The effect of trade and outsourcing on the industrial specialisation in CEECs'*

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Abstract

We run an econometric estimation of the impact of trade and outsourcing from the EU on the manufacturing sector of three CEECs. In particular we are interested in the effect on the differences between the two categories of manual and non manual workers. The main finding is that the outsourcing process influences the specialisation pattern of every country in a different way. The effect is in favour of manual workers for Poland and the Czech Republic, but while the former is specialised in the early stages of production, the latter appears to specialise more in intermediate and final stages. In Hungary non manual intensive final goods drive the exports. We find also a significant effect of FDI in Hungary and the Czech Republic.

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1 Introduction

Eastern European countries have changed dramatically the nature of their external position during the transition process. The evolution of trade in the '90s shows a rising integration of production of these countries with the EU (see for example Kaminski and Ng, 2005). The CEECs are, in the recent years, growing their importance as the industrial base of the enlarged Europe, while the western countries became more specialised in services.

In the first years of transition, delocalisation of production from West to East concerned mainly traditional low tech industries, which exploited the low labour costs, and assembling activities. In recent years instead, there has been a movement away from these industries and toward more capital and skill intensive branches. Furthermore, as found by Kaminski and Ng, 2005) in CEECs processing and production of parts have replaced the simple assembling of imported components and those countries became from 1999 net exporter of parts and products. The evidence is anyway that the trade specialisation pattern of the recent years is mainly a manual intensive one (see Egger and Stehrer 2003) in industries which are, as a whole, considered as skill intensive. Alongside this pattern, a general quality upgrading of the product lines has been observed and this is stronger in the medium and high tech industries (Landesmann and Stehrer 2003, Dulleck et al. 2005, Landesmann and Wörz 2006). Foreign capital has also brought about a substantial technological and organisational improvement, which fostered the restructuring process and increased both the demand and supply of skills (Kataria and Trabold 2004, Radosevic 2004).

The aim of the paper is to investigate the effects of the outsourcing process and trade expansion on the inequalities between manual and non manual workers in the manufacturing sector of three CEECs. We also want to find information on the type of specialisation of those countries in the context of the European division of production. More specifically, by using statistics on FDI and trade with the EU, the latter decomposed into intermediate and final goods, we try to infer which stage of the production process is delocalised to CEECs. After that, an econometric analysis is run in order to verify the evidence from the descriptive statistics and what is the effect on the wage bill ratio between production and non production workers.

An important point in our study is that we empathise differences between countries running separate regression for the Czech Republic, Hungary and Poland.

The results confirm a strong impact of the outsourcing variables both on the evolution of the single industries and on the wage/employment inequalities. The outcome is different for the three countries. Although the conclusion is in favour of a specialisation in manual intensive stages of production in hi-tech industries for Poland and the Czech Republic, we find that the

former is more specialised in the production and export of intermediate goods, while the latter is more involved in intermediate and final stages of production. In Hungary instead there is a specialisation in the export of non manual intensive final goods. Differences arise also concerning the impact of FDI on the wage bill ratio. This is negative for Hungary, null for Poland and positive for the Czech Republic.

Former studies on the outsourcing to CEECs are not numerous. The first one is that of Egger and Egger (2003), where they investigate the employment effect on the Austrian manufacturing of the outsourcing to the eastern neighbours. The result is that outsourcing is a low wage seeking activity and explains almost on quarter of the rise in relative employment in Austria.

The study of Egger and Stehrer (2003), on which we built, analyses specifically the effects on the workers of the receiving country. They find that the outsourcing variables, namely import and exports of intermediate goods, induced, between 1993 and 1999, a growth in the ratio of the wage bill of the two categories biased in favour of manual workers. The second result is that exports of intermediates use manual labour more intensively than imports.

Another study, carried out by Bruno et al. (2004) use the data of Egger and Stehrer updated until 2001. Their focus is on FDI while only final goods trade is included as controller. Although they don't find a direct impact of FDI on wage inequalities, they conclude that foreign capital and trade integration fostered the structural change and helped to decompress the wage structure inherited from the former system. They find anyway that trade variables have a negative impact on the wage bill ratio.[1]

A third important study is that of Geischecker (2004). The author analyse the effect of FDI on the employment share of low, medium and high skilled workers, controlling for intermediate goods trade. The main finding is that FDI, after controlling for the outsourcing variables, have a positive impact on medium skilled workers while they affect negatively, although not significantly, the other two categories. Here the possibility to a apply a finer skill classification comes at the expense of substituting wage data with punctual dummies, which should capture the relative wage movements.

We built mainly on the second and third contributions for a series of reason. First, we want to exploit an updated version, up to 2004, of the data used in both paper. Results can be sensitive to the global imbalances of the first years of transition, so that shifting the sample after mid '90 would provide more reliable results. Second, we use a finer classification, with manufacturing divided into 14 sectors instead of the OECD 6 branches classification used in

[1] In the paper we call the relative wage bill also wage bill ratio or cost ratio, but the meaning is the same.

those studies. Third, the study of Geischecker uses, instead of the wage data which were not observable, country specific time dummies. This choice appear to be a strict simplification, because as evident from our data, wages and employment of different skill groups vary very much from industry to industry, so that not considering this variability misses an important cause of influence. Its choice is explained by the endogeneity problem of the simultaneous determination of wages (regressor) and employment. We don't run into this problem for two reasons. First, we use the first lag of the regressor and second, we don't use wage data as explanatory variable, but they are part of the dependent variable. Another difference is that we focus on the linkages between trade and outsourcing, from one side, and their effects on workers inequalities on the other side. The can be both wage and employment inequalities.

The structure of the paper is as follow. In section 2 we survey the main theoretical contributions concerning outsourcing and the effect of trade on factor prices. In section 3, after describing the dataset, we comment the descriptive evidence concerning the evolution of manufacturing in CEECs and their external performance. In section 4 we show the econometric analysis and the results for the three countries. Section 5 concludes.

2 Survey of the theoretical literature

The theoretical interest with the determinants and effects of the fragmentation of production is relatively new. The main approaches to the topic are in the works of Arndt (1997), Deardorff (1998, 2001, 2005), Jones and Kierzkowski (2001), Kohler (2001 and 2004), Feenstra and Hanson (1996, 1997) and Ethier (2005).[2]

Most of the articles investigate the effect of fragmentation on the outsourcing economy. In line with the recent debate on globalisation, they focus mainly on the job loss effect of delocalising some, usually labour intensive, stages of production to less developed countries. Little theoretical literature exists on the effects on the receiving country, only the models of Feenstra and Hanson (1997) and Ethier (2005) deal specifically with DC.

A first group of models is built in the framework of the standard trade theory (Arndt 1997, Deardorff 2001 and Kohler 2004). The model of Arndt considers, among the others, a case of contemporaneous specialisation in North and South. The North outsources to the south the labour intensive fragment and the vice versa does the South. The result is that the rent to wage ratio (or the skill premium if we consider skilled labour instead of capital) and the capital (skill)

[2] For a survey on the theoretical models of fragmentation see for example Kohler 2001 and 2004.

intensity decline in both countries. The reason of the result is that fragmentation acts as technological improvement in the labour intensive sector.

A similar conclusion lies in Deardorff's modelling. Here the results are more ambiguous because he considers a case with many goods an many factors. One of his conclusions is that if the fragment exported to the south is more labour intensive than the average of all the fragments produced there, then the relative factor price will fall, meaning an increase in wages relative to rents (or a decline in the skill premium). Other examples lead anyway to different results, but all the outcomes depend on the choice of technology and on the factor intensity of the fragments. Furthermore, the outcome in the analytical example strictly relies on the Cobb Douglas assumption and on the way delocalisation takes place.

The model of Jones and Kierzkowski, differently from the others, considers both Hekscher-Ohlin and Ricardian features. Their results depend anyway "on a complex interplay between the factor endowment position and output pattern of a country, an the factor intensities prevailing in the different fragments" (Kohler 2001, pag. 35). In case of a relative unskilled labour abundant country, fragmentation causes a fall in real wages because it acts "like technical progress in the capital intensive sector of the economy" (Jones and Kierzkowski 2001, pag. 13) which raises rents relative to wages. If the country is better endowed with capital (and/or skilled labour), in general fragmentation causes wages to increase in the capital intensive fragment and also employment can be higher than in the integrated production. Their final example shows, in a framework with many countries and many goods, how relative factor prices movements depend upon the endowment difference between the country involved. If this is big, then fragmentation can cause relative wages (wage to rent ratio) to increase in the capital abundant country and fall in the labour abundant one. If differences are relatively small, then factor prices in the two country can be driven closer and, eventually, to equality, meaning a decline in the capital abundant country and a rise in the labour abundant one.

Ethier (2005) develops a 2x2x2 HOS model and investigate the consequences of shifting the focus from the Stolper-Samuelson intersectoral substitution to the intrasectoral relations between inputs. Assuming that capital and skilled labour are complements and unskilled labour and outsourcing substitutes, he finds the following results: an increase in fragmentation or in the use of equipments will rise the skill premium; it rises both the terms of trade and the capital utilisation in the South; the increased globalisation rises the skill premium in both countries; if capital and skilled labour are complements the fluctuations of home employment increase the relative wage in South but not the vice versa; if in addition unskilled labour and outsourcing are substitutes employment fluctuations don't effect the relative wage.

A different framework is used by the Kohler (2001), Deardorff (2005) and Feenstra and Hanson (1996, 1997). The latter is the only model which explicitly considers a less developed country. The authors show that when a fragment at the lower end of the skill intensity is moved from an advanced country to a less advanced one, where the fragment is at the upper end of the skill intensity, then relative employment and wage of skilled workers rise in both countries. As pointed out by Kohler (2001, pag 35 and 36), the result depends upon the hypothesis of a single good and that the imported fragment in the developing country is always the most skill intensive. With many goods and many fragments, less extreme situations are also possible, with the effect potentially going also in the other direction.

In his recent article Deardorff (2005) uses a one sector model to address the issue of skilled labour outsourcing. Although the author recognises that the model can bee a too extreme simplification, the interesting results are that in case of diversification the unskilled workers' wage in the outsourcing country (North) can fall below the one in the sourcing country (South), but if there is a factor endowment induced specialisation, both factors in North can gain from outsourcing.

Kolher (2001) analyse the effects of fragmentation using a specific factor model, which goes beyond the weaknesses of the H-O model in more than two dimensions and releases its assumption of perfect mobility of all factors. In case of outsourcing with foreign direct investments, it is shown that this causes a leverage to the domestic wage rate (i.g. in the north) which forces it to the value of the foreign wage plus an eventual surcharge. This causes a distributional effect in favour of capital, but the welfare effect is likely to be positive. The latter is higher the larger the wage difference in the two countries and the higher the share in value added of the fragment outsourced. When foreign wages are not constant, the equilibrium wage rate in the north is higher, but still below the non outsourcing level. This implies a smaller wage reduction which also causes both a lower welfare gain and less redistribution in favour of capital.

Without capital movements, the outsourcing takes place by importing the fragment which is produced abroad. The final outsourcing equilibrium is with a wage rate below the initial one. The capital rent is, conversely, higher and the higher is the labour intensity of the outsourced fragment, the higher is the rent. If the outsourced fragments is a capital intensive one, then, without FDI, the result is that of an increase in wages relative to capital rent. This is because when capital doesn't move abroad, after outsourcing there will be more capital available for workers. When the outsourced fragment is a relatively labour intensive one, then the remaining segment will not be able to generate enough labour demand at the current wage rate and this will push down wages. Instead, in the first case, there will be more capital available after outsourcing

compared to the additional labour demand. This will enhance the labour productivity, push up wages and decline capital rents.

The other strand of literature we consider, is that relating trade with a skill biased evolution of both employment and wages. The main contributions in this field are the articles of Acemoglu (2003), Epifani and Gancia (2004) and Ekholm and Knarvik (2005).

Acemoglu's argument is that foreign trade induces a skill biased technical change (SBTC). This is because trade between dissimilar countries moves up the prices of the skill intensive goods, so that the production of those goods and the adoption of the technologies embedded in those goods is stimulated.

A similar conclusion can be found in Epifani and Gancia (2004). Here the argument is that also trade between similar countries induces a SBTC. The result lies in the hypothesis of increasing returns, which must be stronger in the skill intensive industry, and in the elasticity of substitution in consumption of skilled and unskilled intensive goods above one. In this way an expansion of the trade volume benefits more the skill intensive goods and the substitution effects allow for the expenditure share (and for wages) to increase in the skill intensive industries.

Ekholm and Knarvik (2005) model the effect on the relative wage of a trade induced technical change. In a first phase of market opening, firms have incentives to adopt a skill biased technology (which is a fixed cost) because of the savings in variable costs (which are identified with unskilled labour). In this way the relative wage increases, but when trade barrier are low a further expansion relies mainly on the use of unskilled labour, reducing by consequence the wage premium. This framework seems interesting for Eastern European countries because they are now in an advanced phase of market opening and technological change, so that the unskilled favouring effect can be expected.

3 The evolution of CEECs manufacturing: descriptive evidence

3.1 Data description

In this section the data used both in the descriptive and in the econometric analysis will be described. The starting year is 1996 for Poland, 1997 for the Czech Republic and 1998 for Hungary. The last year is alternatively 2003 or 2004.

Data for production, wages and employment are collected from the WIIW Industrial Database on Eastern Europe. The series are deflated sector by sector using the Eurostat Total Output Price Index . For each country the starting year considers the break in series. In the Czech Republic, until 1996 only enterprises with more than 100 employees were considered, while from 1997 on, the sample included also enterprises with more than 20 employees. For Hungary

there are two breaks, the first in 1996, where the sample for production at current prices extended from enterprises with more than 20 employees to those with more than 10. The second in 1999, where also enterprises with more than 5 employees were included. For employment the sample changed only in 1999, passing from enterprises with more than 20 employees to enterprises with more than 5 employees. In order to obtain a comparable data for employment also in 1998, we matched the WIIW data with those gathered from the ILO Laborsta Database. The latter considers enterprises with more than 10 employees from 1998. In this way the structural break is not so relevant and we have the advantage to add an extra year to the short time series. For Poland there are no relevant breaks. Labour productivity is defined as the ratio between production in constant Euro and employment.

Data for the FDI inward stock are obtained from the WIIW FDI database. These data last until 2003 and the starting year is 1998 for Hungary, 1997 for the Czech Republic and 1996 for Poland. For the latter only data for ten out of 14 sector (figures for DC, DE, DI and DN are missing)[3] are available.

Data on trade with the EU15 are from the Eurostat Comext Database. In order to get the necessary number of years we consider the EU15 as reporting country. This choice can give less precise data because of the many states involved. On the other side data on exports to the EU can be more precise because the reporting country collects taxes on these. The division between trade in intermediates and final goods is obtained by matching the trade data classified in SITC3 (5 digits), with the BEC classification, which classified goods according to their destination. Finally these data are aggregated at NACE subsections (14 industries). Both matches are made by mean of standard correspondence tables.[4]

Data on the gross fixed capital formation are kindly provided by the WIIW.

Finally, data for wages and employment of manual and non manual workers are collected from the yearbooks of the respective countries. Data until 1999 are the same as in Egger and Stehrer (2003), while data until 2001 are the same as Bruno et al. (2004). For the Czech Republic only data on manual wages where available in the yearbook, while data on manual employment were kindly provided by the Czech Statistical Office. With these data an estimation of wages and employment of non manual workers was possible.

With wages and employment of the two categories we built, as a measure of inequality, the wage bill ratio. This is defined as the ratio between the non manual and manual total wage bill and gives an indication of both the overall workers' inequalities and of which category is used more intensively.

[3] See appendix 3 for the industry codes
[4] See Fontagnè et al. 1996 for the division between intermediates and final goods

All the data are expressed in constant Euro by using the above described deflator and the average exchange rate gathered from the IMF IFS.

3.2 Descriptive statistics

Some descriptive statistics for the Czech Republic, Hungary, and Poland are shown in tables from 1 to 3. E refers to employment, Y to the production value, XI and XF are respectively exports of intermediate and final goods and MI and MF are the import counterpart. The last three columns show the annual average growth of the relative wage bill and its components: the relative employment and the relative wage.

The Czech Republic, Hungary and Poland are in the group (with Slovenia and Slovakia) of the most advanced countries of the former Eastern block. They have shown many similarities in the transition process, but there are also differences, which should rise caution when talking about a unique path of transition.

Starting from employment, in manufacturing it has declined from 1996 to 2004, in Poland, by 21%, but the bulk of the reduction is concentrate in the years between 1999 and 2001, while it kept stable in the remaining years. In the Czech Republic the number of employees declined over the whole period by 12.5%, while in Hungary there has been a cyclical behaviour, with a rise between 1998 and 2000 and a decline from 2002 to 2004 which brought back employment to the initial level. The reasons for the employment reduction lie in the high unemployment, especially for Poland, in the rising employment in the service sector and in the decline of the activity rates.[5] The behaviour of Hungary is instead due to the more advanced stage in the transition process, with labour hoarding already eliminated.

Real output rose steadily in Poland, both in absolute and in per capita terms, with an acceleration between years 1999-2000 and 2003-2004; the same pattern can be found in Hungary and the Czech Republic, with the latter experiencing a steep increase only in the last two years.

Turning to FDI, we can note the first striking difference between countries. The inward stock of foreign investments increased substantially in all the three economies. Poland has a foreign capital stock similar to the other two countries, but in per capita terms it lags substantially behind. In 1998, the FDI stock per employee was half that of the Czech Republic and 30% that of Hungary. Anyway, considering the final year (2003), we can observe a reduction of the gap with Hungary while it kept stable with the Czech Republic. Between the last two countries the relative difference in per capita terms increased only slightly. The reason for this difference lies in Poland's size, which makes the country still a target for further inflows of

[5] See on this topic Boeri (2000) and Boeri and Terrel (2002)

FDI in comparison with the other two, where the potential expansion in the future is much lower.[6]

On the trade side, the main difference can be found by observing total figures for import and export in per capita terms: Hungary has an export intensity which, in 1998, was four times that of Poland and 50% higher than the Czech Republic. While the gap with the latter increased, the one with Poland shrank by one third. This rank holds also for imports of intermediates, but Poland managed to shrink the differences in last years, filling the gap with the Czech Republic and reducing the one with Hungary. Considering the absolute figures, there is a slow down at the begin of the decade in both imports and exports for Hungary and the Czech Rep. This affected all variables, except imports of intermediates for the latter and imports of final goods for the former. In the same years Poland performed to some extent better, experiencing only a reduction in imports of both kind of commodities.

The Hungarian good export performance can be observed also in the higher importance of this flow compared to imports (only from 1999). Exports of intermediates dominated those in final goods until 2002-03, while in the last year the latter exceeded the former. Also on the import side intermediate goods are more important and, in general, they are also bigger than export of intermediates. For final goods trade, export, as stated before, is the most dynamic flow.

In the other two countries, import flows are higher than export flows over the whole period, but the gap is reducing in the Czech Republic. We find similarities with Hungary comparing the composition of the two flow, with intermediate goods which are the main component. In Poland, intermediate exports are growing much faster than those of final goods from 2000 on. Finally, imports of intermediates are higher than exports of intermediates and the same is true for imports of final goods compared to the export counterpart. This difference in the Czech Republic, is small for the import flows, while it is more or less null, from 2001 on, for exports.

Finally, the wage bill ratio increased strongly in Poland and Hungary. The result for the former is driven by the high growth of the relative wage which more than counterbalanced the reduction in the employment ratio. In Hungary, on the opposite the relative employment drove the growth although the wage premium rose as well. The wage bill ratio in the Czech Republic experienced almost no growth, but this is due to the dynamic of the two components which offset each other. The reduction in the employment ratio is probably indication of the ongoing process of labour shedding, which mainly reduces the number of non manual workers because of the

[6] See on this point Hunya and Geischecker 2005

externalisation of many service activities which were formally performed inside the industrial firm.

Summing up the global trend in manufacturing, it is straightforward to see how trade and FDI variables have a different importance and experienced different grow paths in the three countries. In Poland the FDI intensity is still less important than intermediate trade flows, but the former is growing on an average of 30% every year. In terms of flow size, export of intermediate goods is the most important variable and its growth rate is only slightly below that of FDI. The export of final goods grew as well substantially during the whole period. The remaining variables, although on a lower extent, experienced as well a substantial growth. For Hungary, it is evident how export of final goods is the most important variable, with a yearly growth rate of 25%. This is followed by the FDI stock, which grew anyway less than the other countries, and by the import of final commodities. The intermediate goods flows were slightly less dynamic, both experienced a yearly growth below 15%. Finally, for the Czech Republic the FDI growth is the highest. Exports of final goods rose dramatically too during the period, although starting from a lower level. Import of intermediates is also very important for the Czech economy, especially considering its absolute level.

Turning to the behaviour of single industries[7], we can see a clear pattern of change. A group of branches experienced remarkable rates of growth and at the same time a strong increase in both labour productivity and capital formation, while ULC dropped drastically. These industries are, in all countries, DL and DM. The former is the most dynamic one both in the Czech Republic and in Hungary, while in Poland the manufacturing of Transport Equipment led the growth. To these branches we have to add industry DH, which grew also strongly, but more in a extensive way, with lower gains in both productivity and ULC. The mechanical and chemical industries (DK and DG) grew substantially too, especially in Hungary and Poland. In the latter country DJ and DD performed well and, as for the Czech Republic, a good performance is recorded by the paper and publishing industry.

A common feature to all the countries is the bad performance of traditional industries. The food processing still resist and, although its size shrank, it is still very important, especially in Poland. The same is true for the textiles industry, which declined, but in Poland managed to increase labour productivity and reduce ULC. The worst performance is instead recorded by the leather industry, followed by the coke and petroleum industry.

The industries which are more favoured by the FDI inflow are, as for output growth, DM and DL, plus DK and DJ. Also in the chemical industry foreign capital grew substantial. The

[7] See appendix 3 for the industry classification.

wood industry in the Czech Republic and the coke and petroleum industry in Poland grew strongly as well.

The evolution of trade flows among industries is very close to the pattern of output and FDI. The highest growth rate of all trade flows are recorded by DL, DM and DK. In the Czech Republic also DG grew substantially in all trade flows, while in Poland only trade in final chemical goods rose strongly. The Czech Republic experienced also a strong rise in intermediate goods trade for industry DH and a significant rise in the imports of final textile products. In Poland the metal industry (DJ) has high and growing trade flows and the exports for industry DH rose substantially too. Finally the food industry is instead losing importance in Hungary, while Poland is one of the best exporter of final food products.

This indicates that the best performing branches are also those more integrated in the European economy. Although domestic and external performance can influence each other, we think that trade, and more intensively the outsourcing process, drove the overall dynamic of the single industries.

Turning to the cost ratio and its components, they experienced a different dynamics among industries and countries. What seems evident is, anyway, that sectors which expanded their size and trade with the EU show a reasonably clear pattern in wage and employment of the two groups. In Hungary the two parts of the cost ratio increased almost everywhere, with the high tech branches DL and DK experiencing the highest growth. This is evidence of a generalised skill upgrading, stronger in the most dynamic industries. The Czech dynamic shows a rather different pattern, with the cost ratio reducing in the best performing industries. These branches experienced also the biggest reduction in the employment ratio and the higher increase in the wage premium. These findings indicate that the internationalisation process has fostered the enterprise restructuring, with the elimination of the labour hoarding, and a manual labour specialisation. Finally, the picture for Poland is less clear, while low tech branches experienced also a slight growth in the employment ratio, this variable declines in industries such as DM and DL, and increases others like DG, DI and DE. What we can argue looking at the growth rates of trade flow, is that the industries of the first group are more involved in the export of intermediates, while those of the second group are more dynamic in exporting final goods. From the wage side instead, we observe a generalised increase, in general stronger in the best performing industries.

4 Econometric analysis

4.1 Theoretical hypothesis

In this section we carry out an econometric analysis of the impact of trade and outsourcing on the relative wage bill. The latter is defined as the ratio between the total wage bills of non manual and manual workers. In line with this definition, we mean by a positive effect of a regressor that the relative wage bill rises with an increase in the explanatory variable, favouring by consequence the non production workers. The opposite is true for a negative impact of a regressor.

We base the following hypothesis about the effects of regressors on the cost ratio, on the descriptive evidence gathered in the former paragraph and on the theoretical and empirical literature. Accordingly, we expect trade in intermediates to affect the relative wage bill in a negative way. Exports of final goods can have a double effect: a negative one, because the completion of intermediate imports is mainly an assembling process which uses manual workers more intensively; a positive effect, due to the general trade expansion (Acemoglu 2003, Epifani and Gancia 2004) and to the quality upgrading of exported products (Dulleck et. Al. 2005, Landesmann and Stehrer 2003, Landesmann and Wörz 2006). Imports of final goods can have as well both a positive and negative effect. Positive because part of these imports are capital goods which should be complement to "skilled labour". In this case the variable can also indirectly reflect the quality upgrading effect. The negative effect can show up because of capital-manual workers complementarities[8], but also because there can be a dependence on EU for consumption goods with a higher non manual intensity. FDI are expected, in line with Feenstra and Hanson, to have a positive effect. This effect is the result of the technology transfer from more advanced countries.[9] Technology here is intended also as organisational progress, which requires more intellectual occupations and administrative jobs, so favouring the white collars.[10] The impact of FDI can also capture the quality upgrading effect if, as we expect, industries which are more favoured by FDI are also those which succeeded more in upgrading the quality of their products. Gross investments are expected to have a positive effect because we assume capital-skills complementarities. Finally, for labour productivity a negative sign can imply that productivity increases are higher for non manual workers meaning, by consequence, that more manual workers are used in production. The opposite conclusion is valid in case of a positive coefficient. This productivity can be seen also as a scale variable. In this case a negative sign would mean

[8] Which can be expected considering the descriptive evidence and the hypothesis on the other variables
[9] Most of FDI come from the European Union.
[10] Evidence of this upgrading effect in the automotive and electrics industries is found in Kataria and Trabold 2004 and Radosevic 2004

that the expansion of an industry relies mainly on manual workers because their elasticity is higher. In the descriptive section we found that industries which grew more in terms of these variables are the "hi tech" ones, and from the evidence on the outsourcing variables we expect a negative impact of this regressor.

4.2 Model and variables

The equation we estimate is the following:

$$\Delta \ln WBR_{it} = a + b1\Delta \ln Y_{it-1} + b2\Delta \ln FDI_{it-1} + b3\Delta \ln MI_{it-1} + b4\Delta \ln MF_{it-1} + b\Delta \ln 5XI_{it-1} + b6\Delta \ln XFi_{t-1} + \\ + GFCF_{it-1} + \Sigma D_t + \Sigma D_i + u_{it} \qquad (1)$$

WBR is the ratio between the wage bills of non manual and manual workers; Y is the production value; FDI is the inward FDI stock; MI, MF, XI and XF are import and export flows of intermediate and final goods respectively; GFCF if the gross fixed capital formation. D_t are year dummies, which are replaced by a trend variable in order save degrees of freedom. This choice is justified by the very similar results using the time trend instead of the year dummies. Finally, Di are industry dummies, which account for a time invariant effect of the industries' characteristics. These dummies can capture different features of an industry, like capital intensity or the technological level. All regressors are in constant prices (see above) and divided by the employment level. This is done in order to estimate the effect of the intensity of this variables on the inequalities between workers.

Due to data constraints (see section 3.1) the analysis considers the years between 1997 and 2003 for the Czech Republic, 1998 and 2004 for Hungary, 1996 and 2004 for Poland.

We regress the first lag of the log difference of the explanatory variables on the log difference of the dependent in order to rule out endogeneity problems. Furthermore, we decided not to use the lagged dependent variable as regressor because of the small sample length which can give potential problems with dynamic models.

We estimate equation (1) by using the Panel Corrected Standard Error (PCSE) developed by Beck and Katz (1995), which produces estimations of standard errors corrected for both the presence of heteroskedasticity and cross correlation. The estimation is made by using alternatively OLS or Prais-Winsten regressions,[11] with the latter method applied when the errors are time correlated. We estimated the model also with FGLS corrected for heteroskedasticity and FE with robust standard errors, but we report only the results for the first procedure for the

[11] See the Stata 8 user manual

following reasons: first, compared to the FE it takes also in account the effect of cross correlation, which is very likely to be present given the interdependence among industries. Second, due to the sample size we cannot correct the GLS for the presence of cross correlation. Third, the PCSE has better small sample properties then the FGLS. In particular the GLS estimation tends to underestimate the standard deviation so that it over-accepts the significance of regressors. Furthermore its higher efficiency is only asymptotical and in small samples the bias in the estimations can be high.[12] Fourth, the results using GLS are reasonably similar to the PCSE ones.

A weakness point of the Beck and Katz procedure, as found by Kristensen and Wawro (2003), is that its good performance is challenged when autocorrelation is present and when a lagged dependent variable is included in order to eliminate this correlation. But this is not our case as long as don't estimate a dynamic model.

Regression are run in four different specifications: with and without GFCF and with and without industry dummies. Furthermore, we show here only the results without the Coke and Petroleum industry (DF). This is because of its peculiarities which make it behave most of the time as an outlier. We will consider, anyway, also the results including this branch when they are relevant.

4.3 Econometric results

a) Poland

The results for Poland are shown in the first part of table 4, with ID referring to the inclusion of the industry dummies. Their inclusion make a big difference in the outcome. Without them, the impact of exports of intermediates is much higher and the coefficient of final goods exports, although not significant, turns from negative to positive values. Finally, gross investments are never significant, but their exclusion makes import of intermediates not significant as well.

The first important result is the significance of exports of intermediates. According to column 1 of table 4, a 10% change in this variable reduces the relative wage bill by 1 percentage point. Without controlling for industry specific characteristics, the change is 1.54% (column 2). This result confirms the findings of Hegger and Stehrer (2003) and, as they pointed out, "to some extent, this may indicate that the outsourcing […] takes the form of producing intermediate goods from raw materials and exporting them to the EU" (pag. 68).

[12] See Beck and Katz 1995

The second result is that imports of final goods are significant at 10% level and their impact is positive. The most likely explanation for this finding is that imported final goods are composed mainly of high tech capital goods which are complements to non manual labour. Doubling this variable, the cost ratio increases by 7.3%.

Exports of final goods are significant only without both ID and gross investment. In this case their impact is positive, but this is likely to reflect the better export performance of some industries, namely DE, DG, DK and DL, which experienced the higher growth in this variable and where the cost ratio increased more than in the other industries. Interestingly enough, with the inclusion of industry DF, this regressor is significant and with a negative impact.

The other variables are not significant. Considering the foreign capital stock, this means that there is not a direct effect of this variable on workers' inequalities, both in term if technological transfer and of quality upgrading effect. Only with the inclusion of industry DF FDI exert a small positive impact.

Summing up, the participation of Poland in the European division of production has the features of a specialisation mainly in production and exports of manual intensive intermediate goods. This goods are likely to be produced by using intensively final capital goods imported from the outsourcing countries.

b) Hungary

Results for Hungary are shown in the second part of table 4. The columns description is the same as Poland, with the only difference being the addition of a first order serial correlation term. This is included because the Wooldridge test found always a significant autocorrelation. Results don't change much by adding this term, so the reduced number of degrees of freedom doesn't appear to affect the estimation outcomes.

The first important result is that the growth in the stock of foreign capital exerts a significant, although only at 10% level, impact only with industry dummies. In this case we have that a 10% increase in FDI stock reduces the cost ratio by 1.23%. It is interesting to see how this variable is highly correlated with both imports and exports of final goods. With the former, it has a partial correlation of almost 0.5 while with the latter correlation is around half this value. We interpret the first correlation as indication of complementarities between these variables. Both FDI and imported final commodities bring capital goods which raise the relative productivity of non manual workers, in this way less workers of this type are required and, in terms of wage bill, manual workers are, by consequence, favoured. The correlation with final

goods exports is evidence that the export oriented industries are those where foreign presence is higher.

Imports of final commodities are found also significant, although at 10% level. Their impact is very high and negative. A 10% increase in imported final goods cause a reduction in the relative wage bill by 1.3 percentage points. As we said before, the most likely explanation lies in the capital goods inflow which raises the relative productivity of non production workers. A second, likely justification can be anyway that the country depends on foreign sources for the supply of final goods, especially high tech goods, where final commodities imports rose more. Podkaminer (2004) confirms this view by arguing that the expansion of Hungarian imports can be due to a relative rise of the share of imported goods in households demand.

The third important result is the high and negative impact of the output variable. Its coefficient is always significant at 1% level and, accordingly to column 5 of table 4, a 10% increase in labour productivity changes the cost ratio by 1.8% in favour of manual workers. This means that the productivity increase is stronger for non manual workers. The highest growth of this variable is concentrated in industries which grew also more in terms of FDI, for this reason we conclude that productivity increases are mainly FDI induced, so that the effect of both variables goes in the same direction. If we consider productivity as an indicator of the scale of an industry we find also a confirmation of the hypothesis of Ekholm and Knarvik (2005), that after a first phase of trade opening, the expansion of an export oriented industry relies more on the use of unskilled labour because of their higher flexibility.

The interesting result for the specialisation issues is that export of final goods is significant at 5% level and has a positive impact. According to column 5 of table 4, we have that a 100% increase in exports of final goods increases the cost ratio by 6.9 percentage points. This results, was expected if we have in mind the growth of this variable (see table 2), which in the whole manufacturing is twice the growth of intermediate exports. As stated in the introduction, this outcome can be both evidence of a quality upgrading of the exported goods (produced entirely or not at home), with a rise in their value added content, and of a specialisation in the completion of imported intermediates by using more intensively non production labour. These two explanations are interdependent and both valid for two reasons: first, from our data we observe that the industries which grew more in final goods exports, DL, DG, DK and DM, experienced also from 1998 an increase in non production workers driving up both the relative employment and the cost ratio. Second, there is evidence of a strong technological upgrading, drove by FDI, in the electronics industry (Kataria and Trabold 2004), and in the automotive industry (Radosevic 2004).

As we said before, capital stock is significant only with industry dummies. This outcome means that after controlling for specific industry features, where capital structure and intensity can be the most relevant, gross investments have a positive impact on the cost ratio. This result confirms the hypothesis of capital skill complementarities and it is justified also considering the negative impact of FDI and final goods imports. The imported capital goods raise relatively more the productivity of non manual workers, but new machines are also complement to these workers and this is reflected by the positive impact of gross investments. The interconnection with imports, productivity and FDI is also evident by looking at the regressions without capital flow. None of these variables here is significant, implying the presence of a strong omitted variable bias.

The other variables, namely import and export of intermediate goods, have no significant impact on the cost ratio.

Summing up, the evidence is that also in Hungary the internationalisation process affects the relative importance of the two groups of workers, but in a different way compared with Poland and, as we'll see below, with the Czech Republic. Here both FDI and imports of final capital goods increase more the productivity of non manual workers and drive also the overall productivity dynamic, so that relatively more production workers are used. This is confirmed by the concentration of the productivity increases in the FDI intensive branches. The imported capital goods are also complement to non production employees and this can be seen in the positive impact of the gross capital formation. At the same time the effect of exports of final goods goes in the opposite direction, favouring non manual workers. This couples with a substantial upgrading in the quality of exports, which require a higher intensity of non production workers. The last result shows that there is a pattern of change in Hungary's specialisation. From being specialised in assembling high tech imported products, so mainly by use of manual labour, the country is rising the value added chain with a continuous increase in quality and skill content of the exported final commodities.

c) Czech Republic

The estimation results for the Czech Republic are shown in the last section of table 4. The results don't change significantly among the four specifications between regression with and without industry controls. The exclusion of the GFCF has no impact on FDI while it reduces slightly the impact of the output variable and rise the significance of the imports of intermediates.

Contrarily to the other countries, here FDI is the variable which shows the most significant and robust impact. It's effect is positive and highly significant, running from 0.68 with industry controls to 0.58 without them. A rise in the stock of foreign capital by 100% brings about a change in the cost ratio of 6.8% in favour of non manual workers. FDI brings about both the transfer of advanced technology and the organisational change and its impact is very likely to capture also the quality upgrading. All these effects are biased in favour of non manual workers, rising the demand for white collar's jobs.

Labour productivity is also highly significant. Considering column 9 of table 4, a 10% increase in labour productivity causes a reduction in the relative wage bill by almost 3 percentage points. As for Hungary, this can mean that productivity increased more for manual workers so that relatively less of them are required in the production process. Alternatively, it is possible that the relative demand for manual workers increased more during the expansion of the industrial production because of their higher elasticity. The partial correlation with imports of intermediates is positive (0.22) and significant. This means that productivity increased more in industries which had the highest growth in imports of intermediates, reflecting by consequence the manual intensive export specialisation. This makes us conclude that the second interpretation of the coefficient is the more likely one.

The imports of intermediates are significant and with a negative coefficient without GFCF or without dummies. The exclusion of the latter reduces slightly the coefficient, which is anyway high. According to columns 10 and 11 of table 4, a 10% increase in this variable reduces the cost ratio by 2.61 percentage points without industry controls and by 2.15% without capital. This indicates that the further processing or completion of imported intermediate goods uses manual labour more intensively. In addition, the partial correlation with the export of both intermediate and final goods is positive, but significant only for the former. This finding indicates that the Czech Republic is relatively more involved in the completion of imported intermediate imports rather than in their further processing and re-exporting. The latter result is confirmed also by the outcome of the FGLS and by the regression with 14 industries.[13]

Finally, gross investments have a significant and negative impact only after controlling for industry characteristics. This, as it is also for the other two countries, is a reflection of the industry specific features, of which capital is one of the most important.

Summing up, the econometrics returns a picture of the Czech Republic as a where the foreign capital brought about a technological and organisational change which is biased in favour of non manual workers. This means probably that foreign investments implied also an upgrading

[13] In this last case, both export of intermediates and final goods have a negative and significant impact, with the coefficnet for the former being bigger than the latter.

of the product lines. There also is a less strong evidence of a specialisation in the further processing and completion of imported intermediate inputs, meaning that the country position in the EU wide production network is at the end of the chain.

What comes up from the estimation results is a confirmation of the evidence we found in the descriptive analysis. The three country show some differences in the specialisation pattern induced by the outsourcing process. Poland is relatively more specialised in the production of manual intensive intermediate goods, probably from raw materials. The Czech Republic is specialised in the further processing, completion and re-exporting of imported intermediate goods by using mainly manual labour. Finally, Hungary is mainly specialised in the completion of imported intermediate goods using non production workers more intensively. Here the evidence is explained also by an increase in the value added content of these stages of production and a strong quality upgrading effect. Both in the Czech Republic and in Hungary productivity increases are stronger in industries which follow these specialisation patterns, implying a manual labour favouring impact. Hungary shows also other differences compared to the other two countries. Foreign direct investment has here a negative impact. This can be explained by the higher initial absolute stock of FDI, so that the technological and organisational change has in the larger part already occurred. The more likely explanation is, anyway, that FDI increased relatively more the productivity of non manual workers, reducing their use relatively to the manual ones. In the Czech Republic FDI has a positive impact, meaning an induced technological and organisation change, while in Poland there is no significant effect of this variable. Probably the FDI impact reflects also the quality upgrading effect, meaning that Poland lags behind the other two countries in improvements of its products.

5 Conclusions

In this study we analysed the effect of trade and outsourcing from the EU15 on the pattern of specialisation in manufacturing in three CEECs**,** the Czech Republic, Hungary and Poland. While most of theoretical literature focuses only on the effects of outsourcing on the sourcing (advanced) countries, we contribute to the small, but growing empirical literature analysing Eastern European Countries.

We analysed separately the three countries because we wanted to stress the differences in each one's specialisation pattern.

In the first part we analysed descriptive statistics which gave a first information on the industries pattern. The conclusions from this part are essentially two: first, the economic integration with the EU is a primary force in shaping the evolution and competitiveness of the

single industries. Second, concerning country differences, Poland is more specialised in the early stages of production, being the exports of intermediates the most dynamic flow. In the Czech Republic the FDI and exports of final goods are instead the most dynamic flows, but intermediate exports have the highest level. Finally, also in Hungary FDI and exports of final goods show the highest growth rates, furthermore the latter flow became also the most important one in absolute terms.

In the econometric analysis we found a partial confirmation of this pattern. Trade in intermediates benefits manual workers. This indicates that Poland, to a certain extent, is specialised in the production of labour intensive intermediate goods, probably from raw materials. The Czech Republic is more specialised in the further processing and completion of imported intermediates by using manual labour more intensively. Hungary, differently from the others, specialised in the completion of imported intermediates, but with non manual workers being used more intensively. We associate this result to a stronger quality upgrading effect and to an increased value added of the exported final commodities, meaning that Hungary is rising the value added chain. The other difference for Hungary is that FDI favour manual workers while in the Czech Republic they rise the cost ratio. This difference is explained by the increase in the relative productivity of non manual workers in Hungary, which causes an increase in the relative importance of manual workers, and by the already vanished effect of the technological and organisational skill biased change. The latter effect is instead the force behind the result for the Czech industry. There the positive effect of FDI captures also the quality upgrading effect.

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Appendix 1 Descriptive statistics

cz annual	*Y*	*E*	*MI*	*MF*	*XI*	*XF*	*FDI*	*WBR*	*erel*	*wrel*
D	5.9	-2.2	10.9	8.3	14.4	17.7	19.6	-0.05	-2.15	2.1
DA	-1.0	-3.4	7.0	7.0	2.3	15.5	6.3	2.9	-0.6	3.5
DB	1.0	-5.6	6.5	11.4	9.2	7.8	16.3	0.3	-1.1	1.4
DC	-17.0	-14.4	0.7	4.2	-13.2	-2.1	10.0	0.7	1.2	-0.5
DD	4.7	-3.9	7.8	8.1	2.7	9.2	48.6	-1.6	-2.5	0.9
DE	4.2	-2.0	9.5	5.3	17.0	17.1	11.6	1.3	0.3	1.1
DF	-0.2	-8.2	15.0	-1.8	3.2	467.9	4.2	-1.0	-4.7	3.8
DG	2.4	-2.7	7.7	11.2	4.7	15.3	19.3	2.3	0.3	2.0
DH	15.6	4.7	11.8	13.9	19.7	15.5	30.9	-2.1	-4.1	2.1
DI	3.2	-2.1	9.1	0.6	6.1	0.6	9.6	0.1	-3.1	3.3
DJ	2.1	-4.3	11.8	0.0	9.7	13.5	27.8	-0.1	-1.7	1.7
DK	2.4	-4.3	8.4	5.9	17.3	18.3	33.3	-1.9	-4.5	2.7
DL	20.3	3.3	11.6	11.1	19.2	38.0	31.1	-1.2	-4.2	3.1
DM	13.9	2.4	18.6	8.8	29.3	15.4	27.9	-3.0	-5.0	2.0
DN	3.8	-2.0	2.2	2.5	15.5	6.6	17.3	1.5	2.2	-0.6

Table 1 Average annual growth rates of the relevant variables in Czech Republic

hu annual	*Y*	*E*	*MI*	*MF*	*XI*	*XF*	*FDI*	*WBR*	*erel*	*wrel*
D	15.2	0.0	12.3	12.5	11.8	21.0	19.7	2.5	1.6	0.9
DA	4.8	-1.7	7.0	13.6	3.3	4.2	8.6	3.0	1.1	2.0
DB	4.3	-6.2	-1.6	2.9	8.3	-4.2	8.8	0.5	1.7	-1.2
DC	-4.3	-8.1	-2.5	-2.3	-16.4	-8.4	2.1	4.8	4.3	0.5
DD	10.3	2.0	11.4	2.8	2.6	-16.5	13.1	0.1	1.3	-1.3
DE	10.9	6.3	4.5	9.0	12.0	0.3	11.5	2.7	2.3	0.4
DF	-0.9	-9.8	11.4	15.1	-0.6	3.3	-12.9	7.3	3.6	3.5
DG	5.3	-2.9	5.4	6.2	0.1	28.4	22.1	3.6	3.1	0.5
DH	14.2	2.5	9.6	11.6	14.8	11.9	16.7	0.4	-0.4	0.8
DI	6.8	-3.5	8.9	-1.5	6.0	-3.0	7.8	3.9	3.6	0.3
DJ	10.9	1.7	10.9	5.2	6.8	4.4	19.9	0.7	0.4	0.3
DK	15.8	0.6	12.2	8.8	16.1	15.9	19.7	4.3	2.4	1.9
DL	30.7	5.9	21.0	20.8	15.1	32.5	22.5	3.1	2.1	1.0
DM	14.6	2.7	10.1	15.5	13.0	20.1	31.4	0.6	-2.6	3.2
DN	11.2	1.4	10.8	4.6	11.4	6.8	11.1	-1.1	-1.3	0.2

Table 2 Average annual growth rates of the relevant variables in Hungary

pl annual	*Y*	*E*	*MI*	*MF*	*XI*	*XF*	*FDI*	*WBR*	*erel*	*wrel*
D	12.1	-2.9	16.4	14.2	21.6	17.2	22.6	2.3	-0.9	3.2
DA	9.4	-2.0	9.8	11.4	10.3	20.8	18.0	5.6	0.7	4.9
DB	5.1	-7.0	6.1	8.7	18.9	2.8	11.1	2.0	-0.5	2.5
DC	0.0	-9.4	16.4	9.0	10.5	2.2		1.7	-0.5	2.2
DD	12.9	-0.3	23.6	11.6	12.2	9.2	24.0	0.3	-2.0	2.3
DE	13.5	1.0	14.9	7.9	17.8	46.2		5.4	2.8	2.5
DF	4.7	-4.7	9.1	-18.7	8.0	198.6	30.9	9.4	10.2	0.1
DG	10.2	-4.2	16.1	15.1	9.8	43.0	24.0	10.6	7.0	3.4
DH	18.7	3.2	17.8	20.6	30.5	29.2	22.0	3.2	0.9	2.3
DI	12.8	-3.5	11.5	2.1	11.4	8.1		5.5	2.1	3.3
DJ	11.4	-2.7	21.2	7.5	13.4	23.0	22.7	3.3	1.1	2.3
DK	9.8	-6.2	14.0	12.9	23.5	24.5	26.0	2.4	0.4	2.0
DL	16.7	-1.9	20.2	19.3	26.6	31.6	34.8	3.2	-0.7	4.0
DM	19.3	-3.0	21.1	15.9	53.8	21.9	25.1	0.5	-2.8	3.4
DN	15.7	0.9	15.8	10.9	38.4	15.3		0.0	-1.8	1.8

Table 3 Average annual growth rates of the relevant variables in Poland

Appendix 2 Estimation results

	Poland				***Hungary***				***Czech Rep***			
	ID	No ID	ID	No ID	ID	No ID	ID	No ID	ID	No ID	ID	No ID
Y	0.039	0.055	0.039	0.054	**-0.18**	-0.131	-0.163	-0.137	**-0.292**	**-0.212**	**-0.223**	**-0.216**
	0.695	0.634	0.705	0.634	**0.069**	0.187	0.137	0.17	**0.003**	**0.03**	**0.045**	**0.016**
FDI	0.023	0.004	0.021	0.003	**-0.123**	-0.087	-0.048	-0.075	**0.68**	**0.058**	**0.067**	**0.059**
	0.301	0.871	0.342	0.9	**0.071**	0.169	0.357	0.208	**0.000**	**0.000**	**0.000**	**0.000**
MI	-0.05	-0.074	-0.055	-0.073	-0.022	0.007	-0.002	0.005	-0.205	**-0.261**	**-0.215**	**-0.257**
	0.395	0.176	0.313	0.188	0.728	0.906	0.965	0.955	0.112	**0.005**	**0.095**	**0.006**
MF	**0.073**	0.078	0.066	**0.082**	**-0.129**	-0.094	-0.104	-0.086	0.013	0.028	0.014	0.025
	0.064	0.121	0.103	**0.094**	**0.079**	0.238	0.261	0.28	0.902	0.789	0.898	0.812
XI	**-0.099**	**-0.154**	**-0.098**	**-0.147**	0.006	-0.047	-0.023	-0.048	0.013	0.005	0.017	0.000
	0.015	**0**	**0.025**	**0**	0.917	0.497	0.739	0.405	0.883	0.934	0.849	1.000
XF	-0.004	0.065	-0.007	**0.075**	**0.069**	**0.092**	**0.068**	**0.098**	-0.083	0.008	-0.062	0.009
	0.921	0.122	0.87	**0.097**	**0.037**	**0.016**	**0.017**	**0.046**	0.397	0.896	0.471	0.893
GFCF	-4.692	2.885			**27.103**	1.394			**-30.251**	-1.85		
	0.234	0.209			**0.015**	0.586			**0.038**	0.67		
const	**0.146**	**0.119**	**0.138**	**0.122**	0.023	0.051	**0.058**	0.052	**0.138**	0.026	0.065	0.023
	0	**0**	**0**	**0.001**	0.49	0.11	**0.052**	0.161	**0.077**	0.68	0.327	0.712
trend	**-0.012**	**-0.014**	**-0.013**	**-0.014**	-0.01	-0.002	-0.002	0	0.005	0.001	-0.002	0.001
	0.005	**0**	**0**	**0**	0.173	0.751	0.726	0.9	0.63	0.89	0.881	0.947
R2	0.579	0.478	0.572	0.461	0.31	0.18	0.24	0.176	0.343	0.21	0.276	0.207
W	72.8	52.9	131.2	48.99	40.4	29.4	35.7	14.26	106.9	55.4	97.3	54.1
N												

Table 4 Estimation results with the PCSE procedure

Appendix 3 Industry classification according to NACE subsections

DA Food products; beverages and tobacco

DB Textiles and textile products

DC Leather and leather products

DD Wood and wood products

DE Pulp, paper & paper products; publishing & printing

DF Coke, refined petroleum products & nuclear fuel

DG Chemicals, chemical products and man-made fibres

DH Rubber and plastic products

DI Other non-metallic mineral products

DJ Basic metals and fabricated metal products

DK Machinery and equipment n.e.c.

DL Electrical and optical equipment

DM Transport equipment

DN Manufacturing n.e.c.