

**PRELIMINARY WORK – PLEASE DO NOT QUOTE WITHOUT PERMISSION**

**THE IMPACT OF RISING IMPORTS FROM LOW-COST COUNTRIES ON EURO  
AREA PRICES AND LABOUR MARKETS<sup>1</sup>**

**SOME PRELIMINARY FINDINGS**

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**Abstract:**

This paper presents preliminary work dealing with some of the consequences of rising imports from low-cost countries for the domestic euro area economy. The paper provides an overview of how different transmission channels work, and gives a preliminary quantification of the impact of increased import penetration on the euro area economy through these channels. The impact of low-cost countries on euro area producer price inflation is estimated to amount to -0.1 to -0.3 percentage point, and on euro area consumer price inflation to about -0.05 to -0.2 percentage point per year on average over the period 1996 to 2004. Using a broader definition of import penetration and taking into account also spill-over effects to non-low cost countries, panel estimation results suggest that the increase in the import share in euro area countries has led to a reduction in euro area producer prices by about 0.8 to 1.0 percentage point on average per year over the period 1978 to 2003 (and also over the control period 1995-2003). Turning to the impact of rising import penetration on labour markets we find that increased openness may have a negative impact on labour demand in the low skilled sectors both through direct effects stemming from increased competition and offshoring and indirectly through a higher real wage elasticity of labour demand. We do, however, not find a significant impact for the sample of high skilled workers and for the total sample.

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## 1. Introduction

Globalisation is generally used to describe the increasing global interdependence of national economies through trade, production and financial market linkages. At the current juncture, one aspect of intensifying trade relations is the increasing importance of low-cost countries in international trade, with an impact on the domestic economies of developed countries, basically through an effect on competitiveness, import prices and labour markets of these countries. The impact on import prices is ambiguous. While import prices have moderated due to increased trade integration with low-cost emerging economies, the combined effect of rising global demand and the existence of important supply bottlenecks have boosted prices of commodities, particularly energy. As regards labour markets, the trade integration with low-cost countries has shifted relative labour demand in developed countries towards high skilled workers, but the impact on aggregate labour demand is less obvious. Globalisation has also resulted in an increase in the effective labour supply; i.e. domestic firms – via offshoring – now have easier access to global labour markets.

This paper deals with some of the consequences of globalisation on the domestic euro area economy. Given the number of channels via which globalisation affects the domestic euro area economy and the variables on which globalisation is expected to have an impact, we limit the analysis to a narrow range of channels and impacts of globalisation. Primarily this paper aims to look at the impact of rising non-energy imports from low-cost countries on euro area price developments and labour demand. Hence, the wider impacts on exports and output are not considered. The analysis is constrained to two major channels of price effects: import prices and labour markets. As regards import prices we focus on the impact of lower non-energy import prices on producer and consumer prices, leaving the channel from higher commodity prices through global supply bottlenecks uncovered. As regards the labour market we investigate the impact of increasing import penetration on aggregate labour demand in the euro area, with no deeper analysis of changes in labour demand by skill intensity. Finally, it is also important to emphasize that no monetary policy reactions are included in the analysis, which could alter the medium term impact of globalisation on prices, profits and labour demand. Given that monetary policy controls inflation in the medium term, the assumption of unaltered monetary policy reaction means that a one-time opening up of trade is seen to have an impact on changes in relative prices, with only temporary effects on inflation.

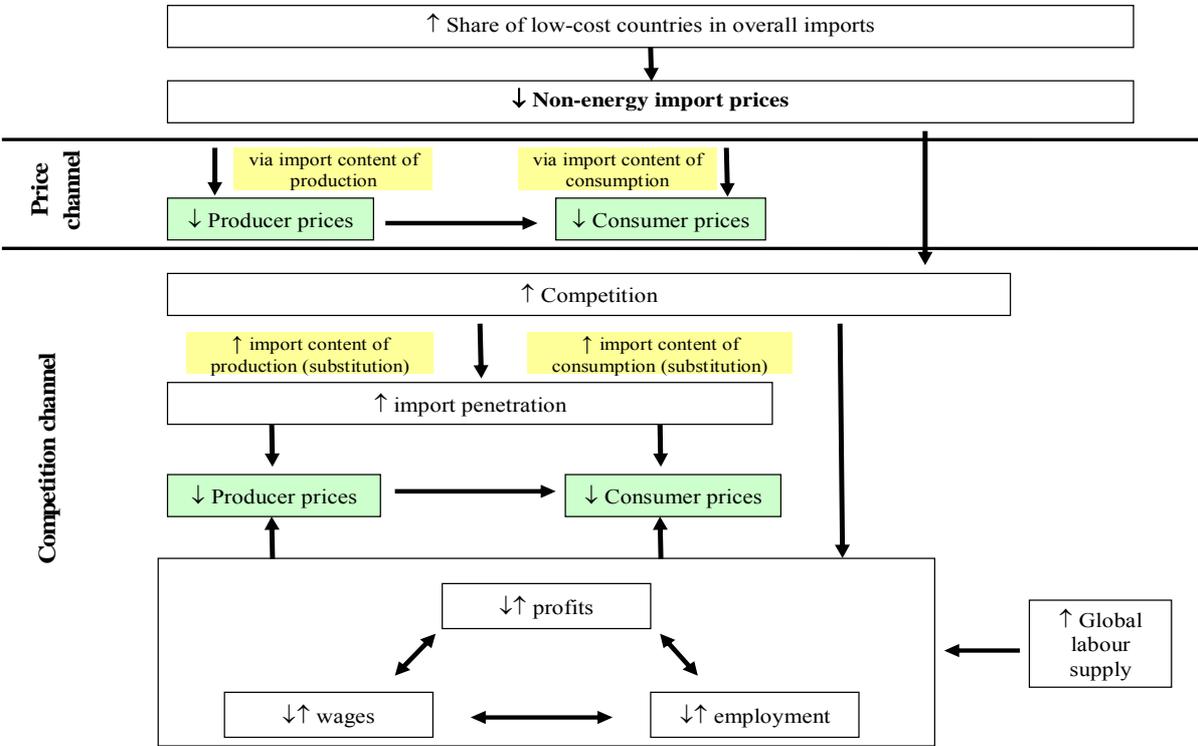
The paper provides an overview of how the above described transmission channels work, and tries to give a preliminary quantification of the impact of rising imports from low-cost countries on the euro area economy through these channels. Section 2 describes the main transmission channels through which lower imports prices are expected to have an impact on the euro area economy. Section 3 analyses this impact on euro area prices. Finally, section 4 covers the impact on the euro area labour market and section 5 concludes.

## 2. Main transmission channels

Increased trade with low cost countries has a downward impact on non-energy import prices of developed economies. The pass-through of lower import prices on domestic prices has two main channels of transmission. First, through the import content of production and consumption import prices feed into domestic prices. Second, the growing integration of low cost countries may increase worldwide competition with effects on domestic and foreign labour markets, profits, innovation and, thereby, on prices (see Chart 1). While the first channel focuses on trade openness in the sense that more import dependent economies may have greater effects, the second channel encompasses the impact of rising imports from low-cost countries in a broader and more interlinked sense, as the different variables concerned have repercussions for each other.

Under the first channel, **opening up to international trade** may contribute to import price moderation, notably through imports from low cost countries. Lower import costs should have a downward impact directly on producer and consumer prices via the import content of production (intermediate and final goods) and consumption (final goods). The decline in input prices may then – at least partly – be passed on to final prices of domestically produced goods (see the “price channel” on Chart 1). As most high-cost countries are affected by this channel, there are spill-over effects between high-income countries as well.

**Chart 1 Transmission mechanism of the impact of rising non-energy imports from low-cost countries to euro area domestic prices**



\* Thick arrows indicate the direction of the impact, thin arrows indicate the direction of change

Under the second channel, **increased competition** may affect the import content of production and consumption, as well as challenge domestic labour markets and profits (see the lower panel of Chart 1). Due to growing competitive pressures firms need to adjust either by cutting costs or squeezing their profits. One way of reducing costs is to shift input demand towards cheaper inputs from low cost countries. Another way is to cut labour costs, which has a direct impact on domestic labour markets. However the opening up of low cost countries provides an additional tool of labour demand adjustment for some of the firms, namely offshoring. Due to transitory costs of the adjustment labour demand is expected to decline in the short run, but to increase in the longer term due to the increase in the scale of production (Tefous (2006)).

The impact of increased imports from low-cost countries on profits and mark-ups is again far from clear-cut. Indeed, firms could be obliged to squeeze their profits due to the increase in competition. At the same time, however, a possible downward impact of increased import penetration on both input and labour costs could be associated with increased profits if this reduction in costs is not fully passed on to output prices. This is, however, less likely the more firms are exposed to competition.

The above described scheme of transmission channels do not consider the monetary policy reaction, which would alter the medium term impact on both prices, profits and labour demand. Given that we focus on non-energy imports we exclude from the analysis both the upward pressure on domestic inflation due to higher oil prices and the positive impact on labour demand (and wages) due to expanding export markets. Thus, our analysis is of a partial nature and the overall net effects on domestic prices are expected to be smaller in absolute terms than depicted by our analysis.

### **3. Rising imports from low-cost countries and euro area domestic prices**

In this section we will focus on the impact of import prices and rising import penetration on euro area producer and consumer prices. In particular, we will present evidence from the literature (Section 3.1), an estimation of the effect of low-cost countries on euro area producer and consumer prices based on an input-output table analysis (Section 3.2) and on a production chain VAR (Section 3.3) and some empirical results using panel estimations with a sectoral dimension (Section 3.4).

#### **3.1 Literature**

A couple of studies have analysed empirically whether rising import penetration has affected inflation, although none of them has focussed on the euro area. The main difference between the studies is whether they analyse the question at the aggregate or sectoral level. Important studies working with aggregate data are Romer (1993), Kim and Beladi (2005), Atkeson and Burstein (2005), the IMF (2006) and Borio and Filardo (2006).

Romer (1993) shows that average rates of inflation are negatively correlated with openness. The intuition behind this is that monetary authorities benefit less from expansionary monetary policy in an open economy, as in such an economy, a monetary expansion which leads to real exchange rate depreciation harms the economy more than under a less open economy. Thereby, monetary expansion would entail a relatively larger increase in domestic prices for a given increase in output. This is empirically tested in a cross-sectional study of 114 countries. The results show that average inflation since 1973 is significantly and negatively affected by average import penetration over the same time horizon. The main conclusion that can be drawn from this paper is that a further increase in openness due to globalisation can make expansionary monetary policy even more difficult and has therefore a downward impact on inflation.

Kim and Beladi (2005) analyse empirically whether trade openness has an impact on the price level, and whether this relationship is stronger in countries with less independent central banks. Their evidence is mixed, with the impact of openness on prices sometimes positive and sometimes negative, while the study does not confirm an impact of monetary policy on the relationship.

Atkeson and Burstein (2005) propose a model parameterised to match some of the main features of trade volumes both at the aggregate and firm level and to reflect the fluctuations in the relative producer and consumer prices of tradable goods. This model is used to assess the extent to which international trade costs and imperfect competition with pricing-to-market play essential roles in accounting for producer and consumer price data. They find that international trade costs are a major determinant for the behaviour of both producer and consumer prices for tradable goods. They also find that imperfect competition with pricing-to-market plays an essential role in accounting for the behaviour of producer prices, but it plays only a minor role in accounting for the behaviour of consumer prices of tradable goods.

A number of studies have used a Phillips curve framework to analyse the impact of globalisation on prices at the aggregate level. Rogoff (2006) has argued that theoretically, globalisation should lead to an increase in competition, which in turn would imply faster response to changes in the cost structure due to lower profit margins and thereby make the Phillips curve steeper. However, empirical studies rather found evidence that the Phillips curve became flatter (see for example Borio and Filardo (2007)). Besides increased credibility and the effect of structural reforms one possible reason is the lower volatility of domestic production due to the increased role of net exports in buffering fluctuations in domestic demand.

The IMF (2006) addresses the question whether increasing openness has affected producer price inflation over the past 15 years. The study argues that the impact of openness on inflation will be temporary as long as there is no change in the monetary policy objective. Indeed, openness should only involve relative price effects and therefore affect inflation only temporarily as the long-run development in prices is expected to be mainly determined by monetary policy. Therefore, price decreases due to lower import prices from low cost countries should be offset by price increases elsewhere, for example energy prices

which are also affected by globalisation. Indeed, the strong increase in world demand for oil is to a large extent due to emerging economies, which thereby put upward pressure on oil prices. The IMF introduces a term capturing the openness of the country into a Philips curve type model for inflation, defined as the non-oil trade share in GDP. Panel estimation results suggest a significant negative impact of openness on relative prices. They also estimate a version of the model including import prices. Their simulation results starting in 1997 show that for advanced economies, import prices brought down inflation from 1997 to 2002 but had no impact thereafter. Their conclusion from this simulation exercise is that during 2003-05, “there was almost no globalization-related impact on inflation.” It should, however, be noted that this result may be due to the fact that the authors do not separate the impact from oil price and exchange rate changes from any globalisation impact.

Finally, Borio and Filardo (2006) estimate an extended Phillips curve equation explaining inflation by the domestic output gap, a global trade weighted output gap, import prices, exchange rates and oil prices. They find that the global output gap is statistically significant and reduces the coefficient on the domestic output gap, in particular since the 1990s in many euro area countries. At the aggregate euro area level, however the results are more ambiguous. They find no significant decline in the sensitivity of inflation to the domestic output gap, and the significance of the global output gap disappears when supply shock variables (import prices, oil prices) are included in the Phillips curve specification. On a dataset of 14 industrial countries Ihrig et al. (2006) find that the global output gap is generally insignificant or even of the wrong sign when changing country weights and the idiosyncratic shocks in the specification. Using the same dataset Ball (2006) also finds either insignificant or very small effects of the global output gap.

Although aggregate studies help to get a general flavour of the impact of openness on inflation, the effect can differ a lot across sectors. However, only few studies have conducted a sectoral analysis.

As regards the impact of rising trade integration on import prices ECB (2006) estimated that the higher level of imports from low-cost countries had a sizeable dampening impact on overall euro area manufacturing import prices of approximately 2 percentage points per annum on average over the period 1996-2005.

Chen et al. (2004) use a disaggregated dataset to analyse the effect of globalisation (defined as trade openness, or imports divided by the turnover on current prices). They distinguish between the direct impact on domestic prices and the indirect impact via productivity and mark-ups on prices. Their finding is that both channels have a significant and similar impact in the short run, while the productivity channel is predominant in the long run.

IMF (2006) also includes a sectoral analysis and finds the direct effect on producer price inflation via import prices to be generally small in industrial economies. In a panel study with sectoral data (using a similar approach to Chen et al. (2004)), import penetration and productivity growth are found to have

been important to explain relative price changes between sectors. According to the results, increased trade openness has reduced relative producer prices in manufacturing by about 0.3 pp on average per year over the past 15 years in their sample of industrialised countries.

Overall, the literature has used different methods to assess whether globalisation in the form of increased openness to international trade has reduced domestic prices. Most studies found a negative, although mostly small, effect. One shortcoming of all studies is that they cannot capture the impact of the increasing importance of low cost countries on import prices in high-cost countries. The studies are not focussed on the euro area, which is of clear interest for the ECB. Therefore, in the following paragraph we will focus explicitly on the effect lower euro area import prices due to the growing importance of low-cost countries on euro area producer and consumer prices.

### 3.2 Effect on prices through the import content of domestic production and consumption

In this section, we attempt to quantify the effect of rising imports from low-cost countries on euro area domestic prices, using information on the import content of production from input-output tables. The advantage of this approach is that it enables us to analyse the impact at a sectoral level and that it takes into account sectoral effects through the production chain.

As a major input to the analysis we use estimated impacts of higher level of imports from low-cost countries on euro area manufacturing import prices by sectors. On the basis of sectoral data on extra-euro area import unit values<sup>3</sup>, ECB (2006) estimated that rising imports from low-cost countries have dampened euro area import price inflation of manufactured goods by approximately 2 pp on average each year during 1996-2005, an effect almost equally accounted for by China and the NMS. This effect is disentangled into a share and a price effect.<sup>4</sup> The share effect is defined as the change in euro area import

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<sup>3</sup> Import unit values are used as a proxy for import prices as at the euro area level import values and volumes are available at a disaggregated level, thereby enabling a detailed analysis of euro area import unit values. These differ from import prices in the national accounts as they do not correct for changes in the quality of the product traded. As a result, unit values may be upward biased compared to import deflators. Therefore, the effect could be overestimated.

<sup>4</sup> The calculation was done Maurin, L. and Rodzko, R. (2006), 'Assessing the downward impact on euro area import prices of increased imports from low-cost countries' ECB mimeo. Their methodology used for the calculation is similar to the one used by Kamin et al. (2004):

$$\frac{\Delta p_{i,t}}{p_{i,t-n}} = \sum_j \left[ \frac{p_{j,t} - p_{HC,t}}{p_{i,t-n}} \Delta \alpha_{j,t} \right] + \sum_j \alpha_{j,t-n} \left[ \frac{\Delta p_{j,t}}{p_{j,t-n}} \frac{p_{j,t-n}}{p_{i,t-n}} - \frac{\Delta p_{HC,t}}{p_{HC,t-n}} \frac{p_{HC,t-n}}{p_{i,t-n}} \right] + \frac{\Delta p_{HC,t}}{p_{HC,t-n}} \frac{p_{HC,t-n}}{p_{i,t-n}}$$

where

- The first term is the share effect – that is, the effect of a change in the import share from a particular country  $j$  given its price differential against the reference (high-cost) group of countries. The size of the share effect depends on both the magnitude of the change in the share, and the import price differential of country  $j$  against the reference country.

prices due to the change in the import share of low-cost countries, while the price effect designates the contribution to total import prices due to import price inflation differentials between low-cost countries compared to that of high cost countries. To measure the impact of import penetration, the share effect is the relevant measure as it mainly reflects the effect of a rising share in euro area imports from low-cost countries through their impact on the total import prices of the euro area. Therefore, it can also be thought of as a price *level* effect. The price effect is due to changes in the import prices of these countries and is therefore strongly influenced by exchange rate movements. For this reason, in what follows we will focus on the share effect, which is estimated to account for an appr. 1.5 pp per annum while the remaining 0.5 pp is mainly due to the import price effect.

Using this information, the effect of low-cost countries on euro area domestic prices can be quantified by linking the share effects on import prices estimated at a sectoral level to the use of imports in production and consumption in this sector using input-output tables.

To calculate the effect on producer prices, we have to take into account not only the direct effect of lower import prices on one specific sector, but also the effect of lower costs in this domestic sector on other domestic sectors. Therefore, the Leontieff coefficients of the input-output tables are used to obtain the total import content of production. Summing up this effect over the different input sectors gives the effect on a specific production sector:

$$\Delta PPI_{SI} = \sum_i (McontP_{SI,i} * MShare\_effect_i) \quad (1)$$

where  $McontP_{SI,i}$  is the import content of production of sector  $i$  used in sector  $SI$  and  $MShare\_effect_i$  is the import share effect in sector  $i$ , i.e. the average annual pp impact of the relatively lower price level in low-cost countries on euro area import price inflation due to an increase in the import share of these countries. We have multiplied the share effect on extra-euro area import prices with the share of extra-euro area imports in total euro area imports for each sector as the input output tables provide information on total trade only. The effect on total manufacturing PPI is then obtained by calculating the contributions of each individual sector to PPI inflation (using the weights from the input-output tables) and adding them up over all manufacturing sectors.<sup>5</sup> Table 1 shows the results in columns (2) and (3).<sup>6</sup>

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- The second term in the equation represents the price effect. It captures the change in the euro area import price due to different import price inflation rates for country  $j$  and the reference country. This impact increases with the import share of country  $j$ .
  - Finally, the third term in the decomposition represents the residual effect due to price developments in the high-cost countries.

<sup>5</sup> Information on the data sources and the matching of sectors between producer and import prices can be found in the appendix.

**Table 1 Low-cost country share effect on euro area prices***(percentage points; average annual effect from 1996 to 2004)*

	Effect of low-cost country share effect on:				
	(1)	(2)	(3)	(4)	(5)
	Sectoral import price inflation	Sectoral producer price inflation	Contribution to total manuf. PPI	Sectoral consumer price inflation	Contribution to total CPI
Textiles	-0.35	-0.07	-0.002	-0.197	-0.002
Wearing apparel; dressing and dyeing of fur	-0.43	-0.08	-0.001	-0.244	-0.005
Tanning, leather; luggage, handbags, saddle, harness, footwear	-0.28	-0.05	-0.000	-0.167	-0.001
Wood, prods, cork, exc. furn; manuf. Artic.straw, plait. mats.	-0.87	-0.09	-0.002	-0.302	0.000
Pulp, paper and paper products	-0.03	-0.03	-0.001	-0.030	0.000
Publishing, printing and reproduction of recorded media day	-0.03	-0.02	-0.001	-0.022	0.000
Chemicals and chemical products	-0.17	-0.06	-0.006	-0.098	-0.002
Rubber and plastic products	-0.30	-0.06	-0.002	-0.149	-0.001
Other non-metallic mineral products	0.66	-0.00	-0.000	0.166	0.001
Basic metals	-0.48	-0.15	-0.008	-0.306	0.000
Fabricated metal products, except machinery and equipment	-0.48	-0.08	-0.005	-0.209	-0.001
Machinery and equipment n.e.c.	-1.11	-0.20	-0.018	-0.529	-0.004
Office machinery and computers	-2.21	-1.22	-0.013	-1.922	-0.003
Electrical machinery and apparatus n.e.c. day	-1.67	-0.21	-0.008	-0.888	-0.002
Radio, tv, communication equipment/apparatus	-2.60	-0.59	-0.025	-1.811	-0.013
Medical, precision and optical instruments, watches/clocks day	-0.77	-0.19	-0.004	-0.489	-0.002
Motor vehicles, trailers and semi-trailers day	-0.28	-0.12	-0.016	-0.197	-0.007
Other transport equipment	-0.26	-0.19	-0.006	-0.235	-0.001
Furniture; manufacturing n.e.c.	-0.59	-0.09	-0.003	-0.259	-0.005
Sum contributions			-0.121		-0.047

Source: Eurostat, OECD and ECB calculations, using information from input-output tables for 2000. Please note that the effect on sectoral import price inflation is calculated on the basis of intra- plus extra-euro area.

The table shows that the impact of lower import prices due to the increasing share of low-cost countries in total imports on sectoral producer price inflation is strongest in “office machinery and computers” and “radio, TV, communication equipment”, where rising import penetration has brought down producer price inflation by about 1.2 and 0.6 pp annually on average over the period 1996 to 2004, respectively. This means that without the increasing importance of low-cost countries, annual price increases in these two sectors would have been 1.2 pp and 0.6 pp higher on average, respectively. In the textile sectors, the corresponding effect was about 0.07 pp. This significantly smaller effect can partly be explained by the relatively small increase in the import shares of low-costs countries in the textile sector. This is due to the fact that the increase of textile imports from China was in a big extent at the expense of the market share

<sup>6</sup> The sectors “food products and beverages”, “tobacco products”, “coke, refined petroleum products and nuclear fuel day” and “Electricity, gas, steam and hot water supply” have been excluded due to data shortages. Although their combined weight in the PPI amounts to about 30%, with the exception of tobacco the import penetration effect is probably not relevant in these sectors.

of the NMS, leaving the overall low-cost import penetration unaltered. Also, branding plays an important role in this sector, reducing thereby the competition and as a result, the import share effect in this sector. Weighting together the effect of the individual sectors gives an estimate of the total low-cost country share effect on euro area manufacturing PPI of about 0.12 pp per annum on average.

Turning to the impact on consumer prices, we use information from input output tables on the import content of consumption in specific sectors and multiply it with the import share effect. As this only provides us with an estimate of the direct effect on consumer prices via imports of final goods, we have to add the domestic production content in consumption of each sector multiplied with the low-cost countries effect on producer prices calculated above:

$$\Delta CPI_{SI} = McontC_{SI} * MShareeffect_{SI} + \Delta PPI_{SI} * (1 - McontC_{SI}) \quad (2)$$

where  $McontC_{SI}$  is the import content of consumption in sector  $SI$  and  $MShareeffect_{SI}$  is the import share effect in sector  $SI$  and  $\Delta PPI$  is the effect of low cost countries' increasing import share on euro area producer prices, as defined above. Again, the total effect is obtained by calculating the contribution of each sector to total consumption of manufactured goods (using weights from the input output tables) and adding them up over all manufacturing sectors. The results are shown in columns (4) and (5) of Table 1. Overall, the impact on CPI is larger than the one on PPI in all sectors due to the additional direct impact via cheaper final goods imports. Again, the low-cost country share effect on sectoral consumer price inflation is strongest in "office machinery and computers" and "radio, TV, communication equipment", where rising import penetration has brought down consumer price inflation by about 1.9 pp and 1.8 pp annually on average over the period 1996 to 2004, respectively. (In the textile sectors, the corresponding effect was small, about 0.2 pp.) The weighted effect on overall consumer price inflation is relatively small, with 0.05 pp. It should, however, be noted that the calculation includes only those sectors for which we have data on the import share effect, i.e. most of the manufacturing sector, while services, food and tobacco are not included. Thereby, the overall coverage of consumer prices in our calculation amounts to only about 18%.

**A number of further caveats** regarding our input-output analysis needs to be borne in mind. First, we focus on the share effect on import prices from the low-cost countries China and the New Member States only. This means that we do not consider the import penetration effect from other low-cost<sup>8</sup> and high-cost competitors on the euro area, which is expected to be particularly strong in high technology sectors, such

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<sup>8</sup> China and the NMS had a somewhat lower than 30% market share in the euro area external trade in 2004. All the other members of the low-cost group (India, ASEAN countries, CIS, MEDA, Central and South America etc.) had another 20% market share, which the I-O and VAR analysis did not take into account.

as IT. Second, the calculations above do not include the impact of rising import penetration on competition in the euro area, with the expected effects on prices, profits and the labour market and thereby indirectly again on prices. Third, the calculation of the effect on producer prices would be more precise if we could use a more detailed sectoral breakdown, as the sectors used above contain still relatively heterogeneous goods so that the goods within one sector are not always competing goods. This also introduces a downward bias into the estimations above. The current limits to the breakdown stem from the number of sectors included in the input-output tables. Fourth, the estimates on the sectoral effects are based on import unit values instead of import prices with the standard caveats that this implies.

Finally, the calculation is done in a static accounting framework, without taking into account dynamic adjustment mechanisms, as input output tables are not available on an annual frequency and are published with substantial delay and the country coverage for the euro area tends to change over time.<sup>9</sup> For this reason, the next paragraph quantifies the effect using a VAR model on the production chain for the euro area.

### **3.3 Passing import price level effects through the pricing chain: results from a VAR model**

We also calculated the overall effect using results from an updated version of a VAR on the euro area production chain as presented in Hahn (2003). This VAR is based on a set of 7 variables (oil prices, interest rate, GDP, exchange rate, Import prices, producer prices and HICP). The identification is given by a basic Cholesky-decomposition with the ordering as indicated above.

Using the VAR we assume that the average annual share effect on extra-euro area import prices will be passed on to the consumer as any other import price shock observed over the estimation sample. In order to calculate the effect, we simply multiply the impulse responses of producer prices and the HICP from a 1% increase in non-oil import prices with the above mentioned share effect on import prices.<sup>10</sup> The results (see Table 2) point to an average annual impact over the period 1995 to 2004 on PPI inflation of about -0.3 pp and on HICP inflation of about -0.07 pp when using impulse responses for the first year. The effect for HICP inflation increases to about -0.2pp when using impulse responses cumulated over three years. The results confirm that when taking into account dynamic adjustments between different price variables,

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<sup>9</sup> We have compared the results for the euro area countries for which input-output tables are available for both 1995 and 2000 (D, ITA, NL, BE, FIN, AUT). In 2000, the total producer price effect was 0.024 pp higher than in 1995, and the consumer price effect was 0.002 pp higher.

<sup>10</sup> In order to calculate the impact of low-cost countries, we use the total average annual share effect on extra-euro area manufacturing import prices as calculated in ECB (2006) and convert it into an effect on intra- plus extra-euro area non-oil import prices as the VAR uses non-oil intra- plus extra-euro area import prices. The total effect on intra- plus extra-euro area import prices (-0.65pp) is calculated as the effect on extra-euro area manufacturing import prices (-1.6 pp) times the weight of manufacturing in extra-imports (0.72) times the weight of extra- in total euro area imports (0.5 pp) divided by the weight of non-oil in total intra- plus extra-euro area imports (0.9).

the effect is somewhat larger than what we found in the static input-output analysis above. It is, however, difficult to disentangle whether the stronger effect compared with the input-output analysis is due to the adjustment in import shares, which is not taken into account in the input-output table analysis, or to some other effects, such as wage adjustment, adjustment in foreign prices or other variables, which are implicitly included in the VAR. It should be noted that these results are probably higher than in reality, as the impulse responses of the VAR are identified unexpected shocks, while the estimated import price effect is an average effect, i.e. does include more than the unexpected component.

**Table 2 Impact of low-cost country share effect on euro area prices using VAR results**

*(cumulated percentage points)*

	Year 1	Year 2	Year 3
PPI	-0.30	-0.30	-0.31
HICP	-0.07	-0.15	-0.18

*Note: averages over years.*

The VAR analysis still has two of the above mentioned caveats: we focus on the share effect on import prices from the low-cost countries China and the New Member States only, and the estimates on the sectoral effects are based on import unit values instead of import prices. Therefore, we also estimate the overall effect of rising import penetration on producer price inflation, which also includes import penetration effects from high-cost and other low-cost countries and the effect of import penetration on domestic market competition.

**3.4 A broader view: price effects using panel estimation models**

In this section, we measure the impact of rising import penetration on euro area domestic prices in an econometric analysis using a sectoral dataset for euro area countries. We use the same dataset as IMF (2006)<sup>11</sup> but modify somewhat the regression as we want to obtain the effect on producer prices rather than on the sectoral price differentials as the IMF. Indeed, as argued by Ball (2006), using relative specifications does not allow to find an overall price effect of increased import penetration as for each relative price fall in one sector there is a relative price increase in another sector. As we do not use a relative specification, we also include a monetary policy variable, namely interest rates. In addition, we restrict the sample to euro area countries. The dataset stems from the OECD STAN database and comprises 6 euro area countries<sup>12</sup> and 15 manufacturing sectors over a period from 1978 to 2003, which is currently the latest available year from the STAN dataset.

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<sup>11</sup> Kindly put at our disposal by F. Jaumotte from the IMF.  
<sup>12</sup> Due to missing observations, Germany, Ireland, the Netherlands, Portugal and Spain have been excluded from the sample.

The estimated equation is:

$$d \ln p_{ijt} = c_{ij} + \alpha d \ln impsh_{ijt} + \beta d \ln prod_{ijt} + \gamma dir_{it} + \varepsilon_{ijt} \quad (3)$$

where  $p$  is the producer price,  $impsh$  the import share (nominal imports divided by value added),  $prod$  is labour productivity and  $ir$  is the interest rate. The subscript  $i$  stands for the country, and the subscript  $j$  for the sector. The variable  $impsh$  should capture the import penetration effect including also competition effects and spillover effects between high-cost countries. In addition, it also includes the effect of import price changes which are, to a large extent, due to exchange rate movements.

Analogously to the IMF (2006), we use a two-step feasible generalised method of moments estimator instrumenting for changes in the import ratio given the possibility of endogeneity.<sup>13</sup> The instruments are the weighted sum of the shares of the other countries in the world production of a sector and the nominal effective exchange rate. As for the euro area countries, the nominal effective exchange rate is strongly correlated with the USD exchange rate, we do, unlike the IMF (2006) paper, not include the latter in our regression. In addition to the full sample from 1978 to 2003, we also use a reduced sample from 1995 onwards, mainly for two reasons: first, the subsample covers a period over which the output gap is, on average, close to zero, so that we reduce the impact of the business cycle on our estimation results. And second, the results are therefore better comparable to the input-output analysis above. The estimation results are shown in Table 3.

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<sup>13</sup> We have also experimented without instrumental variables. In most static versions of the model, we then found no significant effect of the import share.

**Table 3 Estimation results – producer prices**

	Coef	Std error	T-stat	Prob	Long-term coefficient <sup>1)</sup>	Contribution of the import share (pp) <sup>2)</sup>
<b>1978-2003</b>						
producer prices (-1)	0.420	0.166	2.540	0.011		
change in import share	-0.214	0.137	-1.560	0.119	-0.370	-0.78
change in labour productivity	-0.083	0.049	-1.690	0.091	-0.142	
interest rate(-1)	-0.006	0.002	-2.930	0.003	-0.011	
<b>1995-2003</b>						
change in import share	-0.433	0.145	-2.980	0.003		-1.01
change in labour productivity	-0.175	0.067	-2.600	0.010		
interest rate(-1)	-0.009	0.002	-4.680	0.000		

All variables are estimated in first log-differences.

<sup>1)</sup> This effect is calculated by dividing the coefficient of each variable by 1 minus the coefficient of the lagged dependent variable.

<sup>2)</sup> This effect is calculated by multiplying the (long-term) coefficients with the average annual growth in the import share.

The table shows estimations for the full sample (1978-2003) and for the sub-sample starting in 1995. For the long sample, a lag of the dependent variable had to be introduced to correct for autocorrelation.<sup>14</sup> Most variables enter with the expected sign and are significant: interest rates have a negative and significant impact on producer prices in all specifications and productivity has a positive significant impact. Most importantly, the import share is negative and significant, although only at 12% for the long sample.

Overall, the average annual import share effect (calculated as the coefficient multiplied with the average annual growth in the import share, at 2.1% according to the full sample and 2.3% according to the short sample) is estimated to be around 0.8-1.0 pp. This effect is substantially higher than the effect obtained from the VAR, probably due to the fact that the VAR only estimates the impact from a lower import price level due to a higher share of imports from low-cost countries, while the panel estimation has a broader concept of openness, using the change in the total import share. However, the estimated impact is also large compared with the estimate of the IMF (2006) which could be due to the fact that the IMF estimates changes in sectoral producer prices relative to the manufacturing average while our estimates are not specified in relative terms. Therefore, our results can be interpreted as effects under the assumption of no monetary policy reaction. Taking only the short-term reaction, which is possible in the estimation with the full sample due to the dynamic specification, the effect would be somewhat lower, at 0.45 pp, which is similar to a relative specification as used in the IMF (2006) where the effect amounts to 0.4-0.5 pp (see box). The effect on consumer prices can however not be assessed due to data limitations at this disaggregation level.

<sup>14</sup> Although it is recommended to use the Arellano-Bond estimator in panel data with fixed effects when introducing a lagged dependent variable, we have used the correction proposed by Hsiao (1981) as the first method does not allow keeping the instruments for the other explanatory variables.

It should be emphasized that the quantification in this section is of a partial nature. Globalisation affects domestic prices in a very complex way. However, the input-output analysis is of a partial nature, as it does not include dynamic effects and is more an accounting exercise, while the sectoral panel estimation is more encompassing but does not enable us to disentangle the impact of globalisation from other shocks hitting the economy. Therefore, the results should be interpreted with caution.

It should be also noted that all of the above estimates are based on observations in the recent past and cannot easily be extrapolated to the future. In particular, for the results using data on low-cost countries, the effect of China and the New Member States might decline over the future as these countries catch up with associated higher prices. Although other countries might then take over the role of China and the New Member States as main low-cost exporters to the euro area, the impact can alter from what we have presented in this section.

## **4. The impact of increasing import penetration on the euro area labour markets**

### **4.1 Literature**

Theoretically, globalisation affects domestic labour markets through two main mechanisms: it enhances product market competition by the increased volume of trade and gives easier access to global labour supply via immigration and increased capital mobility. These two mechanisms are, however, strongly interrelated. On the one hand, stronger product market competition squeezes profits and enforces an adjustment mostly by innovation and cost reduction through lower employment and / or lower wages. On the other hand, fostered by higher capital mobility corporate adjustment has taken the form of production segmentation (offshoring, delocalisation) in recent decades, both in relation with developed and emerging economies. Regarding the effect of production segmentation on the domestic labour market possible efficiency gains can in the long term counterbalance the initial decline of labour demand. Above that, even the threat of offshoring, without an actual action may be sufficient to decrease wage pressures of employees.

Empirical evidence on the impact of globalisation on labour market developments is limited. Traditional trade theory focuses on what effects *trade in final goods* may have on the domestic economy. Based on

the Stolper-Samuelson theorem<sup>15</sup> the main effect in advanced economies is a shift in the labour demand towards skilled relative to unskilled workers rather than changes in aggregate employment and wage levels. In addition, the literature indicates that international trade explains only a modest 10 to 20 percent in rising income inequalities during the eighties in the US and claims that labour market developments have been driven by other factors than trade, mainly by technology (Lawrence and Slaughter (1993), Borjas, Freeman and Katz (1994)). Evidence for Europe also suggests no or only small impacts of international trade on relative wages, but possibly a larger effect on employment (Cuyvers et al (2002)). This is in line with the supposedly more rigid nature of wages in Europe. Machin and van Reenen (1998) investigate 7 OECD countries and revealed that – although import competition and skill upgrading took place mostly in the same industries – changing skill structure was driven by technological changes and trade had no significant effect.

There are several explanations for the weak empirical findings on the impact of trade on domestic labour markets. One is the endogeneity of technological change. Wood (1994) argues that a significant part of labour saving innovations are induced by trade and claims that a plausible magnitude would be to simply double the previously estimated direct impact coming from trade. Another important aspect is given by Feenstra and Hanson (2003), who point to the relevance of *offshoring*.<sup>16</sup> Offshoring to low-cost countries is mainly concentrated in labour intensive production segments (Baconier et al (2002)), and shifts labour demand from unskilled towards skilled labour within the same industry (Feenstra and Hanson (1999), Gorg et al. (2005)) rather than across industries as assumed by the “final goods trade” literature.

The impact of offshoring on aggregate levels of domestic wages and employment depends on how the parent company and its affiliate (in low-cost countries) specialise. One possibility is when offshoring follows the pattern of comparative advantages and the outsourced (low-skilled) activities are complementary to those left in the parent company. In this case the shift of labour demand for skilled labour is likely to push average wage levels up within the parent company, while the employment of the low skilled should decrease. However the initial employment loss can be counterbalanced by the increase in overall activity due to efficiency gains. An important argument of the literature is that these efficiency gains most likely need time to develop. Therefore, in the short run negative temporary adjustment effects

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<sup>15</sup> According to the Stolper-Samuelson theorem if trade opens up between advanced and developing countries, advanced countries start to import low skilled labour intensive products from developing countries, where these products can be produced with a comparative advantage due to a relative abundance of low skilled labour. As a consequence of trade, relative prices of low skilled products and the demand for low skilled workers will fall in the developed countries, deteriorating the relative labour market position of low skilled workers (lower wages and/or employment). On the other hand the demand for high skilled labour will increase as the advanced economy specialises on high skilled intensive products, and so the wages and/or employment of the high skill workers should rise.

<sup>16</sup> In a broad sense offshoring is a term for imports of intra-industry intermediate inputs, in a more strict sense it means the geographic separation of producing activities, and so it is more of a synonym of *delocalisation*.

can be dominant and their persistence will depend upon the flexibility of product and labour market structures (Tefous (2006)).<sup>17</sup>

Another line of the literature claims that the impact of globalisation occurs via elasticities and, in particular, via the real wage elasticity of labour demand. The main argument behind this idea is that while pressure on prices (wages) shows up only via trade between countries with dissimilar relative endowments, elasticities are affected even when trade intensifies between countries with quite similar endowments (Rodrik (1997))<sup>19</sup>. Based on the fundamental law of labour demand (Hamermesh (1993)) globalisation can raise the elasticity of real wage of the labour demand via two channels: (1) increased competition exerts downward pressure on domestic product prices (higher price elasticity on product markets) so that companies have to limit increases in labour costs and (2) easier access to capital and foreign labour makes it less difficult to substitute away from domestic labour in case its price increases.<sup>20</sup> This theoretical relationship however got weak empirical grounding so far. For the US Slaughter (2001) finds that openness explains only a small part of changing labour demand elasticities. Bruno et al. (2004) obtain a significant impact of changes of import penetration on the price elasticity of demand for labour in the UK, and to a lesser extent in France and Italy. In a recent study, Molnar et al. (2006) use the ratio of outward FDI stock to nominal output as a proxy for an impact of globalisation. They find an overall negative effect on employment growth and a significant positive impact on labour demand elasticities in the OECD countries – in at least the group of those industries that have strong trade relation with emerging economies and supposedly have low cost of delocalisation (textiles, transport equipment, electrical and optical equipment and food).

The increased pressure on employers to keep labour costs low and the possibility for them to use non-domestic factors of production more extensively results in a weakening of the position of workers in the

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<sup>17</sup> The newly emerging trade in tasks theory claims that offshoring is increasingly focused on tasks rather than intermediate goods. Tasks refer to a much finer disaggregation level than intermediates and cover service type of activities rather than goods. But most importantly, the extent to which tasks are exposed to offshoring does not necessarily depend on skill intensity anymore, but much more affected by how easily these tasks can be delivered down a fibre optic cable to remote locations (Baldwin (2006)). Consequently skill intensity is not a useful category anymore to describe shifts in the labour demand.

<sup>19</sup> For example, in a Heckscher-Ohlin trade model if an economy's autarky relative endowment equals that of the rest of the world then when the country opens to trade it experiences no change in product prices and thus (via Stolper-Samuelson theorem) no change in wages. But opening can make foreign factors more substitutable with domestic ones and can make product markets more competitive, resulting in higher labour demand own price elasticities.

<sup>20</sup> According to the fundamental law of labour demand the own-price labour demand elasticity is determined by two factors:

$$\eta_{LL} = -(1-s)\sigma - s\eta .$$

The first term (substitution effect) shows how much labour is substituted by other factors of production when wages increase and so this term is basically determined by the elasticity of substitution ( $\sigma$ ). The second term (scale effect) indicates by what extent output falls due to an increase of production costs implied by higher wages. This is determined by the price elasticity of product demand ( $\eta$ ), which is related to product market competition.

wage bargaining process. This line of argumentation is in line with the anecdotal evidence that even the threat of offshoring, without an actual action may be sufficient to decrease wage pressures in several industries. Some recent empirical studies seem to confirm that indicators of globalisation are negatively correlated with both union bargaining power (Dumont et al. (2006)) and with union membership (Dreher and Gaston (2005)) in a number of OECD countries. Boulhol et. al. (2006) finds that imports from developed countries have significantly contributed to the decrease in both mark-ups and workers' bargaining power in the UK manufacturing sectors in the 1988-2003 period.

The number of studies that try to quantify the **aggregate impact** of globalisation on labour markets is limited. The IMF (2006) estimates a panel regression across manufacturing industries of major developed countries over the period 1978 to 2003. The study quantifies the impact of openness on wages and productivity separately. According to their finding a 1% increase in relative trade openness would increase relative productivity by 0.12% and – although the higher productivity induces higher wages – relative unit labour costs would still decrease by 0.09%.

The OECD (2007) found a significant negative impact of increased import penetration on manufacturing sectoral employment of -0.006 pp in the 1987-2003 period by estimating a labour demand equation with variables of five-year differences. The estimated impact was higher in the case of imports from low-cost countries (-0.05) and using the “narrow” offshoring measure (-0.09). According to their estimates of a translog cost function import penetration has a negative effect on the relative demand for low- and high-skill workers – albeit, more strongly for low-skilled workers – and no effect on the demand for medium-skill workers.

It has to be mentioned that although our analysis is limited to manufacturing developments a significant increase has occurred in the offshoring of services since the mid-nineties. The services sector's offshoring affects rather high skilled than low skilled workers, which means that it has the opposite impact on changes in relative labour demand to that of offshoring in manufacturing. Looking forward it is to be said that offshoring is expected to be an increasingly important factor in affecting labour market developments: about 15-20% of total employment could be subject to international offshoring in the OECD countries in the upcoming years (van Welsum and Vickery (2005)).

## 4.2 Stylised facts

Based on the literature survey in the previous section we may conclude the following. According to the traditional trade theory the opening up of trade with low-cost countries shifts the labour demand from low-skilled to high skilled workers. Sluggishness of the reallocation of resources may result in temporary losses in output and employment at the aggregate level. In the long run however we expect efficiency gains to enhance activity, employment and productivity. Globalisation also weakens the bargaining power of employees and increases the real wage elasticity of labour demand due to increased product market competition and easier substitution among the various inputs of production. This impact moderates real wage developments. In addition, even the threat of offshoring, without an actual action may be sufficient to decrease wage pressures of employees.

As a first step of the analysis we investigate how much the stylised facts are in line with the above implications of the theory. Chart 2 plots *annual average changes* in import penetration<sup>22</sup> with changes in employment, real wages, value-added and productivity in the 1995-2003 period, in the manufacturing sector at an aggregated euro area level<sup>23</sup>. The clear negative relationship between the changes in employment and import penetration suggests that short-run negative impacts of rising import share are dominant within our sample. However the positive relationship between the changes in import penetration and the value added indicate that other mechanisms are present as well. In addition we see that real wages increased relatively more in sectors where import penetration grew faster, which is in some way against the implications of the theory.

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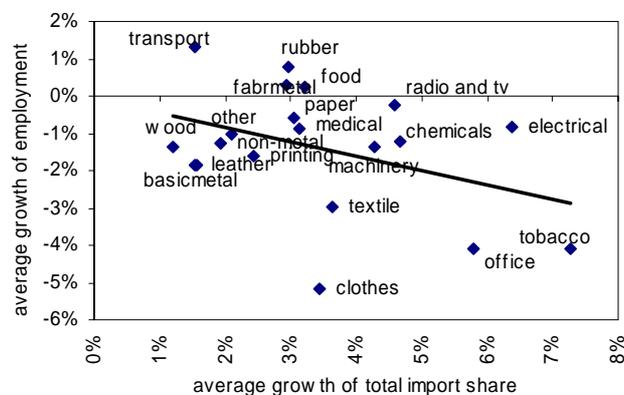
<sup>22</sup> Openness is measured by the share of (intra+extra euro area) imports in nominal domestic use (output + imports-exports). The dataset used in this section is slightly different from the one used in the previous section on PPI and combines data from the EUKLEMS (employment, compensation per employee, output, producer prices) and the OECD STAN (trade data, R&D expenditures) at a 2 digit level (21 manufacturing industries) and for 9 EU countries (euro area with the exception of Ireland, Luxembourg and Greece). The time period used the analysis is 1995-2003.

<sup>23</sup> The euro area aggregate is calculated as a weighted average of 6 euro area countries (Austria, Finland, France, Germany, the Netherlands and Spain). The other euro area countries have been excluded due to severe data limitations.

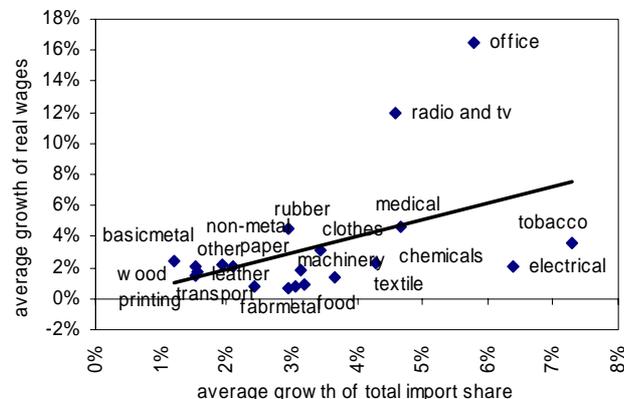
## Chart 2 Labour market developments and import shares across manufacturing industries

average changes 1995-2002

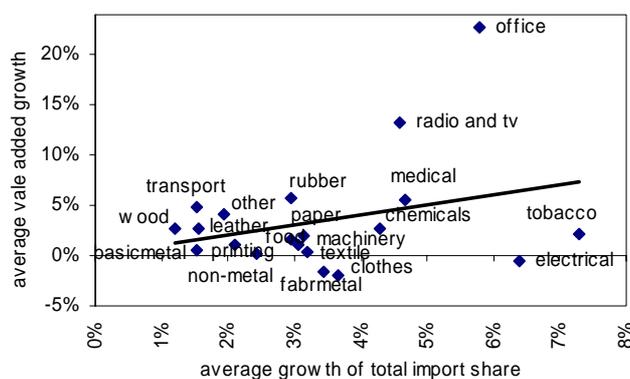
### Employment



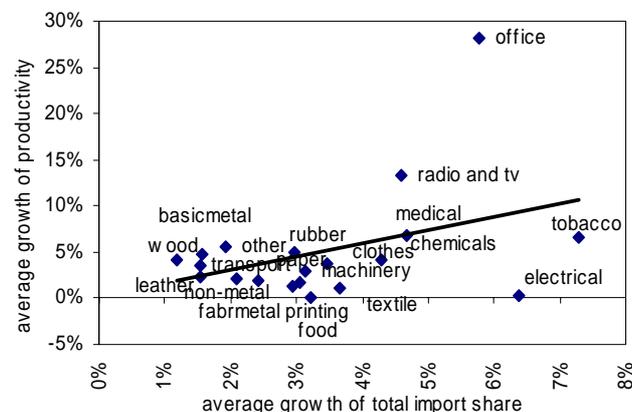
### Real wages



### Value added



### Productivity



Source: OECD STAN; data for aggregate EU6 (AUT, FIN, FRA, GER, NL, ESP)

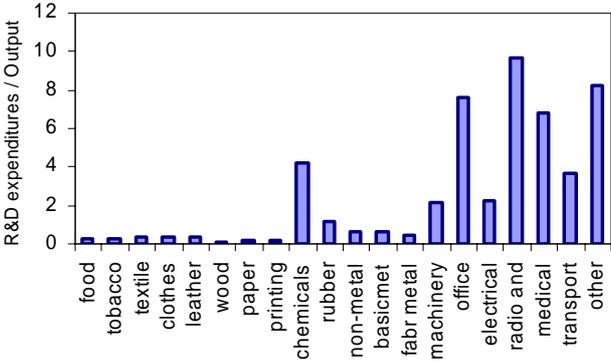
There are at least two possible factors that can help us to understand the somewhat contradictory picture indicated by the Chart 2. One is the impact of technological development. The positive relationship between the import penetration and both real wages and the value added is strongly influenced by two sectors, i.e. the office and accounting machinery and the radio and television industries. When these two sectors are excluded from the analysis one would find a horizontal trendline in the case of real wages and a negative relationship between the import penetration and the value added.<sup>24</sup> Office and accounting machinery and radio and television are the leading IT producing industries, with the highest share of R&D expenditure in output among the manufacturing industries (Chart 3). Benefiting from the use of advanced technologies these sectors were able to reach value added growth well above the manufacturing

<sup>24</sup> The horizontal trendline in the context of real wages and the negative relationship between changes in import penetration and employment supports the idea that the bulk of the labour demand adjustment materialises in the decline in employment rather than wages due to the existing nominal wage rigidities in the euro area.

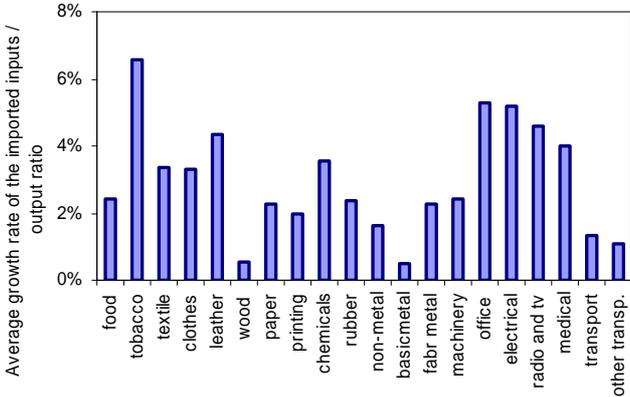
average and strong productivity gains allowed real wages to grow at around 10% in these sectors during the 1995-2003 period.

Another possible explanation of the positive relationship between changes in import penetration and changes in the value added, productivity and real wages is the realization of efficiency gains due to offshoring of various stages of production. Chart 4 plots the average growth rate of the ratio of own imported inputs to production (a change in the so-called narrow offshoring measure) across industries. In the office and accounting machinery and radio and television sectors offshoring increased strongly in the recent years and as a result of that, efficiency gains from the reallocation of resources are anticipated to emerge. It is also worth mentioning however that offshoring activity rose relatively strongly in the tobacco, textile, clothes and leather industries, in which value added declined, and productivity and real wage dynamics remained modest.

**Chart 3 R&D expenditures (1995-2003 average)**



**Chart 4 (Narrow) offshoring (annual average growth 1995-2003)<sup>25</sup>**



Source: OECD STAN; data for aggregate EU6 (AUT, FIN, FRA, GER, NL, ESP)

Overall, the stylised facts indicate no clear patterns across sectors. Import penetration increased similarly in a group of high-skill sectors with strong productivity and in a group of low-skill sectors with negative output growth. This phenomenon can possibly be explained by strong technological developments in the high-skill sectors. However it is also possible that efficiency gains from resource reallocation are strong in the leading high skilled industries, while in the low-skilled sectors of textile, clothes and leather the negative temporary impacts remained dominant. This dualism may justify a sectoral approach in analysing the impact of increased import penetration on labour markets in case the impact is allowed to vary across the different groups of high-skilled vs. low-skilled sectors. This is one of the assumptions we test in the following section.

<sup>25</sup> For details of calculation see section 4.3.

### 4.3 Estimating the effects of import penetration on sectoral labour demand

In this section we estimate the impact of increased import penetration on the euro area sectoral labour demand.

We use a simplified conditional labour demand model specification,<sup>26</sup> where we augment the core specification by measures of import penetration as demand shifters. We also include an interactive term of real wages and import penetration in our equation in order to be able to incorporate the impact of globalisation on real wage elasticity of labour demand. Our specification is similar to Bruno et al. (2004) and assumes that globalisation may have an impact on labour demand through both a direct effect ( $\beta_{imp}$ ) and via an impact on labour demand elasticity ( $\beta_{wimp}$ ):

$$\ln l_{i,j,t} = \gamma * \ln l_{i,j,t} + (\beta_w + \beta_{wimp} * \ln impsh_{i,j,t}) * \ln wp_{i,j,t} + \beta_y * y_{i,j,t} + \beta_{imp} * \ln impsh_{i,j,t} + \mu_t + \varepsilon_{i,j,t} \quad (4)$$

where  $l$  is employment,  $wp$  is real wages,  $impsh$  is the import penetration measure,  $y$  is output,  $\mu_t$  is a time dummy and all variables are in logs.  $\beta_{wimp}$  is a coefficient of the interactive term for the impact of increased import penetration on the real wage elasticity. As discussed previously globalisation should have raised the elasticity of real wage of the labour demand via two channels: (1) increased competition exerts downward pressure on domestic product prices (higher price elasticity on product markets) so that companies have to limit increases in labour costs and (2) easier access to capital and foreign labour makes it less difficult to substitute away from domestic labour in case its price increases.

The dataset used in the analysis consists of 9 euro area countries, 21 manufacturing sectors (at the 2 digit NACE level) and covers the period of 1995-2003. (A detailed description of the countries and sectors is given in Appendix A2.) Trade data are extracted from OECD STAN in order to compile the import-penetration measures. The employment, output, and real wages variables were constructed on the basis of the EUKLEMS dataset.

We use two measures of import penetration to estimate the impact of globalisation on labour demand: the import share and the “narrow” offshoring measure.

Import share is defined as the ratio of imports over domestic absorption:

$impsh_{i,j,t} = M_{i,j,t} / (Y_{i,j,t} + M_{i,j,t} - X_{i,j,t})$  where  $M_{ij}$  and  $X_{ij}$  are values of imports and export in industry  $i$  and country  $j$  and  $Y_{ij}$  is output at current prices.

“Narrow” offshoring is defined as the ratio of own imported inputs over domestic absorption:

$narrow_{i,j,t} = M_{ii,j,t}^{INP} / (Y_{i,j,t} + M_{i,j,t} - X_{i,j,t}) = \alpha_{ii,j,2000}^{INP} * M_{i,j,t} / (Y_{i,j,t} + M_{i,j,t} - X_{i,j,t})$  where  $\alpha_{ii,j,2000}^{INP}$  is the share of imported inputs of industry  $i$  in total imports of the same industry in the year 2000. The source of the coefficient is the OECD Input-output database.<sup>27</sup> Given that our  $\alpha_{ii,j,2000}^{INP}$  coefficient has no time dimension, the “narrow” measure of outsourcing differs from the import share only at the cross-sectional level.<sup>28</sup>

To control for the possibly different impact of increased import penetration on high-skilled and low-skilled sectors we classified the sectors into two groups. (The classification is based on Jean and Nicoletti (2002), for more info see the Appendix A.3.) Our augmented labour demand equation is first estimated on the sample of all sectors and then independently on each of the sub-sample of the high-skilled and low-skilled sector groups.

The equation contains a lagged dependent variable. In order to get unbiased and consistent estimates of the regression coefficients we use the Arellano-Bond estimator. To test the presence of no serial autocorrelation in the levels, we present the 2<sup>nd</sup> order serial correlation of the differenced equation. We consider all the explanatory variables as endogenous and instrument them with their own second, third and fourth lagged values. In order to check the validity of the instruments the Hansen J-test of overidentifying restrictions is used. When the equation is estimated on the sub-sample of high-skilled / low-skilled sector groups the number of instruments is cut in order to keep the power of the test.

The results of the estimations using the import share and the “narrow” offshoring measure are presented in Table 4. The Table consists of 3 blocks: basic labour demand specification (columns 1-3), the augmented labour demand specification using the import share (columns 4-6), and the augmented labour demand specification using the “narrow” offshoring measure (columns 7-9). Each of the estimations has been done on three different samples: including all sectors, and restricting the sample to the group high-skilled sectors and low-skilled sectors.

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<sup>26</sup> In the conditional model, the profit-maximising level of labour demand is determined by minimising the cost of production at a given level of output, contrary to the unconditional labour-demand model where firms maximise profits by choosing the optimal mix of input quantities and the level of output for given input and output prices.

<sup>27</sup> We created also a “broad” offshoring measure, which is defined as the ratio of all imported inputs over domestic absorption:  
 $broad_{i,j,t} = (\sum_m M_{im,j,t}^{INP}) / (Y_{i,j,t} + M_{i,j,t} - X_{i,j,t}) = (\sum_m (\alpha_{im,j,2000}^{INP} * M_{m,j,t})) / (Y_{i,j,t} + M_{i,j,t} - X_{i,j,t})$  where  $\alpha_{im,j,2000}^{INP}$  is the share of imported inputs of industry  $i$  in country  $j$  in total imports of industry  $m$  in country  $j$  in the year 2000, taken from the OECD Input-output database. However estimates were insignificant and therefore we don't report the results.

<sup>28</sup> Given that data on imported input shares are available for the year 1995 it is possible to give time dimension to this factor as well.

**Table 4 The effects of import penetration on sectoral employment - Estimation results**

Dependent var. Employment	Basic labour demand specification			Augmented by import share			Augmented by "narrow" outsourcing		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All sectors	High skilled	Low skilled	All sectors	High skilled	Low skilled	All sectors	High skilled	Low skilled
Employment (-1)	0.6603*** [7.55]	0.6347*** [4.33]	0.6858*** [10.2]	0.5816*** [10.7]	0.4929*** [6.42]	0.6038*** [9.65]	0.5829*** [11.0]	0.4941*** [6.01]	0.6883*** [13.5]
Output	0.1640** [2.50]	0.1983* [1.81]	0.3890*** [4.65]	0.2149*** [3.47]	0.2978*** [3.33]	0.3288*** [4.51]	0.2044*** [3.10]	0.3057*** [3.42]	0.3183*** [5.27]
Real wages	-0.1556*** [-3.01]	-0.1242** [-2.06]	-0.2572*** [-3.27]	-0.1033*** [-3.10]	-0.0788* [-1.93]	-0.1890*** [-3.15]	-0.1078*** [-2.61]	-0.0719* [-1.93]	-0.2394*** [-3.70]
Real wages * Import share				-0.0087 [-0.56]	-0.0036 [-0.25]	-0.0619* [-1.93]			
Import share				-0.0067 [-0.70]	0.0054 [0.58]	-0.0314* [-1.90]			
Real wages * Narrow Offshoring							-0.0058 [-0.42]	-0.0002 [-0.012]	-0.0612* [-1.68]
Narrow Offshoring							-0.004 [-0.44]	0.0092 [1.06]	-0.0369* [-1.84]
Observations	1444	704	740	1350	649	701	1350	649	701
Number of id3	162	79	83	155	75	80	155	75	80
# instruments	90	54	54	144	99	99	144	99	99
Hansen p-value	0.229	0.440	0.274	0.198	0.927	0.984	0.229	0.962	0.893
AR1 p-value	0.000	0.005	0.013	0.000	0.003	0.000	0.000	0.002	0.000
AR2 p-value	0.371	0.299	0.697	0.936	0.972	0.859	0.953	0.972	0.784
Robust t statistics in brackets									
*** p<0.01, ** p<0.05, * p<0.1									

All variables are in logarithms. All equations include time dummies. The reported coefficients are results of a one-step robust Arellano-Bond estimation, i.e. the standard error estimates are consistent in the presence of any pattern of heteroskedasticity and autocorrelation within panels.

The test statistics on the second order autocorrelation and on the overidentifying restrictions indicate that our estimates are consistent and unbiased and the instruments are valid. The relatively small changes in the major parameters of the basic labour demand equation in the different specifications show that these estimates are robust. As regards the import penetration measures the picture is somewhat mixed. When estimated on the sample of all sectors and the sub-sample of high-skilled sectors their coefficients are insignificant. However in the sub-sample of low-skill sectors both the direct impact and the impact on the real wage elasticity are negative and significant at the 10% level. This may imply that the import share and offshoring indeed has a different impact on high-skilled and low-skilled sectors: the impact is significant and negative on both employment and real wage elasticity in the low skilled sectors, but insignificant in the high-skilled ones. This finding is in line with the conclusions drawn from the stylised facts exercise at the end of section 4.2.

As regards the magnitude the derived long-term coefficients of the direct effects of import penetration measures are in the range of -0.08–(-0.12) (Table 5). The 2.1% actual annual growth rate of the import share would imply that the increase of the import share had a -0.17 pp. contribution to the annual average low-skilled employment growth over the period the 1995-2003. The contribution of the “narrow” offshoring is somewhat higher (-0.24 pp). Given the -0.3% annual average growth rate of low-skilled employment, the contributions from increased import penetration explain 50-75% of the total annual decline. According to the calculations import penetration increased the real wage elasticity of labour demand by 0.3pp on an annual average, which compared to an estimated long-term elasticity of real wages of -0.5 to -0.8. However, given the high uncertainty around the real wage elasticity estimates in the empirical literature the impact is in an acceptable range.

**Table 5 Long-term elasticities and calculated actual impacts in the low-cost manufacturing sectors**

Variables	Coeff	Long-term elasticities	Annual average growth of openness measure (%)	Actual impact annual average
<b>Import share</b>				
Emp (-1)	0.603***			
Output	0.328***	0.83		
Real wages	-0.189***	-0.48		
Real wages * Import share	-0.061*	-0.16		-0.33
Import share	-0.031*	-0.08	2.1	-0.17
<b>"Narrow" offshoring</b>				
Emp (-1)	0.688***			
Output	0.318***	1.02		
Real wages	-0.239***	-0.77		
Real wages * Narrow offsh.	-0.061*	-0.20		-0.41
Narrow offsh.	-0.036*	-0.12	2.1	-0.24

As regards the robustness of our estimates the picture is somewhat mixed. We tried three alternative specifications by excluding either the direct impact or the interactive term and also by including the export share into our augmented labour demand specification. Although the signs and value of the coefficients of the import penetration measures remained mostly unchanged, in the new specifications they lost their significance. We also experimented with the inclusion of capital stock and technology proxies into the equations, but these proved to be insignificant.<sup>29</sup>

The theory offers various possible explanations why it is difficult to obtain robust and significant estimates for the impact of rising import penetration on labour demand at the sectoral level. First, it is hard to disentangle the temporary negative effects from the positive impact of the long term efficiency gains. Second, it is hard to find an appropriate proxy for technology and given the strong endogeneity of technology and trade it is almost impossible to separate these two effects from each other. Thirdly, due to increased production segmentation substitution of low-skilled workers with high skilled workers takes place within sectors rather than between them. Thus, a measure that describes the changes in skilled / unskilled ratios within sectors would probably improve the results. Fourth, also the import penetration measures used in our analysis are not disaggregated enough, i.e. a possible distinction by imports of origin could reveal more direct impacts. Finally, according to the theory one of the new characteristics of the recent phase of globalisation is its relatively strong indirect impact on domestic labour markets, the so called “threat” effect. As this effect goes beyond actual import penetration numbers, regressing actual trade data on labour market indicators can not identify this potentially significant impact of globalisation.

<sup>29</sup> One possible explanation for that is the serious data limitation at the 2 digit industry level both in the context of capital stock and R&D expenditure data.

## 5. Conclusions

This paper tries to give a preliminary quantification of the impact of increasing import penetration on euro area prices and labour markets. Given that we focus on non-energy imports we exclude from the analysis both the upward pressure on domestic inflation due to higher oil prices and the positive impact on labour demand (and wages) due to expanding export markets. Thus, our analysis is of a partial nature and the overall net effects on domestic prices are expected to be smaller in absolute terms than depicted by our analysis.

Different methods are used to try to quantify the effect of rising imports on euro area domestic prices. First, we measure the low-cost country effect on euro area producer and consumer prices using information from input-output tables. The main finding is that imports from low-cost countries reduced euro area producer price inflation by about 0.12 percentage point (pp) and consumer price inflation by about 0.05 pp per year on average over the period 1996 to 2004. As this method only allows for a static analysis, we also use a VAR of the production chain to estimate the effect of lower import prices on euro area producer prices and the HICP. These estimates point to an average annual downward impact of about 0.3 pp on producer price inflation and 0.1-0.2 pp on headline HICP inflation over the period 1995 to 2004.

Both the approaches using the I-O tables and the VAR do, however, only include the effect of China and the NMS on euro area import prices. Therefore, we also estimate the import penetration effect using a panel with sectoral data for euro area countries and introducing a more encompassing variable for the import penetration, namely the import share in production of each sector. This variable includes not only the more recently observed effect of low cost countries but more generally the effect of stronger trade integration. The results indicate that increased imports have reduced euro area producer prices at the sectoral level (including both competition and input cost effects and all trading partners) by about 0.8-1.0 pp per year on average over the two estimation periods, namely 1978-2003 and 1995-2003. This effect is, as expected, higher than the one obtained from the VAR. In addition, it also exceeds the estimates of the IMF as our estimates are based on long term elasticities, controlling, for example, for the effects of monetary policy. Taking a more short-term perspective would reduce the estimated impact to about 0.4-0.5pp. The effect on consumer prices can however not be assessed due to data limitations at this disaggregation level.

It should be noted that all of the above estimates are based on observations in the recent past and cannot easily be extrapolated to the future. In particular, for the results using data on low-cost countries, the effect of China and the NMS might decline over the future as these countries catch up with higher price standards. It is important to emphasize that the analysis does not consider the monetary policy reaction, which would alter the medium term impact on prices, profits and labour demand. Given that monetary policy controls inflation in the medium term, the assumption of unaltered monetary policy reaction means

that a one-time opening up of trade is seen to have an impact on changes in relative prices, with only temporary effects on inflation.

Turning to the impact of globalisation on labour markets, an opening up of trade with low-cost countries would imply an increase import penetration in the low-skill sectors and a shift in the labour demand from the unskilled towards the skilled workers in the euro area. According to the traditional trade theory this shift should occur between sectors, i.e. employment / wages in the low-skilled industries with strong import competition should decline relative to the high skilled sector employment / wages. However actual data indicate that import penetration increased similarly strongly both in high-skilled and low-skilled industries in the euro area during the 1995-2003 period. Moreover, while employment declined at the same rate, output, productivity and real wage developments showed a different pattern in the two sector groups: they increased strongly in the high-skilled sectors but remained contained in the low-skilled group. There are two possible explanations for this dualism. One is the strong technological development in the high tech sectors (esp. office and accounting and radio and television), which boosted productivity growth. Given the strong increase of offshoring activities in some of the high-skill sectors another possible explanation is that in these industries the positive efficiency gains of resource reallocation are relatively stronger, while in the low-skilled sectors of textile, clothes and leather the negative temporary impacts remained dominant.

We tried to quantify the impact of increased import penetration on employment and wages by estimating sectoral labour demand equations for the euro area. We found no significant effects either in the sample of all sectors or in the sub-sample of high-skilled industries. In the low-skilled sectors the estimates showed a direct negative impact of import penetration on employment and also a positive impact on real wage elasticity of labour demand. According to the estimates actual import penetration contributed directly by -0.2 pp. annually to the decline in employment and increased real wage elasticity by 0.3-0.4pp.in the low-cost sectors. Given that technology and the capital stock are not included in our specification (mainly due to data problems) these estimates are somewhat uncertain and have to be interpreted with caution. The main message from the analysis on the labour markets is that there is some evidence that globalisation has helped to keep wage developments contained in the 1995-2003 period. However given the complexity of the globalisation effect and the presence of a number of simultaneous shocks (technology, structural reforms etc.) the actual impact is hard to quantify.

## 6. References

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## Appendix A.1 Data used for the input-output analysis

As the classification of producer prices differs from that for import prices, the following matching was done between different sectors, taking the weighted average where several import price sectors have an impact on producer prices:

Producer price sector	Corresponding import price sector(s)
Textiles	Textile yarn, fabrics
Wearing apparel; furs	Dyeing, tanning and colouring materials; Textile yarn, fabrics; Articles of apparel and clothing;
Leather and leather products	Dyeing, tanning and colouring materials; Leather manuf's, n.e.s.; Travel goods; Footwear;
Wood and products of wood and cork (except furniture)	Cork and wood manuf's (excl. furniture)
Pulp, paper and paper products	Paper, paperboard and their articles
Printed matter and recorded media	Paper, paperboard and their articles
Chemicals, chemical products and man-made fibres	Organic chemicals; Inorganic chemicals; Medicinal and pharmaceutical products; Fertilizers ; Chemical materials and products, n.e.s.
Rubber and plastic products	Plastics in primary forms; Plastics in non-primary forms; Rubber manuf's, n.e.s.;
Other non-metallic mineral products	Non-metallic mineral manuf's, n.e.s.
Basic metals	Iron and steel; Non-ferrous metals; Manuf's of metals, n.e.s.;
Fabricated metal products, except machinery and equipment	Iron and steel; Non-ferrous metals; Manuf's of metals, n.e.s.;
Machinery and equipment n.e.c.	Power-generating machinery; Specialised industrial machinery ; Metalworking machinery; General industrial machinery, n.e.s.;
Office machinery and computers	Office and data processing equipment
Electrical machinery and apparatus n.e.c.	Electrical machinery, n.e.s.
Radio, television and communication equipment and apparatus	Telecommunications and sound recording equipment
Medical, precision and optical instruments, watches and clocks	Professional and scientific instruments, n.e.s.; Optical and photographic goods and equipment
Motor vehicles, trailers and semi-trailers	Road vehicles
Other transport equipment	Other transport equipment
Furniture; other manufactured goods n.e.c.	Furniture, and parts thereof

All data are from Eurostat, with the import data from the COMEXT database using extra-euro area trade data.

## Appendix A.2 Data used for the regression analysis

For the regression analysis, sectoral data from the STAN database of the OECD are used. In the estimations of producer prices, we have used the same dataset as IMF (2006), while we have constructed our own somewhat more extensive dataset for the labour market regressions based on the EUKLEMS and the OECD STAN. The IMF dataset and the EU KLEMS – OECD STAN cover the time periods of 1978-2003 and 1995-2003, respectively. The sectors included are the following:

	STAN class.	IMF dataset	EUKLEMS - STAN OECD dataset
FOOD PRODUCTS, BEVERAGES AND TOBACCO	15-16	x	
....FOOD PRODUCTS AND BEVERAGES	15		x
....TOBACCO PRODUCTS	16		x
TEXTILES, TEXTILE PRODUCTS, LEATHER AND FOOTWEAR	17-19		
....TEXTILES AND TEXTILE PRODUCTS	17+18	x	
.....TEXTILES	17		x
.....WEARING APPAREL, DRESSING AND DYING OF FUR	18		x
....LEATHER, LEATHER PRODUCTS AND FOOTWEAR	19	x	x
WOOD AND PRODUCTS OF WOOD AND CORK	20	x	x
PULP, PAPER, PAPER PRODUCTS, PRINTING AND PUBLISHING	21-22		
....PULP, PAPER AND PAPER PRODUCTS	21	x	x
....PRINTING AND PUBLISHING	22	x	x
CHEMICAL, RUBBER, PLASTICS AND FUEL PRODUCTS	23-25		
....COKE, REFINED PETROLEUM PRODUCTS AND NUCLEAR FUEL	23		
....CHEMICALS AND CHEMICAL PRODUCTS	24	x	x
....RUBBER AND PLASTICS PRODUCTS	25	x	x
OTHER NON-METALLIC MINERAL PRODUCTS	26	x	x
BASIC METALS AND FABRICATED METAL PRODUCTS	27-28		
....BASIC METALS	27	x	x
....FABRICATED METAL PRODUCTS, except machinery and equipment	28	x	x
MACHINERY AND EQUIPMENT	29-33		
....MACHINERY AND EQUIPMENT, N.E.C.	29	x	x
....ELECTRICAL AND OPTICAL EQUIPMENT	30-33	x	
.....OFFICE, ACCOUNTING AND COMPUTING MACHINERY	30		x
.....ELECTRICAL MACHINERY AND APPARATUS, NEC	31		x
.....RADIO, TELEVISION AND COMMUNICATION EQUIPMENT	32		x
.....MEDICAL, PRECISION AND OPTICAL INSTRUMENTS	33		x
TRANSPORT EQUIPMENT	34-35		
....MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS	34	x	x
....OTHER TRANSPORT EQUIPMENT	35	x	x
MANUFACTURING NEC; RECYCLING	36+37	x	

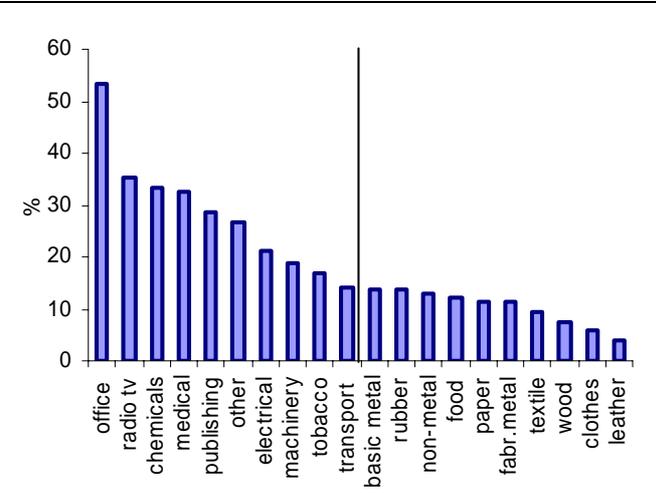
In addition, the following euro area countries were included in the two datasets:

	AUT	BEL	DE	ESP	FIN	FRA	GRE	IRL	ITA	NL	LUX	PRT
IMF dataset	x	x			x	x	x		x			
EUKLEMS – STAN												
OECD dataset	x	x	x	x	x	x			x	x		x

# Appendix A.3 Classification of sectors by skill intensity

Jean and Nicoletti (2002) presents data on the share of skilled workers in sector employment for 18 OECD countries for the year 1995 (see p. 26 Table 1). We use this data to classify the sectors into groups of high-skilled and low-skilled sectors.

**Chart A.3 Share of skilled workers in sector employment**



Source: Jean and Nicoletti (2002)

Low skilled	High skilled
Leather	Office
Clothes	Radio and tv
Wood	Chemicals
Textile	Medical
Fabr. Metal	Publishing
Paper	Other
Food	Electric mach.
Non-metal	Machinery
Rubber	Tobacco
Basic metals	Transport