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The Effect of Import Penetration on Labor Market Outcomes in Austrian Manufacturing Industry [*]

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Abstract — This paper estimates the effects of imports on employment, wages, and the wage share in Austria for the period of 1990-2005 using panel data of manufacturing industry. Imports are disaggregated according to their origin and as final vs. intermediate imports. There is evidence of significant negative effects of imports on employment, wages and the wage share. Particularly workers in high skilled sectors experience negative effects. Offshoring to both Eastern Europe and the developed countries have a negative impact on employment, whereas offshoring to the East has a positive effect on wages, indicating the dominance of scope effects.

Keywords: *Austria, import, wage, employment, labor share*

JEL-Classification: F29, O52, J23, J30

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1. Introduction

The aim of this paper is to analyze the impact of import penetration on employment, wages, and the wage share in the Austrian manufacturing industry. Austria is an interesting case to investigate the effects of import penetration on labor market outcomes, being a small open economy[1], integrated to the other high wage as well as low wage countries. The integration of Eastern Europe to the European economic sphere in the 1990s added a new dimension to the globalization of the Austrian economy. As of 2005, 13.5% of Austria's manufacturing imports are coming from Eastern Europe.[2] During 1990-2005 Austrian imports from the East grew by 7.9%-points as a ratio to domestic absorption in manufacturing. As an outcome of the vertical disintegration of production, intermediate imports increased much faster than final goods particularly in high skilled manufacturing.

These developments in foreign trade coincided with adverse developments in employment, which attracted public attention to globalization, in particular to Eastern enlargement. Despite strong economic growth, manufacturing employment has been decreasing since the 1980s, and total employment is stagnant. Although the decline in manufacturing jobs is an ongoing process of structural change, the opposite trends in employment and import penetration are still striking. Real wages have also stagnated particularly since the mid 1990s. The low skilled manufacturing sectors have experienced more remarkable wage moderation than the high skilled. This development is in striking contrast to the strong improvement in labor productivity, which has always exceeded real

[1] The ratio of exports and imports of goods and services to GDP are 54.2% and 49.4% respectively as of 2005.

[2] 16 countries including the 10 Eastern European new member states as well as five non-member South Eastern Europe (Croatia, Albenia, Bosnia-Herzegowina, Serbia-Montenegro, Macedonia), and Turkey are defined as the East to account for arms length trade.

wage increases since 1980s with few exceptional years. As a consequence, there has been a significant erosion in the wage share (labor compensation/gross value added), which declined from a level of 76.6% in 1978 to 57.8% as of 2005 in manufacturing industry.[3]

The decline in labor share is not specific to Austria, albeit it has experienced one of the steepest declines in the EU. The general declining trend in labor's share in many OECD countries since the mid-1970s and early 1980s is addressed recently also by the OECD (2007) and the IMF (2007) in addition to the earlier contributions (Harrison, 2002; Epstein, 2000).

In this paper first we estimate the effects of imports on employment and wages, and then combining these effects we calculate the effects on the wage share. The estimations are made for a panel of manufacturing sectors for the period of 1990-2005.[4] The effects are separately estimated for low and high skilled sectors, and blue vs. white collar workers. We account for the different effects of imports from the developed countries vs. the East, and the other low wage countries, as well as the effects of final vs. intermediate imports.

The rest of the paper is organized as follows. Section two reviews the theoretical and empirical literature. Section three presents the model. Section four discusses the data and methodological issues. Section five presents the estimation results. Section six concludes.

2. The Literature

2.1 Theoretical literature

Traditional trade theory, based on the Heckscher-Ohlin and Stolper-Samuelson theorems, predicts that trade alters relative prices and therefore relative demand for the factors of production and their rewards. In a capital abundant developed country with a comparative advantage in capital intensive sectors, it is expected that the employment of capital and profit

[3] For the aggregate economy, the corresponding figures are 72% in 1978 and 54.9% in 2005.

[4] The choice of the manufacturing sector and time period is due to data limitations, which is discussed in more detail in section four.

rate increase due to foreign trade, and the employment of labor and wages decline. Similarly in the two factor model with skilled vs. unskilled labor, in a skilled labor abundant country, the prediction is that the employment and wages of unskilled labor or certain groups of labor specialized in import-competing industries will fall. It is also argued that in the short run the immobility of sector-specific capital may prevent the optimal reallocation of production across sectors, and may result in a decline in real wages of the skilled labor in certain sectors as well in the short run. Nevertheless, once the transition period is over, the factors that are relatively abundant in the country are supposed to gain.

Apart from trade theory, labor economics approaches based on factor content analysis evaluate the effects of trade with regards to shifting labor demand. In this case imports are a reduction in demand and therefore employment (e.g. Borjas et al, 1992; Wood, 1994). However this methodology is criticized by trade theoreticians, since it takes the changes in trade volumes and not relative prices as the starting point.

In a third approach trade not only shifts the demand schedules, but also creates international competitive pressures, which may lead to trade induced labor saving technological change and efficiency gains. This process may also lead to negative bargaining pressures over wages, as firms find it harder to accommodate wage demands under the pressure of international competition (Greenaway et al., 1999b; Rodrik, 1997).

Despite differences, all these three approaches focus on the negative effects of imports on labor in general or unskilled labor in particular. However the effects get rather complicated, if one goes beyond a two country, two goods, and two factor framework. More contemporary debates emphasize that the effect depends on whether imports are substitute or complementary to domestic production (Davis and Mishra, 2007). If imports are not the substitutes of domestically produced goods, but mostly complementary input goods, or final goods that are not being produced domestically, the negative effect will not be observed, or even a positive effect is possible. Thus in the case of a developed country final goods imports

from the less developed countries do not necessarily substitute domestic labor. Although it is more likely to have negative substitution effects of intermediate imports as discussed in the international outsourcing literature (Feenstra and Hanson, 1996), intermediate imports may decrease the costs of the firm, and despite a lower domestic value added increase total output, creating a positive scale effect (Grossman and Rossi-Hansberg, 2006). Thus even if offshoring decreases the demand for labor for a given level of value added, through the scale effect, i.e. higher output, the demand for labor increases. Thus the overall effect depends on the negative substitution vs. positive scale effects. In order to capture the scale effect of offshoring in the labor demand estimation we will only control for value added rather than output. Thus the positive effect of intermediate imports on output will show up in the coefficient of imports. If output were to be used, these positive effects would have been absorbed by the output coefficient, and the coefficient of intermediate imports would only reflect the negative substitution effects.

Regarding the skill differentials, the competitive pressures can be higher for low skilled workers in the developed countries due to the skill-bias of trade (Feenstra and Hanson, 1996).

In the empirical analysis, we test the labor demand and wage effects of import volumes due to both changing labor intensity of production for a given level of value added and trade induced labor saving effects.[5] In that sense, the estimation methodology used here is not a direct test of the Hecksher-Ohlin framework.

2.2 Empirical literature

There is some evidence that imports -inter-industry imports with low wage countries as well as intra-industry-imports with developed countries- lead to job and income losses for

[5] See Hine and Wright (1998), Greenaway (1999a and b), Konings and Vandenbussche (1995), OECD (2007) for similar estimations.

workers in import competing industries and in particular for the less skilled labor (e.g. Revenga, 1992; Sachs and Shatz, 1994; Greenaway et al., 1999a and 1999b; Landesmann et al., 2001). There are, however, important differences in the estimated magnitudes of the effects in different studies and differences in the responsiveness of employment vs. wages across countries (OECD 2005): different from US, in Europe employment, rather than wages adjust.

Although originally some trade-theoreticians have argued that the observed changes in import prices and volumes have not been sufficient to explain the large changes in relative wages, and technological change is the main reason for the decline in the relative wage of the unskilled workers (e.g. Lawrence and Slaughter, 1993), more recently there is some consensus that both intermediate goods imports and technology lead to deterioration in the labor market outcomes of particularly less skilled labor (e.g. Feenstra and Hanson, 1999). It is also emphasized that import penetration stimulates defensive innovation; thus trade has a further indirect effect on wages (e.g. Stehrer, 2004).

Regarding the offshoring (intermediate import) effects, OECD (2007) finds that material offshoring has a negative effect on the demand for all skill groups, but the estimated effect is quite larger for low skilled workers. OECD (2007) also finds that wage elasticity of labor demand increased during 1980-2002 due to offshoring. Falk and Wolfmayr (2005) find a significantly negative employment impact of imported materials from the low wage countries in less-skill intensive industries in seven EU countries (including Austria), whereas there is no negative impact from imports originating from developed countries. Also in higher skill industries there is no evidence of a negative effect.

Regarding the changes in labor's share, Breuss (2007) finds that increased trade with the East and FDI in general causes a decline in the labor share in the developed EU countries. IMF (2007) find that changes in export and import prices, offshoring, and immigration had a negative effect on the labor share in developed countries, and they point at technological

change and labor market policies as other important factors. Interestingly according to the estimations in IMF (2007) the skilled labor share[6] declines much more due to globalization and in particular offshoring, and the technological change effect is less important, whereas for the unskilled labor the effect of globalization is much smaller than that of technological change. Another interesting finding is that in small European countries the effects of offshoring and export and import prices are much larger than in large countries, and the contribution of immigration is the smallest. Also in small European countries the effect of globalization in total is as large as the effect of technology.

In the case of Austria Aiginger et al. (1996) find a negative effect of imports from the East on wages based on individual wage data, whereas in a later study based on sectoral data Winter-Ebmer and Zimmermann (1998) find no effect of imports from the East on wages. Hofer and Huber (2003) find no effect on white collar wages, but a positive export and negative import effect on blue-collar wages. Regarding the effects on employment (or unemployment) either no or small impact of imports are found (Aiginger et al., 1996; Winter-Ebmer and Zimmermann, 1998; Hofer and Huber 2003); but a negative effect exists for blue-collar workers, the elderly, and low income workers (Aiginger et al. 1996; Hofer and Huber, 2003), or in low wage industries and in industries with a higher share of foreign workers (Winter-Ebmer and Zimmermann, 1998).

Another group of studies are related to the relative employment of high-skilled to low-skilled labor, which is not directly related to the focus of this study, but interesting

[6] IMF (2007) claims that the income share of skilled workers rose based on the share of skilled wage bill in economy wide value added, rather than the share of skilled wage bill in the skilled sectors' value added, which is also mentioned in the paper. According to the latter indicator the labor share of skilled workers as well as unskilled workers are falling in Europe and Japan.

nevertheless. Egger and Egger (2003) find a positive effect of exports, a negative effect of imports (other than offshoring to the CEECs), and a positive effect of offshoring to the CEECs on relative high skilled employment. On the contrary Lorentowicz et al. (2005) find a negative effect of total offshoring on relative employment and wages of the skilled, which they interpret as an indicator that Austria is a human capital scarce country.

The effect of trade on the wage share in Austria has not been econometrically analyzed as of now to the best of our knowledge. The only finding is based on simulation, where Breuss and Schebeck (1999) point at a slight shift in functional income distribution at the expense of wage earners in Austria about the effects of Eastern enlargement.

3. The model

The model exists of a pair of equations for labor demand and wage bargaining, which are then solved simultaneously and inserted into a wage share equation.

The industry's derived demand for labor is given as follows:

$$l_{i,t} = \beta_i + \beta_t + \beta_w w_{it} + \beta_q q_{i,t} + \beta_m mq_{i,t} + \sigma_{t,i} \qquad (1)$$

where l_i, w_i, q_i are the employment, real wage (labor compensation, deflated by sectoral producers price index), and real value added in sector i respectively (all in logarithms). The core model is augmented by import/domestic absorbtion, mq, which capture the effects of import penetration.[7] The labor demand is based on a production function[8].

[7]We do not take the logarithm of the import/domestic absorption ratios because of the existence of many zero-values at a detailed level of disaggregation with respect to countries and final vs. intermediate imports, as will be discussed in more detail in Section four below.

[8] See Greenaway et al. (1999a) and Hine and Wright (1998) for a model with wage/capital cost also as the explanatory variable. Since it is hard to measure the capital costs the authors then rely on time dummies to reflect this effect, assuming perfect capital markets. However if we assume that capital is quasi-fixed, then we could use instead a capital constrained labor

Theoretically a positive labor demand effect of value added is expected. The demand for labor is expected to be negatively affected by the real wages from a classical point of view. β_i is a sector specific coefficient. β_t is the time dummy, capturing time specific shocks such as exogenous technology shocks, or policy changes and other institutional factors such as employment taxes, employment legislation that may affect labor demand.

The wage bargaining equation is given as follows:

$$w_{i,t} = \alpha_i + \alpha_t + \alpha_l l_{i,t} + \alpha_q q_{i,t} + \alpha_m mq_{i,t} + \varepsilon_{t,i} \qquad (2)$$

where all variables are as defined above. This model is consistent with union bargaining and efficiency wage models (Konings and Vandenbussche, 1995; Greenaway et al, 1999b). In order to avoid the complications of modeling the formation of price expectations, we look at the outcome of bargaining, i.e. the (ex post) real wage. Furthermore to be parallel to the labor demand equation, we are estimating real wages deflated by producers' prices rather than consumer prices[9]. Labor productivity, q-l, will have a positive effect on wages, but the degree at which workers can index wages to productivity improvements will depend on their bargaining power. The employment in the sector captures the insider power and the demand effect, and will affect workers bargaining power positively and lead to higher real wage. However the responsiveness of wages to employment will also depend on the strategy of the labor unions, i.e. the trade off between wages and employment for the unions during a

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demand model. OECD (2007) estimates a similar labor demand function. Unfortunately capital stock is only available at 1-digit level, thus will also not be used in the model.

[9] Although the workers bargain for a targeted purchasing power based on expected CPI inflation, for firms producers' prices is also a binding constraint. So one could estimate the real wage equation either deflated by consumer or producers' prices and account for these price differentials by adding the ratio of CPI/PPI. But since it is not a core variable, we will drop it at the estimation stage to gain degrees of freedom.

recession. Unions may choose to bargain for job protection and accept stagnant wages, in which case the positive effect of employment on wages will disappear. Moreover in our model the negative effect of employment on labor productivity will also be incorporated to the coefficient of employment, making the interpretation of the sign of the coefficient hard. We nevertheless prefer this model because it is parallel to the employment model, which will have a computational advantage when deriving the wage share below. α_i is a sector specific coefficient. α_t is the time dummy, accounting for the economy wide labor market conditions that affect workers' outside options[10], an alternative economy wide wage[11], and the institutional factors that may affect the bargaining power like union density, collective bargaining coverage[12], and structural change in the composition of the workers. Again the core model is augmented by import/domestic absorption, mq, which capture the effects of import competition on the bargaining power of labor, and shift the bargaining curve.

[10] Economy wide unemployment to account for general labor market conditions is not added since this also requires dropping the time dummies; also in a panel context economy wide variables are less useful.

[11] In Austria wage determination is a result of industry-wide collective bargaining, but pattern bargaining makes it highly centralized. But Aiginger et al. (1996) also mention that subsequent negotiations at the firm level are possible, particularly in large firms, which are exposed to higher international competition. Nevertheless regarding the effects of alternative wage as well as pattern bargaining, a reference wage like the average wage rate of the economy could be included. While this would make sense, if one were only interested in wage differentials, it is defeating in our context, since the average wage needs to be explained and not taken as given. Furthermore it would require dropping the time dummies.

[12] There is no collective bargaining coverage or union density data compatible with NACE classification.

Finally the wage share, the share of wage bill[13]/gross value added of the sector is by definition actual real wage over productivity (real value added/employee).[14] Then the wage share in logarithms (ws) is defined as

$$ws=w-q+l \quad (3)$$

Substituting Equation (1) in Equation (2) and vice versa, we get both w and l expressed only in terms of q and mq. Then substituting these new equations for w and l in Equation (3) we get:

$$ws_{i,t} = \frac{\beta_i + \alpha_i + \beta_t + \alpha_t + \alpha_w\beta_w + \alpha_l\beta_l + (\alpha_x(1+\beta_w) + \beta_x(1+\alpha_l))x_{i,t} + \varepsilon_{t,i} + \sigma_{t,i}}{1-\beta_w\alpha_l} - q \quad (4)$$

where x is the vector of q and mq. Taking the derivative of ws with respect to mq, we calculate the effect of import penetration on ws for a given value added (q):[15]

$$\frac{\partial ws}{\partial mq} = \frac{\alpha_m(1+\beta_w) + \beta_m(1+\alpha_l)}{1-\beta_w\alpha_l} \quad (5)$$

This expression incorporates the effect of import penetration on wages discounted by the effect of wages on employment (if wages have a negative effect on employment) and the effect of imports on employment amplified by the effect of employment on wages (if employment has a negative effect on employment), both discounted by a common factor

[13] We use labor compensation rather than wage and salaries to account for the non-wage payments to labor such as social security contributions of the employers as well. A correction of the wage share to account for the labor income of the self-employed was not possible due to lack of detailed sectoral data.

[14] This is a simplification in order to explain the changes in the wage share, assuming that the change in the producers' price index and value added price index are the same, which in reality are different.

[15] Also a given and PPI/value added deflator is assumed.

$(1-\beta_w\alpha_l)$. If neither wages nor employment affect each other ($\beta_w=\alpha_l=0$), then the effect of imports on the wage share is simply the summation of its effects on wages and employment.

4. Data, estimation methodology and specification of the equations

The empirical analysis is based on the panel data of 21 sub-sectors of the manufacturing industry. The share of manufacturing in total imports is 77.4%. Appendix A reports the data sources and Appendix B the list of the sectors. The panel data technique addresses variations both over time and across sectors, and it makes econometrical analysis possible with a database of relatively short time dimension.

It could be interesting to discuss the effects of exports as well but that would lead to multicollinearity problems[16], therefore in this paper we focus on the import effects alone. Since the origin of imports, whether it is a low wage or high wage country with similar factor composition may affect the direction of the impact, we differentiate imports from developed countries (high wage countries), the East, and the rest of the world (primarily other low wage countries). We additionally distinguish intermediate vs. final good imports from different origins. Intermediate import penetration (intermediate imports/domestic consumption) is a proxy for offshoring in the sector[17]. Disaggregated trade data for manufacturing is available only for the period of 1988-2005.

Unfortunately trade in services cannot be integrated to the analysis due to data limitations. The service trade data is available only in the current account statistics, but the

[16] See also OECD (2007) for a similar argument about excluding export effects.

[17] However import penetration ratio is different from both broad outsourcing (all intermediate imports purchased by sector i as a ratio to its value added) and narrow outsourcing (only intermediate imports purchased by sector i from the same sector as a ratio to value added). Both measures of outsourcing require input-output tables, which limit the availability of time series data.

sectoral classification is not based on NACE; furthermore the data is not disaggregated as final vs. intermediate and also not disaggregated with respect to countries. The service trade data, which is available at NACE level, include only the services trade associated with merchandise trade, e.g. the software development service that is incorporated in the import of a CD. This sort of service trade covers only a minor part of total service trade, and is limited only to some high skilled services. We nevertheless repeated the estimations for the total economy including the services for which trade data associated with merchandise trade were available. The findings are qualitatively robust[18], but again they fail to reflect the full effects of trade in services. Accounting for these effects would require the use of input-output tables, which however poses limitations in terms of the availability of long time series data.

In order to account for different impacts on high skilled vs. low skilled labor, two methods are used: first separate estimations are made for low and high skilled sector groups (Appendix C reports the skill taxonomy). Second the estimations are repeated for white collar workers, who are assumed to represent high skilled labor, vs. blue collar workers, who are assumed to represent low skilled labor.

In all equations lags of the explanatory variables and the dependent variable will be used to account for short vs. longer run effects[19]. The lagged employment accounts for the adjustment process due to costs of hiring and firing. The lagged wage accounts for sticky wage adjustment. Thus we estimate the following equations for employment and wages:

$$l_{i,t} = \beta_i + \beta_t + \beta_l l_{i,t-1} + \sum_{j=0}^{1} \beta_{wj} w_{i,t-j} + \sum_{j=0}^{1} \beta_{qj} q_{i,t-j} + \sum_{c}\sum_{n} \sum_{j=0}^{1} \beta_{mcnj} mq_{cn\ i,t-j} + \sigma_{t,i} \qquad (1b)$$

and

$$w_{i,t} = \alpha_i + \alpha_t + \alpha_w w_{i,t-1} + \sum_{j=0}^{1} \alpha_{lj} l_{i,t-j} + \sum_{j=0}^{1} \alpha_{qj} q_{i,t-j} + \sum_{c}\sum_{n} \sum_{j=0}^{1} \alpha_{mcnj} mq_{cn\ i,t-j} + \varepsilon_{t,i} \qquad (2b)$$

[18] The results are available upon request.

[19] Further lags are not used due to the limited sample size. They were also not significant.

where i=1,…,21 for manufacturing[20], t=1990-2005. c is the origin of country index for imports corresponding to developed countries, the East, and the rest of the world. n is the index for the type of goods, i.e. intermediate or final imports. The employment estimation is repeated for blue and white collar workers at 2-digit level but without the real wage, since the latter exists only at 1-digit level. The wage equation is estimated only at 1-digit level. The period of estimation is 1997-2005 in both cases due to data availability. Therefore these results are not comparable with the results from the 2-digit level estimations. Also the wage data is median wage instead of average wage in a sector, since the only source of this data is the Association of Austrian Social Insurance, which reports the data at most up to the social security contribution ceiling.

We estimate the dynamic equation in first difference form in order to transfer out the fixed effects, and use a generalized method of moments technique as in Arrelano and Bond (1991) to overcome the bias that will result in the coefficient of the lagged dependent variable due to differencing. Differencing also helps to overcome the possible problems associated with unit roots.[21] We also compute standard errors that are robust to the existence of sector specific serial correlation. Additionally, the real wage is treated as an endogenous variable in the employment equation, and in the wage equation employment is treated as endogenous. In the employment equation the instruments are employment dated t-2 and earlier, the second

[20] There is an important outlier in the output, value added, and wage bill/value added variable in computing equipment, which might be due to a classification problem. Independent of the cause, we did not want this extreme case to bias the results. It also constitutes only 0.2% of employment as of 2005. The recycling sector, which has no trade data, is also excluded.

[21] Real wage, real value added, employment, import ratio all suffer from unit root problems. Unit root tests are available upon request.

and third lags of real wage[22], and the first differences of the exogenous variables, i.e. output, import penetration and their lags. In the wage equation the instruments are wages dated t-2 and earlier, the second and third lags of endogenous variables, i.e. employment and import penetration, and the first difference of the exogenous variable, i.e. output and its lags.

Based on these estimation results we then calculate the long run coefficients using the contemporaneous and lagged effects and the speed of adjustment for a variable, x, as

$$\beta_x = \frac{\sum_{j=0}^{1} \beta_{xt-j}}{(1-\beta_l)} \qquad (6)$$

$$\alpha_x = \frac{\sum_{j=0}^{1} \alpha_{xt-j}}{(1-\alpha_w)} \qquad (7)$$

The wage share effect in Equation (5) is then calculated based on these long run coefficients.

5. Estimation results

5.1 Employment

Table 1 reports the estimation results for employment modeled as in Equation (1b) for low and high skilled sectors and total manufacturing. The respective long run coefficients are in Table 2a. We will base our discussion of the regression results on the long-run effects, rather than separately discussing the current or lagged effects.

Please insert Table 1 here

Please insert Table 2 here

[22] The instrument set in the case of the lags of employment is expanded as the panel progresses and the number of potential lags increases. This method is efficient; however it was not possible in the case of the other endogeneous variable due to the limited matrix size of the estimation software (STATA).

In spite of the advantages of the dynamic estimation method as discussed above, there is a disadvantage due to the small number of cross-sections in our case. The Sargan test (from the homoskedastic estimator) can not reject the null hypothesis that the overidentifying restrictions are valid; however the test is weakened by the use of many instruments. But given the low number of cross-sections we could not avoid this problem. Since the lagged dependent variable was significant in all specifications, estimating a static model would also have its weaknesses. Furthermore the existence of stochastic trend in the variables requires differencing to avoid spurious results, but then we lose information. We chose the specifications, where there is no second order autocorrelation in the first differenced residuals, which is an important condition for the validity of the estimations.

Offshoring (intermediate import penetration) to the East has a significant negative long-run effect on employment in total manufacturing. The effect is specific to the high skilled sectors. However due to low number of cross sections the estimations for sub-sector groups must be discussed with caution. In low skilled sectors it seems like offshoring to the East is leading to positive employment effects via scope changes. Offshoring to the developed countries has a positive effect in total manufacturing, and in particular high skilled sectors, but a negative effect in low skilled sectors. Final imports from the East also have a negative effect in low skilled sectors. In total manufacturing both types of imports from the rest of the world have a positive employment effect, indicating the dominance of scale effects to substitution effects and the presence of a complementary relationship.

Regarding other control variables, the expected negative effect of wages is not observed. The coefficients of the lagged and current values of real value added have alternating signs, which indicates that a one %-point increase in the rate of growth is leading to a 0.1% growth in employment, but in the long run there is no effect. This finding is perverse and indeed when the time effects are not controlled for, there is also a positive long

run effect of 0.32. But since time effects are jointly significant and they are the only measure of technical change, we will rely on the specification with the time effects.

Table 3a shows the cumulative effect of each explanatory variable on employment, calculated as the long run coefficients multiplied by the actual change in the explanatory variable. It is estimated that intermediate import penetration from the East, which increased 4.6%-points during 1990-2005 in manufacturing, has resulted in a cumulative decline of 20.9% in total manufacturing employment, which actually decreased 16.4% during 1990-2005. Overall summing up all the import effects we find a net effect of 1.8% decline in manufacturing employment due to total imports (12495 jobs). Employment would have decreased 1.8% less in manufacturing without imports.

Please insert Table 3 here

The results for the blue and white collar workers are indicative, although the details are not always consistent with the results for the aggregate manufacturing as expected due to the data problems mentioned in Section four. Estimation results are in the Appendix D Table 1. Overall the results hint at an expected finding: The cumulative effect of imports on blue collar workers` employment in manufacturing is negative (a cumulative effect of -4.4% during 1997-2005) and on white collar workers is positive (a cumulative effect of 8.1% during 1997-2005).

To check for robustness, we estimated the effects using an alternative dynamic estimation method (Arellano–Bover/Blundell–Bond system estimator) as well.[23] The results

[23] The results are available upon request. Arellano–Bover/Blundell–Bond estimator is based on a system of equations: the difference equation as described above according to Arellano–Bond, adding the original equation in levels to the system, where variables in levels are instrumented with suitable lags of their own first differences. This method is particularly suitable for the employment equation which behaves like random walk. In the case of the real

are robust. According to this method the cumulative effect is calculated to be a decline of 16.9% in total manufacturing employment.

Finally we compare our results with those of the previous research, although a strict comparison is not possible due to the differences in the period of analysis as well as methodological differences, particularly in the case of studies using individual data. Nevertheless, our results are consistent with the negative import effect in Winter-Ebmer and Zimmermann (1998), but we do not find higher effects in low wage industries. We find significant effect of imports different from Aiginger et al. (1996), but their study was for a much earlier period, based on individual data, and estimating unemployment. Our finding of negative effects on the blue-collar workers is however slightly comparable with their finding about higher effects for the more disadvantaged.

5.2 Real wages

Table 4 reports the estimation results for real wages modeled as in Equation (2b) for low and high skilled sectors and total manufacturing. The Sargan test unfortunately is again hinting at a problem with the use of too many instrumental variables, however there is not a better way of dealing with the problem given data limitations as discussed above. The long run coefficients are in Table 2b.

Please insert Table 4 here

According to the long-run coefficients, in total manufacturing intermediate imports from the East have a significant positive effect as opposed to the negative employment effect. This result might be indicating that offshoring to the East has resulted in substitution of domestic employment with foreign employment, but in the meantime has resulted in skill upgrading through a scope change. However intermediate imports from developed countries

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wage equation, this is less of a problem. In this estimation we used orthogonal transformation instead of differencing to maximize the sample size in the presence of missing observations.

have now a negative effect on total manufacturing wages as opposed to their positive effect on employment. This effect seems to be dominated by high skilled manufacturing sectors. It seems like in manufacturing intermediate imports from countries with similar level of development are generating more blue collar jobs than white collar jobs, and since these jobs are lower paid jobs, the overall wage effect is negative. There is a positive effect of final imports from the rest of the world.

Table 3b shows the cumulative effect of each explanatory variable on wages, calculated as the long run coefficients multiplied by the actual change in the explanatory variable. The total cumulative effect of imports is negative in total manufacturing. According to these results during 1990-2005 in manufacturing the cumulative increase in offshoring to developed countries has resulted in a 6.2% decline in real wages, whereas offshoring to the East and final imports from the rest of the world has resulted in 1.7% and 1.1% increases respectively. Overall, if there were no imports real wages would have increased 3.4% more in manufacturing in cumulative terms during the last 15 years.

The results for the blue and white collar workers are in the Appendix D Table 2. Differences with regards to aggregate data are even more possible now, since blue and white collar wage estimations were made at the 1-digit level in addition to the before mentioned problems; nevertheless results for wages are more comparable than employment. Now intermediate imports from the developed countries play no negative role. Intermediate imports from the East have a negative effect on blue collar workers in manufacturing, but a positive effect on white collar workers. Overall the results again hint at an expected finding: The cumulative effect of imports on blue collar workers` wages in manufacturing is negative (a cumulative effect of -0.3% during 1997-2005) and on white collar workers is positive (a cumulative effect of 8.2% during 1997-2005).

Again due qualifications mentioned above about the employment effects, we compare the results with the previous research. The findings are consistent with the negative import

effect on blue-collar workers in Hofer and Huber (2003). They find no effect on white collar wages, but we find a positive effect of intermediate imports from the East. Aiginger et al. (1996) find a negative effect of imports from the East, which we also do, but only in the high skilled industries. Different from Winter-Ebmer and Zimmermann (1998), who find no effect of imports, we do find negative effects.

5.3 Wage share

Combining the long run effects on employment and wages as defined in Equation (5), we get the joint effect of the changes in import penetration. Table 2c reports the calculated long run coefficients for the wage share and Table 3c reports the cumulative %-points effect of the actual change in the explanatory variables for low and high skilled and total manufacturing (partial effects for a given level of value added).

Offshoring to the East resulted in a 13.1%-points cumulative decline in the wage share in manufacturing during 1990-2005 and offshoring to the developed countries as well as rest of the world and final imports from the rest of the world contributed positively. The increase in import penetration overall seems to have resulted in a deterioration in the wage share of 3.6%-points in manufacturing during the last 15 years. During this period actual wage share has declined 10.7%-points in manufacturing.

6. Conclusion

This paper estimates the effects of imports on employment, wages, and the wage share in the Austrian manufacturing industry. There is evidence of significant negative effects of imports on both employment and wages, and thereby the wage share.

The negative impact on manufacturing employment is particularly due to offshoring to the East. This shows the importance of distinguishing between final vs. intermediate imports as well as the origin of imports in finding out whether imports substitute or complement domestic labor. As opposed to the employment effect offshoring to the East has a positive effect on wages, which might be indicating that Eastward offshoring has resulted in

substitution of domestic employment with foreign employment, but in the meantime has resulted in skill upgrading through a scope change. Offshoring to the developed countries has a positive employment and a negative wage effect. Apparently intermediate manufacturing imports from countries with similar levels of development are generating more blue collar jobs than white collar jobs in Austria, and since these jobs are lower paid jobs, the overall wage effect is negative. Manufacturing imports from the rest of the world have positive employment and wage effects, indicating the dominance of a complementary relationship.

As a result, offshoring to the East resulted in a decline in the wage share in manufacturing but offshoring to the developed countries and overall imports from the rest of the world contributed positively, although the total effect is still negative.

Regarding skill differences both wages and employment in the high skilled sectors seem to have lost more. But in general the negative effects are limited to the blue-collar workers' wages and employment, whereas white collar workers are positively affected by imports. This is consistent with the skill-bias of trade argument.

The results indicate the domination of substitution effects of imports particularly for lower skilled workers. It could be that this would be less of a problem as skill-upgrading and positive scope and scale effects are realized in the coming years. However in the meantime negative employment effects generate unemployment problems and wage losses for a significant part of the working population. These negative effects of trade are also politically destabilizing at the national. Furthermore they create a discontent about the European enlargement process undermining the visibility of the gains for the Austrian economy via exports. If economic policy has a target to avoid these adverse political effects of trade, there is need for a new policy framework to prevent the destructive wage competition on a European level, which includes the coordination of labor market policy and wage bargaining based on productivity-led wage to facilitate wage convergence as well as a systematic EU policy on regional development and social cohesion.

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Table 1. Estimation results - dependent variable: Δln employment, 1990-2005

	Manufacturing		
Variable	Low skilled	High skilled	Total
Δln Employment t-1	0.798	0.978	0.954
	0.000	*0.000*	*0.000*
Δln Real wage t	-0.061	0.066	-0.012
	0.428	*0.425*	*0.836*
Δln Real wage t-1	-0.061	-0.051	0.012
	0.439	*0.572*	*0.853*
Δln Real value added t	0.118	0.100	0.100
	0.000	*0.015*	*0.000*
Δln Real value added t-1	-0.046	-0.100	-0.100
	0.002	*0.000*	*0.000*
Δ Intermediate Imports: Developed	-0.168	-0.347	-0.218
	0.290	*0.020*	*0.037*
Δ Intermediate Imports: Developed t-1	-0.210	0.394	0.271
	0.089	*0.007*	*0.008*
Δ Final Imports: Developed	0.016	-0.013	-0.014
	0.900	*0.818*	*0.718*
Δ Final Imports: Developed t-1	0.116	0.055	0.014
	0.387	*0.354*	*0.718*
Δ Intermediate Imports: East	1.105	0.809	0.622
	0.020	*0.026*	*0.035*
Δ Intermediate Imports: East t-1	-0.463	-1.045	-0.832
	0.319	*0.006*	*0.006*
Δ Final Imports: East	-0.629	0.079	-0.220
	0.002	*0.766*	*0.148*
Δ Final Imports: East t-1	0.186	-0.017	0.002
	0.381	*0.939*	*0.990*
Δ Intermediate Imports: ROW	1.152	0.202	0.493
	0.000	*0.513*	*0.034*
Δ Intermediate Imports: ROW t-1	1.223	-0.267	0.096
	0.018	*0.452*	*0.705*
Δ Final Imports: ROW	-0.079	0.133	0.202
	0.791	*0.195*	*0.007*
Δln Final Imports: ROW t-1	0.039	-0.049	0.084
	0.874	*0.693*	*0.357*
Constant	-0.001	0.001	0.000
	0.104	*0.569*	*0.941*
Number of observations	144	192	336
Number of groups	9	12	21
AR (2) p-value	0.252	0.430	0.600
Joint sign. of time dummies (p-value)	0.000	0.013	0.000
Sargan test (p-value)	1.000	1.000	0.959
p-values under coefficients (in italics)			

Table 2. Long run coefficients (1990-2005):

a. Employment	**Manufacturing**		
	Low skilled	**High skilled**	**Total**
Real Wages	0.000	0.000	0.000
Real value added	0.356	0.000	0.000
Intermediate imports from developed countries	-1.040	2.136	1.152
Final imports from developed countries	0.000	0.000	0.000
Intermediate imports from East	5.470	-10.727	-4.565
Final imports from East	-3.114	0.000	0.000
Intermediate imports from rest of the world	11.757	0.000	10.717
Final imports from rest of the world	0.000	0.000	4.391

b. Wage	**Manufacturing**		
	Low skilled	**High skilled**	**Total**
Employment	0.000	0.000	0.000
Real value added	0.373	0.000	0.000
Intermediate imports from developed countries	0.000	-0.462	-0.848
Final imports from developed countries	1.567	0.353	0.000
Intermediate imports from East	0.664	0.470	0.382
Final imports from East	0.000	-1.590	0.000
Intermediate imports from rest of the world	-6.276	0.000	0.000
Final imports from rest of the world	3.881	0.602	0.863

c. Wage share	**Manufacturing**		
	Low skilled	**High skilled**	**Total**
Intermediate imports from developed countries	-1.040	1.675	0.304
Final imports from developed countries	1.567	0.353	0.000
Intermediate imports from East	6.134	-10.257	-4.183
Final imports from East	-3.114	-1.590	0.000
Intermediate imports from rest of the world	5.481	0.000	10.717
Final imports from rest of the world	3.881	0.602	5.254

Table 3: Cumulative % change effects of imports (1990-2005)

a. Employment: Cumulative % change during 1996-2005 due to:			
	Manufacturing		
	Low skilled	**High skilled**	**Total**
Real wage	0.00	0.00	0.00
Real value added	3.84	0.00	0.00
Intermediate imports from developed countries	-5.62	15.72	8.44
Final imports from developed countries	0.00	0.00	0.00
Intermediate imports from East	16.89	-57.18	-20.86
Final imports from East	-15.25	0.00	0.00
Intermediate imports from rest of the world	7.63	0.00	5.28
Final imports from rest of the world	0.00	0.00	5.36
Total cumulative % change effect of imports	3.65	-41.46	-1.78
Memo item: Actual cumulative % change in employment	-27.72	-6.77	-16.49
b. Wage: Cumulative % change during 1990-2005 due to:			
	Manufacturing		
	Low skilled	**High skilled**	**Total**
Employment	0.00	0.00	0.00
Real value added	4.02	0.00	0.00
Intermediate imports from developed countries	0.00	-3.40	-6.21
Final imports from developed countries	9.13	0.22	0.00
Intermediate imports from East	2.05	2.50	1.75
Final imports from East	0.00	-4.12	0.00
Intermediate imports from rest of the world	-4.07	0.00	0.00
Final imports from rest of the world	9.73	0.32	1.05
Total cumulative % change effect of imports	16.84	-4.48	-3.41
Memo item: Actual cumulative % change in wages	28.75	40.16	37.97
c. Wage share: Cumulative %-point change during 1990-2005 due to:			
	Manufacturing		
	Low skilled	**High skilled**	**Total**
Intermediate imports from developed countries	-3.87	8.42	1.53
Final imports from developed countries	6.29	0.15	0.00
Intermediate imports from East	13.04	-37.35	-13.10
Final imports from East	-10.50	-2.82	0.00
Intermediate imports from rest of the world	2.45	0.00	3.62
Final imports from rest of the world	6.70	0.22	4.40
Total cumulative %-point change effect of imports	14.11	-31.38	-3.56
Memo item: Actual cumulative %-point change in wage share	-12.01	-9.93	-10.70

Table 4. Estimation results - dependent variable: Δln real wage, 1990-2005

	Manufacturing		
Variable	Low skilled	High skilled	Total
Δln Real wage t-1	0.866	0.751	0.796
	0.000	*0.000*	*0.000*
Δln Employment	-0.051	0.059	-0.010
	0.508	*0.367*	*0.901*
Δln Employment t-1	0.049	-0.004	0.025
	0.563	*0.955*	*0.734*
Δ Intermediate Imports: Developed	-0.138	0.161	0.034
	0.492	*0.053*	*0.633*
Δ Intermediate Imports: Developed t-1	-0.135	-0.276	-0.173
	0.279	*0.009*	*0.071*
Δ Final Imports: Developed	0.210	0.088	0.047
	0.018	*0.015*	*0.242*
Δ Final Imports: Developed t-1	-0.047	0.010	0.006
	0.594	*0.851*	*0.901*
Δ Intermediate Imports: East	-1.127	-0.771	-0.654
	0.013	*0.080*	*0.078*
Δ Intermediate Imports: East t-1	1.216	0.888	0.732
	0.001	*0.076*	*0.064*
Δ Final Imports: East	0.206	-0.396	-0.132
	0.124	*0.068*	*0.507*
Δ Final Imports: East t-1	-0.084	0.077	0.140
	0.567	*0.720*	*0.433*
Δ Intermediate Imports: ROW	-0.841	-0.092	-0.264
	0.002	*0.631*	*0.330*
Δ Intermediate Imports: ROW t-1	0.227	-0.096	0.018
	0.428	*0.789*	*0.953*
Δ Final Imports: ROW	0.520	0.150	0.176
	0.000	*0.008*	*0.003*
Δ Final Imports: ROW t-1	-0.049	0.240	0.182
	0.834	*0.197*	*0.235*
Δ Real value added t	0.101	0.025	0.041
	0.000	*0.444*	*0.149*
Δ Real value added t-1	-0.051	0.000	-0.024
	0.075	*0.996*	*0.429*
Constant	-0.001	0.004	0.002
	0.347	*0.007*	*0.033*
Number of observations	144	192	336
Number of groups	9	12	21
AR (2) p-value	0.783	0.226	0.212
Joint sign. of time dummies (p-value)	0.000	0.000	0.000
Sargan test (p-value)	1.000	1.000	1.000
p-values under coefficients (in italics)			

Appendix A

Data sources

Statistics Austria, Panel data of industries, 1976 onwards, NACE 2-digit

Bilateral trade database of Austrian Institute of Economic Research, NACE 2-digit level, 1988 onwards.

Association of Austrian Social Insurance, employment and median wage for white and blue collar workers, only 1995 onwards at a comparable classification, NACE 1-digit for wages and NACE 2-digit for employment.

Appendix B Sectoral classification at 2-digit NACE level

2-Digit	
10-14	Mining and quarrying
MANUFACTURING	
15	Food products and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel, dressing and dyeing of fur
19	Leather, leather products and footwear
20	Wood and products of wood and cork
21	Paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Coke, refined petroleum products and nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastics products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products, except machinery and equipment
29	Machinery and equipment, n.e.c.
30	Office, accounting and computing machinery
31	Electrical machinery and apparatus, nec
32	Radio, television and communication equipment
33	Medical, precision and optical instruments, watches and clocks
34	Motor vehicles, trailers and semi-trailers
35	Other transport equipment
36	Furniture; manufacturing n.e.c.

Appendix C: Skill taxonomy for manufacturing industries

Low skilled sectors: 15, 16, 17, 18, 19, 25, 26, 27, 36
High skilled sectors: 20, 21, 22, 23, 24, 28, 29, 30, 31, 32, 33, 34, 35

Note: Classification is based on Peneder (1999). The medium skilled/blue collar industries are classified as medium skilled, whereas medium skilled/white collar industries sectors that are also technology driven are classified as high skilled; the other medium skilled/white industries are classified as medium skilled.

Appendix D Table 1: Estimation results - dependent variable: Δln employment, blue and white collared workers 1997-2005

	Manufacturing	
Variable	Blue	White
Δln Employment t-1	0.894	0.742
	0.000	*0.000*
Δln Real value added t	0.002	0.095
	0.977	*0.009*
Δln Real value added t-1	0.050	-0.002
	0.328	*0.954*
Δ Intermediate Imports: Developed	0.088	-0.082
	0.704	*0.621*
Δ Intermediate Imports: Developed t-1	0.524	0.293
	0.018	*0.069*
Δ Final Imports: Developed	-0.106	0.153
	0.196	*0.007*
Δ Final Imports: Developed t-1	0.204	0.084
	0.008	*0.240*
Δ Intermediate Imports: East	0.377	1.214
	0.546	*0.006*
Δ Intermediate Imports: East t-1	0.299	-0.020
	0.647	*0.966*
Δ Final Imports: East	0.562	-0.273
	0.134	*0.331*
Δ Final Imports: East t-1	-0.634	0.230
	0.043	*0.490*
Δ Intermediate Imports: ROW	-0.087	-0.264
	0.858	*0.437*
Δ Intermediate Imports: ROW t-1	-1.175	-0.846
	0.035	*0.035*
Δ Final Imports: ROW	0.283	-0.057
	0.103	*0.675*
Δ Final Imports: ROW t-1	0.154	-0.330
	0.547	*0.079*
Constant	-0.006	-0.003
	0.044	*0.194*
Number of observations	189	188
Number of groups	21	21
AR (2) p-value	0.473	0.073
Joint sign. of time dummies (p-value)	0.479	0.018
Sargan test (p-value)	0.132	0.004
p-values under coefficients (in italics)		

Appendix D Table 2: Estimation results - dependent variable:Δln real wage, blue and white collared, 1997-2005

	Manufacturing	
Variable	Blue	White
Δln Real wage t-1	0.515	0.489
	0.000	*0.000*
Δln Employment	-0.121	-0.148
	0.010	*0.012*
Δln Employment t-1	0.032	0.028
	0.581	*0.590*
Δ Intermediate Imports: Developed	0.049	0.053
	0.544	*0.354*
Δ Intermediate Imports: Developed t-1	0.004	0.094
	0.970	*0.363*
Δ Final Imports: Developed	0.012	0.088
	0.850	*0.221*
Δ Final Imports: Developed t-1	0.048	-0.045
	0.476	*0.473*
Δ Intermediate Imports: East	-1.643	-1.656
	0.001	*0.000*
Δ Intermediate Imports: East t-1	1.587	2.152
	0.001	*0.000*
Δ Final Imports: East	0.111	0.275
	0.492	*0.341*
Δ Final Imports: East t-1	0.145	0.081
	0.474	*0.804*
Δ Intermediate Imports: ROW	0.328	0.322
	0.501	*0.510*
Δ Intermediate Imports: ROW t-1	0.354	0.183
	0.567	*0.712*
Δ Final Imports: ROW	0.096	0.291
	0.647	*0.062*
Δ Final Imports: ROW t-1	-0.039	-0.247
	0.746	*0.271*
Δln Real value added t	0.067	0.080
	0.055	*0.063*
Δln Real value added t-1	0.023	0.000
	0.501	*0.992*
Constant	-0.003	-0.004
	0.295	*0.260*
Number of observations	99	98
Number of groups	11	11
AR (2) p-value	0.145	0.215
Joint sign. of time dummies (p-value)	0.000	0.000
Sargan test (p-value)	1.000	1.000
p-values under coefficients (in italics)		

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