The effect of FDI and foreign trade on wages in the Central and Eastern European Countries in the post-transition era: A sectoral analysis

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Abstract

The aim of this paper is to estimate the effect of FDI and trade openness on wages in the CEECs in the post-transition era. We utilize a cross-country sector-specific eceonometric analysis based on one-digit level panel data for manufacturing industry in the Czech Republic, Hungary, Poland, Slovakia, Slovenia, for the period of 2000-2004. The results suggest that the increases in productivity are reflected in wages only to a modest extent, even in the long-term, leading to a steady decline in the share of labor in manufacturing industry in almost all sub-sectors in all countries. Meanwhile, the high significant and negative effect of unemployment on wages shows that the labor market is flexible in terms of wage flexibility. FDI has a positive effect on wages only in the capital and skill intensive sectors. The results also show that the increase in trade with EU did not lead to positive prospects for wages in manufacturing industry, contrary to the expectations of pro-market policies and traditional trade theory. The long-term net effect of exports and imports is negative, suggesting that integration of CEECs to EU via trade liberalization have worked at the expense of labor.

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1. Introduction

This paper aims at exploring how labor in the Central and Eastern European Countries (CEECs) is effected by the integration to the Western European economic area through foreign direct investment (FDI) and trade in the post-transition era. Most studies expect Eastern enlargement to bring about the catching-up of the new member states in terms of GDP per capita through FDI or international trade in the foreseeable future, though the time horizons as well as country specific expectations of such predictions differ (Landesmann, 2003; Landesmann and Stehrer 2002; Hunya and Geishecker, 2005). However this process also has differenial effects on different social groups. A decade of transition has brought about dramatic changes in the structure of employment and wages in the CEECs. More than a decade after the transition crisis open unemployment remains high despite a massive exit from the labor market in most countries. The employment growth since 1995 has been disappointing, given the reasonable performance of the CEECs in output growth (Havlik and Landesmann, 2005; Landesmann et al, 2004).

The labor market effects of European enlargement have been discussed disproportionately from a western point of view, focusing on the negative effects of outsourcing and FDI outflow to the East on unemployment and wages in EU15, particularly regarding the unskilled labor (eg. Anderton and Brenton, 1999; Falk and Wolfmayr, 2005; Geishecker, 2005). The European Comission's Employment in Europe reports in 2004 and 2005 draw a more optimistic picture for the West as well as the East, while adressing the possibility of unskilled and older workers losing in both regions (European Commission 2004, 2005). Nevertheless, the idea that trade and capital mobility play an unambigously positive role for the CEECs, and as the skill levels adjust and upgrade, the losses will also disappear, is dominating economic policy. This "enlargement optimism" is based on the argument that European integration driven by FDI and export orientation will lead to a transfer of modern technology and consequently growth that will eventually trickle down to workers.

Empirical evidence, on the other hand suggests that there is no automatic mechanism ensuring optimistic prospects for labor. Hunya and Geishecker (2005) suggest that the nature of FDI in manufacturing will remain to be low-wage seeking, vertical, export-oriented investment. Egger and Stehrer (2001) find that the wage bill of both skilled and unskilled workers significantly lose from an increase in the share of Multinational Enterprises (MNEs). They

argue that this is because the labor productivity increase induced by MNEs is larger than their positive impact on output and wage rates. In terms of wage levels and industrial relations, the prospects are also not unambiguously positive. MNEs do not necessarily transfer their "high-road" employment practices and industrial relations to the CEECs. Galgoczi (2003) reports that, according to an analysis of the Hungarian Metal Unions, MNEs match their wage and welfare policies solely to the local conditions; even some big firms are union free; and cases of threatening of the trade union president has been observed. Stehrer and Woerz (2005) report evidence of a downward pressure of FDI on wage growth for a cross-country analysis for OECD and non-OECD Eastern European and Asian countries.

The effect of FDI on macroeconomic performance is also a controversial issue. Mencinger (2003) and Blaas and Lorant (2006) report that MNEs contributed more to imports than to exports, and the spillovers from single firms to the sector does not seem to be sufficiently strong to increase growth. Mencinger argues that FDI could also force small emerging local competitors out of business. In a more detailed cross-country sectoral analysis, Fillat-Castejon and Woerz (2005) find that the impact of FDI on growth and productivity as such is often weak, however FDI often turns out to be an important contributor to growth in combination with investment or exports.

Regarding the effect of trade, Egger and Stehrer (2001) show that both intermediate goods exports and imports of the CEECs exhibit a positive impact on the unskilled workers' wage bill in absolute terms as well as relative to the wage bill of the skilled workers. However, their results also show that the final goods exports have a negative significant effect on the absolute and relative wage bill of the unskilled workers, and this effect is greater than the positive effect of intermediate exports. The results of Stehrer and Woerz (2005) for a larger pool of countries find no significant effect of exports, but a negative effect of imports on wages.

The aim of this paper is to adress these controversies based on an empirical analysis of the effect of European economic integration on wages in the CEECs. We estimate a wage equation, which incorporates international trade and foreign direct investment as shift variables. We aim at answering the following questions: Do FDI and international trade with EU15 improve the bargaining power of labor and increase wages in the CEECs after controlling for industrial properties, productivity and labor market conditions? Or quite on the contrary, do openness and capital mobility intensify the distributional conflict, and lead to

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downward pressures on wages? Do these effects vary with respect to the capital and skill intensity of the sectors? We utilize a cross-country sector-specific eceonometric analysis based on one-digit level panel data for manufacturing industry, suplied by the Vienna Institute of International Studies. The countries included are Czech Republic, Hungary, Poland, Slovakia, Slovenia, and the period of analysis is 2000-2004, both of which are determined by data availability.

The paper consists of five sections, including this introductory one. Section 2 presents the conceptual framework of our model. Section 3 discusses the descriptive statistics of our working sample. Section 4 presents the empirical results, and Section 5 concludes.

2. The wage equation

The wage equation (equation 1 below) is based on a standard bargaining model, which is consistent with conflict inflation models (Sylos-Labini, 1979; Rowthorn, 1977; Arestis, 1986), as well as recent wage curve models (eg. Blanchflower and Oswald, 1995). To avoid complications of modeling the formation of price expectations, an ex post version of the model is used. We thus look at the outcome of bargaining, i.e. the (ex post) real wage. Changes in productivity will affect worker's aspirations and the unemployment rate in the economy will affect their bargaining power. The first novelty of this paper is to incorporate the effect of international capital mobility and trade to the model, as factors which would shift the bargaining curve.[1] The second novelty is to introduce sector specific effects to bargaining, based on a panel of 14 sectors for five countries for the period of 2000-2004.

$$WR = f(QR/L, U, FDISQ, XQEU, MQEU) \qquad (1)$$

where WR, QR/L, FDISQ, XQEU and MQEU are the real wage, labor productivity, unemployment rate, inward FDI stock/output, exports to EU/output and imports from EU/output respectively. Different version of this basic wage equation will be estimated, the details of which are presented in section 3. Here theoretical predictions will be discussed.

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[1] It has been suggested that a reference wage like the average wage rate of the economy be included. While this would make sense, if one were only interested in wage differentials, it efeating in our context, since the average wage needs to be explained and not taken as given.

Increases in productivity are expected to have a positive effect on wages, and the coefficient reflects to what extent productivity gains are equally shared between capital and labor. A coefficient of 1 would mean that labor's share in value added is staying constant, other things being equal. Higher unemployment is expected to lead to a lower bargaining power of workers, and lower real wage. If the coefficient of unemployment is negative, assuming that the effect is economically significant, the labor market is considered flexible (in the sense of wage flexibility).

Economic theories differ on the expected effects of opening up the economy. Table 1 below summarizes the different expectations about the effect of openness on wages in different sectors according to three theories: 1. traditional trade theory in the short and the long run, 2. the bargaining theory of political economy, 3.the skill and capital bias in international competition argument. The expected effect is shown through both changes in relative capital/labor ratio (substitution between capital and labor), and the skilled labor intensity (substitution between unskilled and skilled labor). A positive effect is indicated by "+", a negative effect by "-".

Insert Table 1 here

Traditional trade theory, based on Heckscher-Ohlin and Stolper-Samuelson theorems, expects a positive effect of openness (an increase in the export and import intensity of production as well as FDI inflow) on the wages (in nominal as well as real terms), due to the increased labor intensity of production (and consequently increased labor demand) in countries with a comparative advantage in labor intensive industries, at least in the long run[2] (Krugman and Obstfeld, 1994; Krueger, 1983). However, these effects need not materialize in the short run. According to the *short-run versions of traditional trade theory*, the short-run results may differ due to the immobility of sector-specific capital, which prevents the optimal reallocation of production across sectors. This may result in a decline in real wages in the exportable sectors due to falling marginal product of labor with fixed capital, and in the importable sectors due to a decline in output as well as employment in the short run (Edwards, 1988; Cox-Edwards and Edwards, 1994; Milner and Wright, 1998). Nevertheless, once the

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[2] While the export/output ratio (or FDI/GDP) ratio would have different effects on employment than the import/output ratio, their effects on wages are similar in traditional trade theory, reflecting an increase in the rewards to the relatively abundant factor used more intensively by the exporting sectors, whose prices increase in relative terms after openness.

transition period is over, the factors that are relatively abundant in the country are supposed to gain. In models with differentiated labor input, the effects of openness on wages may also depend on the sectoral differences via effects of trade on relative labor demand for skilled vs unskilled labor in a country abundant in unskilled labor. We will also investigate this difference.

Political economists have pointed out on the contrary that opening up may also intensify distributional conflicts through increased competitive pressures, which leads to labor disciplining effects. This may adversely affect the bargaining power of labor and result in a negative effect on wages, for a given level of economic activity, productivity, and employment. The shift in the relative importance of domestic vs. international markets increases the relative importance of wages as a cost item rather than as a source of demand. In an increasingly global economy, even producers of mass consumer goods do not produce only for domestic markets, and are more likely to consider labor as a cost factor, rather than a factor of demand, and are, therefore, more cautious in terms of their wage policy. Moreover, trade liberalization policies have usually been accompanied by a shift in the balance of power relations in favor of capital and the deregulation of the labor market, in order to alleviate the pressure of international competition over profits. The conceptual framework is developed in several theoretical as well as empirical studies, discussing the effects of globalization on labor and the threat effects associated with international capital mobility and outsourcing (Onaran, 2004 and 2005; Lee and Jayadev, 2005; Harrison, 2002; Pollin, 2002; Diwan, 2001; Burke and Epstein, 2001; Rodrik, 1998; UNCTAD, 1997)[3]. This argument is related with a *political economy* aspect different from the short-run arguments of the traditional trade theory based on fixed capital and declining marginal product of labor. Nevertheless, it is accepted that the changes in balance of power relations do take time, and therefore the effects of openness may be observed only in the medium run.

In order to appreciate the predictions of these theories, it is also necessary to distinguish between the effects on different sectors. Hence we group sectors into capital vs. labor intensive ones, and ones using predominantly skilled or unskilled labor. Thus the following four categories are defined: capital intensive and using unskilled labor, CU, capital intensive

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[3] One interesting extension to this paper would be to interact the productivity and unemployment variables with the internationalization variables to test whether the individual elasticities are also affected by opening up. However the data limitations regarding the length of the time series do not allow for this test at the time being.

and using skilled labor, CS, labor intensive and using unskilled labor, LU, labor intensive and using skilled labor, LS. Appendix A presents the sectoral taxonomy.

Political economy approach (Bohle and Greskovits, 2005; Gourevitch, 1986; Kurth, 1979; Ferguson, 1984; Shafer, 1994) argues that the factor intensity of specific industries shapes businesses' willingness to accommodate demands for higher wages, and labor's capacity to enforce higher wages and better work conditions. Given that labor costs are relatively less important in capital intensive industries, employers in these sectors can afford to pay comparatively higher wages. At the same time, collective action is easier in capital intensive industries, where a few large firms employ concentrated, high numbers of workers. Vice versa, businesses in labor intensive industries are much more dependent on labor costs for competitiveness, and the dispersed nature of the industries in labor intensive sectors weakens labor's capacity to act collectively. The significance of skills points in a similar direction. The more an industry relies on skilled labor for its operation, the likelier it is that firms will pay higher wages to increase their workers' loyalty. Whereas highly skilled labor is a scarce resource, unskilled labor can easily be replaced. Labor's bargaining power is expected to vary positively with capital intensity, and the use of skilled labor, and negatively with labor intensity, and the use of unskilled labor. On the basis of this, Bohle and Greskovits (2005) hypothesize two polar cases: capital intensive industries that use highly skilled labor with comparatively the highest bargaining power (e.g. car industry), and the labor-intensive industries that use low skilled labor the lowest bargaining power (e.g. textile and apparel). The differences in bargaining power may affect how much of the productivity gains are reflected to wages, and how flexible wages are with respect to unemployment. The effects of openness will also differ across sectors. In this context, the relative bargaining power effects of the sectors will be important, with the wages in the CS sectors being least adversely affected, and the LU the most.

Regarding sectoral differences, *traditional trade theory* argues that in a country with relatively more abundant unskilled labor, the wage of the unskilled workers will increase as a result of openness, and that of the skilled workers will decrease in the long run. If we extrapolate the arguments of the traditional trade theory for the long-run to our sectoral framework, a positive effect in LU and CU, and an ambiguous effect in CS and LS sectors[4]

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[4] We assume that wages in the CS and LS industries are dominated by the wages of skilled workers, and wages in CU and LU industries are dominated by that of the unskilled.

would be expected, depending also on the effects of substitution between capital and skilled labor. The *short-run* results with sector-specific capital and skills, will again be an overall decline in wages for both skilled and unskilled labor in the framework of new versions of the model.

The traditional trade theory is also challenged by an empirical approach based on increasing evidence, which indicates the adverse effects of capital mobility, increased *international competition*, and the pressure for technological change on unskilled labor in both developed and developing countries, contrary to the expectations of the traditional trade theory even in the long-run (e.g. for the cases of US and Mexico trade, Feenstra and Hanson, 1997; Harrison and Hanson, 1999). The argument of these studies is that the FDI inflow as well as international competition, is increasing the skill bias of production, and adversely affecting the relative demand for unskilled labor[5]. Additionally, just as internationalization of production increases the skill intensity of production, it may also increase the capital intensity of production, simply because of the available technologies as well as international competition (Onaran, 2001). Then not only unskilled labor may be affected negatively, but labor as a whole. If this is the case, the result will be a negative coefficient of exports, imports and FDI on wages in the CU and LU sectors, and ambiguous effects in CS and LS, depending on which of the skill or capital intensity biases dominates.

While the discussion usually refers to openess, it may be useful to distinguish between exports and imports. Imported goods can be complementary to labor, rather than being a substitute of domestically produced goods. Then the negative bargaining effect of the political economy argument will not be observed with imports, but only with exports (Onaran, 2004).

In the case of FDI, the optimistic expectation is again that an increase in FDI will not only increase the demand for labor based on arguments of traditional trade theory, but that an increase in the ratio of FDI to GDP will create positive effects on wages through the transfer of more productive technology and better working relations in the firms with foreign capital. However, there are four factors that may work in the opposite direction (Onaran, 2004). Obviously, the nature of FDI, whether it is in the form of equity capital or new investment in machinery and equipment, matters in the realization of the expected positive spill over effects. Moreover, if FDI is mostly in terms of stock market transactions, rather than a genuine

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[5] Harrison and Hanson (1999) also present a literature review indicating that these results are not due to labor market rigidities.

interest in long-term investment, then the increase in pressure on the firm through shareholder valuation can lead to further conflicts in the bargaining process. Second, it is also well known that low labor costs are one of the major factors that attract FDI. In this situation, the threat of capital flight in the event of a reversal of this relative labor cost advantage may generate a significant downward pressure on wages as the economy becomes more open to FDI inflows (Crotty et al, 1998; Burke and Epstein, 2001; Harrison, 2002, Rodrik, 1998). Third, it is known that even when the positive firm level effects of FDI are realized, the spill-over effects can be quite limited, leading to a dual economy, without any major positive effects on economy wide competitiveness, employment, and wages (Mencinger, 2003). Fourth, depending on the capital and skill intensity of the industry the effect of FDI may change: higher positive effects are expected in capital intensive industries, where labor costs are less important, and technological spill over effects from foreign firms to the rest of the sector can be more relevant. In capital intensive industries the threat effects of further relocation of capital is also more moderate, since capital mobility is expected to be more costly in these sectors (Burke and Epstein, 2001). Also, in line with the empirical critique of the traditional trade theory, FDI may have positive effects on skilled wages and negative effects on unskilled wages.

3. Data and the descriptive statistics of the sample

This section presents the stylized facts of our working sample for each country, with an emphasis on sectoral differences. The countries of analysis are the relatively more developed new members of EU in CEE -the Czech Republic, Hungary, Poland, Slovakia, Slovenia- for which data is available. The Baltic countries are left out of analysis due to data problems in Estonia and Latvia. The main data source is the Vienna Institute for International Economic Studies (WIIW) Industrial Database, which reports one digit level sectoral data (ISIC Rev. 3), which include 14 sectors. The one-digit sectoral classification was chosen because sectoral FDI data is available only at this level of detail.[6] Our sample covers only manufacturing industry, which is the only sector with reliable time series data for wages. The manufacturing industry is accounting for 17-28% of employment and 15-25% of GDP; however, it is attracting almost half of the FDI inflow, and generating 80-95% of the merchandise exports and imports. Manufacturing as a tradable sector is also most likely to be affected by the integration to the European economic sphere. For the years, where data is available, the ratio

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[6] Where data was available (Hungary, Poland, and Slovenia) the robustness of our results for the effects of the variables other than FDI was checked at two digit level (i.e. 23 sectors).

of manufacturing wages to total wages is close to 1 (for the last year ranging between 0.83-1.04 for different countries). Thus the results for manufacturing are suggestive for the overall effects of globalization on labor.

Data availability determines the period of analysis. Foreign trade data based on the records of the countries themselves (as opposed to EU15 records) starts only in 1999; FDI data is only available for a period of 1996/1998-2003/2004 depending on the country. As a consequence, our working sample is covering the period of post-transition recovery. The severe contractions in economic activity in the early and mid 1990s do not distort our estimations.

In order to capture the time lag in the effects of FDI and international trade on wages, the relevant variables are used in lags. This is also helpful in avoiding endogeneity problems. We use the stock of FDI rather than the inflow of FDI in order to reflect the long term effects of the foreign capital that has accumulated in a sector over the last decade[7]. In the case of exports, unfortunately the lack of long time series data prevent us from using longer time lags or moving averages; however we assume that the current level of export and import intensity are reflecting the cumulative performance of the sector in terms of foreign trade in the past years.

In terms of the effect of foreign trade, this study focuses on trade of the CEECs with the EU15, since that reflects a certain pattern of international division of labor and specialization in trade between the center, which is both capital and skilled labor abundant, and the periphery, which is relatively not only labor but also unskilled labor abundant. The exports to EU would be the relatively less skill intensive and more labor intensive goods, and the imports from EU will be the relatively more capital and skill intensive goods. Trade with EU15 reflects roughly 50-75% of the foreign trade effect of the CEECs.

Table 2 shows the averages of the variables for the pools of CS, CU, LS, LU, and aggregate manufacturing industry during the period of estimation for each country and sector. Although the results suggest mixed performance across countries as well as across industries within the same country, one result seems to be clear: The relatively strong opening up of the economies, improved exports in manufacturing and foreign direct investment does not go along with a

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[7] The source of FDI data is international investment position derived from company surveys, as opposed to the standard balance of payments source for the FDI flows.

parallel strong improvement in wages in the manufacturing industry. The result is a decline in the share of labor in manufacturing industry in aggregate and in most of the sectors in all countries during 2000-2004[8]. Even in the period after the initial shock of transformation the tide of economic recovery has not lifted all boats equally. In Poland the difference is most pronounced, with productivity in manufacturing increasing on average 8.4% per year, and real wages increasing by 1.0%. In Hungary, where real wage increases has been the highest with an annual average rate of 3.8%, annual productivity increase has been 6.5%.

Insert Table 2 here

Average wages are highest in CS and lowest in LU in all countries. Average productivity is lowest in LU sectors in all countries, and in four countries CS is the highest productivity sector. In terms of the reflection of productivity to wages, there seems to be a negative relation between the growth pace of productivity and the share of labor in output. In all countries the highest export/output ratios (to EU) are in the labor intensive sectors (both skilled and unskilled). The highest import from EU (as a ratio to output) is in LS sectors in Poland, Slovenia, Czech Republic, and Slovakia, followed by CS sectors. In Hungary the highest ratio is in LU sectors, and CS comes the second. In capital intensive sectors there is a trade deficit in all countries and, other than Hungary and the Czech Republic, there is also a trade deficit in LS, which is an interesting result since this is also a leading export sector in all these countries. These stylized facts indicate the existence of intra-industry trade rather than a clear specialization based on comparative advantages.

In terms of the stock of FDI as a ratio to output, the capital intensive industries, and mostly the unskilled ones have usually been the leading sectors, which have attracted most FDI. In Czech Republic and Hungary, electronics as a labor and skill intensive industry is also a relevant receiver.

Finally, the average unemployment rate during 2000-2004 in Poland and Slovakia was very high (19.0-18.3%), and in the other countries moderately high, ranging between 7.9% in

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[8] The only exceptions are in Hungary some LU sectors (food & tobacco, leather), and CS sectors (paper & publishing, automotive), in Slovenia all LU sectors and two CU sectors (rubber and non-metallic minerals, and in Czech Republic only leather. Overall, Slovenia is an exception, where in almost half of the sectors wages have exceeded productivity increases. But even in Slovenia, productivity in manufacturing has increased on average 2.4% per year, whereas real wages increased by 1.9%.

Czech Republic to 6.0% in Hungary. In Poland unemployment continued to increase, whereas in other countries there is a modest decline.

4. Estimation methodology and the results

This section presents the estimation results for the wage bargaining model in Equation 1. At the first step, versions of the wage equation are estimated for the aggregate pool of all the sectors in all five countries using a two-way panel data estimation technique with sector and period specific fixed effects. Second, separate panel data estimations are performed for each group of sectors, CS, CU, LS, LU, by pooling the relevant sectors across all five countries. Third, a cross-section model based on the average value of all the variables for each sector in all five countries is estimated to obtain long-term effects. We first turn to the short-run version, which takes the form:

$$WR_{ji,t} = \beta_{ji} + \alpha_t + \beta_1(QR_{ji,t}/L_{ji,t}) + \beta_2 U_{j,t} + \beta_3 FDISQ_{ji,t-1} + \beta_4 XQEUQ_{ji,t-1} + \beta_5 MQEU_{ji,t-1} + \varepsilon_{ji,t} \qquad (2)$$

where j is the country index (=1,…,5); i is the sector indicator (i=1,…, 14); t=2000,…,2004; WR, QR/L, FDISQ, XQEU and MQEU are the real wage (gross wage per worker, logarithm in constant prices (deflated by CPI) and Euros of 1999), labor productivity (logarithm of real output per worker, in constant prices (deflated by sectoral PPI) and Euros of 1999), unemployment rate, inward FDI stock/output, exports to EU/output and imports from EU/output respectively in sector i in country j. U is the unemployment rate in country j in time t. All variables, except for U, are sector specific variables. β_{ji} is an individual cross-section specific fixed effect unique to each sector in a country. α_t is a period specific effect, which is the same across the sectors and countries, and captures the time trend and the period specific shocks that are common to all countries and sectors during the estimation period.

Each sector in each country is treated as an individual cross-section unit[9]. Thus, for 5 countries, and 14 sectors, there are 70 different cross-sections. Five versions of the equation will be estimated. Specification 1 includes only productivity and the rate of unemployment.

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[9] The panel data technique allows us to pool the data across countries and make sector-specific estimations. However, the weakness of panel data estimations is the assumption of a homogenous coefficient for the regressors across countries and sectors in the pool. We assume that the variation across sector groups is more important then the heterogeneity across countries. The shortness of the time series do not allow for single-sector specific coefficient estimates for each country.

Specification 2 and 3 alternately add the FDISQ or XQEU and MQEU. Specification 5 is the full specification given above.

Some remarks about the specification of the variables are in place here. Real wage and productivity are variables that may suffer from unit root problems. However, with short time-series the power of the unit root tests are low and the problem is less significant in a panel setting, and it is advised to work with the logarithmic level of these variables, which we will follow here (Wooldridge, 2002; Hamilton, 1994). Unemployment rate, export, import and FDI ratios traditionally tend to be stationary, particularly for a short time period. Nevertheless, the existence of a trend in most of these variables requires the use of a time trend, which in our case is reflected by the period specific fixed effects. Finally, we compute standard errors that are robust to the existence of sector specific serial correlation (White 1982; Arellano, 1987; Wooldridge, 2002).[10]

The estimation results for the wage equation with different specifications are in Table 3.1-3.5 for the aggregate pool as well as the sub-pools. The F and Chi-square tests for the joint significance of the fixed effects and their probabilities are reported at the end of each model. The cross-section fixed effects are jointly significant in all specifications. The time specific effects are significant in all estimations, other than the sub-pool for LS, where the results are relatively robust between the estimation with or without the time effects. However, in the LS pool there is only one sector and the degrees of freedom are rather low. Thus the results should only be interpreted with caution. Regarding the choice between the cross-section fixed vs. random effects, we work with fixed effects, since the sector specific effects have an economic interpretation. Moreover, the Hausman tests for the aggregate pool and LU sub-pool, for all specifications suggest the use of fixed effects. For consistency, fixed effects models are also used for CS, CU and LS, particularly since the results are fairly robust.

Insert Table 3

Table 3.1 shows the results for the aggregate pool. The sector specific productivity (QR/L), has the expected positive effect on wages (WR) in all specifications, however the economic

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[10] Another obvious way to address the problem of serial correlation could be to use the lagged dependent variable as an explanatory variable, however that would require the use of dynamic panel data estimation, and with the small number of cross-sections (ranging between 5 and 25), the results would not be reliable. Nevertheless, based on the aggregate pool, we also estimate a dynamic model.

effect is rather small. In most cases the coefficient estimate is around 0.12, which means that a 10% productivity increase would only lead to a 1.2% real wage growth. One is almost tempted to say that wages are de-linked from productivity growth. This is consistent with the stylized facts indicating that the average increase in wages has been lagging behind productivity increases in almost all of the sectors in all countries. Overall there are few sectors, which are having wage increases systematically above productivity increases. If there were more of such sectors, a low coefficient of productivity could have been interpreted as a sign of pattern bargaining (or solidaristic wage bargaining) where a leading sector sets wages and unions in other sector follow suit; or as a high labor mobility in competitive markets, which equalizes wages across sectors with productivity differentials. But evidence suggests that wages lag behind productivity improvements in most sub-sectors. Using the lag of productivity does not change the results. The cumulative estimation results based on period averages below will provide more insight on the long-term relations.

In terms of the aggregate labor market conditions, the negative effect of unemployment (U) on the bargaining power of workers is verified in all specifications for the aggregate pool. Moreover, the economic effect of the coefficient estimates is impressive. A 1%-point increase in unemployment leads to a reduction of real wage by 1%. Real wages thus are rather flexible and responsive to the labor market conditions in these countries. The effect of unemployment on wages may be overstated somewhat since the unemployment rate may also capture country characteristics, but since the regression also controls for sectoral and temporal fixed effects the resulting bias ought to be small.

Regarding the variables reflecting the effects of integration to the global economy and the EU, FDI stock as a ratio to the output of the sector (FDISQ) has a positive effect in all specifications for the aggregate pool. However, the economic significance of the effect is rather small. A 10 %-point increase in the FDI stock/output ratio leads to only a 1.1%-point real wage growth. This may sound substantial, but the FDI inflow to achieve this is quite ambitious: the FDI stock/output ratios are ranging between 0.06 and 0.30; a 10%-point increase implies a 30% increase of the highest existing FDI stock. Such dramatic increases rarely happen.

The effect of FDI on wages might of course work indirectly by boosting productivity growth. Such a channel, however, is unlikely, since productivity increases fail to translate into more

than symbolic wage increases. Nonetheless, the effectiveness of this channel was tested by an auxiliary regression that excludes productivity growth, but then in the aggregate pool the coefficient of FDI becomes insignificant. The effect of FDI on productivity is also not robust, which is surprising given the strong firm-level evidence of productivity effects of FDI (eg. Hunya and Geishecker, 2005). Again according to an auxiliary estimation, regressing productivity on FDISQ, after controlling for cyclical fluctuations, i.e. the logarithmic change in output, FDI has a positive effect on productivity only in the specification without time effects. However the time effects are jointly significant and their inclusion leads to an insignificant effect of FDI on productivity. Although such results are in contrast to the micro-level positive effects of FDI on productivity at the firm level, they suggest lack of positive spill over effects to the sector in general. If we use the positive and statistically significant coefficient of FDI in the productivity estimation (without time effects), which is 0.60, we can calculate the total cumulative effect of FDI on wages. According to Specification 2 in Table 3.1, a 1%-point increase in FDI ratio has a 0.11% direct effect on wages. The indirect effect via productivity increase would be 0.13*0.60=0.07. Thus the total effect of a 1%-point increase in FDI ratio on wages is a 0.18% increase. Given that productivity has increased by 0.60%, the rest (0.42%) will increase the capital share. Thus the FDI-led productivity growth is leading to deterioration in functional income distribution[11].

In terms of international trade effects of EU integration on labor in the CEECs, exports to EU and imports from EU as a ratio to the output of the sector (XQEU and MQEU) are statistically insignificant in all specifications for the aggregate pool. There is no observable short run effect of imports and exports. However, it turns out that there are long-run effects that will be discussed later.

In the second step the estimations are repeated for sub-pools of sectors according to their capital and skill intensity (CS, CU, LS, and LU). This has been done for sectors at the 1-digit and at the 2-digit level, the latter excluding FDI data and the Czech Republic and Slovakia. The results for the 1-digit estimations are in Tables 3.2-3.5. Overall this does not improve the quality of the estimates. The significance of the coefficient of productivity is robust across sectors; unemployment is also significant and negative in all sectors but LS. The most interesting finding is that the effect of FDI is significant only in CS sectors, and this result is

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[11] The implication of the increase in profit share on the profit rate has to take into account also the increase in the capital stock.

robust in different specifications. In terms of the magnitude of the effect in CS, the coefficient is again modest. The cumulative effect of a 1%-point increase in FDI ratio on wages is an increase of 0.33%[12]. This means that a 1%-point increase in FDI ratio leads to a deterioration of 0.59% in labor's share in the CS sectors. As regards foreign trade, the only difference is that in CU export orientation of the industry has a negative effect on wages, and this result is robust in different specifications. Other than that, trade effects do not seem to be playing a role in wage bargaining in the short run.

At the 2-digit level a clear pattern regarding the size of the coefficients of unemployment and productivity emerges: capital intensive sectors have a higher coefficient on productivity and skilled sectors show a weaker effect of unemployment (see Table 4).

Insert Table 4

In spite of the limitations in terms of the sample size, for the aggregate pool, we also estimate a dynamic model for the full specification, where we use the first lag of the real wage as a regressor[13]. The results are mostly robust with respect to the static model; however in the dynamic estimation with time effects, FDI is insignificant in the aggregate pool. But in the CS sub-pool FDI is positive and significant again with or without time effects. The results for the other sub-pools are also comparable to the static models. However, the Sargan test rejects the validity of the over-identifying restrictions. Moreover, it is not reliable to estimate the dynamic specification for small samples.

Finally, we estimate the following cross-section model based on the five-year average value of all the variables for all sectors in all five countries. The results can be interpreted as long-term effects reflecting variations across sectors and countries, though the notion of the long run does not perfectly match the theoretical notion of capital mobility across sectors. The estimated equation is the following:

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[12] When productivity is regressed on FDI ratio after controlling for cyclical fluctuations, it is found that a 1%-point increase in FDI ratio leads to a 0.92% increase in productivity, but this effect disappears when time effects are also added. So

[13] The results are available upon request. We use differenced data as in Arrelano and Bond (1991), and 1-step estimation procedure. The instruments are the second and third lag of real wage, the first lags of the levels of the predetermined variables productivity and unemployment, and the differences of the strictly exogenous variables $FDISQ_{t-1}$, $XQEU_{t-1}$, $MQEU_{t-1}$. Two alternative specifications are estimated with and without time effects.

$$avgWR_{ji} = \beta + \beta_1 avg(QR_{jii}/L_{jii}) + \beta_2 avgU_j + \beta_3 avgFDISQ_{ji} + \beta_4 avgXQEUQ_{ji} + \beta_5 avgMQEU_{ji} + \varepsilon_{ji}$$
(3)

where avgWR, avgQR/L, avgU, avgFDISQ, avgXQEU and avgMQEU are the averages of the real wage, labor productivity, unemployment rate, inward FDI stock/output, exports to EU/output and imports from EU/output respectively for sector i in country j during the estimation period. The average values for FDISQ, XQEU, and MQEU are for the period of 1999-2003 in order to reflect the same lag structure as in the previous estimations. For wage and productivity average is calculated for 2000-2004. The sample is average values for 14 sectors and 5 countries, and the number of observations is 65 with the 5 missing sectors. The estimation is based on White-heteroskedasticity-consistent standard errors & covariance. The estimation results are in Table 5.

Insert Table 5

The positive effect of productivity is enhanced; the long-term coefficient (0.34) is higher than the contemporaneous effect, but still not very high. This value also corresponds to the stylized facts derived from Table 1. The effect of unemployment is also negative, significant, and much higher, indicating that a 1%-point increase in average unemployment rate in five years is leading to a 3.7% decrease in average annual real wages. The most interesting result of the long-term effects is that trade with EU15 starts to play a significant role, but the results regarding exports are opposite to what the traditional trade theory would expect. A 1%-point increase in export-orientation of the sector towards the EU15 leads to a downward pressure of 0.51% on real wages, whereas an increase in import from EU15 as a ratio to output leads to an increase of 0.35% in real wages. These results suggest that imports from EU15 are mostly intermediate inputs and capital goods that are complementary to labor, and not a substitute for domestic production. On the other hand, the net effect of exports and imports is negative (both variables have roughly the same standard deviation), suggesting that increased exposure to foreign markets have raised the competitive pressures on labor in the bargaining process over the longer term. The negative effect of exports is robust to the exclusion of productivity or unemployment or imports, whereas the positive effect of imports is not robust. Another interesting result is that the effect of FDI stock as a ratio to output also turns into negative now, indicating the dominance of the threat effects. This result is different from the time series effects in the panel estimations. The long-term effects were also incorporated in the

panel estimations, but when the volatility in the FDI stock through time is eliminated, it is found that the sectors with a higher FDI stock as a ratio to the output of the sector have a lower average wage rate.

Finally we compare our results to Egger and Stehrer (2001), as the only econometrical study to the best of our knowledge on wages in the CEECs. Their unskilled wage bill variable is the wage bill of manual workers, which is comparable to our aggregate wage variable, since the manual worker wage bill is most likely to dominate the wage bill of the total workers. Thus we interpret our findings about the negative effect of exports on wages as consistent with their findings about the negative net effect of total (final and intermediate goods) exports on manual workers` wage bill. Similar to us, they also find a positive effect of imports on the manual workers` wage bill. However, this is just a side finding in Egger and Stehrer (2001), and their focus is the relative increase in the wage bill of manual to non-manual workers as a result of trade, and they do not emphasize the net negative effect of total exports. The results of Stehrer and Woerz (2005) do not directly comparable to our results, since they are pooling a more homogenous group of countries. Nevertheless, their long-term estimation results indicate a negative effect of FDI on wages, which is similar to our findings, but no significant export effect, and a negative import effect different from us.

5 Conclusions

To summarize, the sectoral panel analysis of manufacturing industries during 2000-2004 yielded the following results: In the short run, productivity has a weak effect on wages, unemployment a strong one, FDI a positive one that is driven mostly by the capital intensive and skilled sectors, and international trade none. In capital intensive sectors the effect of productivity seems stronger than in labor intensive ones, and the effect of unemployment seems stronger in unskilled sectors then in skilled ones. In the long run, the effects of productivity remain modest and that of unemployment stronger. Interestingly, the effect of FDI turns negative. Exports have a negative effect on wages and imports a positive one.

With all due qualifications because of short time series and at times disappointing levels of statistical significance, these results shed light on theoretical debates. The results yield little support to traditional trade theory. In the long run, neither FDI nor international trade have the expected effect. Similarly, recently proposed short-run revisions of traditional trade theory are

not supported by our results. From this point of view even the short-run positive effect of FDI in capital and skill intensive sectors is perverse. The evidence about the wage flexibility suggests that labor market institutions or wage rigidities are not the reason for the disappointment about the optimistic expectations about trade and FDI. The skill bias and the political economy hypotheses on the other hand are broadly in line with our findings. Both give similar predictions, with the former emphasizing skill bias and the latter bargaining power effects, however, this is not a matter of fundamental disagreement. Both theories predicted the potentially negative effect of international trade and FDI. The main shortcoming of these theories seems to be that they cannot explain the different findings for the short and long run effects. However, it is fair to consider their expectations more in the framework of the medium term.

Already the stylized facts revealed that rapid improvements in manufacturing exports and foreign direct investment did not go along with a comparable improvement in labor's share in the CEECs in the post-transition era. Overall, even in the decade after the transformation, the tide of economic recovery has not lifted all boats equally. One possible interpretation is that the increases in productivity are to a significant extent based on downsizing and labor shedding rather than on genuine improvements of technological efficiency.

FDI inflows to the CEECs have been the channel, around which most of the optimistic expectations are built. Economic policy typically aims at attracting high FDI inflows. However, FDI does not seem to deliver, what economic policy expects from it. In particular, private capital flows seem unable to lead to a egaliterean income distribution. Similarly shocking to many economists will be the finding that interantional trade does not deliver an increase in wage shares in the labor abundant economies. Heckscher-Ohlin and Samuelson-Stolper theorems do not seem to rule the development in the CEECs in the past decade.

The results are suggestive for the general spirit of economic policy. The breakdown of the planned economies in 1989 caused a swing in the penudulum of economic policy making to the extremes of market euphoria. Like in the aftermath of most euphorias, the day of reckoning reveals many unkept promises. It is now time to reexamine tools of economic policy making such as industrial policy, incomes policy and the EU's cohesion and budget policies to ensure that productivity growth does not lead to a polarization of society.

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Table 1. The effect of openness on wages

| | 1. Traditional trade theory | | | | 2. Political economy (Bargaining theory) | | 3. International competition (Skill and capital bias) | |
| | 1a. Long-run | | 1b. Short-run (Sector specific capital) | | | | | |
	Capital	Skill	Capital	Skill	Capital	Skill	Capital	Skill
CS	+	-	-	-	-/0	-/0	-	+
CU	+	+	-	-	-/0	-	-	-
LS	+	-	-	-	-	-/0	-	+
LU	+	+	-	-	-	-	-	-
Total	+		-		-		-/?	

Table 2. Period Averages[1] for manufacturing industry and subpools

Country	Sub-pool	% Δ WR[2]	% Δ QR/L[2]	FDISQ	XQ EU	MQ EU	XQW[3]	MQW[3]	WR, non-log[4]	U	Avg ann. change U
HU	**CS**	0.042	0.043	0.28	0.43	0.64	0.62	0.89	518.7		
	CU	0.038	0.048	0.30	0.31	0.53	0.48	0.76	363.1		
	LS	0.032	0.100	0.20	0.78	0.44	0.96	0.95	378.4		
	LU	0.033	0.025	0.21	0.94	0.68	1.17	1.05	244.3		
	Total	0.038	0.065	0.26	0.54	0.48	0.71	0.77	355.0	5.98	-0.06
PL	**CS**	0.018	0.077	0.14	0.24	0.48	0.36	0.66	551.6		
	CU	0.007	0.071	0.13	0.19	0.28	0.29	0.37	395.1		
	LS	0.006	0.088	0.07	0.41	0.56	0.54	1.03	465.2		
	LU	0.005	0.049	0.20	0.35	0.25	0.46	0.39	287.7	18.98	1
	Total	0.010	0.084	0.14	0.24	0.31	0.34	0.46	386.0		
SL	**CS**	0.021	0.058	0.16	0.51	0.66	0.86	0.85	970.1		
	CU	0.020	0.030	0.18	0.41	0.50	0.68	0.69	794.1		
	LS	0.019	0.060	0.11	0.63	0.74	0.97	1.19	817.9		
	LU	0.013	-0.023	0.05	0.53	0.45	0.81	0.69	676.0		
	Total	0.019	0.024	0.11	0.48	0.58	0.77	0.82	799.4	6.52	-0.18
CZ	**CS**	0.031	0.068	0.22	0.43	0.57	0.67	0.84	451.8		
	CU	0.029	0.062	0.31	0.40	0.41	0.62	0.56	386.5		
	LS	0.033	0.132	0.25	0.98	0.93	1.24	1.53	368.6		
	LU	0.028	0.053	0.14	0.56	0.42	0.74	0.77	290.9		
	Total	0.032	0.070	0.22	0.48	0.47	0.69	0.70	370.4	7.94	-0.22
SK	**CS**	0.032	0.077	0.10	0.44	0.50	0.79	0.78	339.6		
	CU	0.016	0.044	0.15	0.28	0.31	0.57	0.52	303.2		
	LS	0.006	0.094	0.07	0.61	0.73	0.80	1.26	237.6		
	LU	0.008	0.064	0.06	0.56	0.33	0.72	0.59	201.2		
	Total	0.017	0.067	0.14	0.41	0.38	0.67	0.64	260.7	18.36	-0.1

Note: 1) 2000-2004 for WR and QR/L, 1999-2003 for the others. 2000-04 for unemployment rates
2) Average annual change
3) XQW and MQW stand for export to the world/output and imports from the world/output.
4) memo-item
Source: WIIW trade, FDI, and industrial databases
Source: unemployment rates: WIIW hand book of statistics

Table 3: Estimation results								
Dependent variable: Wage at constant Prices and Euros of 1999, in logs, 1-digit, 2000 2004 (balanced panel)								
3.1. Aggregate pool (All sectors)								
Specification	**1**		**2**		**3**		**4**	
Cross-sections included	*70*		*65*		*70*		*65*	
Observations	*350*		*325*		*350*		*325*	
	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.
Constant	6.510	0.000	6.478	0.000	6.501	0.000	6.470	0.000
Productivity	0.125	0.001	0.127	0.001	0.119	0.004	0.119	0.004
Unemployment	-1.132	0.000	-0.950	0.010	-1.141	0.000	-0.958	0.007
FDI inward stock/Output (-1)			0.108	0.058			0.124	0.048
Exports to EU/Output (-1)					0.006	0.885	-0.001	0.976
Imports from EU/Output (-1)					-0.020	0.643	-0.034	0.467
Cross section effects	Fixed		Fixed		Fixed		Fixed	
Time effects	Fixed		Fixed		Fixed		Fixed	
Adjusted R-squared	0.994		0.994		0.994		0.994	
Prob(F-statistic)	0.000		0.000		0.000		0.000	
Tests								
Cross-section F	408.534	0.000	389.710	0.000	368.143	0.000	337.276	0.000
Cross-section Chi-square	1601.950	0.000	1495.322	0.000	1568.937	0.000	1451.415	0.000
Period F	31.578	0.000	23.353	0.000	30.488	0.000	23.594	0.000
Period Chi-square	132.403	0.000	102.126	0.000	129.388	0.000	103.733	0.000

Dependent variable: Wage at constant Prices and Euros of 1999, in logs, 1-digit, 2000 2004 (balanced panel)

	3.2. Capital & skill intensive sectors								3.3. Labor & skill intensive sectors							
Specification	1		2		3		4		1		2		3		4	
Cross-sections included	*25*		*23*		*25*		*23*		*5*		*5*		*5*		*5*	
Observations	*125*		*115*		*125*		*115*		*25*		*25*		*25*		*25*	
	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.
Constant	6.712	0.000	6.656	0.000	6.785	0.000	6.738	0.000	6.344	0.000	6.617	0.000	6.405	0.000	6.373	0.000
Productivity	0.141	0.049	0.141	0.040	0.140	0.060	0.142	0.045	0.073	0.052	0.141	0.025	0.060	0.112	0.050	0.180
Unemployment	-1.065	0.096	-0.945	0.176	-1.190	0.037	-1.064	0.085	-0.767	0.433	-0.691	0.401	-0.587	0.408	-0.585	0.438
FDI inward stock/Output (-1)			0.201	0.050			0.210	0.053			-0.519	0.085			0.072	0.879
Exports to EU/Output (-1)					0.038	0.629	0.031	0.648					-0.091	0.394	-0.101	0.522
Imports from EU/Output (-1)					-0.131	0.190	-0.137	0.173					-0.088	0.320	-0.089	0.299
Cross section effects	Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed	
Time effects	Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed	
Adjusted R-squared	0.991		0.988		0.988		0.988		0.994		0.995		0.996		0.995	
Prob(F-statistic)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Tests																
Cross-section F	272.309	0.000	267.766	0.000	250.849	0.000	247.334	0.000	808.213	0.000	503.914	0.000	257.272	0.000	232.334	0.000
Cross-section Chi-square	510.827	0.000	489.075	0.000	503.777	0.000	482.779	0.000	136.160	0.000	126.255	0.000	111.578	0.000	111.209	0.000
Period F	9.625	0.000	6.409	0.000	9.767	0.000	6.418	0.000	0.550	0.702	0.542	0.708	0.740	0.583	0.684	0.618
Period Chi-square	42.733	0.000	30.311	0.000	44.085	0.000	30.991	0.000	3.648	0.456	3.858	0.426	5.510	0.239	5.553	0.235

Dependent variable: Wage at constant Prices and Euros of 1999, in logs, 1-digit, 2000 2004 (balanced panel)

	3.4. Capital intensive & unskilled sectors								3.5. Labor intensive & unskilled sectors							
Specification	**1**		**2**		**3**		**4**		**1**		**2**		**3**		**4**	
Cross-sections included	15		14		15		14		25		23		25		23	
Observations	75		70		75		70		125		115		125		115	
	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.	coeff.	prob.
Constant	6.863	0.000	6.931	0.000	7.057	0.000	7.064	0.000	6.194	0.000	6.168	0.000	6.230	0.000	6.194	0.000
Productivity	0.202	0.000	0.220	0.000	0.205	0.000	0.210	0.000	0.095	0.004	0.095	0.004	0.111	0.003	0.109	0.004
Unemployment	-1.558	0.001	-1.583	0.008	-1.593	0.001	-1.501	0.005	-1.115	0.003	-0.869	0.084	-1.098	0.005	-0.838	0.104
FDI inward stock/Output (-1)			-0.062	0.455			0.007	0.926			0.014	0.747			-0.030	0.451
Exports to EU/Output (-1)					-0.402	0.008	-0.403	0.009					0.003	0.968	0.005	0.938
Imports from EU/Output (-1)					-0.128	0.527	-0.130	0.537					0.046	0.461	0.052	0.421
Cross section effects	Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed	
Time effects	Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed		Fixed	
Adjusted R-squared	0.994		0.994		0.996		0.996		0.995		0.995		0.995		0.995	
Prob(F-statistic)	0.995		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Tests																
Cross-section F	558.530	0.000	486.641	0.000	739.459	0.000	578.026	0.000	508.778	0.000	425.009	0.000	454.928	0.000	356.992	0.000
Cross-section Chi-square	373.670	0.000	340.786	0.000	397.406	0.000	355.646	0.000	609.305	0.000	541.598	0.000	598.099	0.000	524.449	0.000
Period F	4.216	0.005	3.801	0.009	7.830	0.000	6.805	0.000	16.929	0.000	13.188	0.000	11.516	0.000	10.655	0.000
Period Chi-square	20.384	0.000	18.916	0.001	35.359	0.000	31.983	0.000	67.819	0.000	55.523	0.000	50.743	0.000	47.660	0.000

Table 4. Standardized coefficients of productivity and unemployment in specification 1 for sector groups*			
Productivity			
	1	CS	0.3689
	2	CU	0.3264
	3	LU	0.1714
	4	LS	-0.0011
Unemployment			
	1	LS	-0.2670
	2	CS	-0.3368
	3	LU	-0.3440
	4	CU	-0.4803

*2-digit, Hungary, Poland, Slovenia

Table 5. Long term estimation: Dependent variable: Average wage at constant Prices and Euros of 1999, in logs, 2000-2004

Cross-sections included: 65 (14*5, 5 missing sectors)

	coeff.	prob.
Productivity, log average	0.342	0.000
FDI inward stock/Output (-1)	-0.967	0.004
Exports to EU/Output (-1)	-0.510	0.001
Imports from EU/Output (-1)	0.351	0.019
Unemployment	-3.7	0.000
Adjusted R-squared	0.608	
Prob(F-statistic)	0.000	

Appendix A: Taxonomy

Capital intensive and skilled (CS)	Labor intensive and skilled (LS)	Capital intensive and unskilled (CU)	Labor intensive and unskilled (LU)
1 digit			
paper, printing, publishing 21-22	electrical and optical equipment 30-33	rubber and plastics 25	food, beverages, tobacco 15-16
coke, refined petroleum 23		other non-metallic mineral 26	textiles 17-18
Chemicals 24		basic metals and fabricated metal 27-28	leather & footwear 19
machinery and equipment n.e.c. 29			wood 20
transport equipment 34-35			manufacture n.e.c., Recycling 36-37
2 digit			
22	16	21	15
23	30	25	17
24	31	26	18
29	32	27	19
34	33	28	20
35			36
			37

Note: The classification of capital and labor intensive sectors relies on authors' judgement, based on a narrowing down of the 5-category taxonomy in Peneder (20001). The skill classification is derived from the 3-category WIIW classification in Landesmann et al (2004) such that low and medium skill industries are classified as unskilled, and high skill industries are classified as skilled.