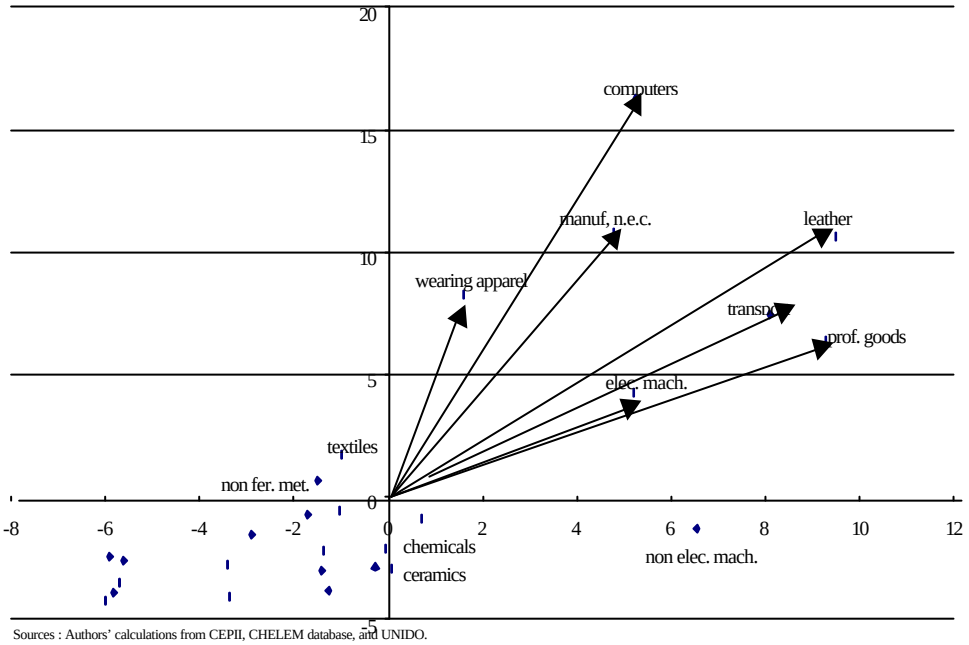
Table 4– Market shares in the European Union, the dollar zone and third countries, 1996

	EU 15			$ zone			Third countries		
	MS EU 15	MS $ zone	MS third zone	MS EU 15	MS $ zone	MS third zone	MS EU 15	MS $ zone	MS third zone
Manufacturing	**89.8**	**5.8**	**4.5**	**4.6**	**90.5**	**4.9**	**6.7**	**5.9**	**87.4**
Food products	96.0	2.5	1.5	1.2	98.0	0.8	2.6	7.3	90.2
Textiles	87.5	7.8	4.7	2.3	95.5	2.2	11.5	7.1	81.4
Wearing apparel	67.6	15.7	16.7	3.0	95.8	1.2	14.8	30.3	55.0
Leather and leather products	70.1	22.5	7.4	12.0	85.5	2.5	22.9	24.0	53.1
Wood and wood products	95.1	2.7	2.2	0.8	99.0	0.2	2.4	5.8	91.8
Furniture	92.9	2.5	4.6	3.9	95.5	0.6	9.8	6.7	83.5
Publishing and printing	98.7	0.8	0.4	0.9	98.9	0.2	2.0	0.6	97.4
Plastic products	92.0	4.4	3.6	3.7	92.6	3.7	8.8	3.8	87.4
Metal products	93.1	3.1	3.7	4.7	91.1	4.2	5.9	2.4	91.7
Machinery and equipment	89.2	5.0	5.8	11.3	79.2	9.5	9.8	3.7	86.5
Professional goods	73.7	14.4	11.9	8.6	78.3	13.1	17.9	19.1	62.9
Manufacturing n.e.c.	73.3	19.0	7.7	6.2	85.4	8.4	11.1	14.9	74.0
Chemicals except pharmaceuticals	90.6	4.8	4.6	5.3	90.3	4.4	10.1	6.2	83.7
Beverages	97.0	2.2	0.8	4.3	95.3	0.3	3.7	1.4	94.9
Tobacco	98.7	1.1	0.2	0.9	98.7	0.3	1.2	6.5	92.2
Paper products	93.7	3.8	2.5	2.5	96.3	1.2	6.6	3.7	89.7
Coke, refined petroleum products	96.1	1.6	2.3	1.2	96.7	2.1	3.0	5.2	91.7
Rubber products	90.8	4.5	4.7	2.6	93.2	4.2	5.3	2.7	92.0
Ceramic products	95.3	2.2	2.5	5.6	91.5	3.0	14.5	3.6	82.0
Glass and other non-metallic min. prod.	97.0	1.0	2.1	1.9	96.4	1.7	1.9	1.4	96.7
Iron and steel	95.1	1.3	3.5	3.9	89.1	7.0	4.2	2.7	93.1
Non-ferrous metals	83.7	6.2	10.2	2.8	91.1	6.1	5.0	7.6	87.4
Electrical machinery	80.5	11.9	7.6	6.0	84.2	9.8	6.0	7.7	86.3
Pharmaceuticals	92.2	3.3	4.5	5.7	92.5	1.9	8.7	2.1	89.2
Office machinery and computers	65.6	27.4	6.9	5.8	82.9	11.3	7.2	15.6	77.2
Transport equipment except cars	82.6	15.5	1.9	9.2	89.3	1.5	2.1	3.8	94.1
Automobiles	93.5	2.3	4.2	4.6	88.2	7.3	10.8	3.5	85.7

Note: MS= market share.

Sources: Authors' calculations from the CEPII CHELEM database for trade; UNIDO and national sources for production.

Graph 6 – The most exposed sectors to competition from the dollar zone in the EU-15 and foreign markets



Sources : Authors' calculations from CEPII, CHELEM database, and UNIDO.

Note: on the X-axis, the degree of sectoral exposure to competition from the $ zone on the foreign markets (dollar market and third markets) relative to the average of the manufacturing sector; on the Y-axis , the degree of sectoral exposure in the European market relative to the average of the manufacturing sector.

Table 5 – The sector exposure of EU-15 to the competition from the dollar zone, 1996

	EU-15			$ zone			Third zone		
	Share in EU-15 prod.	MS $ zone	Indicator	Share in EU-15 prod.	MS $ zone	Indicator	Indicator	Total	*Relative total*
Manufacturing	**86.7**	**5.8**	**5.0**	**7.9**	**90.5**	**7.1**	**0.3**	**12.4**	**0**
Office machinery and computers	77.6	27.4	21.3	12.7	82.9	10.6	2.1	33.9	**22**
Leather and shoes	69.7	22.5	15.7	17.0	85.5	14.5	2.4	32.5	**20**
Transport equipment except cars	80.3	15.5	12.4	16.5	89.3	14.8	0.7	27.9	**16**
Manufacturing n.e.c.	77.9	19.0	14.8	11.2	85.4	9.6	1.4	25.8	**13**
Professional goods	73.5	14.4	10.6	17.0	78.3	13.3	1.4	25.3	**13**
Electrical machinery	78.2	11.9	9.3	14.2	84.2	12.0	0.6	21.9	**9**
Wearing apparel	83.0	15.7	13.0	6.5	95.8	6.3	2.4	21.7	**9**
Machinery and equipment	75.1	5.0	3.7	17.0	79.2	13.5	0.5	17.7	**5**
Textiles	84.3	7.8	6.6	5.9	95.5	5.7	0.5	12.8	**0**
Chemicals except pharmaceuticals	85.5	4.8	4.1	8.6	90.3	7.8	0.3	12.2	**0**
Non-ferrous metals	89.5	6.2	5.5	6.0	91.1	5.4	0.2	11.2	**-1**
Pharmaceuticals	86.4	3.3	2.9	7.5	92.5	7.0	0.2	10.0	**-2**
Rubber products	89.7	4.5	4.1	5.6	93.2	5.2	0.2	9.4	**-3**
Plastics	87.8	4.4	3.9	5.6	92.6	5.1	0.3	9.3	**-3**
Ceramics	87.7	2.2	2.0	7.4	91.5	6.8	0.2	8.9	**-3**
Metallic Products	88.7	3.1	2.8	6.4	91.1	5.9	0.1	8.8	**-4**
Automobiles	86.6	2.3	2.0	7.1	88.2	6.3	0.3	8.6	**-4**
Beverages	90.5	2.2	2.0	6.2	95.3	5.9	0.1	8.0	**-4**
Paper	90.8	3.8	3.5	4.5	96.3	4.4	0.1	7.9	**-4**
Iron and steel	89.6	1.3	1.2	6.8	89.1	6.0	0.1	7.3	**-5**
Furniture	90.8	2.5	2.2	3.9	95.5	3.8	0.1	6.1	**-6**
Glass and other non-metallic min. prod.	93.3	1.0	0.9	4.1	96.4	4.0	0.0	4.9	**-7**
Food	96.5	2.5	2.4	1.7	98.0	1.7	0.1	4.2	**-8**
Wood products except furniture	96.4	2.7	2.6	1.4	99.0	1.4	0.0	4.0	**-8**
Coke, refined petroleum products	96.8	1.6	1.5	1.7	96.7	1.6	0.0	3.2	**-9**

Tobacco	97.8	1.1	1.1	1.5	98.7	1.5	0.1	2.6	**-10**
Publishing and printing	97.0	0.8	0.8	1.4	98.9	1.3	0.0	2.2	**-10**

Sources: Authors' calculations from CEPII CHELEM database for trade; UNIDO and national sources for production.

3.3. EU-15 Compared to EMU-11

Table 6 encapsulates the sensitivity differences of the euro zone to its enlargement with respect to its relationship with the dollar zone. The results suggest two remarks: on the one hand, the degree of exposure gets stronger with the EMU enlarging to the United Kingdom, Sweden and Denmark, but on the other hand, this increase is rather weak. The increase of the degree of exposure stems from two factors:

– when the euro zone gets larger, the external trade level of the Union is lessened since trade inside the euro is removed;

– hence, the weight of trade of the dollar zone increases in world trade;

– lastly, adding new countries which are traditionally more open to the dollar zone, strengthens this exposure.

But this effect is of a second order, as it only amounts to an increase by 0.6 percentage points in the indicator, relative to a level of 11.7, that is to say an increase by 5 %.

At a sector level, the effects are rather mixed:

Two sectors lessen their exposure to the dollar zone: plastics by -0.2 percentage points and above all other transport equipment by -1.8 percentage points, that is by more than six per cent. This sector, chiefly spans the aeronautics industry, an up-market segment of high technology in the American manufacturing sector. It is the main sector to benefit by the enlargement to the three potential applicants. Half of this effect stems from the magnitude of these sectors in the United Kingdom and in Sweden –by the means of a kind of « consolidation » in the zone– and the other half comes from the decrease of competition in third markets.

Electrical machinery and computers are the main sectors that experience an important increase in their exposure. In nearly all cases, the increase is first of all due to a deeper penetration of the European internal market. The entry of new countries that are very open to exports from the dollar zone rather increases the exposure of the European industry. But this cannot be assimilated to a negative effect, as the link with the dollar might provide low cost imports of electronics goods to the other European industries. But as far as the “dollar” effect is concerned, it is correct to underline that these sectors are more sensitive than others.

This analysis shows that EU enlargement to other European countries might not necessarily reduce exposure to the dollar zone.

Table 6 – Indicators of exposure of EU-15 and EMU-11 to competition from the dollar zone, 1996

	Market of EU-15/EMU-11		Market share of the $ zone		Market share of third zone		Total		
In %	EU-15	MU-11	EU-15	MU-11	EU-15	MU-11	EU-15	MU-11	Diff.
Manufacturing	**5.0**	**4.3**	**7.1**	**6.7**	**0.3**	**0.7**	**12.4**	**11.7**	**0.6**
Publishing and editing	0.8	0.5	1.3	1.0	0.0	0.0	2.2	1.5	0.7
Tobacco	1.1	1.4	1.5	0.8	0.1	0.1	2.6	2.3	0.3
Refined petroleum and coal	1.5	1.7	1.6	1.4	0.0	0.0	3.2	3.1	0.1
Wood products except furniture	2.6	2.2	1.4	1.6	0.0	0.1	4.0	3.9	0.1
Food	2.4	2.4	1.7	1.6	0.1	0.1	4.2	4.2	0.0
Glass and other non-metallic min.prod.	0.9	0.8	4.0	4.0	0.0	0.1	4.9	4.8	0.1
Furniture	2.2	1.9	3.8	3.8	0.1	0.5	6.1	6.2	0.0
Iron and steel	1.2	1.1	6.0	6.1	0.1	0.1	7.3	7.3	0.0
Paper	3.5	3.1	4.4	4.2	0.1	0.4	7.9	7.7	0.2
Beverages	2.0	1.9	5.9	5.6	0.1	0.2	8.0	7.6	0.4
Metallic Products	2.8	2.4	5.9	5.8	0.1	0.3	8.8	8.5	0.3
Automobiles	2.0	1.7	6.3	5.6	0.3	0.6	8.6	7.8	0.7
Ceramics	2.0	1.6	6.8	5.9	0.2	0.6	8.9	8.1	**0.9**
Rubber products	4.1	3.3	5.2	5.1	0.2	0.6	9.4	9.0	0.4
Pharmaceuticals	2.9	2.8	7.0	6.3	0.2	0.3	10.0	9.4	0.6
Plastics	3.9	3.4	5.1	5.2	0.3	0.7	9.3	9.3	**-0.2**
Non-ferrous metals	5.5	4.5	5.4	4.9	0.2	0.7	11.2	10.1	1.1
Chemicals except pharmaceuticals	4.1	3.7	7.8	7.5	0.3	0.6	12.2	11.8	0.4
Textiles	6.6	5.4	5.7	5.7	0.5	1.3	12.8	12.4	0.3
Machinery and equipment	3.7	3.0	13.5	13.1	0.5	0.9	17.7	17.0	0.7
Electrical machinery	9.3	7.1	12.0	10.4	0.6	2.1	21.9	19.7	1.2
Wearing apparel	13.0	10.4	6.3	6.7	2.4	4.1	21.7	21.2	0.4
Transport equipment except cars	12.4	12.3	14.8	15.9	0.7	1.4	27.9	29.6	**-1.8**
Professional goods	10.6	9.2	13.3	12.7	1.4	2.7	25.3	24.6	0.5
Manufacturing n.e.c	14.8	12.0	9.6	8.7	1.4	4.2	25.8	24.9	0.7
Office machinery and computers	21.3	16.5	10.6	8.3	2.1	7.7	33.9	32.5	1.4
Leather and shoes	15.7	13.0	14.5	14.8	2.4	4.6	32.5	32.5	0.0

Sources: Authors' calculations from CEPII CHELEM database for trade; UNIDO and national sources for production.

In summary, the indicator computed for EU-15 and EU-11 against the dollar zone is above average for the manufacturing sector respectively for about the same list of industries but textiles:

EU-15	EU-11
Computers,	Computers,
Leather,	Leather,
Transport except cars,	Transport except cars,
Manufactured products n.e.c,	Manufactured products n.e.c,
Professional goods,	Professional goods,
Electrical machinery,	Electrical machinery,
Wearing apparel,	Wearing apparel,
Machinery and equipment.	Machinery and equipment,
	Textiles.

The chemicals industry does not pertain to the list as it is just about the same level as average in EU-11.

4. THE ESTIMATION OF SECTORS' SENSITIVITY TO EXCHANGE RATE FLUCTUATIONS

4.1. Data Issues

To estimate sectors' sensitivity to exchange rate fluctuations a typical regression relates trade volumes to exchange rate variables, cost variables and other control variables. In the present study, we are also interested in identifying the impact of market structure on sectors' sensitivity. Hence, four data sets were collected: trade, production, exchange rate and market structure data.

4.1.1. Trade volume estimations

The analysis of sectors' exposure to competition from the dollar zone used a 3 digit sector classification. Ideally, we should use a similar classification for the econometric analysis. However, to conduct such an analysis, two sets of variables (trade and costs) should be collected on a time series, bilateral (including non-European partners), and sectoral basis. Given the available data sets, it is not possible to fulfil these requirements at the finest level of desaggregation. For instance, it is possible to collect trade flows at the 3 digit level but it is not possible to collect the corresponding costs series especially for non-European partners. Hence, a trade-off among the various dimensions of the data was made and we ended up with the following sample. Note however, that when the results of sections 3 and 4 will be combined in section 5, a coherent framework will be used.

The analysis focuses on imports and exports of 11 declaring countries: Belgium-Luxembourg, France, Denmark, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom. Bilateral trade flows between these countries and seventeen partners are analysed. The partners are the 11 declaring countries plus Austria, Finland, Sweden, the United States, Canada and Japan. The sector desaggregation is defined according to the NACE revision 1 classification: food products, beverages and tobacco (Food); textiles and textile products (Text.); leather and leather products (Leat.); wood and wood products (Wood); pulp, paper and paper products, publishing and printing (Paper); Energy (Ener.), chemicals, chemical products and man-made fibres (Chem.); rubber and plastic products (Rub.); other non-metallic mineral products (Min.); basic metals and fabricated metal products (Met.); machinery and equipment n.e.s. (Mach.); electrical and optical equipment (Elec.); transport equipment (Trans.); manufactured goods n.e.s (Other). The dependent variables, i.e. bilateral export and import volumes, are drawn from Eurostat's trend database. Exports from country *I* to country *J* in sector *S* will be termed X_{IJS}, whereas imports in country *I* from country *J* in sector *S* will be termed M_{IJS}.

Nominal exchange rate series are drawn from the IMF's *International Financial Statistics* (CD-ROM). The US exchange rates are used to obtain other bilateral rates. They are collected on an annual and on a monthly basis. The latter is used to compute exchange rate volatility as the standard deviation, over twelve months, of exchange rate changes. Expectations of future exchange rate changes are measured using the interest differential between the exporter and the importer. The 12-month euro-interest are drawn from the IMF CD-ROMS. The bilateral exchange rate between country *I* and country *J* will be termed E_{IJ} and is defined as the number of currency units of the declaring country *I* for one currency unit of the partner country *J*. Therefore, an increase in E_{IJ} means a depreciation of country I's currency with respect to country J's currency. By analogy, volatility and the expectations of exchange rate changes are denoted respectively V_{IJ} and R_{IJ}. A positive R_{IJ} implies an expected depreciation of the declaring country *I* currency with respect to the partner country *J*.

As a proxy for costs, producer price indexes in ECU for each country and each sector are used. Sector production, measured in constant ECU of 1995, for each country and each sector is also used to take account of possible demand or supply effects. The respective total production of the declaring country and of the partner country in sector *S* are noted VD_s and VP_s. In the same way, $PPID_S$ and $PPIP_S$ will respectively denote producer prices of the declaring country and of the partner country in sector *S*. These two sets of data were drawn from Eurostat's European Business Trends database.

4.1.2. Market structure indicators

Finally, four market structure indicators are considered: concentration, segmentation, differentiation, and the degree of scale economies. Concentration is measured as the 5-firm concentration ratio, and the data are drawn from Davies and Lyons (1996). We use the 1987 measure for the years 1989 to 1992, whereas the 1993 measure is used for the subsequent years[7]. Segmentation and differentiation data are taken from Oliveira Martins and *al*. (1996). These are dummy variables taking value one for segmented (differentiated) sector and zero otherwise. A sector characterized by the existence of large establishments, covering a large proportion of output and employment is termed segmented while differentiation is approximated by R&D intensity. In order to measure the degree of scale economies, we use the minimum efficient scale, i.e. the theoretical scale of the plant at which all economies of scale are exhausted. These data are provided by the European Commission (1997). Note that this indicator is closely related, although richer, to the segmentation indicator. These indicators are available in Table 7.

[7] We thank the authors for providing us with the more recent data.

Table 7 – Selected sector indicators: EU-11

Sector		Log (MES)	Concentration		Segmen-tation	Differen tiation	% Production	CEPII	% Imports	% Exports
			1993	1987						
(Food)	Food products, beverages and tobacco	5.78	0.28	0.23	0.5	0	16.86	4.5	7.59	7.11
(Text.)	Textiles and textile products	2.53	0.12	0.09	0	0	4.44	16.4	7.60	4.57
(Leat.)	Leather and leather products		0.14	0.08	0	0	0.49	32.5	2.00	1.02
(Wood)	Wood and wood products		0.12	0.08	0	0	1.67	3.9	1.76	1.20
(Paper)	Pulp, paper and paper products, publishing and printing	5.52	0.11	0.10	0.5	0	8.02	4.4	3.32	3.65
(Ener.)	Energy products				1	0	4.31	3.1	2.61	1.97
(Chem.)	Chemicals, chemical products and man-made fibres	6.03	0.52	0.49	1	1	12.96	11.2	11.48	12.92
(Rub.)	Rubber and plastic products	5.52	0.23	0.28	0.5	0	3.46	10.6	2.93	3.04
(Min.)	Other non-metallic mineral products	3.91	0.26	0.20	1	0	2.63	6.1	1.57	1.67
(Met.)	Basic metals and fabricated metal products	6.32	0.22	0.22	1	0	9.49	8.4	8.69	8.26
(Mach.)	Machinery and equipment n.e.s.	5.22	0.20	0.19	0	1	11.68	17.0	9.52	13.29
(Elec.)	Electrical and optical equipment	4.92	0.34	0.34	1	1	11.95	23.4	23.99	22.31
(Trans.)	Transport equipment	8.43	0.47	0.43	1	1	12.04	12.4	16.92	18.99
	Coefficient in imports equation	-0.08	0.89							
	Coefficient in exports equation	0.45	-0.15							

Source: Authors' calculations. The CEPII column gives the index of competition from the dollar zone on European trade. As computed by the CEPII, the higher is the indicator

the stronger is competition.

4.2. Difference in Sensitivity across Sectors

To investigate whether exchange rate fluctuations have a differentiated impact on trade volumes across sectors, the following equations were estimated:

$$X_{IJS} = b_0 + \sum_S b_{1S}(E_{IJ} \times SEC_S) + b_2 V_{IJ} + b_3 VD_S + b_4 VP_S + b_5 PPIP_S + b_6 PPID_S + e_{X_{IJS}} \quad (3)$$

$$M_{IJS} = g_0 + \sum_S g_{1S}\left(E_{IJ} \times SEC_S\right) + g_2 V_{IJ} + g_3 VD_S + g_4 VP_S + g_5 PPIP_S + g_6 PPID_S + e_{M_{IJS}} \quad (4)$$

Where:

X_{IJS} = Exports from country *I* to country *J* in sector *S*

M_{IJS} = Imports in country *I* from country *J* in sector *S*.

E_{IJ} = Bilateral exchange rate between country *I* and country *J*. An increase in E_{IJ} means a depreciation of country I's currency

V_{IJ} = Volatility of exchange rate changes

VD_S and VP_S = Total production of the declaring country and of the partner country in sector *S*

$PPID_S$ and $PPIP_S$ = Producer prices of the declaring country and of the partner country in sector *S*.

SEC_S = Dummy variable that takes the value 1 for sector *S* and 0 otherwise.

Equations (3) and (4) can be derived from a structural model of exporter's behaviour (see for instance Sekkat, 1998). All variables are average annual growth rates over the period 1989-97. Volatility is the logarithm of the average volatility over the same period.

Equations were first estimated using yearly growth rates. The results failed to show a consistent and robust impact of market structure indicators on exchange rate coefficients. Such a result is considered to be due to two factors. On the one hand, the series of market structure indicators are available only for one point in time. Compared to the rest of the sample they do not display enough variance and hence a correlation may not show up. On the other hand, the impact of market structure is mainly a long term phenomenon and may not appear using a short term approach i.e regression on yearly growth rate. It was therefore decided to abstract from short term effects by estimating equations (3) and (4) using the average annual growth rates over the period 1989-97.

When the used sample combines various dimensions of the data (for instance time-sector-countries) a typical issue concerns the dimension according to which coefficients are allowed to vary. The focus of the econometric analysis is on the sensitivity of each sector to exchange rate changes. Such a sensitivity depends mainly on sector's characteristics i.e technology, product differentiation, scale economies and so on. While the importance of a given sector may differ across European countries (which may be accounted for using fixed effects) there is no reason that its response to exchange rate changes differs across countries of similar level of development and hence using similar technologies. Hence, while the exchange rate coefficients are allowed to vary across sectors there are assumed to be similar (for a given sector) across countries.

The most natural way to conduct the investigation is to run a panel regression. We introduced fixed effects for sectors and countries. The fixed effects of importing countries proved to be significant. Hence, in addition to sector fixed effects, dummies for partners are included into the exports equation and reporter's dummies are included in the imports equation. To save on space, fixed effects coefficients are however not reported. Estimation results are presented in Table 8 below. The "other products" sector was disregarded because of its high heterogeneity.

From Table 8, it appears that the F-test for common intercepts rejects the null hypothesis both for imports and exports and that the Hausman test statistics for random versus fixed effects is not significant. These two observations justify the focus upon fixed effects models. The adjusted R^2 in Table 8 are of medium level. This is not surprising for regressions using growth rates.

A first interesting result is Table 8 concerns the effect of prices. In general, increases in the declaring country's producer prices should increase its imports from the partner countries and significantly decreases its exports towards them. The effects of price in Table 8 is significant only for the exporter. Coefficients for producer prices have the correct sign and are significant for *PPIP* in the case of imports and for *PPID* in the case of exports. When domestic country's producer prices increase by 1 %, its exports fall by about three fourth of a percent. In the same way, an increase in the partner country's producer prices significantly decreases its exports towards the reporting country. When the partner country's producer prices increase by 1 %, its exports towards the reporting country decrease by about one half of a percent.

Coefficients of total production variables are significant in three cases over four. An increase in total production in the partner country or the declaring country both raises imports from the partner country to the declaring country. The impact of total production is of comparable magnitude to the impact of producer prices: a 1 % increase in total production

for the partner country or the declaring country induces an increase of about one half of percent of imports from the partner country to the declaring country.

Regarding exchange rate variables, one must separate exports and imports. For exports, a depreciation of the declaring country's currency should increase exports towards its partners. This is the case for 6 sectors. The leather sector, however, has a significant and unanticipated sign. For imports, a depreciation should decrease imports. The results show that the exchange rate coefficients are significantly different from 0 and negative in eight imports cases. Overall, exchange rate coefficients prove generally higher or comparable to the costs coefficients. The Energy sector display high coefficients for both imports and exports reflecting a high elasticity of demand in the long run.

An increase in exchange rate volatility has a consistently negative impact upon imports, which can very well be understood if producers are risk-averse. Increases in exchange rate uncertainty reduce international trade. However, as compared to producer prices coefficients, the effect appears rather small.

In Table 8, one can easily notice that the coefficients of exchange rate are different across sectors for both imports and exports: the purpose of Table 10 is to test for such differences. These tables present t-statistics for the test of equality of coefficients for every couple of sectors.

Table 8– Estimation results of equations (3) and (4)

		Imports	**Exports**
(PPID)	Producer prices of the declaring country	-0.0980	-0.7285*
		(-0.20)	(-3.33)
(PPIP)	Producer prices of the partner country	-0.4312*	-0.1727
		(-2.04)	(-0.49)
(VP)	Total production of the partner country	0.6331*	0.2469**
		(5.10)	(1.75)
(VD)	Total production of the declaring country	0.0064	0.6561*
		(0.04)	(6.56)
(VIJ)	Volatility of exchange rate changes	-0.0558*	0.0097
		(-2.99)	(0.50)
(Food)	Food products, beverages and tobacco	-1.0085	0.2420
		(-4.24)	(1.26)
(Text.)	Textiles and textile products	-0.4615	-0.2948
		(-0.97)	(-0.73)
(Leat.)	Leather and leather products	-0.0841	-0.5011**
		(-0.25)	(-1.65)
(Wood	Wood and wood products	-0.4197	-0.0034
		(-1.25)	(-0.01)
(Paper)	Pulp, paper and paper products, publishing and printing	-1.0549*	0.4019
		(-2.74)	(1.21)
(Ener.)	Energy products	-4.3692*	3.8628*
		(-4.87)	(4.20)
(Chem.	Chemicals, chemical products and man-made fibres	-0.7884*	0.5495*
		(-2.88)	(2.29)
(Rub.)	Rubber and plastic products	-0.8467*	0.4737*
		(-3.42)	(2.14)
(Min.)	Other non-metallic mineral products	-0.8524*	0.7657*
		(-3.72)	(3.96)
(Met.)	Basic metals and fabricated metal products	-0.5536	0.3503
		(-0.83)	(0.62)
(Mach.	Machinery and equipment n.e.s.	-1.2144*	1.0711*
		(-4.25)	(4.55)
(Elec.)	Electrical and optical equipment	-1.0268**	0.3380
		(-1.69)	(0.66)
(Trans.	Transport equipment	-0.6827	2.4517*
		(-1.14)	(4.37)
Nob		568	565
R^2		0.21	0.30
F-stat		2.1874*	2.361*
H-stat		12.4130	14.7780

Table 9– Estimation results of equations (3) and (4)

		IMPORTS	EXPORTS
(Met.)	Basic metals and fabricated metal products	-0.5536	0.3503
		(-0.83)	(0.62)
(Mach.)	Machinery and equipment n.e.s.	-1.2144*	1.0711*
		(-4.25)	(4.55)
(Elec.)	Electrical and optical equipment	-1.0268**	0.3380
		(-1.69)	(0.66)
(Trans.)	Transport equipment	-0.6827	2.4517*
		(-1.14)	(4.37)
Nob		568	565
R^2		0.21	0.30
F-stat		2.1874*	2.361*
H-stat		12.4130	14.7780

Table 10– Import and export equation: t-statistics for equality of exchange rate coefficients for couples of sectors

Import		Food	Text.	Leat.	Wood	Paper	Ener.	Chem.	Rub.	Min.	Met.	Mach.	Elec.	Trans.
(Food)	Food products, beverages and tobacco	0.00												
(Text.)	Textiles and textile products	1.03	0.00											
(Leat.)	Leather and leather products	2.24*	0.65	0.00										
(Wood)	Wood and wood products	1.43	0.07	-0.70	0.00									
(Paper)	Pulp, paper and paper products, publishing and printing	-0.10	-0.97	-1.90**	-1.24	0.00								
(Ener.)	Energy products	-3.62*	-3.85*	-4.47*	-4.12*	-3.40*	0.00							
(Chem.)	Chemicals, chemical products and man-made fibres	0.61	-0.60	-1.62	-0.85	0.56	3.82*	0.00						
(Rub.)	Rubber and plastic products	0.47	-0.72	-1.82**	-1.02	0.46	3.79*	-0.16	0.00					
(Min.)	Other non-metallic mineral products	0.47	-0.74	-1.88**	-1.06	0.45	3.80*	-0.18	-0.02	0.00				
(Met.)	Basic metals and fabricated metal products	0.64	-0.11	-0.63	-0.18	0.65	3.41*	0.33	0.41	0.42	0.00			
(Mach.)	Machinery and equipment n.e.s.	-0.55	-1.36	-2.56*	-1.80**	-0.33	3.35*	-1.08	-0.97	-0.99	-0.91	0.00		
(Elec.)	Electrical and optical equipment	-0.03	-0.73	-1.35	-0.87	0.04	3.08*	-0.36	-0.27	-0.27	-0.52	0.28	0.00	
(Trans.)	Transport equipment	0.50	-0.29	-0.87	-0.38	0.52	3.42*	0.16	0.25	0.26	-0.14	0.80	0.40	0.00

Table 10– (cont.) Import and export equation: t-statistics for equality of exchange rate coefficients for couples of sectors

Export		Food	Text.	Leat.	Wood	Paper	Ener.	Chem.	Rub.	Min.	Met.	Mach.	Elec.	Trans.
(Food)	Food products, beverages and tobacco	0.00												
(Text.)	Textiles and textile products	-1.20	0.00											
(Leat.)	Leather and leather products	-2.07*	-0.41	0.00										
(Wood)	Wood and wood products	-0.73	0.60	1.21	0.00									
(Paper)	Pulp, paper and paper products, publishing and print.	0.42	1.33	2.00*	0.94	0.00								
(Ener.)	Energy products	3.85*	4.14*	4.50*	4.02*	3.54*	0.00							
(Chem.)	Chemicals, chemical products and man-made fibres	1.00	1.80**	2.71*	1.51	0.36	-3.48*	0.00						
(Rub.)	Rubber and plastic products	0.79	1.67**	2.59*	1.35	0.18	-3.58*	-0.23	0.00					
(Min.)	Other non-metallic mineral products	1.92**	2.37*	3.51*	2.29*	0.95	-3.29*	0.70	1.00	0.00				
(Met.)	Basic metals and fabricated metal products	0.18	0.93	1.33	0.57	-0.08	-3.26*	-0.33	-0.20	-0.70	0.00			
(Mach.)	Machinery and equipment n.e.s.	2.73*	2.93*	4.08*	2.97*	1.64	-2.94*	1.55	1.85**	1.00	1.18	0.00		
(Elec.)	Electrical and optical equipment	0.18	0.97	1.41	0.59	-0.10	-3.35*	-0.37	-0.24	-0.78	-0.02	-1.30	0.00	
(Trans.)	Transport equipment	3.73*	3.98*	4.63*	3.93*	3.14*	-1.31	3.12*	3.28*	2.84*	2.65*	2.27*	2.78*	0.00

Note: * significant at 5 %, ** significant at 10 %.

Source: Authors' calculations.

There are many cases where the t-statistic is significant i.e. sectors respond differently to exchange rate changes. For instance, export of sectors Mach. (Machinery and Equipment) and Ener. (coke, refined petroleum products and nuclear fuel), display a significantly different response to exchange rate fluctuations than sector Food (Food products, beverages and tobacco). Exchange rate depreciation, i.e. an increase in E_{IJ}, boosts machinery and energy exports by a significantly larger amount than in the case of food and drink. The same depreciation reduces energy imports significantly more than food imports.

The results in Table 9 clearly suggest that the sensitivities to exchange rate fluctuations are different across sectors. The next section expands further the analysis. This is interesting for two reasons: first, the role of market structure is still not identified and second differences that are not apparent in the tables may be found. Indeed, the interaction variable approach does not permit to consider either the evolution of market structure indicators over time or the compensating effects of possible explanations to the sector differences.

4.3. The Role of Market Structure

In this section, we examine whether the heterogeneous responses of trade volumes to exchange rate fluctuations can be accounted for by sector-specific characteristics. We consider four sector characteristics related to the competitiveness in the various sectors: scale economies in sector *S* (MES_S), segmentation in sector *S* (SEG_S), product differentiation in sector *S* (DIF_S), and concentration in sector *S* (CON_S). The precise definitions of these variables are given in section 4.1.

The following interaction variables were then constructed:

$$ESEG_{IJS} = E_{IJ} \; x \; SEG_S \qquad (5)$$

$$ECON_{IJS} = E_{IJ} \; x \; CON_S \qquad (6)$$

$$EMES_{IJS} = E_{IJ} \; x \; MES_S \qquad (7)$$

Clearly, the regression coefficient associated with, for instance, $ESEG_{IJS}$ represents the role played by segmentation in generating the response of trade volume to exchange rate fluctuations. The same holds for the other interaction variables.

Following the analysis by Sapir and Sekkat (1995) we should take account of dynamics. For sectors where dynamics are important, expectations of exchange rate changes play a significant role. The issue here is to determine sectors for which dynamics considerations are important. There is no available classification identifying sectors for which dynamics is important. Hence, one should rely on conceptual analysis. Looking at the literature, it

appears that dynamics is in general associated with consumers' loyalty i.e. a consumer is likely to buy a given brand if he bought it in the past. Consumers' loyalty was documented for various products such as software's, computers, or cars. These are in general goods involving product differentiation. Indeed, there is almost no consumers' loyalty for homogeneous unmarked products such as bread, oil, or paper. Hence, to avoid arbitrary choice, we rely on the differentiation indicator to identify those sectors for which dynamics may play a role.

We first compute expected exchange rate movements. This is done by postulating uncovered parity and, hence, the expected exchange rate change between countries *I* and *J* is given by:

$$R_{IJ} = R_I - R_J \qquad (8)$$

This is the (one-year) interest rate differential between country *I* and country *J*. The next step defines an interaction variable, ERW_{IJ}, between the expected exchange rate change and sectors where dynamics is assumed to be important:

$$ERW_{IJ} = R_{IJ} \; x \; DIFFs \qquad (9)$$

The equations to be estimated are the following:

$$X_{IJS} = \hat{a}_0 + \hat{a}_1 E_{IJ} + \hat{a}_2 V_{IJ} + \hat{a}_3 VD_S + \hat{a}_4 VP_S + \hat{a}_5 PPIP_S + \hat{a}_6 PPID_S + \hat{a}_7 Eij*CHAR_S + \hat{a}_8 ERW_{IJ} + \hat{a}_{XIJS} \qquad (10)$$

$$M_{IJS} = \tilde{a}_0 + \tilde{a}_1 E_{IJ} + \tilde{a}_2 V_{IJ} + \tilde{a}_3 VD_S + \tilde{a}_4 VP_S + \tilde{a}_5 PPIP_S + \tilde{a}_6 PPID_S + \tilde{a}_7 Eij*CHAR_S + \tilde{a}_8 ERW_{IJ} + \tilde{a}_{MIJS} \qquad (11)$$

Where $CHAR_S$ denotes the characteristics of sector *S*. Thus, for a given sector *S*, the sensitivity to actual exchange rate changes is given, respectively for exports and imports, by:

$$\hat{a}_1 + \hat{a}_7 CHARs \qquad (12)$$

and

$$\tilde{a}_1 + \tilde{a}_7 CHARs \qquad (13)$$

As imperfect competition reduces the sensitivity to exchange rate, the expected signs are $\hat{a}_7 < 0$ and $\tilde{a}_7 > 0$. With respect to $\hat{a}_8$ and $\tilde{a}_8$ we expect the same sign as for $\hat{a}_1$ and $\tilde{a}_1$ because when dynamics is important, future exchange rate evolutions has the same impact as the actual evolution.

We will consider separately each of the characteristics and also perform a regression with all the characteristics. These equations are estimated in a similar way than before.

For each regression, we only present the fixed-effects results. The Hausman test for fixed versus random effects indeed systematically pleads in favour of a fixed-effects specification. Moreover, the F-test systematically rejects the null hypothesis of common intercepts.

The results concerning the effect of concentration are displayed in Table 11. The coefficients associated with the exporter price variables, *PPIDS* (for exports) and *PPIPS* (for imports), have the expected sign and are highly significant. They have the same order of magnitude as in Table 8. The « price effect » already detected is confirmed as an important feature of the data. As in Table 8, the coefficients for VD_S and VP_S are significant in three instances, and are positive. Their magnitude, again, is comparable to the coefficients for producer price variables: a 1 % increase in VP_S boosts imports into the country by about 0.5 %.

The exchange rate coefficients E_{IJ} have the expected sign and are significant both for imports and for exports. Point estimates suggest that a 1 % depreciation of the domestic currency increases exports by 0.38 % and decreases imports by 0.86 %. The sensitivity is not homogenous across sectors. Concentration, indeed, proves significant for imports. The more concentrated the sector, the less depreciation will decrease imports. Accrued exchange rate variability significantly decreases trade volumes. Estimates suggest that this effect is significant only for imports: a 1 % increase in volatility decreases the growth rate of imports by about 0.06 %. The expected exchange rates variable also proves significant, for both imports and exports. In that case, for sectors where dynamics matter, a 1 % expected depreciation induces a 0.04 % drop in imports.

Table 11 – Estimation results of equations (10) and (11) using concentration ratio

	I	Imports	Exports
(PPID)	Producer prices of the declaring country	-0.4986	-0.7878*
		(-1.14)	(-3.80)
(PPIP)	Producer prices of the partner country	-0.4948*	-0.2738
		(-2.51)	(-0.78)
(VP)	Total production of the partner country	0.5418*	0.2952*
		(4.50)	(2.05)
(VD)	Total production of the declaring country	0.2464	0.6017*
		(1.64)	(5.87)
(EIJ)	Bilateral exchange rate between country *I* and country *J*	-0.8598*	0.3816*
		(-5.08)	(2.44)
(ERW)	Dynamics	-0.0376*	0.0370*
		(-3.43)	(3.90)
(VIJ)	Volatility of exchange rate changes	-0.0595*	0.0143
		(-3.38)	(0.73)
(ECON)	Concentration	0.0003**	-0.0001
		(1.98)	(-0.59)
Nob		562	560
R^2		0.21	0.26
F-stat		2.4334*	2.1963*
H-stat		13.0260	11.0590

Note: Figures in brackets denote the t-statistics, R2 is the adjusted R-square, Nob is the number of observations, F-stat is the Fisher statistics for the non-existence of fixed effects, H-stat is the Hausman statistics for the existence of fixed effects versus random effects. F-stat is distributed as a F(11,532) in the case of imports and as a F(11,525) in the case of exports. H-stat is distributed as a 2(11) for imports and as a ÷2(12) in the case of exports.

*: significant at 5 %, **: significant at 10 %.

Source: Authors' calculations.

The results regarding the segmentation indicator are shown in Table 12. Results concerning price variables are both quantitatively and qualitatively similar to those with concentration. Production variables also display results that are qualitatively similar to those concerning concentration.

The exchange rate coefficients E_{IJ} again, have the expected sign but are not significant for exports. A 1 % depreciation in the domestic currency reduces import by about 0.72 %. The coefficients of the expected exchange rate display the expected sign and are significant in the export and the import equations. Variability, again, displays a significantly negative sign in import equation: point estimates suggest that a 1 % increase in variability decrease import growth rate by about 0.06 %.

Table 12 – Estimation results of equations (10) and (11) using the segmentation indicator

		IMPORTS	EXPORTS
(PPID)	Producer prices of the declaring country	-0.3295	-0.8597*
		(-0.76)	(-4.21)
(PPIP)	Producer prices of the partner country	-0.4019**	-0.0008
		(-1.95)	(0.00)
(VP)	Total production of the partner country	0.5404*	0.3923*
		(4.37)	(2.81)
(VD)	Total production of the declaring country	0.1028	0.6109*
		(0.67)	(6.02)
(EIJ)	Bilateral exchange rate between country *I* and country *J*	-0.7247*	0.1241
		(-3.69)	0.72
(ERW)	Dynamics	-0.0220*	0.0310*
		(-2.44)	(4.00)
(VIJ)	Volatility of exchange rate changes	-0.0599*	0.0183
		(-3.21)	(0.93)
(ESEG)	Segmentation	-0.0828	0.4483*
		(-0.38)	(2.42)
Nob		568	565
R^2		0.19	0.26
F-stat		2.0911*	2.8721*
H-stat		12.5980	18.1420

Note: See Table 11. F-stat is distributed as a F(12,537) in the case of imports and as a F(12,529) in the case of exports. H-stat is distributed as a $\div^2(12)$ both for imports and for exports.

*: significant at 5 %, **: significant at 10 %.

Source: Authors' calculations.

Finally, segmentation has a significant sign in the export equation only. The sign is, however, positive. Exports seem to increase more in response to depreciation in the more segmented sectors. This is not in accordance with theory. The segmentation indicator may capture other effects than only imperfect competition.

Results concerning economies of scale ($EMES_S$) are displayed in Table 13.

The results concerning price and production variables are qualitatively similar to those above. The exchange rate coefficients E_{IJ} bear the expected sign and are significant in both

equations. A 1 % depreciation of the domestic currency induces a drop of about 0.8 % in imports and an increase of about 0.41 % in exports. The interaction variable for the expected exchange rate still displays a correct sign and is significant in both the import and the export equations. In these sectors where dynamics is important, an expected 1% depreciation induces approximately a 0.02 % fall in imports and similar increase in exports. Variability, again, displays a significantly negative sign in imports equation. A 1 % rise in volatility induces a fall in the growth rate of imports by about 0.05 %.

Table 13– Estimation results of equations (10) and (11) using the intensity of scale economies

		IMPORTS	**EXPORTS**
(PPID)	Producer prices of the declaring country	0.0180	-0.7169*
		(0.05)	(-3.51)
(PPIP)	Producer prices of the partner country	-0.5093*	-0.0135
		(-2.51)	(-0.04)
(VP)	Total production of the partner country	0.7309*	0.2939**
		(5.69)	(1.91)
(VD)	Total production of the declaring country	0.1512	0.7538*
		(0.92)	(7.23)
(EIJ)	Bilateral exchange rate between country *I* and country *J*	-0.8814*	0.4088*
		(-5.39)	(2.76)
(ERW)	Dynamics	-0.0191*	0.0238*
		(-2.11)	(3.03)
(VIJ)	Volatility of exchange rate changes	-0.0476*	0.0083
		(-2.59)	(0.42)
(EMES)	Scale economies	0.0001	0.0003*
		(0.77)	(2.68)
Nob		499	496
R^2		0.23	0.31
F-stat		3.3510*	2.8614*
H-stat		10.9980	9.7984

Note: see Table 11. F-stat is distributed as a F(9,471) in the case of imports and as a F(9,463) in the case of exports. H-stat is distributed as a $\div^2(9)$ both for imports and for exports.

*: significant at 5 %, **: significant at 10 %

Source: Authors' calculations.

The scale economy variable is significant in the export equation only. When economies of scale are important, depreciations have a higher impact on exports. A similar problem as with the segmentation indicator appears. This is not surprising since the two indicators are closely related.

A final round of regressions was performed using all the sector characteristics (except SEG which is related to MES) in the same regression. Results are displayed in Table 14.

With all variables in the regression, concentration and dynamics are the only characteristics giving a significant and consistent (with theory) effect. Scale economies are not significant for imports and have an unexpected sign for exports. Compared to the regression with concentration ratio only, the results in Table 13 reveal now an effect of concentration also on export. Note that the samples are different due to data availability on scale economies. The sample underlying the results in Table 10 includes two additional sectors (Leat., Wood). The interaction variable with the expected exchange rate is significant and has the right sign in both equations. For these sectors where dynamics matters, point estimates suggest that the impact of an expected depreciation is very close, in magnitude, for both imports and exports.

Table 14 – Estimation results of equations (12) and (13) using all market structure indicators

		IMPORTS	EXPORTS
(PPID)	Producer prices of the declaring country	-0.4559	-0.6074*
		(-1.01)	(-2.90)
(PPIP)	Producer prices of the partner country	-0.4884*	-0.2447
		(-2.41)	(-0.70)
(VP)	Total production of the partner country	0.6871*	0.3254*
		(5.31)	(2.12)
(VD)	Total production of the declaring country	0.2123	0.7178*
		1.27	(6.83)
(EIJ)	Bilateral exchange rate between country I and country J	-1.0538*	0.5657*
		(-5.82)	(3.45)
(ERW)	Dynamics	-0.0334*	0.0348*
		(-2.99)	(3.75)
(VIJ)	Volatility of exchange rate changes	-0.0471*	0.0053
		(-2.57)	(0.27)
(ECON)	Concentration	0.0003*	-0.0003*
		(2.18)	(-2.21)
(EMES)	Scale economies	0.0000	0.0004*
		(-0.03)	(3.26)
Nob		499	496
R^2		0.24	0.32
F-stat		2.9840*	2.9788*
H-stat		11.3240	9.8414

Note: See Table 11. F-stat is distributed as a F(9,470) in the case of imports and as a F(9,432) in the case of exports. H-stat is distributed as a $\div^2(9)$ both for imports and for exports.

*: significant at 5 %, **: significant at 10 %.

Source: Authors' calculations.

In any case subsequent analyses will focus more on concentration ratios and dynamics. Moreover, given that concentration ratios are available for more than one period, it is useful to analyse the sector sensitivity over time.

Exchange rate variability is significant in the imports equation only. Point estimates suggest that a 1 % increase in volatility decreases the growth rate of imports by about 0.04 %. Finally, the results for producer prices and produced quantities are qualitatively similar to our previous findings.

To sum up, the estimation results show that costs considerations and exchange rate are important determinants of trade. Hence competitiveness, as measured by the real exchange rate, is one of the most important determinants of European trade. Exchange rate volatility has an adverse effect on imports. Such a conclusion seems robust to various specifications of imports equations though the literature has never reached a consensus in this respect. The impact of exchange rate changes on trade varies across sectors. Concentration and dynamics explain the variations. The more concentrated is a sector, the less exchange rates change will affect its trade. For goods submitted to hysteresis either on the supply or the demand sides, the more temporary exchange rate changes are, the less trade will be affected.

5. EURO-DOLLAR EXCHANGE RATE GLOBAL IMPACT ON EUROPEAN TRADE

The objective of the paper is to identify sectors, which are the most likely to be affected by the euro/dollar fluctuations. Such an impact depends on the exposure of a given sector to competition from the dollar zone and on its sensitivity to exchange rate variations. For this purpose, the econometric results and CEPII's exposure index are combined. Note that the industrial classification used in section 3 is more detailed than the one used in section 4. For reasons of consistency, the CEPII recalculated the exposure index using the classification adopted in section 4. Finally, to shed further light on the impact on Europe as a whole, the importance and the characteristics of the various sectors will be examined.

5.1. Sensitivity to Exchange Rate Changes and Exposure to the Dollar Zone Competition

To identify the most sensitive sectors to exchange rate fluctuations, we focus only on those coefficients which are significant. The energy sector has the highest coefficient both for imports and exports. Because of its specific characteristics, this sector will be left aside in what follows. With respect to imports, one can distinguish two subsets of sectors. One with relatively high coefficients (equal to or above 1) including food, paper products, machinery, and electrical products. The other with coefficients below 1 including chemicals, rubber and non-metals. Turning to exports, two subsets of sectors can also be distinguished: machinery and transport equipment have coefficients higher than 1, while leather, chemicals, rubber and non metals have coefficients lower than 1. Furthermore, table 9 suggests that differences here are statistically significant. Note also that the "low sensitivity" sectors are broadly similar for imports and exports.

There is no clear correspondence between the degree of sensitivity of the sectors and market structure indicators and in particular to concentration ratios (Table 7). A high sensitivity sector such as transport equipment has a concentration index of 0.43 while a low

sensitivity sector such as rubber has a concentration index of 0.23. Recall that the econometric analysis has shown that concentration has a significant and consistent impact on sectors' sensitivity to exchange rate fluctuations. However, such sensitivity depends also on other factors, which may have an opposite effect to the one of concentration. Given that the estimated coefficients represent the "net effect", the relation between concentration and the coefficients may be blurred. One of these factors was identified in the econometric analysis. For the sectors Chem., Trans., Elec. and Mach., it was found that dynamics considerations increase the sensitivity to exchange rate changes when they are perceived as permanent.

The analysis by the CEPII's team has identified sectors, which are the most exposed to competition from the dollar zone. The team has also distinguished between competition in the European and in the foreign markets. They identified the most exposed sectors to competition from the dollar area, as those sectors with an indicator higher than the average of total manufacturing. Matching their findings with the sector classification used for the econometric analysis (Table 15) implies that **textile products, leather products, machinery and equipment, electrical optical equipment and transport equipment** and, to a lesser extent, **chemicals** are the sectors facing the most important competition from the dollar zone. Competition concerns both the European and foreign markets except for the machinery and equipment and the chemical sectors where competition is more important in foreign markets. The estimated coefficient for textile product is not different from zero neither in the imports nor in the exports equations. The estimated coefficients for leather and chemicals was found to be lower (significantly in the case of exports) than those (when significant) of machinery, electrical and transport equipment. Combining the CEPII's results and the estimation results the classification in table 14 emerges where the most sensitive and the most exposed sectors to the dollar are machinery and equipment, electrical and optical products and transport equipment.

Table 15 – Four sectoral Types

Sensitivity to Exchange Rate	**Exposure to competition from the dollar zone**	
	High	**Low**
High	Machinery and equipment n.e.s. Electrical and optical equipment Transport equipment	Energy products Food products, beverages and tobacco Pulp, paper and paper products, publishing and printing
Low	Textiles and textile products Leather and leather products Chemicals, chemical products and man-made fibres	Wood and wood products Rubber and plastic products Other non-metallic mineral products Basic metals and fabricated metal products

With respect to the importance in the economy, table 16 shows that in general the most important sectors are the same irrespective of the ratio considered (production, employment or trade). These sectors are food, paper products, chemicals, metals, machinery, and electrical products and transport equipment. The three sectors which are highly sensitive to exchange rate and highly exposed to competition from the dollar zone are important and represent together about one third of European output. Except for basic metals, the low sensitivity-low exposed sectors are of low importance in Europe. Among the remaining sectors, chemicals (low sensitivity-high exposure) food and paper (high sensitivity-low exposure for both) are important to the European economy. At the country level, a different picture may appear however. Section six will further investigate in country details.

A detailed assessment of the effect of dollar depreciation on sectoral trade may be conducted using the estimated coefficients. The effects on exports and imports can be separated. The coefficients *Eij* in Table 16 are the elasticity of trade volume to exchange

rate changes and have a straightforward interpretation. For instance, a depreciation of 1% of the dollar should decrease the export of machines to the dollar zone by 1.07 %. It is possible to go beyond such a direct assessment in order to determine the effects on market shares. Combining the estimated coefficients with the market shares computed by the CEPII does this. Abstracting from income effects, the coefficients time the market share and the assumed dollar depreciation give the change in market shares. This is of course crude measuring but sufficient as an indicator of the effect of the dollar changes on sector trade.

Table 16 presents the effects of a 10 % dollar depreciation on the market share of each sector. The last two columns give respectively the change of the dollar zone's market share on the euro zone market and the change of the euro zone market share on the dollar zone market. For instance the 10 % depreciation will decrease the European market share on the dollar zone by one percentage point in the Trans. sector i.e. the market share becomes 3.1 % instead of 4.1 %.

On the import side the most affected sectors are energy and electrical products. The dollar zone market shares in the European market increase by 0.74 and 1.45 percentage points respectively. While the energy products sector may be left aside because of its specificity, the electrical products sector deserves more attention. It is one of the most important sectors in the economy with an already high penetration by the dollar zone and a high sensitivity to exchange rate fluctuations. European producers will highly suffer from such depreciation.

Looking at exports the larger impacts concern machinery and transport equipment. Both are among the most important sectors in Europe. Depreciation will decrease European market share in the dollar zone by 1 percentage point i.e. from 9.10 to 8.10 % and from 4.1 to 3.1 % respectively.

Overall the results suggest that the effect of dollar depreciation will affect the European economy both through a reduction in its market shares in the dollar zone and through a higher penetration of this zone in the European market. On the import side, Ener. And Elec. will be the most affected while on the export side, Mach. and Trans. will be the most affected.

Table 16 – Changes in market shares following a 10 % depreciation of the dollar

SECTOR		$E_{I,J}$ coefficients		Market shares		Changes	
		M	X	The dollar zone in the Euro zone	The euro zone in the dollar zone	The dollar zone in the euro zone	The euro zone in the dollar zone
(Food)	Food products, beverages and tobacco	-1.01	0.24	2.4	1.1	0.24	-0.03
(Text.)	Textiles and textile products	-0.46	-0.29	10.5	2.2	0.48	0.06
(Leat.)	Leather and leather products	-0.08	-0.50	21.8	10.7	0.18	0.54
(Wood)	Wood and wood products	-0.42	0.00	2.3	0.7	0.10	-0.00
(Paper)	Pulp, paper and paper products, publishing and printing	-1.05	0.40	1.9	1.2	0.20	-0.05
(Ener.)	Energy products	-4.37	3.86	1.7	0.8	0.74	-0.31
(Chem.)	Chemicals, chemical products and man-made fibres	-0.79	0.55	4.3	4.1	0.34	-0.23
(Rub.)	Rubber and plastic products	-0.85	0.47	5	2.8	0.42	-0.13
(Min.)	Other non-metallic mineral products	-0.85	0.77	1.2	2.4	0.10	-0.18
(Met.)	Basic metals and fabricated metal products	-0.55	0.35	2.8	3.2	0.16	-0.11
(Mach.)	Machinery and equipment n.e.s.	-1.21	1.07	4.3	9.1	0.52	-0.97
(Elec.)	Electrical and optical equipment	-1.03	0.34	14.1	4.4	1.45	-0.15
(Trans.)	Transport equipment	-0.68	2.45	4.8	4.1	0.33	-1.01

Source: Authors' calculations.

5.2. A Detailed Analysis of Sector Characteristics

In section 5.1 the sectors' potential to be affected by euro/dollar fluctuations was examined on the basis of the exposure indicator and the exchange rate coefficients. The theoretical review in section 2.2 has shown that the two determinants in turn depend on the barriers to trade and market structure. Moreover the impact for the European economy as a whole depends on the importance of the various sectors in Europe. Hence, to shed further light on the impact of the euro/dollar fluctuations on the European economy, this section examines the importance of such characteristics in Europe.

5.2.1. Barriers to trade

Sectors are more or less protected against international competition. Different forms of protection exist, of which tariff protection is the only form compatible with the principles of the GATT and its successor the WTO. Although most tariffs have been reduced in the past decades, non-tariff protection has become more common in the form of voluntary export restraints, import quotas, anti-dumping measures or technical and sanitary regulations. The effects of the different types of protection are difficult to analyse. Messerlin (1999) has proposed a method to estimate tariff equivalents of non-tariff barriers by measuring the increase of consumer prices resulting from protection. Although he used controversial methods, we choose to adapt Messerlin's estimates to our classification (presented in Table 17) as a pedagogic exercise without giving any approval to its estimates. The most protected sectors are by decreasing order food, for which protection adds 30 per cent to the price, clothing, iron and steel, and car manufacturing.

5.2.2 Market structure

In concentrated sectors, the number of firms remains constant with increasing production volumes. High levels of concentration are found in sectors with high entry costs (e.g. with high fixed costs and therefore large-scale economies). In sectors with low levels of concentration, the number of firms increases with production volumes. Entry costs to these sectors are low and concentration ratios fall with an increase of market size. The degree of concentration determines the role of prices in competition. Concentration is measured here by the share of the five largest firms in European production, as given in Davies and Lyons (1996).

The role of prices in competition also depends on the degree of product differentiation. As differentiation can be based on various characteristics, it is difficult to find criteria to classify products. Nevertheless, two types of differentiation can be identified (see Oliveira Martins, 1994). The sale of different product varieties at the same price is referred to as horizontal differentiation. Products are vertically differentiated when they are sold at different prices which customers associate to brands with different qualities. The vertical positioning of a firm on a range of products requires heavy investments in R&D and/or marketing to achieve a brand image. In this study, only horizontal and vertical product differentiation are distinguished (Table 17).

Table 17 – Industry and Market Structures in the EU15, in 1996

	ISIC Code		Employment Structure	Value added structure	Total rate of protection (% of retail Price)	Degree of product Differentiation	Demand elasticity (b)	Exposure to competition (relative to the Mean)	Exports as a Share of Production			Imports as a Share of Final Demand		
									TOTAL	INTRA Europe	EXTRA Europe	TOTAL	INTRA Europe	EXTRA Europe
1	311	Food products	11.6	9.5	30.4	High	1.5	-8.0	22.6	16.3	6.3	22.2	16.4	5.8
2	313	Beverages	1.4	2.6	22.5	High	1.5	-4.0	29.8	16.9	12.9	22.7	18.6	4.1
3	314	Tobacco	0.3	1.6	66.6	High	1.5	-10.0	14.5	10.1	4.4	12.1	10.4	1.6
4	321	Textiles	5.8	3.2	20.3	Low	8.0	1.0	61.3	38.1	23.2	58.3	41.1	17.3
5	322	Clothing	4.5	1.9	31.4	Low	8.0	10.0	78.4	52.5	25.8	84.2	38.5	45.7
6	***323***	Leather products	2.2	0.9	***11.4***	Low	8.0	20.0	94.9	50.3	44.6	94.8	51.2	43.6
7	331	Wood products	3.1	1.7	6.2	Low	4.0	-8.0	17.1	11.5	5.5	17.8	11.4	6.4
8	332	Furniture	3.8	2.0	5.7	Low	1.5	-6.0	38.6	24.3	14.3	35.2	25.6	9.6
9	341	Paper and paper	3.0	3.0	7.6	Low	4.0	-4.0	49.7	31.9	17.8	43.7	35.6	8.1
10	342	Printing and	5.6	4.7	7.5	Low	4.0	-10.0	9.5	5.4	4.1	7.1	5.5	1.5
11	351	Chemical	5.4	7.9	***8.9***	High	1.5	0.0	50.3	29.8	20.5	45.2	32.8	12.4
12	3522	Pharmaceuticals	1.9	2.5	n.a.	High	1.5	-2.0	42.1	21.5	20.6	34.5	24.4	10.1
13	353	Refined	0.5	4.3	***6.7***	Low	1.5	-9.0	17.4	10.4	7.0	16.6	10.5	6.1
14	355	Rubber products	1.4	1.2	7.8	Low	1.5	-2.0	59.3	42.7	16.5	57.4	44.7	12.7
15	356	Plastic products	3.8	3.3	7.7	Low	8.0	-2.0	72.9	51.7	21.3	69.8	57.5	12.3
16	361	Ceramics	1.1	0.6	8.4	Low	3.0	-3.0	46.9	26.8	20.1	38.5	31.1	7.4
17	362	Glass and other	4.3	4.0	***5.8***	Low	3.0	-7.0	25.2	15.1	10.0	20.2	16.1	4.0
18	371	Iron and steel	3.7	3.5	17.7	Low	3.0	-5.0	43.7	27.8	16.0	37.8	30.7	7.0

Table 17 (cont.) – Industry and Market Structures in the EU15, in 1996

	ISIC Code		Employment structure	Value added structure	Total rate of protection (% of retail Price)	Degree of product Differentiation	Demand elasticity (b)	Exposure to competition (relative to the Mean)	Exports as a Share of Production TOTAL	INTRA Europe	EXTRA Europe	Imports as a Share of Final Demand TOTAL	INTRA Europe	EXTRA Europe
19	372	Non-ferrous metals	1.4	1.5	6.8	Low	3.0	-1.0	50.5	34.5	16.0	54.9	31.5	23.4
20	381	Metallic products	10.5	7.8	10.6	High	1.5	-4.0	41.6	24.9	16.7	36.0	27.3	8.7
21	382x	Machinery and equipment	10.9	8.3	4.2	High	1.5	5.0	64.2	28.9	35.3	52.7	38.1	14.6
22	3825	Computer and office	1.1	1.1	9.6	High	1.5	22.0	93.0	63.7	29.3	94.0	54.1	40.0
23	383	Electrical machinery	11.6	9.6	7.4	High	1.5	9.0	70.6	37.8	32.8	67.5	41.8	25.7
24	384-	Transport equipment except	3.5	2.7	***7.5***	High	1.5	16.0	46.6	13.9	32.7	39.1	15.9	23.3
25	3843	Cars	8.2	7.7	14.6	High	1.5	-3.0	67.6	46.8	20.9	62.9	53.7	9.2
26	385	Professional equipment	2.3	1.8	5.9	High	1.5	16.0	84.5	42.1	42.4	83.3	45.2	38.1
27	390	Other manufacturing	1.8	1.1	7.2	Low	8.0	16.0	92.2	57.2	35.0	94.6	69.1	25.6
	300	Total	100.0	100.0	11.0			0.0	48.6	28.9	19.7	44.6	31.1	13.5

Notes : (a) Percentage of the five largest firms in production of European Union except Austria, Finland, and Sweden in 1987.

(b) 2-digits Armington elasticities.

Sources: see Appendix 5.

Homogeneous products are characterised by great sensitivity of demand to price changes. On the basis of a variety of studies, Cortes and Jean (1996) estimated average Armington elasticities at the 2-digit level. Except for refined petroleum, coal and rubber products, they found that low-differentiated products have demand elasticities above three. The high demand elasticity for clothing originates from the heavy competition from emerging countries, which sell at low prices thanks to their cheap labour force.

The cross-section of the two dimensions of concentration and the two of differentiation gives four market types (see Table 18). Firms included in the first and the fourth panels compete mostly through prices. Yet in the latter case product variety also plays a role. European firms belonging to the first panel compete mostly with emerging countries. In the second and third panel, prices are of lesser importance in competition. Firms part of the second panel achieve economies of scale in the production of homogeneous goods, and compete mostly on the basis of production volumes. Enterprises in the third panel produce mostly high-value added goods, which require large investments; their competition is based on the brands offered. Often they have substantial market power.

Table 18– Four Market Types

Product differentiation	**Degree of Concentration**			
	Small		**Large**	
	1		**2**	
Small	356	Plastic products	355	Rubber products
	331	Wood products except furniture	371	Iron and steel
	322	Clothing	372	Non-ferrous metals
	323	Leather products and shoes	353	Refined petroleum and coal products
	332	Furniture		
	342	Printing and publishing		
	321	Textiles		
	361	Ceramics		
	341	Paper and paper products		
	390	Other manufacturing		
	362	Glass and non-metallic products		
	4		**3**	
Large	381	Metallic products	3825	Computers and office equipment
	382x	Machinery and equipment	314	Tobacco
	311,2	Food products	3843	Cars
	3522	Pharmaceuticals	351	Chemical products
			384-cars	Transport equipment except
			383	Electrical machinery
			385	Professional equipment

313	Beverages

Note 1: Sectors are little concentrated if the share of the five largest firms in production is below 25 %.
Note 2: The sectors in the first and fourth panels are arranged by decreasing order of concentration, whereas sectors in the second and third panels are classified by increasing concentration ratios.

5.3. Sectoral Importance in Europe

The effect of devaluation for European manufacturing depends above all on the size of the sectors, which are subject to international competition. Size is estimated by their shares in value added and employment of total manufacturing (as derived from the OECD's STAN database). Metal products and machinery are the largest industries in European manufacturing, and are also the sectors in which Europe is specialised.

Among the sectors subject to competition from countries of the dollar zone, the most important ones in terms of employment are electrical and machinery and equipment, and to a lesser degree textiles and clothing. The impact of a monetary shock on total employment in manufacturing depends therefore on the consequences for those particular industries. Other sectors under competitive pressure, such as professional equipment, computers and office machinery and equipment, are relatively intensive in qualified personnel and represent only a small share of industrial employment in Europe.

Clothing, leather products, shoes and toys are sectors whose share in total value added is far smaller than their share in employment. Therefore labour productivity is smaller than the average of manufacturing. In clothing, European firms compete with firms of the dollar zone (for a large part located in Asia), whose advantage is mainly based on relatively low unit labour costs. The same is true for other sectors, which are relatively less important in terms of employment and even more so in value added terms, such as leather products, shoes and toys. Heavy price competition mainly results from little product differentiation, high demand elasticities, and low sector concentration levels. Despite the protection of European producers of clothing and leather products, firms from the dollar zone manage to compete with them.

Other European sectors which compete heavily with countries of the dollar zone (professional goods, transport equipment, computers and other office machinery) have quite different characteristics: labour productivity are close or above the average of manufacturing, little protection against competition outside Europe, the products sold are highly differentiated with low demand elasticities, concentration ratios are high as well as the degree of openness. Instead of prices, product differentiation is the key factor in competition with the dollar zone.

The most important sectors in terms of employment among those least-exposed to competition from the dollar zone, are food manufacturing, printing and publishing, and glass and other non-metallic products and to a lesser extent wood, furniture and tobacco. In terms of the share in value added, refined petrol is important. Labour productivity in petrol refining and tobacco is largely superior to average manufacturing productivity[8] The limited competition from the dollar zone in petrol refining originates mostly from the small price differences of crude oil between continents. A possible price advantage elsewhere is therefore counter-balanced by transport costs. The globalisation of this sector is mostly through foreign direct investment. High concentration rates in tobacco manufacturing, which enable firms to influence prices, are an important entry barrier for firms of the dollar zone. Moreover, as demand elasticities for tobacco and petrol are low in the short run, prices matter little in competition.

The absence of competition in food manufacturing results from the relatively high rates of protection, as well as high concentration ratios and substantial transport costs, relative to the unit values of products.

5.4. A Summary for EU-11

The sectors that share the same features, as a strong exposition to competition, a high sensitivity to exchange rate fluctuations from the dollar zone and a relatively large importance in the economy, are machinery and equipment, electrical equipment, and transport equipment (Table). That could mean that these sectors that trade highly tradable goods, i.e. goods greatly exposed to foreign competition try to shield themselves by differentiating their products as is shown in table 18 and as it was already stated about the role of dynamics in these sectors. Other strongly exposed sectors such as leather and textiles are relatively unimportant. The sensitivity of the volume of trade of these sectors to exchange rates fluctuations is rather weak while their share in exports and imports is rather strong; That would testify that a vertical differentiation takes place although this variable is strangely given as rather weak in both sectors.

Some sectors such as chemicals, which represent an important share of manufacturing and exports are little sensitive to exchange rates fluctuations. Chemicals seem to be protected by a high concentration ratio and by a strong products differentiation strategy. The other sectors, weakly exposed to the dollar competition and to foreign competition in general are part of the sheltered economy, with one part playing a fairly important role in the economy as the other part remains weak in terms of value added and employment. Energy, food,

[8] These findings are partly explained by the high taxes on these goods. As value-added is estimated on market prices, they include these taxes.

beverages and tobacco, and paper and publishing belong to the first group. The second one covers metal products, plastics and rubber products, other non-metallic products and wood and wood products. Let us remind that in food, clothing and car manufacturing, barriers to trade reduce the sectors' exposure to competition from the dollar zone.

Nonetheless, our comment should be somewhat refined by going into sectoral details. Indeed, in transport equipment, the exposure is strong in aeronautics but weak in the automobiles sector. While the importance of the former in the economy is weak, the importance of the latter is above average. In the electrical machinery sector, the importance of the computers and the professional goods industries is still very limited.

In summary, attention should be given to the following sectors or sub-sectors as their exposure, sensitivity, differentiation and importance in the economy is high: **machinery and equipment and electrical machinery. Transport equipment except for cars**, can be added, even though its contribution to value added and employment is below the average. Nevertheless, its sensitivity to exchange rates fluctuations is high. In terms of total value added and employment, these three sectors represent respectively 23 % and 25 %.

Table 19 – Summary of Sectoral Characteristics

Strongly exposed sectors in EU-11

	Relatively strong importance in the economy (value added and employment)				Relatively weak importance in the economy (value added and employment)		
	Mach.&Eq.	Elect. Mach.	Transport equipment		Textiles*	Leather	Other manuf.
Sensitivity	Strong	strong	strong		weak	weak	
% M	Weak	strong	strong		strong	strong	strong
% X	Strong	strong	strong		strong	strong	strong
Concentration	Weak	strong	strong		weak	weak	weak
Differentiation (dynamics)	Strong	strong	strong		weak	weak	weak

Weakly exposed sectors in EU-11

	Chemicals	Metals	Energy*	Food	Paper, publ.	Plast.&rubber	Other n. metal.	Wood
Sensitivity	Weak	Weak	strong	strong	Strong	weak	weak	weak
% M	Weak	Weak	weak	weak	Weak	weak	weak	weak
% X	Strong	Weak	weak	weak	Weak	weak	weak	weak
Concentration	Strong	Weak	strong	weak	Weak	weak	weak	weak
Differentiation (dynamics)	Strong	Weak	weak	strong	Weak	weak	weak	weak

Source: Authors' calculations.

* The importance of these sectors in employment is rather strong while their magnitude in value added is rather weak.

In italics, some industries have been added due to their distinctive behaviour relative to the sector they belong to.

6. ASYMMETRIES WITHIN EU

Countries are not equally exposed or sensitive to exchange rate fluctuations, even though they have a common currency. Such differences give rise to the so-called asymmetry issue. There in fact many kinds and sources of asymmetries. What is the long-term effect of a monetary Union on such asymmetries? One expect a reduction of asymmetries in general and that if a monetary Union does not reduce asymmetries in the long term, it may fail.

The issues related to some industrial asymmetries are addressed here using our database made up of 15 (countries) x 27 (industries) x 3 (variables) that is to say 1215 primary observations. Below, we first focus on the three biggest economies, Germany, the United Kingdom and France, then we compare the most exposed to the least exposed country, and finally we summarise our data.

6.1. The Largest European Economies Compared: Germany, France and the United-Kingdom

We first compare the largest European countries. With an indicator of 10.8 %, France is the least exposed country out of the three to competition from the dollar zone, followed by Germany, whose exposure is only 1 point higher, and finally the United Kingdom whose exposure is about 50 % above the level of France. The difference between the results for France and Germany on the one hand and the UK on the other hand stems half from the greater penetration of the UK domestic demand by exports of the dollar zone, but also from a more marked presence of British companies in the dollar markets. The geographical orientation of trade then leads to a strong asymmetry (Table 20).

The sectoral results are even more striking and contrasted.

In four cases only France experiences an exposure to the dollar zone well above that of its partners, and in these cases, France exports to the dollar zone are larger then its partners, namely in the glass industry, in steel, beverages and other transport equipment (mainly aeronautics). Where French industries are the most competitive they tend to be world competitors and so are more exposed than average industries. France is thus more present in the dollar zone due to its most competitive products.

The British position exhibits more contrasted features than France does. The most-exposed industries can be tiered in three categories:

– the overly export-oriented industries towards the dollar zone (the British figure is twice as high as that of France) such as tobacco, refined petroleum and automobiles, ceramics, non-ferrous metals, computers and professional goods;

– the second category includes industries with a strong penetration ratio of the dollar zone in the British market (the British figure is half of the French level): wood, rubber, textiles, electrical equipment, machinery and equipment and wearing apparel;

– the third category gathers both the highest importing and exporting industries, from and to the dollar zone, namely publishing and editing, paper, metal products.

Germany's position is relatively moderate. Only two industries stand out with respect to exports, that is plastics and fibres and other manufacturing products (music instruments, toys, etc.). In third markets, Germany exhibits a strong presence in professional goods and in other manufacturing products.

Table 20 - Indicators of exposure for France, Germany and UK to competition from the dollar zone

1996	Import exposure of Fr,Germ.& UK			Export exposure to the $ zone			Non-dollar countries exposure			Total exposure		
In %	Fr.	Ger.	UK	Fr.	Ger.	UK	Fr.	Ger.	UK	Fr.	Ger.	UK
Manufacturing	**3.1**	**3.3**	**5.7**	**6.1**	**6.9**	**8.6**	**1.6**	**1.6**	**1.6**	**10.8**	**11.8**	**15.8**
Food	1.7	1.9	2.0	1.2	0.7	1.3	0.4	0.4	0.2	3.4	3.0	3.5
Refined petroleum and coal	1.6	0.6	0.7	1.0	0.5	2.8	0.1	0.1	0.2	2.6	1.2	3.7
Tobacco	0.0	0.2	0.1	0.1	0.9	3.9	0.2	0.2	0.2	0.3	1.3	4.2
Publishing and editing	0.5	0.4	2.0	1.0	0.7	2.8	0.0	0.1	0.1	1.6	1.1	4.8
Furniture	2.8	1.3	3.0	2.6	1.1	2.5	0.6	0.7	0.4	6.0	3.1	5.9
Iron and steel	0.5	0.8	0.9	8.4	6.6	4.9	0.6	0.4	0.3	9.5	7.8	6.1
Glass and other n. metal. min.prod.	0.8	0.5	2.1	11.1	1.1	3.9	0.9	0.1	0.2	12.9	1.7	6.2
Wood products except furniture	1.9	2.4	5.8	1.6	0.7	0.6	0.4	0.2	0.2	3.9	3.4	6.6
Paper	2.3	2.4	4.4	2.8	4.1	4.1	1.0	1.1	0.6	6.1	7.6	9.0
Plastics	2.0	1.8	3.8	4.3	6.3	4.9	1.8	2.0	1.3	8.2	10.2	10.0
Beverages	1.2	1.4	1.9	14.2	1.3	8.0	1.2	0.2	0.3	16.6	3.0	10.2
Metallic Products	1.7	2.0	3.9	4.9	5.9	6.4	0.7	0.9	0.6	7.2	8.9	10.9
Automobiles	0.6	1.2	1.5	2.9	7.8	8.5	0.9	1.2	1.1	4.4	10.2	11.1
Rubber products	1.6	2.0	4.3	5.2	5.2	5.3	2.1	1.4	1.4	8.9	8.6	11.1
Pharmaceuticals	1.9	2.0	2.5	5.0	4.4	9.2	1.0	0.7	0.9	7.9	7.1	12.6
Textiles	3.2	3.3	7.9	4.6	5.8	6.4	3.3	4.1	2.1	11.1	13.2	16.4
Chemicals except pharmaceuticals	2.4	2.1	3.9	7.4	9.0	10.5	1.7	1.8	2.0	11.5	12.9	16.5
Non-ferrous metals	3.7	2.6	7.6	3.8	5.4	8.3	2.1	1.8	1.9	9.6	9.9	17.8
Machinery and equipment	2.7	1.7	4.9	10.2	12.6	14.5	1.9	1.6	1.7	14.8	15.9	21.1
Wearing apparel	6.5	9.3	13.6	8.2	2.6	5.6	6.5	7.5	6.0	21.2	19.4	25.2
Transport equipment except cars	8.1	11.2	10.0	29.4	9.9	15.5	3.6	3.7	2.1	41.0	24.8	27.6
Professional goods	6.8	5.4	8.1	7.7	15.6	16.3	4.0	6.6	5.5	18.5	27.6	29.9
Electrical machinery	5.2	5.7	8.3	13.3	9.7	17.6	4.4	3.6	4.6	22.9	19.0	30.5
Ceramics	0.7	0.6	2.6	1.8	16.9	25.8	0.4	2.5	2.5	3.0	19.9	30.9
Manufacturing n.e.c	7.9	2.4	1.4	8.3	16.1	16.4	10.1	11.4	13.7	26.3	29.9	31.4
Leather and shoes	6.0	2.4	13.6	15.6	13.1	14.3	12.7	14.0	7.3	34.3	29.4	35.2
Office machinery and computers	8.4	10.3	2.8	6.3	7.1	17.3	11.7	14.2	18.7	26.4	31.6	38.7

Sources: Authors' calculations from CEPII's CHELEM database for trade; UNIDO and national sources for production.

6.2. Ireland against Portugal

If we consider the aggregate measure of exposure to the dollar zone, we find very significant asymmetries within euroland. We can classify countries along a frontier between Southern and Northern countries (Table 21).

Exposure to the US dollar declines from North to South. Ireland, the United Kingdom, the Netherlands and Finland have an exposure ratio above the average. On the contrary, France, Austria, Spain, Greece and Portugal are relatively little exposed, while Italy, Belgium and Germany are within the average. Exposure to the dollar zone is not influenced by the size of the country, a fact that, at first, might be surprising. As small countries are in general more open to trade, one could expect that they would trade relatively more with the dollar zone. But that effect could be offset by the proximity effect: small countries trade relatively more with their neighbours than big countries. This would explain why the Portuguese exposure to the dollar zone is so low, but it does not explain why Ireland is so different from Portugal. Among all EU members, Ireland is by far the most exposed to the dollar zone. How can we explain such differences? First of all, countries are more or less open to external trade: Ireland is twice as open to trade as Portugal (on average for all goods and services (X+M)/GDP respectively equalled to 110 % for Ireland and 59 % for Portugal).

Table 21– Total exposure of individual EU members

Ireland	20.2
Sweden	16.2
United Kingdom	15.8
Netherlands	15.4
Finland	13.3
Belgium	12.5
UE15	12.4
Italy	12.0
Germany	11.8
UE11	11.8
France	10.8
Austria	8.9
Spain	8.2
Greece	7.7
Portugal	6.5

Another explanation is the different industrial structures in terms of value added. We know that some industries are more open to trade than others and that some industries are more developed in the dollar zone than others. Ireland is producing relatively more electronics, electrical and chemical goods than Portugal and the latter is producing more textiles, wearing

apparel and knitting, whose imports from the dollar zone are hindered by the Multi-Fibre Arrangements (Table 22).

The accelerated opening of Portugal since its entry in the EU (international trade grows by more than 10 % per year) together with the dismantling of the MFA could reduce the asymmetries between European countries.

Table 22 – Indicators of exposure for Ireland and Portugal to competition from the dollar zone, 1996

	Import Exposure		Export Exposure to the $ zone		$ Exposure in Third Country		***Total***	
In %	Ireland	Portugal	Ireland	Portugal	Ireland	Portugal	Ireland	Portugal
Manufacturing	**4.8**	**2.0**	**11.7**	**2.8**	**3.7**	**1.7**	**20.2**	**6.5**
Food	1.7	0.8	1.0	0.5	0.2	0.0	2.9	1.4
Refined petroleum and coal	0.1	0.0	3.1	0.0	0.1	0.0	3.3	0.0
Tobacco	1.2	3.1	0.0	2.5	0.3	0.1	1.5	5.7
Publishing and editing	4.3	0.4	0.4	6.5	1.1	0.6	5.8	7.6
Furniture	1.2	2.1	3.5	1.3	0.8	0.2	5.6	3.6
Iron and steel	0.7	0.1	4.8	1.7	0.1	0.2	5.7	1.9
Glass and other n. metal. min.prod.	2.7	0.5	3.5	0.5	1.9	0.5	8.1	1.5
Wood products except furniture	0.9	1.2	2.2	1.9	0.7	0.4	3.7	3.6
Paper	1.9	0.8	2.5	2.0	1.7	1.7	6.1	4.5
Plastics	1.6	0.1	10.2	3.6	0.7	0.8	12.5	4.4
Beverages	3.6	0.9	7.6	3.8	1.7	0.6	12.9	5.3
Metallic Products	0.0	0.6	3.2	0.7	2.7	1.3	5.9	2.5
Automobiles	3.5	0.8	16.4	7.9	4.1	2.3	23.9	10.9
Rubber products	2.3	2.7	3.1	0.7	2.6	1.1	7.9	4.5
Pharmaceuticals	1.4	0.8	13.0	1.5	1.8	0.3	16.1	2.6
Textiles	4.0	1.1	5.8	2.2	2.5	1.0	12.3	4.3
Chemicals except pharmaceuticals	3.9	1.5	3.1	0.3	5.5	0.4	12.4	2.2
Non-ferrous metals	0.1	2.0	21.6	2.1	4.4	1.7	26.1	5.9
Machinery and equipment	3.1	2.5	5.3	4.1	5.3	2.1	13.7	8.6
Wearing apparel	2.2	2.3	18.5	5.4	3.9	1.3	24.6	9.0
Transport equipment except cars	6.5	3.1	16.4	5.3	6.3	6.6	29.1	15.0
Professional goods	3.8	0.3	1.9	2.1	13.6	13.9	19.4	16.3
Electrical machinery	9.9	8.8	20.8	2.2	8.5	1.5	39.2	12.4
Ceramics	6.9	1.1	10.7	5.3	9.8	12.7	27.4	19.0
Manufacturing n.e.c	0.5	5.0	5.9	1.4	19.5	3.5	26.0	9.9
Leather and shoes	0.9	6.3	14.7	1.6	21.9	4.8	37.5	12.7
Office machinery and computers	6.3	4.1	5.7	2.9	13.8	13.8	25.8	20.8

Sources: Authors' calculations from CEPII, CHELEM database for trade; UNIDO and national sources for production.

6.3 Industry by Country Exposure

The asymmetries between European countries with regard to the exposure to the dollar results either from differences in the ***average*** exposure of countries or from large variations of the countries' ***sectoral*** exposure relative to the average of the European Union. To assess the importance of the second explanation an indicator of similarity of industrial structure developed by Freudenberg, Gaulier and Kesenci (1998) was used to measure differences in sectoral exposure across countries:

$$SIM_{i,EU} = 100 * \sum_{k} \left| \frac{Q_{.k}}{Q_{..}} * \left(I_{i.k} - I_{.k} \right) \right|$$

where i is the country, k the sector and the dot stands for EU-15 or for total sectors; Q is the production. I is the indicator of exposure to the competition from the dollar zone. It was divided by the sum of the indicators for all sectors k in country i in order to normalise the similarity indicator to 100. The absolute difference in the indicator of exposure between the country *i* and that of the European Union is weighted by the share of each sector in total production of the EU. The higher the indicator, the more dissimilar the sectoral exposure of a given country is to EU. On the contrary, a low value of this indicator means the country is as exposed on average as in EU-15 for similar sectors.

The sectoral exposure of the United Kingdom and Germany, which indicators are 0.39 and 0.49 respectively, resembles that of the European Union as a whole. On the contrary, the sectoral exposure of Sweden and Austria, two newcomers in the EU, is very dissimilar. While the United Kingdom, which is overexposed by 3.5 points relatively to EU-15, exhibits a weak sectoral dissimilarity in exposure with EU-15, Portugal, the least exposed in EU-15, shows very large differences in sectoral exposure compared to average EU-15 (Table 23).

Table 23: Indicator of similarity of the country's sectoral exposure relative to the EU-15, in %

SWEDEN	**1.19**
AUSTRIA	**1.12**
PORTUGAL	**0.98**
SPAIN	**0.92**
NETHERLANDS	**0.91**
FINLAND	**0.91**
GREECE	**0.88**
IRELAND	**0.86**
ITALY	**0.83**
DENMARK	**0.83**
FRANCE	**0.69**
B&L	**0.59**
GERMANY	**0.48**
UNITED KINGDOM	**0.39**

The discrepancies in the sectoral exposure of EU countries are shown in more detail in Table 24. This table shows the difference between the exposure of each sector in each country and that of the EU as a whole. 12.4 was removed from each figure. Sectors exposed above the average, which are highlighted in the table, are for a large part the same in all countries.

Almost no sector exhibits an exposure equal to the average of the European Union (few zeros). Moreover, it is difficult to identify regularities concerning the asymmetries (a lot of figures being different from zero). Here, our main goal is to identify those sectors in which individual countries are clearly over-exposed relative to the EU average. This is done in three steps:

1. Sectors whose exposure is above the EU average (12.4) are shortlisted. This is shown by the positive numbers highlighted.

2. Within each sector, the countries are identified according to their overexposure relative to the EU average. In the table, the bold letters point to such sectors.

3. Among the countries selected in step 2, are shortlisted those whose exposure is the largest compared to the average, i.e. at least by 4.5 points. These countries are marked in red.

The UK, Ireland, the Netherlands and Sweden have relatively more sectors in which they are exposed relatively to the sectoral average of EU 15 while Portugal, Austria, Spain and Greece are relatively more shielded from the competition from the dollar zone.

Table24 : Sectors exposure to the dollar zone, in difference with the EU manufacturing average, in %

	EU-15	UK	DK	GR	SW	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Manufacturing	0,0	3,4	-1,1	-4,6	3,8	-1,6	-0,6	-0,4	7,8	-4,2	-5,9	3,0	0,1	0,9	-3,5
Food	-8,2	-8,9	**-3,9**	**-7,8**	-10,5	-9,0	-9,4	**-7,1**	**-6,8**	**-7,7**	-8,7	**-4,3**	**-8,0**	-11,0	-11,3
Textiles	0,4	**4,0**	-2,3	-4,9	**3,5**	-1,3	**0,9**	**1,0**	**1,3**	-2,2	-3,8	-1,0	**2,0**	-1,8	-3,2
Wearing apparel	9,3	**12,9**	**12,0**	3,9	**12,6**	8,8	7,0	**15,3**	7,0	-2,9	4,0	4,1	1,3	6,5	4,1
Leather	20,1	**22,8**	15,9	11,4	19,7	**21,9**	17,1	**25,6**	13,4	14,8	8,4	14,9	13,7	12,8	7,5
Wood	-8,3	**-5,8**	-8,3	-9,0	-10,6	-8,5	-9,0	**-7,5**	**-6,6**	-10,1	**-4,8**	**-3,8**	**-5,7**	-10,7	-9,8
Furniture	-6,3	-6,5	**-0,9**	-7,8	**-3,8**	-6,4	-9,3	**5,2**	**-4,3**	-8,7	-10,9	**-4,6**	-7,7	-8,4	-10,0
Publishing	-10,2	**-7,6**	-11,1	-11,0	-11,5	-10,8	-11,3	-10,3	**-9,5**	**-9,6**	-11,0	-11,0	-11,2	-11,8	-11,7
Plastics	-3,1	**-2,4**	-5,0	-6,0	**-2,8**	-4,2	**-2,2**	**-2,1**	**-0,1**	-6,0	-8,1	**-2,8**	-3,4	-4,4	-4,6
Metal products	-3,6	**-1,4**	-6,7	-6,3	**-2,1**	-5,1	**-3,5**	**0,5**	**0,5**	-7,3	-7,1	-3,6	-4,8	-4,4	-5,7
Non electrical machin.	5,3	**8,7**	4,3	2,1	**9,8**	2,4	3,5	**8,3**	**12,2**	-0,3	-3,4	**9,8**	**6,4**	5,3	**5,9**
Professional goods	12,9	**17,5**	3,2	5,2	**17,7**	6,1	**15,2**	12,2	**15,0**	12,8	6,6	**16,0**	6,1	**16,3**	9,2
Manufacturing nec	13,4	**19,1**	**16,3**	11,6	12,7	**13,9**	**17,5**	7,2	**13,6**	7,7	-2,4	9,4	**13,7**	**14,5**	9,0
Chemicals	-0,2	**4,1**	-2,0	-4,0	-7,2	-0,9	**0,5**	-4,9	**13,7**	-3,1	-6,5	**4,1**	-0,4	-4,9	-7,0
Beverages	-4,4	**-2,2**	-9,5	-10,7	**-2,1**	**4,2**	-9,4	-3,1	**0,1**	-10,1	-7,9	**8,3**	-4,8	-6,4	-10,9
Tobacco	-9,8	**-8,2**	-11,4	-11,5	-10,0	-12,1	-11,1	-12,4	**-9,1**	-10,5	-12,4	**-8,2**	**7,5**	**-1,8**	-12,2
Paper	-4,5	**-3,4**	-9,0	-6,1	**-2,6**	-6,3	-4,8	-4,8	-6,3	-7,7	-7,9	**-1,9**	**-3,7**	**-1,7**	**-3,9**
Refined petrol., coal	-9,2	**-8,6**	-11,2	-9,3	-10,0	-9,7	-11,2	**-8,4**	-10,9	**-5,1**	**-6,7**	**-7,3**	**-8,9**	**-1,2**	-12,3
Rubber	-3,0	**-1,3**	**-2,4**	**0,8**	**1,3**	-3,5	-3,8	**-2,7**	-4,5	**-1,2**	-7,9	**-2,2**	-4,5	-4,5	-7,1
Ceramics	-3,5	**18,5**	**-1,8**	**-0,3**	**0,3**	-9,4	**7,5**	-4,4	**11,5**	**9,4**	**-1,5**	**-2,5**	-9,6	-9,4	**4,2**
Glass, oth. n. met. pr.	-7,5	**-6,2**	-10,5	**-4,6**	-7,7	**0,5**	-10,7	**14,0**	**-6,7**	**2,5**	-10,5	-9,9	**-6,7**	-8,5	-8,9
Iron & steel	-5,1	-6,3	-7,7	**-2,0**	**-1,7**	**-2,9**	**-4,6**	-5,7	-8,7	-8,2	-8,8	**2,6**	**-2,3**	**-4,8**	-8,5
Non ferrous metals	-1,2	**5,4**	-8,0	-3,8	-1,7	-2,7	-2,5	-2,8	**0,0**	-4,5	-10,2	**0,9**	**3,2**	-3,3	-7,6
Electrical machinery	9,5	**18,1**	**9,6**	-4,1	**18,7**	**10,5**	6,7	5,5	**16,7**	3,2	2,6	8,5	8,7	**12,4**	-1,3
Pharmaceuticals	-2,4	**0,2**	-3,2	-10,9	**9,7**	-4,5	-5,3	**2,3**	**3,8**	-8,6	-9,8	**5,9**	**9,6**	-4,5	**0,8**
Computers	21,5	**26,3**	15,2	19,9	**28,6**	14,0	19,2	14,7	**25,2**	**22,9**	0,3	14,7	**22,7**	**25,3**	19,7
Transport except cars	15,5	15,3	5,6	**20,7**	3,1	**28,7**	12,4	2,2	**26,8**	3,3	0,1	**28,5**	**21,3**	**34,0**	11,3
Automobiles	-3.8	**-1.3**	**-3.4**	-6.3	**14.1**	-8.0	**-2.2**	**-3.6**	-6.5	-6.6	-9.8	-7.1	-6.2	**0.6**	**-1.8**

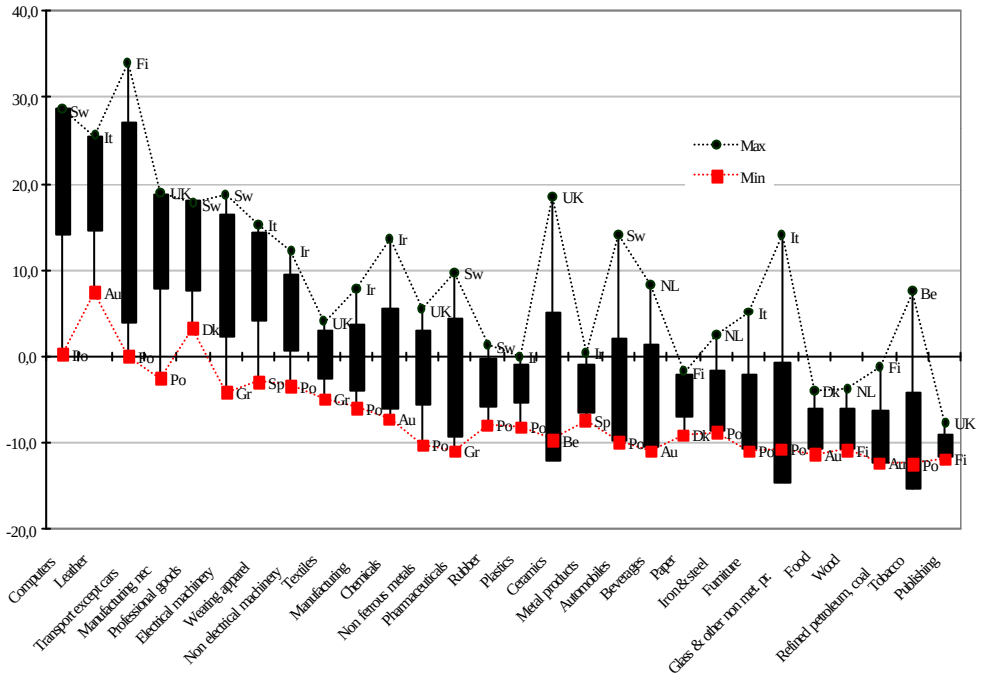
Notes: The EU average (12.4) was deducted from all figures. The marked lines indicate positive figures above the EU average. The bold figures show those sectors more exposed than the EU sector average (first column). Figures in red indicate those countries the exposure of which is at least 4.5 points higher than the to EU average for the sector. As the exposure of EU-15 and EU-11 are much alike, we only show the results for EU-15.

Sources: Authors' calculations.

Graph 7 shows the dispersion by sector of manufacturing, as well as how they are exposed relative to the average. The dark bar indicates one standard deviation around the mean (+ or -). The middle of the bar equals the mean. Sectors with a positive mean are the over-exposed sectors in EU, i.e. the first nine sectors. Among them, Italy is the most over-exposed in leather and wearing apparel, Sweden in computers, professional goods and electrical machinery, the UK in other manufacturing and textiles. The dispersion is the largest for transport equipment except cars and ceramics, and very small for publishing and plastics.

Table 25 summarises the sectors having an exposure above the EU sectoral average by at least 4.5 points. In three sectors, transport except cars, pharmaceuticals and ceramics, several countries are over-exposed to competition from the dollar zone. At the very extreme, only one country is over-exposed for such sectors as chemicals or automobiles for example. The UK and Italy experience a strong exposure relative to EU sectoral average for ceramics and glass respectively.

Graph 7 – Dispersion of the indicator of exposure across sectors



Notes: The red line indicates the minimum values of the indicator of exposure relative to the EU average and the black one the maximum values. The dark bar is the mean plus or minus one standard deviation and shows the dispersion within one sector. The middle of the dark bar is thus the sectoral average relative to EU 15. The dispersion is not necessarily included in the minimum and maximum bracket as the standard deviation is computed against a weighted average. The graph is also sorted by the sectoral average relative to EU 15.

Sources:Authors'calculations.

Table 25– Asymmetries by industry

Transport except cars: Finland, France, Netherlands, Ireland, Belgium & Lux., Greece.
Pharmaceuticals: Sweden, Belgium & Lux., Netherlands, Ireland, Italy.
Ceramics: UK, Ireland, Spain, Germany, Austria.
Non electrical mach.: Ireland, Sweden, Netherlands.
Electrical mach.: Sweden, UK, Ireland.
Glass: Italy, Spain, France.
Beverages: Netherlands, France, Ireland.
Computers: Sweden, UK.
Professional goods: Sweden, UK.
Non ferrous metals: UK, Belgium & Lux.
Tobacco: Belgium & Lux, Finland.
Furniture: Italy, Denmark.
Chemicals: Ireland.
Wearing apparel: Italy.
Leather: Italy.
Automobiles: Sweden.
Iron & steel: Netherlands.
Wood: Netherlands.
Refined petrol.: Finland.
Manufacturing n.e.c.: UK.

6.4 Exposure and sensitivity: a synthesis

Table 26 presents value added and employment of the over-exposed sectors of each country (the bold figures in Table 24) along with value added and employment of sectors as defined in step 3 (the red figures in Table 24).

The over-exposed sectors in the individual countries make up a large part of value added and employment in the UK, Ireland, United Kingdom, Sweden and Italy. This bunch of countries is also over-exposed in terms of value-added and employment in the over-exposed sectors of EU, as the latter account for one to two fifths of these countries' total value added and employment.

When the most over-exposed sectors by country (by 4.5 points above the EU sectoral average) are taken into consideration, Ireland, Sweden, the Netherlands, Italy, the UK and Belgium could be the most affected in terms of value added and employment (column 2 of Table 26) in the wake of a dollar shock.

Table 27 summarises the sensitivity differences across the over-exposed sectors identified in our "specific exposure list" (Table 25). As a reminder, the over-exposed sectors in countries being over-exposed in the EU which are sensitive to exchange rates fluctuations are: transport, non electrical machinery, electrical machinery, computers and professional goods.

Table 26– Breakdown of value added and employment, 1996

	In % of value added		In % of employment	
	Total exposed sectors	The most exposed sectors (step 3)	**Total exposed sectors**	The most exposed sectors (step 3)
UE-15	**(30.6)**		**(43.7)**	
UK	**80.1**	14.9	**80.1**	17.8
DK	**30.2**	3.4	**32.8**	4.7
GR	**32.3**	0.0	**30.5**	0.0
SW	**68.1**	38.1	**65.7**	38.7
FR	**25.1**	9.3	**25.6**	7.3
GE	**41.9**	0.3	**41.7**	0.5
IT	**63.7**	16.6	**71.4**	23.2
IR	**97.6**	60.8	**92.4**	37.9
SP	**29.7**	7.3	**27.1**	6.6
PO	**5.5**	0.0	**8.4**	0.0
NL	**65.8**	20.3	**55.7**	19.9
BL	**55.9**	13.4	**52.6**	12.6
FI	**43.8**	7.7	**35.0**	6.7
AU	**22.1**	0.3	**19.6**	0.4

Sources : OECD, STAN database.

Table 27– The most exposed sectors in individual countries: sensitivity to exchange rates fluctuations

	Tr.	Pha.	Cer.	N. elec.	Elec.	Glass	Bever.	Comp.	Prof. G.	N. fer. M.	Tobac.	Furn.	Chem.	Wearing	Leather	Auto.	Iron	Wood	Ref. pet.
IR	+	-	-	+	+		+						-						
IT		-				-						-		-	-				
SW		-		+	+			+	+						-	+			
SP			-			-													
GR	+														-				
FR	+					-	+												
GE			-																
AU			-																
FI	+										+								+
DK												-							
NL	+	-		+			+										-	-	
PO																			
BL	+	-								-	+								
UK			-		+			+	+	-			-						

Sources: Authors' calculations (see the econometric analysis).

A final list of over-exposed countries for sensitive sectors emerges for which we assess the share in value added and employment of total manufacturing as well as the rate of import penetration and export openness (Table 28). A separate comment on over-exposed sectors in EU-15 on the one hand and on the remaining sectors on the other hand can be furthered.

Ireland and Sweden, the countries with the highest value added and employment shares in sectors that are over-exposed relative to the EU average, will be the most likely to be affected by a dollar shock. As for export openness, Sweden, the UK and the Netherlands happen to be more concerned by an hypothetical dollar shock, in sectors which are also over-exposed in EU-15. Overall, the contributions of the over-exposed sectors in EU-15 (Non electrical and electrical machinery, professional goods, computers and transport except cars) explain the specific sectoral exposure of most countries (except France and Finland).

The remaining sectors are made up of beverages, tobacco, refined petroleum and automobiles. Sweden is very exposed as it is specialised in automobiles, relatively more than the EU-15 average in terms of value added, employment and exports. In Ireland and the Netherlands, beverages account for a share in value added above the one of EU. The openness degree (exports relative to production) is moreover quite important for beverages in France and the Netherlands (around 25 %). The weakness at least of tobacco's value added in Belgium and Finland involves that this sector should be put aside. The same line can be repeated for refined petroleum as it does not weigh much in Finland's value added. In the Netherlands and Ireland, beverages contributes more to value added than it does at the EU-15 level.

Automobiles and beverages could claim to complete the EU sectors list. Hence, if we refine the list of overexposed sectors to competition from the dollar zone for EU-15 taking into account sectors' sensitivity to exchange rates fluctuations, their importance in the economy and the relevant market structure characteristics such as concentration and differentiation, by adding those sectors described above, the list becomes:

– Machinery and equipment;
– Electrical machinery (Electrical industry, professional goods and computers);
– Transport equipment except cars.
and
– Automobiles;
– Beverages.

Table 28 – High exposure - high sensitivity sectors

1. **In % of a country's total manufacturing value added**

	UE-15	UK	GR	SW	FR	IR	NL	B&L	FI
N. elect. Mach.	8.3			**12.8**		**14.8**	7.1		
Prof. Goods	1.8	1.7		**3.2**					
Beverages	2.6				2.3	**4.0**	**3.8**		
Tobacco	1.6							0.7	0.4
Ref. petr., coal	4.3								2.6
Elec. mach.	9.6	8.8		7.4		**18.3**			
Computers	1.1	1.8		**2.4**					
Transport except cars	2.7		**5.3**			1.1	2.6	**7.9**	**4.7**
Automobiles	7.7			**9.0**					
Total		12.2	5.3	34.7	2.3	38.2	13.5	8.5	7.7

2. **In % of a country total manufacturing employment**

	UE-15	UK	GR	SW	FR	IR	NL	B&L	FI
N. elect. Mach.	10.9			**12.4**		9.3	8.9		
Prof. Goods	2.3	1.9		**2.6**					
Beverages	1.4				1.0	**2.1**	1.2		
Tobacco	0.3							**0.7**	0.2
Ref. petr.. coal	0.5								**0.8**
Elec. mach.	11.6	11.3		9.2		**14.3**			
Computers	1.1	**1.6**		**3.3**					
Transport except cars	3.5		**4.5**			**4.0**	**3.8**	**10.7**	**5.6**
Automobiles	8.2			**9.2**					
Total		14.8	4.5	36.8	1.0	29.7	13.9	11.4	6.7

3. **Import penetration**

	UE-15	UK	GR	SW	FR	IR	NL	B&L	FI
N. elect. Mach.	14.4			13.6		**22.7**	**24.6**		
Prof. Goods	36.6	31.4		23.6					
Beverages	4.1				3.7	3.7	**13.7**		
Tobacco	1.6							**28.8**	**11.8**
Ref. petr.. coal	6.1								**25.3**
Elec. mach.	25.2	**36.0**		16.7		22.2			
Computers	39.5	**42.6**		17.9					
Transport except cars	23.1		**57.2**			**62.2**	**42.9**	**34.7**	**42.6**
Automobiles	9.0			**11.6**					
Total		36.8	57.2	15.4	3.7	21.8	25.4	37.9	32.6

4. **Export openness**

	UE-15	UK	GR	SW	FR	IR	NL	B&L	FI
N. elect. Mach.	33.9			**36.9**		32.6	**36.8**		
Prof. Goods	40.0	34.0		**43.4**					
Beverages	12.8				**26.2**	12.6	**24.5**		
Tobacco	4.4							3.6	3.8
Ref. petr.. coal	6.5								**23.0**
Elec. mach.	31.1	**31.8**		**48.7**		25.3			
Computers	28.4	**37.0**		**47.9**					

Transport except cars	32.2	8.4			30.5	**32.8**	16.4	**42.1**
Automobiles	19.5		**42.1**					
Total	33.6	8.4	43.3	26.2	24.4	33.2	12.5	31.1

Notes: Openness is the share of goods exported outside the EU in production, import penetration is the share of goods imported from outside the EU in final demand. Figures above the EU average are in bold.

Sources: Authors' calculations from OECD, Stan database.

GENERAL CONCLUSION

From a sectors point of view, our study showed that some sectors such as machinery equipment, electrical equipment and transport equipment are both overexposed to the competition from the dollar zone and sensitive to dollar fluctuations. These sectors are relatively important in the EU. Moreover, they are characterised by high concentration ratios and dynamics. These two market structure characteristics were identified in the econometric analysis as those explaining exchange rate differences across sectors. At a country level, among the big countries, the UK is the most exposed to the competition from the dollar zone and France the least. In EU, Ireland is the most exposed and Portugal the least. Nevertheless, the UK is the most similar to EU 15 in terms of industrial exposure and Portugal one among the least. It was also shown that the over-exposed sectors in EU-15 are often the most exposed for individual countries, the most sensitive to exchange rates fluctuations and the most likely to be affected in terms of value added, employment and exports. In addition, automobiles and beverages could complete the EU sectors list at the margin.

Monetary Union improves dramatically the consistency of the European Union for two reasons: firstly, the establishment of the single market has increased trade between its member countries, secondly, it increases price transparency and leads to the convergence and equalisation of prices in the long run. If not on a voluntary basis it will be through the reinforcement of a strong competition policy within the Commission which will give the necessary incentives (in general) as can be seen from the automotive sector example. These two effects combined may increase the market power of Europe in world trade.

Increasing market power does not mean that Europe will become less open to world trade. On the contrary, for the Monetary Union as a whole, the possible future enlargement with the United Kingdom and Sweden will increase exposure of the monetary Union to the dollar zone. Further enlargement to eastern countries will have rather mixed effects from that point of view since they are more European oriented than the United Kingdom for example.

Globally, several trends will contribute to increased exposure to the dollar: firstly, the rise in world trade. One of the major sources of growth is the increased market access to developing countries following the multilateral trade negotiations as part of the WTO framework. Secondly, the development of the "new economy" will increase the trade in products and services related to ICT. Another effect of the new economy is the reduction of the cost of international trade, and the reinforcement of the international division of labour. Since many parts of these new industries linked to the new economy are located in developing (notably Asian emerging countries) countries and the fact that their trade is one of the most dynamic, then this will contribute to the development of trade with the dollar zone. Finally, despite many difficulties, multilateral trade

negotiations have made important progress in the liberalisation of information industries (zero tariff) and financial sectors.

REFERENCES

ABD-EL-RAHMAN, K. (1986), "Réexamen de la définition et de la mesure des échanges croisés de produits similaires entre les nations", *Revue Économique*, n° 1.

AGLIETTA M., C. BAULANT & V. COUDERT (1998), "Pourquoi l'euro sera-t-il fort ? Une approche par le taux de change d'équilibre", *Revue Économique*, vol. 49, n° 3, mai.

ATHUKORALA P. & J. MENON (1995), "Exchange Rates and Strategic Pricing: The Case of Swedish Machinery Exports", *Oxford Bulletin of Economics and Statistics*, 57, 4, pp. 533-545.

BALASSA B. (1986), "Intra-Industry Specialisation: A Cross-Section Analysis", *European Economic Review*, vol. 30, n° 1.

BALDWIN R. & P. KRUGMAN (1989), "Persistent Trade Effects of Large Exchange Rate Shocks", *Quarterly Journal of Economics*, vol. CIV, Issue 4, November 1989.

BISMUT C. & J. OLIVEIRA-MARTINS (1986), "Le rôle des prix dans la compétition internationale entre l'Europe, les États-Unis et le Japon", in *Industrie mondiale : la compétitivité à tout prix*, sous la Direction de M. Fouquin, Economica.

BÉNASSY-QUÉRÉ, A. (1996), "Potentialities and Opportunities of the Euro as an International Currency", CEPII, *Document de travail*, n°96-09.

CADIOU L., O. CORTES & C. LEFÈVRE (1997), "L'impact sectoriel du taux de change du dollar", *La lettre du CEPII*, n°157, mai, La Documentation Française.

CAMPA J. & L. GOLDBERG (1997), "The Evolving External Orientation of Manufacturing: A Profile of Four Countries", *Economic Policy Review*, July, Federal Reserve Board of New York,.

CAMPA J. & L. GOLDBERG (1998), "Employment versus wage adjustment and the U.S. dollar", Federal Reserve Board of New York, *Staff Reports*, n° 56, December, 1998.

CEPII (1998), *Compétitivité des Nations*, Economica, Paris.

COPPEL J. & M. DURAND (1999), "Trends in Market Openness", OECD, Economic Department, *Working Papers*, n°221.

CORTES O. & S. JEAN (1996), "Pays émergents, emploi déficient ?", CEPII, *Document de travail*, n° 96-05, Paris.

DAVIES S. & B. LYONS (1996), *Industrial Organization in the European Union*, Oxford University Press, Oxford.

DIXIT A. (1989), "Entry and Exit Decisions under Uncertainty", *Journal of Political Economy*, vol. 97, n° 3, pp. 620-638.

DORNBUSH R. (1987), "Exchange Rates and Prices", *American Economic Review*, vol. 77, n° 1, March, pp. 93-106.

FEENSTRA R. (1989), "Symmetric Pass-Through of Tariffs and Exchange Rates under Imperfect Competition: An Empirical Test", *Journal of International Economics*, vol. 27, August, pp. 25-45.

FEINBERG R. (1986), "The Interaction of Foreign Exchange and Market Power Effects on German Domestic Prices", *Journal of Industrial Economics*, September, pp. 61-70.

FONTAGNÉ L., M. FREUDENBERG (1997),"Intra-industry Trade: Methodological Issues Reconsidered", CEPII, working paper, n°97-01 January.

FONTAGNÉ L., M. FREUDENBERG & D. ÜNAL-KESENCI (1996), "Statistical Analysis of Trade in Intermediate Products", Eurostat, 6D series.

FREUDENBERG M., G. GAULIER & D. ÜNAL-KESENCI (1998), "Proximité géo-économique et échanges commerciaux", *Economie Internationale*, n°74, 2ème trimestre.

FREUDENBERG M. (1998),"Echanges Intra-branche et nature des relations internationales des pays de la Communauté Européenne", Thése de Doctorat, Université de Paris1 Panthéon Sorbonne.

FRENKEL J. &ROSE A. (2000),"Estimating the Effect of Currency Unions on Trade and Output", NBER, *Working Paper*, n°7857, August 2000.

FROOT K. & P. KLEMPERER (1989), "Exchange Rate Pass-Through When Market Share Matters", *American Economic Review*, vol. 79, n° 4, September, pp. 636-654.

GOLBERG L. and K. CROCKETT (1998), "The Dollar and US Manufacturing", Federal Reserve Board of New York, *Current Issues in Economics and Finance*, Vol. 4, n°12.

KRUGMAN P. (1991a), *Geography and Trade*, Cambridge, the MIT Press.

KRUGMAN P. (1991b), "Increasing Returns and Economic Geography", *Journal of Political Economy*.

MANN C. (1989), "Prices, Profit Margins, and Exchange Rates", *Federal Reserve Bulletin*, 72, pp. 366-379.

MARTSON R. (1990), "Pricing To Market in Japanese Manufacturing", *Journal of International Economics*, 29, pp. 217-236.

MENON J. (1995), "Exchange Rate Pass-Through", *Journal of Economic Surveys*, pp. 197-231.

MESSERLIN, P.A. (2000), *Measuring the Cost of Protection in Europe*, Institute for International Economics, Washington DC, forthcoming.

OLIVEIRA MARTINS, J. (1994), "Structure du marché, échanges et salaires dans l'industrie", OECD, *Revue économique*, , n° 22, pp. 143-168.

OHNO K. (1989), "Export Pricing Behaviour of Manufacturing : A US-Japan Comparison", International Monetary Fund, *Staff Papers*, 36, September, pp. 550-579.

SAPIR A. & Kh. SEKKAT (1995), "Exchange Rate Regime and Trade Prices: Does the EMS Matter? ", *Journal of International Economics*, 38, pp. 75-94.

SEKKAT Kh. (1998), "Exchange Rate Variability and EU Trade", *European Commission Economic Papers*, n° 127, February.

UNIDO (1997), "Industrial Development Global", Report 1997, Vienna.

APPENDIX

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APPENDIX 1 – THREE ZONES

European Union	**Dollar zone**	**Others**
(15 countries)	**(25 countries)**	**(14 countries)**
Austria	Algeria	Czech Republic
Belgium-Luxembourg	Argentina	Hungary
Denmark	Australia	Japan
Finland	Brazil	Morocco
France	Canada	New-Zealand
Germany	Chile	Norway
Greece	China	Poland
Ireland	Colombia	Romania
Italy	Ecuador	Russia
Netherlands	Egypt	South Africa
Portugal	Hong Kong	Switzerland
Spain	India	Tunisia
Sweden	Indonesia	Turkey
United Kingdom	Israel	Venezuela
	Korea	
	Malaysia	
	Mexico	
	Pakistan	
	Peru	
	Philippines	
	Saudi-Arabia	
	Singapore	
	Taiwan	
	Thailand	
	United States	

APPENDIX 2 – SECTORAL BREAKDOWN: PRODUCTION (ISIC, NACE) & TRADE (CHELEM)

	ISIC, Rev 2	NACE	CHELEM
Total manufacturing	300	D	
1. Food products	311	15	KA…KG
2. Textiles	321	17	DA+DD
3. Clothing	322	18	DB+DC
4. Leather products and shoes	323+324	19	DE
5. Wood products except furniture	331	20	EA
6. Furniture	332	36	EB
7. Printing and publishing	342	22	ED
8. Plastic products	356	25	GH
9. Metallic products	381	28	FA+FB
10. Machinery and equipment	382-3825	29	FC. FH
11. Professional goods	385	33	FI. FK
12. Other manufacturing	390	36+37	EE
13. Chemicals except pharmaceuticals	351+352-3522	24	GA..GE, GG
14. Beverages	313	15	KH
15. Tobacco	314	16	KI
16. Paper and paper products	341	21	EC
17. Refined petroleum and coal	353+354	23	IG+IH
18. Rubber products	355	25	GI
19. Ceramics	361	26	BB
20. Glass and other non-metallic product	362+369	26	BA..BC
21. Iron and steel	371	27	CA+CB
22. Non-ferrous metals	372	27	CC
23. Electrical machinery	383	31+32	FL..FN, FP..FR
24. Pharmaceuticals	3522	24	GF
25. Computers and other office	3825	30	FO
26. Transport equipment except cars	384-3843	35	FV+FW
27. Cars	3843	34	FS..FU

APPENDIX 3 – DATA BASES

Production

Sources:

– UNIDO, *Industrial Statistics Data Base 1999*, CD-ROM.

Other sources:

– UNIDO, « Industrial Development Global Report 1997 » et UNIDO Web-site: Saudi Arabia, Pakistan, Peru, Thailand;

– OECD, STAN Database: Australia, Mexico, New-Zealand;

– OECD, Economic Studies: Romania;

– European Commission, DEBA Database: Germany, France, Italy.

National Sources: Czech Republic, Hong-Kong, Egypt.

Bilateral Trade

Sources:

– CEPII, CHELEM Database, CD-ROM 1999.

Other sources:

– IMF, *Direction of Trade Statistics*, for Saudi Arabia, Czech Republic, Russia.

APPENDIX 4 – COMPETITION AND MARKET SHARES

Table A4.1a. – Competition of the dollar zone against EMU-11, 1996

	EMU-11			dollar zone			1/3 zone		
In %	Share in EU-11 prod.	MS $ zone	Indicator	Share in EU-11 prod.	MS $ zone	Indicator	Indicator	Total	*Rel. total*
Manufacturing	**81.4**	**5.3**	**4.3**	**7.4**	**90.5**	**6.7**	**0.7**	**11.7**	
Leather and shoes	60.0	21.8	13.0	17.3	85.5	14.8	4.6	32.5	**21**
Office machinery and computers	62.0	26.6	16.5	10.0	82.9	8.3	7.7	32.5	**21**
Transport equipment except cars	75.0	16.4	12.3	17.8	89.3	15.9	1.4	29.6	**18**
Manufacturing n.e.c.	69.0	17.4	12.0	10.1	85.4	8.7	4.2	24.9	**13**
Professional goods	65.7	14.0	9.2	16.3	78.3	12.7	2.7	24.6	**13**
Wearing apparel	75.0	13.9	10.4	6.9	95.8	6.7	4.1	21.2	**9**
Electrical machinery	72.2	9.9	7.1	12.4	84.2	10.4	2.1	19.7	**8**
Machinery equipment	70.0	4.3	3.0	16.6	79.2	13.1	0.9	17.0	**5**
Textiles	76.4	7.0	5.4	6.0	95.5	5.7	1.3	12.4	**1**
Chemicals except pharmaceuticals	80.4	4.6	3.7	8.3	90.3	7.5	0.6	11.8	**0**
Non-ferrous metals	85.0	5.3	4.5	5.4	91.1	4.9	0.7	10.1	**-2**
Pharmaceuticals	83.2	3.4	2.8	6.8	92.5	6.3	0.3	9.4	**-2**
Plastics	79.3	4.3	3.4	5.6	92.6	5.2	0.7	9.3	**-2**
Rubber products	82.6	4.1	3.3	5.5	93.2	5.1	0.6	9.0	**-3**
Metallic Products	84.2	2.8	2.4	6.4	91.1	5.8	0.3	8.5	**-3**
Ceramics	86.2	1.8	1.6	6.5	91.5	5.9	0.6	8.1	**-4**
Automobiles	79.4	2.1	1.7	6.3	88.2	5.6	0.6	7.8	**-4**
Paper	84.7	3.6	3.1	4.4	96.3	4.2	0.4	7.7	**-4**

Table A4. (cont.)1a. – Competition of the dollar zone against EMU-11, 1996

In %	EMU-11			dollar zone			1/3 zone		
	Share in EU-11 production	Market share of the $ zone	Indicator	Share in EU-11 production	Market share of the $ zone	Indicator	Indicator	Total	*Relative total*
Beverages	85.4	2.2	1.9	5.8	95.3	5.6	0.2	7.6	**-4**
Iron and steel	85.1	1.3	1.1	6.8	89.1	6.1	0.1	7.3	**-4**
Furniture	87.6	2.2	1.9	4.0	95.5	3.8	0.5	6.2	**-6**
Glass and other non metallic min. prod.	90.9	0.8	0.8	4.1	96.4	4.0	0.1	4.8	**-7**
Food	93.7	2.6	2.4	1.7	98.0	1.6	0.1	4.2	**-8**
Wood products except furniture	93.9	2.3	2.2	1.6	99.0	1.6	0.1	3.9	**-8**
Coke, refined petroleum products	95.9	1.7	1.7	1.5	96.7	1.4	0.0	3.1	**-9**
Tobacco	97.4	1.5	1.4	0.8	98.7	0.8	0.1	2.3	**-9**
Publishing and printing	96.3	0.5	0.5	1.0	98.9	1.0	0.0	1.5	**-10**

Sources: Authors' calculations from CEPII Chelem database for trade; UNIDO and national sources for production.

Table A4.1b. – Market shares in the UM-11, the dollar zone and third countries, 1996

In %	UM 11			$ zone			Third countries		
	Market share of UM 11	Market share of $ zone	Market share of third zone	Market share of UM 11	Market share of $ zone	Market share of third zone	Market share of l'UM 11	Market share of $ zone	Market share of third zone
Manufacturing	**85.4**	**5.3**	**9.3**	**3.5**	**90.5**	**6.0**	**8.7**	**6.2**	**85.0**
Food products	93.4	2.6	4.0	0.9	98.0	1.1	3.9	6.1	90.0
Textiles	83.4	7.0	9.6	1.9	95.5	2.6	13.7	7.8	78.5
Wearing apparel	61.5	13.9	24.6	2.6	95.8	1.5	15.8	28.7	55.5
Leather and leather products	65.8	21.8	12.5	10.7	85.5	3.8	25.4	24.3	50.2
Wood and wood products	93.5	2.3	4.2	0.7	99.0	0.4	2.9	5.4	91.7
Furniture	88.8	2.2	9.0	3.1	95.5	1.4	9.4	6.0	84.6
Publishing and printing	97.9	0.5	1.6	0.5	98.9	0.6	1.8	0.9	97.3
Plastic products	86.7	4.3	9.0	3.0	92.6	4.3	12.9	4.1	83.0
Metal products	90.0	2.8	7.2	3.8	91.1	5.1	7.5	2.8	89.7
Machinery equipment	84.5	4.3	11.2	9.1	79.2	11.7	11.4	4.3	84.3
Professional goods	66.2	14.0	19.8	6.4	78.3	15.3	18.3	18.1	63.6
Manufacturing n.e.c.	66.2	17.4	16.4	4.7	85.4	9.9	15.1	16.8	68.1
Chemicals except pharmaceuticals	85.8	4.6	9.5	4.2	90.3	5.5	12.2	6.1	81.7
Beverages	93.6	2.2	4.2	3.0	95.3	1.7	5.7	1.6	92.8
Tobacco	96.7	1.5	1.9	0.4	98.7	0.9	1.6	4.7	93.8
Paper products	87.0	3.6	9.3	1.9	96.3	1.8	9.1	3.9	87.0
Coke, refined petroleum products	94.0	1.7	4.3	0.8	96.7	2.4	3.0	4.1	93.0
Rubber products	86.3	4.1	9.7	2.2	93.2	4.6	9.3	3.4	87.3

Table A4.1b. (cont.)– Market shares in the UM-11, the dollar zone and third countries, 1996

In %	UM 11			$ zone			Third countries		
	Market share of UM 11	Market share of $ zone	Market share of third zone	Market share of UM 11	Market share of $ zone	Market share of third zone	Market share of l'UM 11	Market share of $ zone	Market share of third zone
Ceramic products	93.6	1.8	4.6	4.6	91.5	4.0	17.8	4.4	77.8
Glass and other non metallic min. prod.	95.8	0.8	3.3	1.7	96.4	1.9	2.8	1.4	95.8
Iron and steel	90.9	1.3	7.7	3.1	89.1	7.8	6.1	2.4	91.5
Non-ferrous metals	80.5	5.3	14.2	2.1	91.1	6.9	7.0	7.9	85.1
Electrical machinery	75.2	9.9	15.0	4.2	84.2	11.6	8.5	9.4	82.2
Pharmaceuticals	86.4	3.4	10.2	3.9	92.5	3.6	8.7	2.3	89.0
Office machinery and computers	52.0	26.6	21.4	3.4	82.9	13.7	12.8	18.2	69.0
Transport equipment except cars	77.5	16.4	6.1	6.1	89.3	4.6	2.4	5.9	91.7
Automobiles	88.7	2.1	9.1	3.5	88.2	8.3	17.3	3.4	79.3

Sources: Authors' calculations from CEPII Chelem database for trade; UNIDO and national sources for production.

Appendix 5 – Sector Indicators : Sources and Methods

Sector shares in Value Added and Employment, 1996

VA = value added

All figures are derived from OECD's STAN database, except for those of Ireland as this country was excluded from STAN. Data on Ireland were taken from UNIDO's *Industrial Statistics Database.* All value added data are in national currencies and were converted to US dollars by the average exchange rate for 1996 as derived from IMF's *International Financial Statistics.*

VA in Denmark, Germany, Ireland and Sweden had to be estimated, as well as employment in France, Ireland and Sweden.

Employment in Denmark, VA in Greece, as well as employment and value added in Finland, the Netherlands, Portugal, Spain and the United Kingdom were available for the 4-digit sectors in 1995, but not in 1996. Instead these data were estimated by applying the 1995 breakdown to the 3-digit data of 1996.

VA in France, employment in Germany, and VA and employment in Austria are only available at the 2-digit level in 1996. The 2, 3 and 4-digit figures were available for 1995. The 3 and 4-digit data for 1996 were therefore estimated using the 1995 breakdown.

Other adjustments:

– For Belgium (VA), Denmark (employment), Spain (VA and employment), and the United Kingdom (VA and Employment), the 1996 data are only available at the 3-digit level. The 4-digit data are estimated with the breakdown of **1994**.

– For Greece (employment), the 1996 data are only available at the 3-digit level. The 3 and 4-digit level data were estimated with the breakdown of **1992**.

– For Italy (VA and employment), the 1996 data are only available at the 2 digit level. The 3 and 4-digit level data were estimated with the breakdown of **1994**.

– For Belgium (employment), 1996 data are only available at the 2-digit level, the more detailed data were estimated using the 1992 breakdown.

Overall Rates of Protection

Data on protection were derived from Messerlin (1999). The overall protection rate is the sum of three types of barriers: those linked to the treatment of the most favoured nation (MFN), non-tariff barriers converted into tariff-equivalents, and anti-dumping measures. The sector breakdown of this study is somewhat more aggregated than that of Messerlin. For the following industries, arrhythmic means were calculated:

– 323 is the average of 323 et 324;

– 362 is the average of 362 et 369;

– 384 is the average of 3841, 3842, 3844, 3845 and 3849

For pharmaceuticals, we assumed the same rate of protection as for industrial chemicals.

Concentration Ratios

Source: Davies S. and B. Lyons (1996), Industrial Organisation in the European Union: Structure, Strategy, and the Competitive Mechanism, Clarendon Press, Oxford. The ratios refer to the share of the five largest firms in total production in the European Union, in 1987.

Product Differentiation

Source: J. Oliveira Martins (1994), « Structure du marché, échanges et salaires dans l'industrie », *Revue économique de l'OCDE,* n° 22, Spring.

Demand Elasticities

Source: Cortes Olivier et Sébastien Jean (1996), « Pays émergents, emploi déficient? », *Document de travail,* n° 9605, CEPII, Paris.

APPENDIX 6 – INDUSTRIES IMPORTANCE IN THE ECONOMY

TABLE 6.1. – VALUE ADDED STRUCTURE, IN %, 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Food	**9.5**	10.8	15.6	16.9	9.1	**9.2**	10.9	6.2	8.5	18.5	12.5	16.1	9.4	16.7	7.8	7.4
Textiles	**3.2**	2.7	2.4	9.8	1.2	**3.3**	2.2	1.3	8.4	1.4	3.2	13.5	1.6	4.2	1.5	3.1
Wearing apparel	**1.9**	2.1	1.4	3.2	0.2	**1.9**	1.7	1.0	4.3	0.6	2.1	5.0	0.6	1.9	0.8	0.9
Leather	**0.9**	0.7	0.4	1.5	0.2	**1.0**	0.8	0.3	3.0	0.1	1.1	3.0	0.2	0.1	0.4	1.0
Wood	**1.7**	1.1	2.7	2.0	3.5	**1.7**	1.7	1.5	2.0	0.9	1.5	3.3	1.5	0.6	5.4	2.4
Furniture	**2.0**	1.7	3.4	1.3	1.1	**2.1**	1.6	2.0	3.2	0.5	1.2	0.8	1.1	3.7	0.9	4.1
Publishing	**4.7**	8.5	9.8	4.3	7.8	**3.9**	5.6	2.4	3.5	3.0	3.5	2.3	8.4	4.4	6.3	3.7
Plastics	**3.3**	4.0	2.7	2.4	1.6	**3.3**	2.8	3.4	3.3	1.8	4.6	1.6	3.5	5.1	1.1	2.4
Metal products	**7.8**	5.4	9.2	3.2	10.6	**8.0**	8.1	8.8	9.2	1.8	5.5	5.4	7.3	6.0	6.7	8.6
Machinery equipment	**8.3**	9.7	15.1	1.3	12.8	**7.8**	5.9	8.5	8.7	14.8	4.9	2.7	7.1	8.5	12.3	10.4
Prof.goods	**1.8**	1.7	2.6	0.1	3.2	**1.8**	1.6	2.2	2.1	4.4	0.3	0.7	1.6	1.1	2.3	0.8
Manuf nec	**1.1**	1.2	2.5	0.9	1.1	**1.1**	1.7	0.7	1.2	0.5	1.5	1.9	0.6	1.3	0.7	0.7
Chemicals	**7.9**	8.3	5.5	6.8	4.9	**8.0**	7.1	7.8	5.3	22.5	11.4	3.9	12.0	12.6	5.4	5.8
Beverages	**2.6**	2.9	2.0	6.4	1.3	**2.5**	2.3	1.8	2.7	4.0	4.0	5.9	3.8	2.0	1.6	3.4
Tobacco	**1.6**	0.9	0.5	4.2	0.4	**1.8**	1.3	2.4	0.5	0.6	1.2	2.0	4.8	0.7	0.4	4.5
Paper	**3.0**	3.3	2.8	4.2	9.6	**2.8**	2.6	2.1	2.9	0.7	2.0	5.1	2.9	2.1	16.3	4.1
Ref.petr., coal	**4.3**	1.2	0.8	5.1	1.1	**4.9**	6.5	7.0	1.1	0.1	3.2	0.7	8.1	1.4	2.6	1.8
Rubber	**1.2**	1.0	0.4	0.6	0.7	**1.3**	1.2	1.1	1.7	0.6	2.7	1.3	0.7	0.6	0.5	1.1
Ceramics	**0.6**	0.4	0.3	0.6	0.3	**0.6**	0.3	0.3	2.1	0.1	0.5	1.5	0.4	0.4	0.2	0.3
Glass & other n. met. Pr.	**4.0**	3.0	4.2	7.3	2.2	**4.1**	3.5	3.7	4.3	3.4	6.9	6.3	3.3	4.0	2.8	6.2
Iron & steel	**3.5**	2.9	0.9	1.6	3.4	**3.6**	2.6	4.3	4.3	0.3	3.2	1.1	2.5	3.8	3.8	4.8
Non ferrous metals	**1.5**	1.0	0.3	3.0	1.2	**1.6**	1.7	2.2	1.0	0.0	1.1	0.2	1.1	2.0	1.7	1.0
Electrical machinery	**9.6**	8.8	5.3	4.7	7.4	**9.9**	10.7	11.5	7.3	18.3	5.0	6.5	9.9	6.3	10.7	13.2
Pharmaceuticals	**2.5**	4.3	4.7	2.3	3.4	**2.2**	2.3	1.9	1.8	-	4.0	1.8	2.8	2.8	0.8	2.5
Computers	**1.1**	1.8	0.5	0.0	2.4	**1.0**	2.0	0.9	1.0	-	0.5	0.1	0.5	-	1.1	
Transport except cars	**2.7**	4.6	2.9	5.3	0.4	**2.5**	3.5	1.4	2.3	1.1	2.7	2.5	2.6	7.9	4.7	0.8
Automobiles	**7.7**	5.8	1.3	1.0	9.0	**8.2**	7.7	13.1	4.1	-	9.6	4.8	1.8	-	1.2	4.8
TOTAL	**100.0**	100.0	100.0	100.0	100.0	**100.0**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TOTAL exposed sectors	**27.4**	43.0	30.6	29.7	39.6	**30.2**	40.9	35.9	56.9	61.7	42.8	40.8	41.6	36.7	33.1	35.5

Sources: OECD STAN database.

Table 6.2. – Employment structure, in %, 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Food	**11.6**	9.4	15.3	16.4	7.9	**10.2**	12.5	9.2	6.4	15.9	13.9	10.2	15.4	12.1	9.6	10.5
Textiles	**5.8**	4.0	3.2	13.1	1.6	**5.4**	3.8	1.9	11.7	5.7	5.9	11.8	2.5	5.5	2.1	5.0
Wearing apparel	**4.5**	3.6	2.0	8.4	0.4	**4.1**	2.9	1.9	7.2	3.4	4.9	13.6	1.8	3.9	1.9	2.2
Leather	**2.2**	1.2	0.5	3.1	0.3	**2.2**	1.3	0.6	5.1	0.5	2.3	6.4	0.7	0.5	0.8	2.4
Wood	**3.1**	2.0	3.7	2.3	5.1	**2.8**	2.1	2.1	2.8	2.8	4.5	4.3	2.3	2.3	7.1	3.2
Furniture	**3.8**	3.0	4.7	2.1	1.5	**3.4**	2.3	3.0	4.8	1.5	4.0	3.6	2.4	3.6	2.1	6.0
Publishing	**5.6**	7.2	7.6	3.5	8.3	**4.2**	5.9	3.2	2.9	5.4	4.3	3.3	9.9	4.9	8.0	3.7
Plastics	**3.8**	4.1	3.2	3.0	1.7	**3.2**	3.0	3.9	2.6	4.1	3.0	2.1	3.5	2.6	1.6	2.2
Metal products	**10.5**	7.5	9.9	5.8	11.6	**9.5**	8.1	9.6	10.6	6.0	9.1	9.4	10.7	9.8	8.5	9.7
Machinery equipment	**10.9**	11.5	18.3	2.5	12.4	**8.9**	8.6	10.2	8.5	9.3	7.5	3.9	8.9	6.1	11.4	10.6
Prof,goods	**2.3**	1.9	2.8	0.2	2.6	**2.0**	1.6	3.1	2.0	6.4	0.5	0.6	1.4	0.9	2.1	1.1
Manuf nec	**1.8**	1.2	2.4	0.5	5.3	**1.5**	2.2	0.7	1.5	1.4	2.5	1.8	1.6	1.5	1.2	1.1
Chemicals	**5.4**	4.6	4.3	4.9	3.4	**4.8**	4.7	6.0	3.4	7.9	3.6	2.4	7.2	10.3	5.0	3.8
Beverages	**1.4**	1.0	1.0	3.3	0.6	**1.3**	1.0	1.1	0.9	2.1	2.1	1.9	1.2	2.0	1.0	2.5
Tobacco	**0.3**	0.2	0.3	3.3	0.1	**0.3**	0.1	0.2	0.5	0.7	0.3	0.1	0.6	0.7	0.2	0.3
Paper	**3.0**	3.2	1.8	2.6	5.6	**2.4**	2.5	2.2	2.3	1.7	2.0	1.4	2.6	2.5	9.2	3.2
Ref,petr,, coal	**0.5**	0.3	0.4	1.8	0.3	**0.5**	0.4	0.3	0.5	0.2	0.5	0.5	0.8	0.6	0.8	0.7
Rubber	**1.4**	1.1	0.6	0.5	0.8	**1.3**	2.1	1.2	1.2	1.1	1.5	0.7	0.6	0.6	0.6	0.7
Ceramics	**1.1**	0.8	0.4	0.9	0.3	**1.1**	0.5	0.5	2.4	0.3	0.8	3.6	0.6	0.5	0.3	0.4
Glass & other n, met, Pr,	**4.3**	3.0	3.5	6.6	2.1	**3.9**	2.7	3.3	4.4	4.7	5.8	5.8	3.0	4.8	2.8	5.2
Iron & steel	**3.7**	2.8	0.7	1.6	3.0	**3.4**	3.9	4.7	2.2	0.7	2.4	1.1	2.2	4.4	2.9	4.5
Non ferrous metals	**1.4**	1.0	0.3	1.8	1.1	**1.3**	1.0	2.3	0.5	0.1	0.7	0.6	0.6	1.2	1.1	1.2
Electrical machinery	**11.6**	11.3	5.8	4.1	9.2	**10.0**	10.8	13.5	6.7	14.3	5.4	5.1	10.7	7.7	9.8	13.3
Pharmaceuticals	**1.9**	1.7	1.9	2.5	1.9	**1.6**	2.2	1.3	1.9	-	1.5	1.1	1.5	-	1.1	1.3

Table 6.2. (cont.) – Employment structure, in %, 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Computers	**1.1**	1.6	0.5	0.0	3.3	**0.7**	1.4	0.8	0.5	-	0.2	0.1	0.5	-	1.2	
Transport except cars	**3.5**	4.8	3.1	4.5	0.4	**2.7**	3.6	2.0	2.7	4.0	3.0	1.9	3.8	10.7	5.6	1.0
Automobiles	**8.2**	6.1	1.6	0.7	9.2	**7.5**	8.7	11.2	3.9	-	7.6	2.7	3.0	-	2.1	4.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL exposed sectors	**37.8**	47.4	35.6	33.0	44.7	**37.5**	40.8	41.2	67.4	43.9	43.9	53.1	39.3	38.8	33.9	37.5

Sources: OECD STAN database.

Table 6.3. – Degree of openness (share of exports in total production), 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Food	**6.1**	2.8	19.0	6.8	3.6	**4.2**	5.0	3.6	6.1	9.2	4.1	3.5	10.4	5.9	5.3	3.9
Textiles	**22.7**	13.2	19.6	4.7	33.2	**16.7**	15.8	37.4	18.3	9.6	9.4	6.9	14.5	24.6	35.4	19.5
Wearing apparel	**24.7**	15.8	20.1	10.0	39.2	**16.9**	23.2	18.6	34.2	6.3	4.9	9.0	8.7	4.3	17.2	21.4
Leather	**43.7**	25.4	22.3	38.3	31.0	**32.2**	43.0	51.0	48.4	20.0	21.9	10.7	15.3	9.1	49.2	21.8
Wood	**4.8**	1.3	5.9	5.3	4.7	**3.5**	3.6	3.7	7.0	1.3	2.9	9.9	2.7	3.5	5.1	8.3
Furniture	**12.9**	4.8	26.4	11.3	22.1	**9.1**	9.2	5.7	36.0	6.3	5.9	3.2	10.8	4.6	18.5	6.6
Publishing	**4.1**	5.2	3.6	4.9	2.4	**2.3**	3.1	3.6	3.7	3.4	3.2	1.1	1.6	1.8	5.8	3.7
Plastics	**19.8**	10.0	19.5	12.1	22.3	**12.7**	11.5	19.4	19.3	9.3	7.7	5.2	14.4	11.3	29.5	32.4
Metal products	**15.7**	11.9	10.8	11.5	17.7	**11.2**	10.7	14.2	24.0	13.5	6.5	7.5	10.8	9.4	19.6	16.7
Machinery equipment	**33.9**	29.2	31.4	40.3	36.9	**23.4**	23.0	26.7	37.0	32.6	15.9	11.3	36.8	28.5	29.9	39.8
Prof,goods	**40.0**	34.0	19.2	27.6	43.4	**23.5**	18.3	37.4	32.9	33.1	24.4	15.8	39.2	14.7	40.1	38.6
Manuf nec	**41.7**	38.2	30.6	24.2	37.9	**21.0**	21.3	44.8	16.9	22.5	11.2	4.8	24.0	22.3	46.4	0.0
Chemicals	**20.1**	20.2	24.7	13.6	9.5	**14.0**	16.3	20.1	10.3	38.3	9.8	7.7	24.1	13.1	23.1	17.1
Beverages	**12.8**	14.2	4.8	6.3	10.2	**8.2**	26.2	3.7	15.5	12.6	3.4	9.0	24.5	8.0	11.5	6.6
Tobacco	**4.4**	6.8	6.1	7.9	5.2	**2.1**	2.1	3.3	0.1	3.8	1.9	0.5	7.2	3.6	3.8	1.4
Paper	**12.5**	7.2	8.3	8.9	19.6	**8.5**	6.7	12.2	6.9	3.6	4.7	6.6	15.6	7.9	18.5	25.5
Ref,petr,, coal	**6.5**	4.2	6.3	17.8	9.3	**4.4**	2.7	2.7	5.3	0.8	17.2	6.8	12.3	8.7	23.0	7.0
Rubber	**15.6**	11.0	13.7	11.9	33.7	**10.6**	10.9	13.2	12.4	9.5	13.5	2.7	17.4	8.6	23.2	17.2
Ceramics	**19.5**	46.0	37.2	34.1	32.1	**12.8**	4.0	47.5	12.9	19.6	50.2	13.7	12.9	2.5	7.6	37.4
Glass & other n, met, Pr,	**9.8**	7.2	4.1	12.6	9.7	**7.3**	24.9	2.8	47.5	6.0	21.2	3.5	3.0	13.7	30.2	6.9
Iron & steel	**14.1**	8.9	25.8	18.0	19.5	**10.1**	15.8	14.8	11.4	4.9	5.3	7.9	23.6	15.6	14.6	14.7
Non ferrous metals	**14.8**	16.4	8.5	15.0	16.5	**9.3**	9.4	12.8	9.2	9.5	7.4	1.3	11.4	16.9	12.2	14.5
Electrical machinery	**31.1**	31.8	33.2	9.3	48.7	**20.2**	26.5	22.5	24.1	25.3	14.0	11.1	56.6	21.8	39.0	16.7
Pharmaceuticals	**19.1**	16.3	36.0	1.8	41.5	**11.8**	14.1	12.6	21.9	20.5	4.2	3.6	31.0	40.0	21.7	25.9
Computers	**28.4**	37.0	31.0	43.4	47.9	**15.5**	14.7	21.6	16.8	35.7	25.7	5.4	13.5	27.6	38.0	46.4
Transport except cars	**32.2**	25.2	19.9	8.4	10.4	**20.4**	62.2	15.5	19.7	30.5	19.2	15.8	32.8	16.4	42.1	9.1

Automobiles	**19.5**	17.2	32.6	6.8	42.1	**12.5**	7.4	19.3	18.8	6.1	9.0	2.9	8.5	9.5	29.9	24.0
Pharmaceuticals	**19.1**	16.3	36.0	1.8	41.5	**11.8**	14.1	12.6	21.9	20.5	4.2	3.6	31.0	40.0	21.7	25.9

Table 6.3. (cont.) – Degree of openness (share of exports in total production), 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Computers	**28.4**	37.0	31.0	43.4	47.9	**15.5**	14.7	21.6	16.8	35.7	25.7	5.4	13.5	27.6	38.0	46.4
Transport except cars	**32.2**	25.2	19.9	8.4	10.4	**20.4**	62.2	15.5	19.7	30.5	19.2	15.8	32.8	16.4	42.1	9.1
Automobiles	**19.5**	17.2	32.6	6.8	42.1	**12.5**	7.4	19.3	18.8	6.1	9.0	2.9	8.5	9.5	29.9	24.0
TOTAL	**18.6**	15.8	20.6	11.1	24.3	**12.7**	13.8	16.3	19.0	22.9	8.6	6.9	24.2	14.6	21.6	17.9
TOTAL exposed sectors	**33.0**	26.7	27.3	15.5	43.0	**33.8**	25.1	25.3	29.4	31.8	14.8	9.7	25.8	22.1	35.7	26.0

Sources: OECD STAN database.

Table 6.4. – Import penetration (share of imports in final production), 1996

	EU-15	UK	DK	GR	SW	**EU-11**	FR	GER	IT	IRE	SP	PORT	NL	B&L	FI	AU
Food	**5.8**	5.4	13.1	4.9	4.6	**3.8**	4.2	4.6	4.8	2.4	5.5	7.2	10.1	3.7	2.6	2.5
Textiles	**17.2**	16.3	12.9	8.4	25.0	**11.3**	10.1	25.2	10.2	10.3	8.8	5.1	15.0	25.7	17.9	13.3
Wearing apparel	**44.5**	38.7	45.3	12.6	46.3	**31.9**	41.4	49.2	31.4	15.9	11.9	3.3	47.0	21.1	32.2	29.6
Leather	**42.8**	32.4	27.1	24.2	33.3	**30.8**	35.4	44.9	53.6	24.1	16.2	11.4	36.0	30.6	37.4	20.9
Wood	**6.3**	7.9	7.5	5.4	2.2	**4.3**	3.8	7.6	6.5	6.2	1.3	0.9	15.3	7.0	0.9	5.4
Furniture	**9.3**	5.2	24.8	5.3	12.6	**6.6**	7.8	10.0	9.6	8.6	1.5	0.9	14.7	7.7	7.9	6.2
Publishing	**1.5**	2.6	1.1	1.8	1.3	**0.7**	0.9	1.2	0.6	2.8	0.4	1.0	1.3	0.9	0.6	2.3
Plastics	**11.9**	7.8	10.8	8.5	10.4	**7.0**	6.2	11.0	8.9	12.5	3.8	2.6	12.4	7.9	10.2	14.8
Metal products	**8.6**	8.5	6.4	7.2	8.4	**5.7**	4.7	9.3	7.9	9.8	2.7	2.2	11.0	5.9	6.9	8.2
Machinery equipment	**14.4**	16.4	9.5	20.9	13.6	**8.5**	9.8	9.4	9.4	22.7	8.9	8.6	24.6	18.3	9.2	18.5
Prof,goods	**36.6**	31.4	10.0	27.0	23.6	**21.6**	19.3	37.3	23.6	35.7	26.4	22.2	40.4	22.9	23.4	25.3
Manuf nec	**43.9**	44.7	25.9	25.6	23.5	**22.6**	28.1	45.9	15.0	27.8	19.0	8.5	27.2	18.2	28.6	-
Chemicals	**12.3**	12.1	10.5	12.3	6.7	**8.4**	9.9	10.1	7.7	35.0	9.0	7.3	21.6	10.1	9.2	8.0
Beverages	**4.1**	4.1	3.1	1.2	3.8	**2.6**	3.7	3.5	1.6	3.7	1.2	0.2	13.7	5.5	6.0	1.9
Tobacco	**1.6**	0.4	1.5	0.2	0.1	**1.3**	0.3	0.2	0.1	0.2	2.6	0.0	2.1	28.8	11.8	0.2
Paper	**7.6**	7.8	4.0	10.3	6.2	**5.0**	5.1	7.7	8.6	3.6	3.2	2.2	12.3	8.0	1.2	9.5
Ref,petr,, coal	**6.1**	3.6	10.9	4.9	6.9	**4.3**	4.0	2.8	6.8	4.7	7.8	5.3	22.0	3.4	25.3	9.8
Rubber	**12.6**	12.6	14.9	17.7	15.7	**7.8**	7.3	9.9	9.6	15.3	6.5	8.3	15.9	10.2	10.3	8.3
Ceramics	**7.3**	20.2	20.1	15.0	15.8	**4.5**	1.8	24.5	1.6	10.4	1.0	2.3	15.6	2.1	2.6	11.0
Glass & other n, met, Pr,	**4.0**	5.5	2.7	3.3	4.4	**2.8**	5.9	2.5	17.0	1.3	8.5	0.3	3.4	6.4	11.7	2.4
Iron & steel	**6.9**	4.4	10.8	15.3	5.3	**4.9**	4.3	7.5	7.5	6.0	2.5	4.6	12.7	7.0	9.3	6.7
Non ferrous metals	**23.1**	28.9	17.2	23.6	18.0	**14.8**	16.8	18.5	19.3	16.6	7.9	9.8	27.3	24.3	9.9	15.8
Electrical machinery	**25.2**	36.0	21.3	9.4	16.7	**15.5**	19.8	21.1	13.4	22.2	11.6	12.5	40.8	19.1	21.4	12.3
Pharmaceuticals	**10.0**	6.9	5.8	7.0	20.4	**6.6**	7.5	6.1	16.9	4.4	4.4	7.4	19.1	24.3	12.7	12.9
Computers	**39.5**	42.6	18.7	16.9	17.9	**27.0**	21.0	44.4	15.2	78.1	28.3	8.9	44.4	17.2	34.3	31.1
Transport except cars	**23.1**	19.0	20.8	57.2	10.2	**12.4**	27.2	17.8	11.5	62.2	14.1	13.6	42.9	34.7	42.6	21.8
Automobiles	**9.0**	8.5	18.0	20.0	11.6	**5.5**	3.2	7.1	7.1	16.4	5.3	6.1	9.6	5.8	15.3	15.9

TOTAL	**13.3**	13.5	13.1	11.7	10.9	**8.7**	8.9	11.7	9.5	20.6	6.6	6.2	26.0	12.1	11.2	11.1
TOTAL exposed sectors	**27.3**	25.4	19.0	19.9	17.7	**27.7**	17.2	21.1	14.6	38.5	12.0	8.1	27.8	21.5	21.2	17.4

Sources: OECD STAN database.

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