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Trade Integration, Outsourcing and Employment in Austria: A Decomposition Approach

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Wolfgang Koller and Robert Stehrer

Trade Integration, Outsourcing and Employment in Austria: A Decomposition Approach

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Abstract

In this paper we study the employment effects of changes in the levels and patterns of trade integration and outsourcing in the Austrian economy over the periods 1995-2000 and 2000-2005. Based on an input-output framework, we apply a hierarchical decomposition analysis to disentangle the employment effects of changes in labour productivity, technical input coefficients and final demand components. Outsourcing is modelled as changes in the shares of domestically produced intermediates. For this some further details can be derived by distinguishing between intermediate imports according to educational intensities of the imported intermediate products. A similar decomposition of the final demand vector allows then to draw conclusions on the employment effects of overall trade integration over this period. We further calculate the employment effects, distinguishing three employment groups by educational attainment levels. The results suggest that the overall employment effect of trade integration has been positive in general. On top of that we do not find that the unskilled workers are hurt more than the other two skill groups. Further we find a distinct pattern of employment effects in the two periods considered: In the period 1995-2000 we observe relatively strong positive employment effects in the production of high skill intensive products and negligible effects in the production of low skill intensive products. However, this pattern changed in the period 2000-2005 where strong positive employment effects are found in the latter but even negative employment effects in the production of high skill intensive commodities.

Keywords: *outsourcing, offshoring, employment effects, hierarchical decomposition, input-output modelling*

JEL classification: *C67, D57, F16*

TRADE INTEGRATION, OUTSOURCING AND EMPLOYMENT IN AUSTRIA: A DECOMPOSITION APPROACH

1 Introduction

The employment effects of outsourcing and offshoring are still debated in the economics profession but even more represent a matter of concern for policy makers. The concern is that the recent phenomena of outsourcing stages of production abroad affects the level of employment and the structure of demand for labor (e.g. according to educational attainment categories) at home. This is reflected in rising unemployment rates in general and parts of the labor force - like low skilled workers - in particular together with rising wage differentials between skilled and unskilled workers. The theoretical literature identified the effects of outsourcing on relative labor demand in a number of contributions. In general, effects on relative labor demand mainly depend on the outsourcing sector and the skill intensity of the stage of production outsourced abroad (see Arndt and Kierzkowski, 2001, for an overview). In the empirical literature the effects of outsourcing have mainly been studied by regressing a measure of outsourcing on changes in labor demand, relative wages or the wage bill shares as the dependent variable and controlling for other variables such as skill-biased technical change (see Feenstra and Hanson, 1999, for an important contribution in this respect). It goes, however, beyond the scope of this paper to give a comprehensive review of the literature (see Crinò, 2007; Knabe and Koebel, 2006, for recent overviews). Let us only note that most of these studies mainly refer to material offshoring with a strong focus on the manufacturing industries and in most cases do not include the effects of service offshoring which are discussed only recently. The measure for outsourcing is either constructed using input-output or use tables following the suggestion by Feenstra and Hanson (1996) - the 'wide' and 'narrow' measure of outsourcing - or by applying end-use categories to detailed trade data.[1] The results concerning the effects of outsourcing on employment and wages found in this literature are rather mixed, although there seems to be a consensus that outsourcing has adverse albeit small effects on the demand for unskilled workers. However, following Feenstra and Hanson (1999), many studies also argue that effects of skill-biased technical change are even more important. Concerning this literature we should also mention that contributions in this tradition only provide evidence for direct employment effects as typically a particular measure of outsourcing in a particular sector is regressed on an employment variable of this sector as the dependent variable.

[1] For a review of the various concepts used see, for example, Horgos (2007).

Although the subject of outsourcing - trade in intermediate products - could also be a key issue in the input-output framework, it is surprising that only very few contributions tackle this issue (see Wixted et al., 2006; OECD, 2007, for an overview of current useages of the input-output framework in an international context). Reasons for this lack of studies may be the lack of appropriate data (input-output tables including international flows at constant prices in particular) as well as methodological problems. The first issue is tackled in this paper by a procedure outlined below (see Section 3). Using these data we suggest a decomposition approach to encounter for the employment effects of outsourcing. Although this approach also has some shortcomings (potential caveats and critical issues are discussed below in Section 5) we nonetheless think it provides additional insights and may lay the ground for future research. Thus, based on input-output modeling we employ a different strategy of assessing the impact of outsourcing on employment levels and structures. Starting from the classical input-output framework including international trade (for an early contribution see Stone, 1969) we apply a hierarchical decomposition approach to single out the employment effects of changes in labor productivity, in the coefficients matrix, in final demand components and in international outsourcing. This latter effect is tackled by applying a share matrix (see Skolka, 1977) capturing the effects of changes in the share of imported intermediates. This effect can further be split into the effects of imports (outsourcing) of particular products or groups of products (e.g. according to the energy, material and service inputs and/or according to the skill content of these products according to a particular taxonomy) on the one hand and to particular outsourcing industries on the other. Further, employment effects of final demand changes can be split into the effects of changes in domestic demand and foreign demand on domestic products (exports). In doing so we however would calculate the employment effects of changes in the levels of domestic and foreign demand which cannot be compared straightforwardly to the employment effects of outsourcing as these are defined via changes in the shares of imported intermediates.[2] To encounter for this and to be able to provide comparable results on the employment effects of outsourcing we also report on a decomposition of the final demand vector which allows to calculate the employment effects of changes in the export shares only. This also allows us to encounter for import effects (changes in import shares in the final demand vector) as well. This then allows us to provide a comprehensive picture of the net employment effects of internationalization. Finally, by applying labor input coefficient vectors differentiated by educational attainment levels we are also able track the above mentioned employment effects for three various skill

[2] As an example: In a growing economy with no structural changes we would find positive employment effects of exports but zero effects of outsourcing.

groups (according to educational attainment categories). Details of these calculations are provided in Section 2.

Let us finally summarize what are - in our view - the main contributions of the present paper to the existing literature. First, compared to the econometric approaches used intensively, one should note that in our approach we take direct and indirect employment effects of outsourcing into account providing a more complete picture of the effects of outsourcing. Second, the decomposition procedure allows us to calculate the employment effects of internationalization as already mentioned. Third, in this paper we can also assess the magnitude of 'insourcing' which means that for some reasons firms or sectors may reintegrate production stages in the domestic economy. As we will see below, this has non-negligible employment effects. Fourth, as calculations are performed at the detailed industry level we can in general track the employment effects of outsourcing of particular (groups of) products and of particular (groups of) sectors or any combinations of these for each skill group. Finally, within the input-output literature we are not aware of such an approach to study the effects of outsourcing and thus this paper could provide some suggestions in modeling and studying the effects of trade in intermediates and changes in the export and import structures of final demand in the input-output framework.

The paper is structured as follows. In Section 2 we present the methodological framework. Section 3 provides information about the data used and summarizes some important changes in the structure of outsourcing and import and export shares in the final demand vector. In Section 4 we discuss the results of the decomposition analysis in detail with a particular focus on the employment effects of internationalization. Section 5 concludes.

2 Employment effects of trade and outsourcing: A decomposition approach

In this paper we are mainly interested in explaining the changes in the levels of employment (differentiated by educational attainment groups) and the particular role of outsourcing and trade integration in general in the respective changes. We start from the well-known relationship

$$\mathbf{q} = \mathbf{A}_d\mathbf{q} + \mathbf{f}_d = \mathbf{L}_d\mathbf{f}_d,$$

i.e. the vector of output levels $\mathbf{q}$ equals the (domestic) Leontief inverse times the vector of final demand (including exports) for domestic products $\mathbf{f}_d$. More specifically, the Leontief inverse can be written as

$$\mathbf{L}_d = (\mathbf{I} - \mathbf{D}_A \otimes \mathbf{A})^{-1}.$$

In this term $\mathbf{A}$ denotes the matrix of technical input coefficients and $\mathbf{D}_A = \mathbf{A}_d \oslash \mathbf{A}$, i.e. the matrix of domestic shares; $\oslash$ and $\otimes$ denote denote elementwise division and multiplication of matrices or vectors of conforming dimensions, respectively. The employment level is then calculated by multiplying the expression above with the (transposed) vector of labor input coefficients, i.e. $\mathbf{b}'\mathbf{L}_d\mathbf{f}_d$. To calculate sectoral employment levels the vector of labor input coefficients has to be replaced by a matrix with the labor input coefficients on the diagonal denoted by $\hat{\mathbf{b}}$; i.e. sectoral employment levels are obtained as $\hat{\mathbf{b}}\mathbf{L}_d\mathbf{f}_d$. Changes in the (sectoral) employment levels are then caused either by changes in the vector of labor input coefficients, changes in the Leontief inverse and changes in the vector of final demand for domestic products. The changes in the Leontief inverse can themselves either stem from changes in the matrix of technical input coefficients or changes in the sourcing structure in net terms (i.e. whether the share of intermediate inputs purchased abroad is rising or falling). Similarly, the vector of final demand for domestic products can be written as

$$\mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d,$$

i.e. the sum of domestic demand $\mathbf{h}_d$ and exports $\mathbf{x}_d$.

To disentangle the employment effects of the factors described above, we apply a hierarchial decomposition (see Rose and Casler, 1996; Dietzenbacher and Los, 1998; Chen and Wu, 2008, for relevant contributions). We present a detailed outline of the procedure in the Appendix Section A. Here we sketch mainly the model and its hierarchical structure in Figure 2.1which forms the basis for the decomposition analysis.

Our decomposition analysis decomposes changes in employment into changes in determinant variables according to an underlying model. Consequently, at the first level we decompose employment effects into changes in productivity $\mathbf{b}$, changes in the domestic Leontief inverse $\mathbf{L}_d$ and changes of final demand levels $\mathbf{f}_d$. Changes in the Leontief inverse can further be decomposed into changes of the technical coefficient matrix $\mathbf{A}$ and changes in the shares of imported inputs $\mathbf{D}_A$. The latter we decompose into changes for types of commodities. In the paper we mainly show results for three different groups according to skill intensities (see below) denoted here as h, m, l respectively.[3] Each of these matrices

[3] A second typology used is the distinction between energy, material and services inputs.

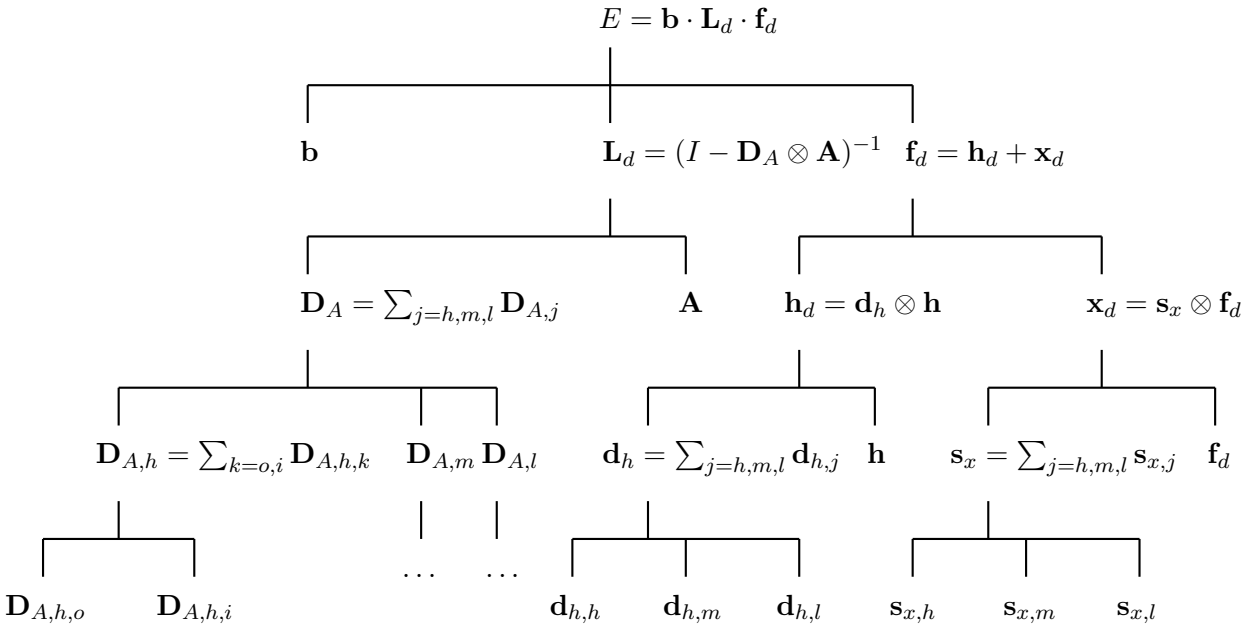

Figure 2.1: Hierarchical decomposition

$\mathbf{D}_{A,i}$ thus has non-negative entries in the rows for the corresponding products and zeros otherwise. Finally, these changes can further be decomposed into those for which domestic shares are decreasing (i.e. outsourcing) and increasing ('insourcing').

Further, final demand for domestic products $\mathbf{f}_d$ can be decomposed into changes in domestic demand $\mathbf{h}_d$ and export levels $\mathbf{x}_d$ along the same lines.

Overall, we are interested in calculating the employment effect of trade integration of the Austrian economy, i.e. the net effect of (net) outsourcing, exports and imports. As we calculate the outsourcing effect as a change in *shares* in the domestic sourcing matrix $\mathbf{D}_A$ we also have to consider only changes in the export and import shares rather than the respective levels. For this reason we rewrite the vector for final demand for domestic products as

$$\mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d = \mathbf{d}_h \otimes \mathbf{h} + \mathbf{s}_x \otimes \mathbf{f}_d.$$

Here, $\mathbf{h}$ denotes domestic demand for final products (including imports). The vector $\mathbf{d}_h = \mathbf{h}_d \oslash \mathbf{h}$ thus denotes the shares of total (i.e. including imports) domestic demand for final products. Correspondingly, the vector $\mathbf{s}_x = \mathbf{x}_d \oslash \mathbf{f}_d$ denotes the share of exports (of domestically produced products) in total (i.e. including exports) demand for domestic products. This allows to compare employment effects resulting from a change in the import orientation, a change in export orientation and the change in outsourcing

(i.e. changes in the domestic share matrix for intermediates).[4] These again are decomposed into various commodity groups similar to above.

Furthermore we finally distinguish the employment effects by three educational attainment categories (low, medium, high according to ISCED categories). Technically we do this by calculating $\mathbf{b}'_e\mathbf{L}_d\mathbf{f}_d$ for each of the three groups denoted by e and correspondingly for the lower levels of the hierarchal decomposition.

In the structural decomposition analysis the overall change in employment between two points in time is decomposed into changes attributable to changes in determinant variables. A problem is that the number of possible decomposition forms increases with the number of determinants (see the appendix for more details). Dietzenbacher and Los (1998) suggest to compute the averages over these decomposition forms which we will follow in this paper. In the next section we report the arithmetic mean of the decomposition forms at the respective levels of the hierarchical decomposition.[5]

3 Data and selected descriptive results

3.1 Data

The analysis is based on the commodity-by-commodity framework. The main data sources are the official Austrian input-output tables for the years 1995, 2000 and 2005 (Statistik Austria, 2001, 2004, 2009). The data preparation procedures further included the preparation of the employment data in a fashion compatible to the input-output table, i.e. in the dimension of commodities. Several plausibility checks were applied to the data. The employment data were prepared in total (by CPA-sector) and by educational attainment categories (high, medium and low according to ISCED categories). Statistik Austria provides employment data in full time equivalents (FTE) by products. For the break down of these figures according to ISCED categories we used the data from EUKLEMS, available by industry and ISCED category, applied the commodity technology assumption and finally corrected for consistency with the aggregates as given by Statistik Austria.

For the comparison of input-output tables over time it is crucial to use tables at constant prices. For Austria, tables at constant prices are currently not available. Therefore, we invested some efforts to construct tables at approximated constant prices of 1995, i.e. deflate the data for 2000 and 2005. Our

[4] In the appendix we show an alternative however equivalent decomposition in terms of growth rates.

[5] Detailed results including minima, maxima, ranges and standard deviations are available upon request.

procedure draws on approaches developed by Dietzenbacher and Hoen (1998) and reflects the restrictions of data availability in Austria. We developed several different deflation procedures and report the results from the most sophisticated one only, while being able to compare with the results calculated with alternative, simpler deflation procedures.

The used deflation procedure is based on information on prices which are exclusively derived from the official Austrian National Accounts (Statistik Austria, 2009). The deflation procedure involve the construction of a set of price index vectors $\mathbf{p}_u = (p_i^u)$, where p_i^u is the price index of commodity i in the combined use/source category u. We differentiate prices for the following use/source categories: intermediate domestic inputs, intermediate imports, consumption of domestic goods, consumption of imported goods, domestic goods used for gross capital formation, imported goods used for gross capital formation, exports of domestic goods, exports of imported goods, output and imports. The approach in calculating these price index vectors is top down, i.e. the price indices for output $\mathbf{p}_q$ and imports $\mathbf{p}_m$ are calculated before the price indices for the various use categories. It should be emphasized that the distinction between domestic prices and imported prices is merely of an approximative nature, as $\mathbf{p}_m$ is calculated as a transformation of $\mathbf{p}_q$ given additional data on import prices that are available on an aggregate product level only (commodities CPA 1-37 and CPA 40-95). At some stages of the procedure RAS was used to guarantee consistency of the price indexes, given the weights found in the input-output tables. In the deflated tables the deflated use/source combination is given as $\mathbf{u}^* = \hat{\mathbf{p}}_u^{-1})\mathbf{u}$, where the $\mathbf{u}$ denotes the use/source combination vector or matrix before deflation. At the end of the procedure a correction was carried through in order to ascertain the horizontal input-output balance equations. The alternative, simpler deflation procedures considered only a single price index vector $\mathbf{p}$, which was in one case identical to $\mathbf{p}_q$ used in the procedure sketched before (i.e. it was derived from the National Accounts). A complete description of the approaches is available upon request. In general, the results are not affected to a large extent and the general picture and conclusions from the analysis would not be different. The description of the other approaches and the respective results are available upon request. We present a table showing the differences at the total economy level in Appendix Tables B.1 and B.2.

3.2 Trade integration and employment: A simple story?

Before presenting the results from the decomposition analysis it might be useful to present some trends in employment and trade integration of the Austrian economy. We start with trends in employment for the periods 1995-2000 and 2000-2005 in full time equivalents (as used also later in the decomposition

analysis) which are reported in Table 3.1. First, as one can see from this table there is quite a difference in

	Total economy		Excluding agriculture	
ISCED	1995-2000	2000-2005	1995-2000	2000-2005
Low	-6.88	-3.88	-3.85	-3.31
Medium	-0.64	0.00	0.94	-0.66
High	15.25	8.23	14.89	8.00
Total	-1.04	0.69	1.19	0.28

Table 3.1: Average annual change in full time equivalents in per cent

total employment growth rate whether including or not including agriculture. This however mainly stems from a methodological break between 1995 and 2000 and thus do not reflect the actual developments. When excluding agriculture, employment (in full time equivalents) was rising by about 1.2 per cent over the period 1995-2000 but only at 0.28 per cent over the period 2000-2005. With respect to educational attainment categories one finds that the low educated group declined by almost four in the first and more than three percent in the second period, the medium educated group shows an increase by about little less than one percent in the first period and declined by about 0.6 per cent in the second period. For the high educated group we can see that the growth rate was quite large with about 15 per cent in the first and still 8 per cent in the second period, thus well above the overall growth rate.

It is of course tempting to relate these changes in employment demand to trade integration of the Austrian economy after EU accession and with the Eastern European economies in particular. In Table 3.2 we therefore present some indicators of the increasing trade integration. In the first line we report the

	1995	2000	2005
Export share	25.3	32.2	34.5
Import share	12.2	14.7	14.1
Share of imported intermediate inputs	25.3	29.5	29.6

Table 3.2: Export and import shares in per cent (based on nominal values)

share of exports in total final demand for domestic products (i.e. including exports) for 1995, 2000 and 2005. The second line reports the share of imports in total domestic demand (i.e. including imports but not exports) and the third line reports the share of intermediate inputs in total intermediate inputs. Export shares were rising from about 25 percent to almost 35 percent over the period 1995 to 2005 whereas the share of imports was lower and increasing much less from about 12 to 14 percent. Further, also the share of imported intermediate inputs was rising from 25 to about 30 percent over the full period. Though this indicates that potential employment losses from increased imports and outsourcing should

have been compensated from higher export activities a more detailed approach is necessary to figure out the relative importance. Furthermore, the decomposition approach applied in this paper will also reveal whether particular groups of employed persons (e.g. the low educated) are affected from trade integration or whether particular industries experience particular strong changes in employment levels due to trade integration. The general view (in the literature but also in the public debate) would be that though trade integration had predominantly positive employment effects it had worsened the position for low educated workers due to competition from low cost countries and outsourcing activities to those countries.

4 Results from the decomposition analysis

Let us now come to the presentation of the most important results from the decomposition analysis outlined above. We first present the overall results and the effects of trade integration at the the total economy level. Looking specifically at the effects of outsourcing we apply two categorizations of used (outsourced) products: first by a typology of products according to skill intensity, and second, according to energy, material, and services.[6] In the main text we report the results using the fourth deflation procedure mentioned above; selected results using the other deflation procedures are reported in the Appendix.[7] We then proceed to present results distinguishing three types of workers corresponding to their educational attainment levels according to ISCED categories. Finally, we highlight some interesting results at a more detailed level for selected industries.

4.1 Employment effects of international integration

4.1.1 Overall employment changes

Though the main focus of this paper are the employment effects of changes in exports, imports and intermediates sourced from abroad, i.e. outsourcing we start with a short summary of the overall results also for the other levels in the hierarchical decomposition as discussed above which are presented in Table 4.1. This table reports the absolute changes over the two periods 1995-2000 and 2000-2005, the average changes per year and the relative changes per year (i.e. the percentage change divided by the number of years) for both subperiods. We express employment in terms of employment full-time equivalents

[6] The first is according to Peneder (2007) though this refers to industries rather than products. The second follows the classification into these three types of intermediates as used in the EU KLEMS database. The classifications are listed in Appendix Table B.1.

[7] Even more results are available upon request.

	Absolute changes		Absolute changes p.y.		Relative changes p.y. (in %)	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
Labour input coefficients	-755454	-242704	-151091	-48541	-4.19	-1.42
Domestic Leontief inverse	-12152	-35742	-2430	-7148	-0.07	-0.21
.Input coefficients	19440	-1766	3888	-353	0.11	-0.01
.Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
Final demand	579875	396575	115975	79315	3.22	2.32
.Final domestic demand	209076	169518	41815	33904	1.16	0.99
.Final export demand	370799	227057	74160	45411	2.06	1.33
Total	-187731	118129	-37546	23626	-1.04	0.69

Table 4.1: Results for the total economy

(FTE).[8] The figures are presented for the first two levels of the hierarchical decomposition. Note, that the method guarantees that figures at the second level of the hierarchical decomposition sum up to the figures at the first level. The last line ('Total') presents total employment change which in fact is the sum of the effects of changes at the first level in the hierarchy of decompositions, i.e. changes in labor input coefficients, the domestic Leontief inverse and the changes in final demand. Total employment (in full-time equivalents) was declining by about one per cent per year between 1995 and 2000 and increasing by 0.69 per cent over the period 2000-2005. The decline in the first period was mainly caused by strong negative effect of decreasing labor input coefficients caused by a methodological break in agriculture (CPA 01, 02, and 05) as already discussed above.[9] Labor productivity growth has a negative effect on employment as expected at a magnitude of around minus 1.7 and 2.5 percent in the second and first subperiod (without CPA 01, 02 and 05) respectively. Changes in the domestic Leontief inverse contributed only marginally, showing small negative effects in both periods. Changes in final demand contributed positively to employment growth in the first period with more than three per cent per year; in the second period the final demand effect have however been lower at about 2.3 percent per year.

This leads us to the second level in the hierarchical decomposition analysis concerning decompositions of the domestic Leontief inverse and the final demand components. For the latter it turns out that employment growth due to exports with slightly above two percent was almost twice as high as employment growth driven by domestic demand over the first period (1.16 percent). In the second period the employment effect of exports declined to 1.33 percent in the period; but it still remained higher than the effect of final domestic demand with about one percent per year. Finally, the changes in the Leontief

[8] Note that these figures are thus not directly comparable to employment changes by persons or hours worked.

[9] This severe change in labor input coefficients in agriculture are thus mainly caused by a methodological revision rather than reflecting actual productivity growth and thus should not be given too much attention. One should further note that this does not affect the other results.

inverse can be traced back to changes in the input coefficients and changes in the domestic share matrix. The first component turned out to be positive (0.11 percent) in the first but only marginally different from zero in the second period. The positive effect might be interpreted as an increase in the 'roundaboutness' of production which might however have been (indirectly) caused by the supply of relatively cheap intermediate inputs from the Eastern European countries neighboring Austria. This second component concerns the effects of changes in the domestic share matrix as described above. An increase in the share of intermediate products purchased abroad ('outsourcing') would imply a negative (direct and indirect) employment effect. This is also what we actually find in both periods. Employment declined by about 0.2 per cent in both periods due to this trend. It is interesting to note that this component is relatively similar for both periods as one might have expected that a relatively stronger effect in the first period caused by outsourcing of intermediates to the Central and Eastern European countries when trade integration of Austria with these countries gained momentum and was occurring quite rapidly.

4.1.2 Effects of internationalization

The (negative) employment effects of increased outsourcing activities have to be compared to the (expectedly positive) employment effects of exporting activities on the one and the (expectedly negative) employment effects of imports on the other hand. As we have already seen above in Table 4.1 export activities (final export demand) strongly contributed to employment growth in both subperiods. However, these figures also include a 'level' and 'trend' effect whereas the figures for outsourcing effects consider only changes in the shares of intermediates imported from abroad. To get comparable figures we thus decomposed the final demand components in a second way as outlined above, i.e. considering changes in the shares of exports and imports. The results are presented in Table 4.2.[10] In particular we present the employment effects due to outsourcing (i.e. change in the domestic share matrix), a change in the shares of imports in final (domestic) demand and a change in the share of exports in final demand. The sum of these three effects is denoted as 'internationalization' effect. We provide even some more information in this table by breaking down the various effects into product categories which will be discussed below in more detail.

We already mentioned the negative employment effects of outsourcing of about -0.2 percent or by about +6300 and +6800 full-time equivalents per year, respectively. As expected, we also find negative effects changes in the shares of imported products in final domestic demand with -0.16 percent in the

[10]These results are quite robust with respect to different inflation procedures as shown in Appendix Tables B.1 and B.2.

	Absolute changes		Absolute changes p.y.		Relative changes p.y. (in %)	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
..Low skill intensive products	-23950	-21591	-4790	-4318	-0.13	-0.13
..Medium skill intensive products	661	2050	132	410	0.00	0.01
..High skill intensive products	-8302	-14434	-1660	-2887	-0.05	-0.08
Import shares in final demand	-28760	-12121	-5752	-2424	-0.16	-0.07
..Low skill intensive products	-15856	-15367	-3171	-3073	-0.09	-0.09
..Medium skill intensive products	-16772	1191	-3354	238	-0.09	0.01
..High skill intensive products	3869	2056	774	411	0.02	0.01
Export shares in final demand	118877	80343	23775	16069	0.66	0.47
..Low skill intensive products	41195	69230	8239	13846	0.23	0.41
..Medium skill intensive products	61891	22613	12378	4523	0.34	0.13
..High skill intensive products	15791	-11500	3158	-2300	0.09	-0.07
Internationalization	58526	34247	11705	6849	0.32	0.20
..Low skill intensive products	1389	32271	278	6454	0.01	0.19
..Medium skill intensive products	45779	25854	9156	5171	0.25	0.15
..High skill intensive products	11358	-23878	2272	-4776	0.06	-0.14

Table 4.2: Results for the total economy - Effects of internationalization

first but only -0.07 percent in the second period. In absolute terms the import effects was almost as large as the outsourcing effect in the first period (-5700) but only a third of this in the second period (-2400). These negative effects are counteracted by positive effects from export activities expressed as the share of exports in total demand for domestic products. The export effects have been quite strong in the first period with 0.66 percent per year but have been somewhat smaller in the second period with 0.47 percent. In absolute numbers these figures are +23700 and +16000 for the first and second period respectively. Summing up these three components reveals that the employment effects of internationalization have been positive in general with about +11700 and +6800 full-time equivalents per year in the two periods. In relative terms employment (expressed in full-time equivalents) increased due to internationalization by 0.3 and 0.2 percent per year, respectively.

The employment effects of internationalization however differ when considering outsourcing differentiated by product categories. We opted for distinguishing three types of products according to skill intensities. We classify the intermediate inputs according to educational intensities based on the taxonomy in Peneder (2007). For our purposes we however distinguish only three categories: low, medium and high educational intensive which corresponds to the Peneder taxonomy 6 and 7 (=low), 3 to 5 (= medium), and 1 and 2 (=high), respectively (see Appendix Table B.1). The employment effects differ across these groups: Whereas the internationalization effects are positive for medium skill intensive products in both periods (+0.25 and +0.15 percent per year), the effects are however much smaller for

the low and high skill intensive products in the first period (+0.01 and +0.06 percent per year). And even more interesting, the employment effects became even strongly negative for the high skill intensive products in the second period (-0.14 percent per year) whereas these are strongly positive (+0.19 percent per year) for the low skill intensive products. When tracing these changes back to the three components (outsourcing, imports and exports) one can see that the dynamics for the medium skill intensive products mainly stems from exporting activities mostly in the first but less so in the second period whereas the outsourcing effect is negligible; the importing effect was negative though relatively small in the first subperiod. For the low skill intensive products outsourcing has a much larger (negative) effect but also import activities play a role almost as large as outsourcing. However, a strong positive effect is found for exporting activities which have even become larger in the second period. Finally, for the high skill intensive products outsourcing shows a negative effects (though a little smaller than for low skill intensive products). The effect of imports is positive albeit small in both periods (thus indicating a decreasing share of imported products in total domestic demand). However, the export effect turned from positive (+0.09 percent per year) to negative (-0.07 percent per year). Together with the outsourcing effect this results in a low but positive employment effect of internationalization in the first but a strong negative effect (-0.14 percent per year) in the second period. In general, most of the changes over the two subperiods thus stems from changes in the effects of export dynamics which have become much better for low skill intensive products but worse for medium and even negative for high skill intensive products. Only the import effect of medium skill intensive products also changed over the two periods. The Austrian economy thus seems to have lost competitiveness in the medium and high skill intensive products whereas gained competitiveness in the low skill intensive products. Though one can still see a positive employment effect from outsourcing this is more and more based on a strengthened position in the low skill intensive products.

4.1.3 The employment effects of outsourcing

Nonetheless, in the recent debate the employment effects of outsourcing have been discussed intensively. Thus we provide some additional information on the employment changes resulting from outsourcing activities. Additionally we further decompose the net outsourcing effect by type of product into an international outsourcing effect (i.e. an decrease in domestic shares) and an international 'insourcing' effect (i.e. an increase in domestic shares). This corresponds to the fourth level in the left branch of Figure 2.1. The first captures the effect of what is commonly understood as outsourcing: more intermediate

products are imported from abroad rather than demanded at home. The second effect is less debated and captures the effect that demand for intermediate products is redirected domestically.[11] Thus, Table 4.3 again repeats the figures for the employment effects of (net) outsourcing in total and broken down by product categories but additionally the split into outsourcing and insourcing effects. Note, that the hierarchical decomposition guarantees that these two effects sum up to the net outsourcing effect already discussed above. We thus discuss only these two additional decomposition results.

	Absolute changes		Absolute changes p.y.		Relative changes p.y. (in %)	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
.Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
..Low skill intensive products	-23950	-21591	-4790	-4318	-0.13	-0.13
...Outsourcing	-51903	-40488	-10381	-8098	-0.29	-0.24
...Insourcing	27953	18897	5591	3779	0.16	0.11
..Medium skill intensive products	661	2050	132	410	0.00	0.01
...Outsourcing	-31177	-33063	-6235	-6613	-0.17	-0.19
...Insourcing	31838	35113	6368	7023	0.18	0.21
..High skill intensive products	-8302	-14434	-1660	-2887	-0.05	-0.08
...Outsourcing	-14195	-38948	-2839	-7790	-0.08	-0.23
...Insourcing	5893	24514	1179	4903	0.03	0.14

Table 4.3: Outsourcing effects differentiated by educational intensity categories

For the low skill intensive products we already mentioned the overall negative outsourcing effect (-0.13 percent per year in both periods). However, it is remarkable that nonetheless there are relatively large employment effects from insourcing as well which compensate more or less the negative outsourcing effect by half though a little bit less so in the second period. This is even more pronounced for the medium skill intensive products where both the outsourcing and insourcing effect more or less compensate each other resulting in the overall negligible net effect. Finally, for the skill intensive products both insourcing and outsourcing effects increased (in absolute terms) though the former little more. This resulted in a higher negative net effect (-0.08 percent per year) in the second period. Summarizing, the results reveal that (net) outsourcing indeed has had negative employment effects in the two subperiods considered. However, the magnitude of the effects as well as the dynamics differ across outsourced product types. Additionally one finds that both outsourcing and insourcing activities are ongoing with the latter having non-negligible employment effects and partly compensate for the negative outsourcing effects. This aspect is hardly discussed in the literature but seemingly deserves more attention in future research.

Products can also be classified into other categories. In the next table we show a similar decompo-

[11] This should however not be confused with exports of intermediates, i.e. outsourcing from abroad, which we cannot capture directly, however are included in exports.

sition, however distinguishing between energy, material and service inputs respectively (see Appendix Table B.1). Results are presented in Table 4.4.[12]

	Absolute changes		Absolute changes p.y.		Relative changes p.y.	
	1995-2000	2000-2004	1995-2000	2000-2004	1995-2000	2000-2004
.Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
..Energy	-2556	-3045	-511	-609	-0.01	-0.02
..Materials	-32957	4325	-6591	865	-0.18	0.03
...Outsourcing	-72502	-36497	-14500	-7299	-0.40	-0.21
...Insourcing	39544	40822	7909	8164	0.22	0.24
..Services	3922	-35255	784	-7051	0.02	-0.21
...Outsourcing	-21197	-72260	-4239	-14452	-0.12	-0.42
...Insourcing	25119	37005	5024	7401	0.14	0.22

Table 4.4: Outsourcing effects differentiated by energy, material, and service products

Net outsourcing in energy products has only little employment effects and are not discussed here any further. More interestingly, outsourcing effects for material products have been quite strong in the first period but decreased to only half in the second period. This might be explained by outsourcing activities to the New Member States taking place in the first period. However again, the insourcing effects in both periods are also at a non-negligible magnitude and even overcompensated the outsourcing effect in the second period. For the service products we again find a different pattern: Insourcing effects have even been stronger in the first period resulting in a positive net employment effect. However, the outsourcing effect has become much stronger in the second period whereas the insourcing effect increased only slightly. This resulted in a strong negative net outsourcing effect in the second period. As most of the service activities are classified as high skilled this also explains the pattern described above that the negative outsourcing effects of high-skill intensive products increased over time.

4.2 Decomposition results by educational categories

This overall positive employment effect of trade integration might however differ across skill types of workers. The common argument is that advanced economies outsource low skill intensive stages of production and thus one would expect a negative effect on employment for less educated workers. Similarly, one might argue that low skill intensive industries tend to have more outsourcing activities though this is empirically less justified. In this section we therefore present the resulting employment effects of internationalization differentiated by three types of workers according their educational attainment levels

[12] Given the low number of energy products we however present the outsourcing and insourcing effects only for material and service products.

(corresponding to ISCED categories high, medium, low). For short we will refer to low, medium and high educated workers in the discussion.

Table 4.5 provides evidence on employment effects of trade integration similar to above (see Table 4.2) however differentiated for different types of workers. This table contains a lot of detailed information. We thus start the discussion with the overall effects of internationalization (see rows 'Internationalization'). The first remarkable result is that the overall internationalization effect is positive for all three types of workers. In terms of magnitudes the effects have been larger (in relative terms) for the medium and high educated workers in the first period; however, in the second period the effects are the largest for the low educated workers. However, one should note that this was more caused by a strong decline for the medium and high educated workers rather than a strong increase of the positive effects for low educated workers. Thus there is no evidence that trade integration was harmful for low educated workers in terms of employment effects. For all three types of workers these overall positive effects are mostly driven by the exporting activities (see rows 'Export shares in final demand'): The (net) outsourcing effects (rows 'Domestic share matrix') are of similar magnitude for all three types of workers, though slightly higher for medium educated workers in both periods and for high educated workers in the first period and slightly lower for high educated workers in the second period. A change in import shares in final domestic demand (rows 'Import shares in final demand') has had strongest effects for low educated workers (-0.15 percent per year on average); though the effects have been at a comparable magnitude for the medium and high educated workers (slightly lower for this group) in the first period, the effects are lower (in absolute terms) in the second period for these two groups. Regarding export activities one can see that in the first period these are higher for medium and high educated workers though not to a large extent; however, these have dropped for these two groups quite a bit in the second period whereas the (positive) effects have even increased for the low educated workers.

This latter aspect deserves more attention and we shall discuss these changes regarding the skill intensity of products. The table reveals that the positive employment effect of the total internationalization effect particularly increased for low skill intensive products whereas decreased for medium and high skill intensive products (and even turned negative for the latter) for all three types of workers. This means that export activities increased particularly in low skill intensive products which is beneficial for low educated workers. As the changes in imports for the three product types are less pronounced (though becoming more negative for the low skill intensive products for low educated workers) this resulted in the pattern described above, that (positive) overall employment effects from internationalization are even

Educational category		Absolute changes 1995-2000	Absolute changes 2000-2005	Absolute changes p.y. 1995-2000	Absolute changes p.y. 2000-2005	Relative changes p.y. (in %) 1995-2000	Relative changes p.y. (in %) 2000-2005
Low	Domestic share matrix	-8252	-6129	-1650	-1226	-0.16	-0.18
	..Low skill intensive products	-7205	-5956	-1441	-1191	-0.14	-0.18
	..Medium skill intensive products	-281	385	-56	77	-0.01	0.01
	..High skill intensive products	-766	-558	-153	-112	-0.02	-0.02
	Import shares in final demand	-7915	-4505	-1583	-901	-0.16	-0.14
	..Low skill intensive products	-4621	-4822	-924	-964	-0.09	-0.15
	..Medium skill intensive products	-3790	17	-758	3	-0.08	0.00
	..High skill intensive products	496	299	99	60	0.01	0.01
	Export shares in final demand	29219	21158	5844	4232	0.58	0.64
	..Low skill intensive products	13629	18688	2726	3738	0.27	0.56
	..Medium skill intensive products	12943	3585	2589	717	0.26	0.11
	..High skill intensive products	2647	-1114	529	-223	0.05	-0.03
	Internationalization	13052	10524	2610	2105	0.26	0.32
	..Low skill intensive products	1804	7910	361	1582	0.04	0.24
	..Medium skill intensive products	8872	3987	1774	797	0.18	0.12
	..High skill intensive products	2377	-1373	475	-275	0.05	-0.04
Medium	Domestic share matrix	-19851	-24199	-3970	-4840	-0.17	-0.22
	..Low skill intensive products	-15220	-13440	-3044	-2688	-0.13	-0.12
	..Medium skill intensive products	1838	1011	368	202	0.02	0.01
	..High skill intensive products	-6469	-11770	-1294	-2354	-0.06	-0.11
	Import shares in final demand	-19192	-6300	-3838	-1260	-0.17	-0.06
	..Low skill intensive products	-10118	-8830	-2024	-1766	-0.09	-0.08
	..Medium skill intensive products	-11485	1335	-2297	267	-0.10	0.01
	..High skill intensive products	2411	1196	482	239	0.02	0.01
	Export shares in final demand	78870	50074	15774	10015	0.69	0.45
	..Low skill intensive products	25139	43531	5028	8706	0.22	0.40
	..Medium skill intensive products	43695	15930	8739	3186	0.38	0.14
	..High skill intensive products	10036	-9386	2007	-1877	0.09	-0.09
	Internationalization	39828	19576	7966	3915	0.35	0.18
	..Low skill intensive products	-199	21260	-40	4252	0.00	0.19
	..Medium skill intensive products	34049	18276	6810	3655	0.30	0.17
	..High skill intensive products	5978	-19960	1196	-3992	0.05	-0.18
High	Domestic share matrix	-3489	-3648	-698	-730	-0.22	-0.13
	..Low skill intensive products	-1526	-2195	-305	-439	-0.10	-0.08
	..Medium skill intensive products	-897	654	-179	131	-0.06	0.02
	..High skill intensive products	-1066	-2107	-213	-421	-0.07	-0.08
	Import shares in final demand	-1653	-1316	-331	-263	-0.11	-0.05
	..Low skill intensive products	-1117	-1715	-223	-343	-0.07	-0.06
	..Medium skill intensive products	-1497	-162	-299	-32	-0.10	-0.01
	..High skill intensive products	962	561	192	112	0.06	0.02
	Export shares in final demand	10788	9111	2158	1822	0.69	0.33
	..Low skill intensive products	2427	7011	485	1402	0.16	0.26
	..Medium skill intensive products	5253	3099	1051	620	0.34	0.11
	..High skill intensive products	3108	-1000	622	-200	0.20	-0.04
	Internationalization	5646	4147	1129	829	0.36	0.15
	..Low skill intensive products	-216	3101	-43	620	-0.01	0.11
	..Medium skill intensive products	2859	3591	572	718	0.18	0.13
	..High skill intensive products	3003	-2545	601	-509	0.19	-0.09

Table 4.5: Effects of internationalization by educational attainment categories

more pronounced for low educated workers. Finally, with respect to outsourcing we find that these are more pronounced for low skilled workers in the low skill intensive products with similar magnitudes for both periods. For the medium educated workers negative effects are found for outsourcing of low skill intensive and high skill intensive products where especially the latter become almost as important as the former in the second period. A similar pattern can be found for outsourcing activities for high skilled workers. This aspect might be driven by outsourcing activities mainly taking place in high skill intensive industries. Even when outsourcing relatively low skilled activities in these high skill intensive sectors might result in an overall negative effect for high educated workers. Without going into detail one should further mention that there is again a considerable amount of both insourcing and outsourcing taking place simultaneously as already described above.[13]

4.3 Results by outsourcing product

So far we considered only the effects of internationalization for the total economy though differentiating by the type of products which are outsourced. However, results might differ across outsourcing activities of the production of a particular product as the relative importance of outsourcing and trade exposure might differ. As we use product by product tables we cannot strictly speak of 'outsourcing industries'; however, for sake of simplification we use this terminology from now on. In this section we summarize the results when differentiating between different industries differentiated by skill intensities as already used above.[14] Table 4.6 presents the results for each of these three types of industries. The interesting question is whether employment effects differ (in relative terms) across these three types. Considering the overall internationalization effect first we find that internationalization had positive effects in the first period in all three industry categories. The smallest effects are found in the low skill intensive industries (with +0.07 percent per year), followed by the medium skill intensive industries (+0.48 percent per year) and the high skill intensive industries with +0.55 percent per year. This shows that there have been positive employment effects in all three categories (which is an interesting result in itself) and that the ranking might be as expected. However, this pattern changed for the second period where we still find much larger positive effects in the low skill intensive industries (+0.53 percent per year), smaller however still positive effects for the medium skill intensive industries compared to the first period (+0.24 percent per year) and strongly negative effects for the high skill intensive industries (-0.63 percent per year).

[13] These detailed results are available upon request.

[14] One should note hear that results are available for all product categories, however.

Outsourcing industries		Absolute changes 1995-2000	Absolute changes 2000-2005	Absolute changes p.y. 1995-2000	Absolute changes p.y. 2000-2005	Relative changes p.y. (in %) 1995-2000	Relative changes p.y. (in %) 2000-2005
Low skill	Domestic share matrix	-20528	-19794	-4106	-3959	-0.29	-0.38
	..Low skill intensive products	-19034	-19134	-3807	-3827	-0.27	-0.37
	..Medium skill intensive products	-1014	30	-203	6	-0.01	0.00
	..High skill intensive products	-480	-691	-96	-138	-0.01	-0.01
	Import shares in final demand	-14441	-12843	-2888	-2569	-0.20	-0.25
	..Low skill intensive products	-12954	-13254	-2591	-2651	-0.18	-0.25
	..Medium skill intensive products	-1650	358	-330	72	-0.02	0.01
	..High skill intensive products	162	53	32	11	0.00	0.00
	Export shares in final demand	39707	60169	7941	12034	0.55	1.15
	..Low skill intensive products	34301	59277	6860	11855	0.48	1.14
	..Medium skill intensive products	4870	1461	974	292	0.07	0.03
	..High skill intensive products	535	-568	107	-114	0.01	-0.01
	Internationalization	4738	27532	948	5506	0.07	0.53
	..Low skill intensive products	2314	26889	463	5378	0.03	0.51
	..Medium skill intensive products	2206	1849	441	370	0.03	0.04
	..High skill intensive products	218	-1206	44	-241	0.00	-0.02
Medium skill	Domestic share matrix	-2502	-915	-500	-183	-0.03	-0.01
	..Low skill intensive products	-3635	-1706	-727	-341	-0.04	-0.02
	..Medium skill intensive products	2086	2194	417	439	0.02	0.02
	..High skill intensive products	-952	-1403	-190	-281	-0.01	-0.02
	Import shares in final demand	-15378	-1092	-3076	-218	-0.18	-0.01
	..Low skill intensive products	-2062	-1553	-412	-311	-0.02	-0.02
	..Medium skill intensive products	-13752	165	-2750	33	-0.16	0.00
	..High skill intensive products	436	296	87	59	0.01	0.00
	Export shares in final demand	59117	24545	11823	4909	0.69	0.26
	..Low skill intensive products	5081	6989	1016	1398	0.06	0.07
	..Medium skill intensive products	52209	19413	10442	3883	0.61	0.21
	..High skill intensive products	1827	-1857	365	-371	0.02	-0.02
	Internationalization	41237	22537	8247	4507	0.48	0.24
	..Low skill intensive products	-617	3729	-123	746	-0.01	0.04
	..Medium skill intensive products	40542	21772	8108	4354	0.47	0.23
	..High skill intensive products	1311	-2964	262	-593	0.02	-0.03
High skill	Domestic share matrix	-8562	-13266	-1712	-2653	-0.38	-0.53
	..Low skill intensive products	-1281	-752	-256	-150	-0.06	-0.03
	..Medium skill intensive products	-411	-174	-82	-35	-0.02	-0.01
	..High skill intensive products	-6870	-12340	-1374	-2468	-0.30	-0.49
	Import shares in final demand	1060	1814	212	363	0.05	0.07
	..Low skill intensive products	-840	-560	-168	-112	-0.04	-0.02
	..Medium skill intensive products	-1370	668	-274	134	-0.06	0.03
	..High skill intensive products	3270	1707	654	341	0.14	0.07
	Export shares in final demand	20053	-4371	4011	-874	0.88	-0.17
	..Low skill intensive products	1813	2964	363	593	0.08	0.12
	..Medium skill intensive products	4812	1739	962	348	0.21	0.07
	..High skill intensive products	13428	-9074	2686	-1815	0.59	-0.36
	Internationalization	12551	-15822	2510	-3164	0.55	-0.63
	..Low skill intensive products	-308	1652	-62	330	-0.01	0.07
	..Medium skill intensive products	3031	2233	606	447	0.13	0.09
	..High skill intensive products	9829	-19708	1966	-3942	0.43	-0.79

Table 4.6: Results differentiated by outsourcing industries

The positive development in the low skill intensive industries was mainly caused by a strong increase in the export shares in final demand which has risen from +0.55 to +1.15 percent per year employment effect. The other components has slightly deteriorated. For the medium skill intensive industries the lower effects were again largely due to lower export shares in final demand though the effect of imports have become negligible. The strong negative effect in the high skill intensive industries was caused, first, by the fact that the effects of exporting activities become strongly negative (from +0.88 to -0.17 percent per year) and, second, a higher degree of outsourcing taking place (from -0.38 to -0.53 percent per year). This confirms the results from above that the Austrian economy tended to loose competitiveness in high skill intensive industries.

This leads to the second question which types of products within these industries caused these changes over time. Here again we use the skill type classification as above. Again looking first at the overall effect we can see that the internationalization effect improved mainly for low skill intensive products in the low skill intensive industries (+0.03 to +0.51 percent per year) whereas the others have only been marginally changed. In the medium skill intensive industries we can mainly see a reduction in the effects of internationalization in medium skill intensive products. Finally, for the high skill intensive industries the largest effect occurs in internationalization dynamics of high skill intensive products which turned from +0.43 to -0.79 percent per year.

Looking at the individual components (changes in the domestic share matrix, import shares and export shares) reveals that in the high skill intensive industries the effects of increased (net) outsourcing and, more importantly, the effects of a reduction in export shares (from +0.59 to -0.36 percent per year) caused the employment losses. In the low skill intensive industries the effects become increasingly positive caused by higher export shares predominantly in low skill intensive products. The pattern for the medium skill intensive industries is less clear, however.

Again this information can be broken down for the three educational groups of employed persons. In Table 4.7 we present an overview on the employment effects of internationalization for the three industries. In the last part of the table we again report the overall results by educational groupings (as already reported in Table 4.5).

In the first period (1995-2000) there are strong positive effects for all three educational categories in the high skill intensive industries, and positive but less strong effects in the other two. Only very little but still positive effects are found for the low skill intensive industries. However, this pattern dramatically changed for the second period where the employment effects turned positive for the low skill

	Absolute changes		Absolute changes p.y.		Relative changes p.y. (in %)	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
			Low skill intensive industries			
Low	2576	7214	515	1443	0.10	0.46
Medium	2132	18061	426	3612	0.05	0.56
High	30	2258	6	452	0.03	0.51
			Medium skill intensive industries			
Low	8067	3504	1613	701	0.40	0.23
Medium	31026	16208	6205	3242	0.53	0.25
High	2145	2825	429	565	0.32	0.22
			High skill intensive industries			
Low	2410	-194	482	-39	0.73	-0.09
Medium	6670	-14692	1334	-2938	0.57	-1.14
High	3471	-936	694	-187	0.44	-0.09
			Total			
Low	13052	10524	2610	2105	0.26	0.32
Medium	39828	19576	7966	3915	0.35	0.18
High	5646	4147	1129	829	0.36	0.15

Table 4.7: Internationalization effect by outsourcing industry and educational categories

intensive industries, declined but remained positive in the medium skill intensive industries and turned into negative in the high skill intensive industries. The overall employment effects of internationalization however remained positive but become less strong for the medium and high educated workers.

5 Conclusions

In this paper we presented the results of a hierarchical decomposition analysis to figure out the employment effects of trade integration of the Austrian economy over the periods 1995 to 2000 and 2000 to 2005. We did this by decomposing changes in the domestic input matrix into changes in input coefficients and changes in the domestic share matrix. The latter captures the effects of outsourcing activities. To compare the employment effects of outsourcing to the effects of import penetration and exporting activities we decomposed changes in the final demand vector in changes in import shares (in final domestic demand) and changes in export shares (in final demand for domestic products).

The results show that the employment effects of internationalization have been positive in general with about +11700 full-time equivalents per year in the first and +6900 full time equivalents in the second period. Whereas the negative effects of outsourcing and changes in import shares have been similar in the

first but less so in the second period these have been compensated by larger positive effects of exporting activities. The latter effect was however much lower in the second period due to a decline in the employment effects from exporting medium and high tech products. The employment effect of outsourcing of medium skill intensive products has been even positive on both periods. A second interesting result which has to be explored in further detail is that in both periods substantial outsourcing and insourcing (i.e. a redirection of trade in intermediates) took place though the first effect dominates in general, i.e. the net outsourcing effects are negative. Third, the results show that internationalization has had positive employment effects for all three types of workers differentiated by educational attainment categories (high, medium and low). Surprisingly, whereas these are of similar magnitude in the first period the effects have even become stronger for the low educated workers whereas the positive effect declined for the medium and high educated workers. This as mainly driven by a decline of the positive internationalization effects in medium and high skill intensive products which for the high educated workers even become negative in the second period. This is confirmed when differentiating the results with respect to skill intensity of the outsourcing 'industry' (i.e. the outsourcing activities in the production of a particular product). The internationalization effect declined for medium and high skill intensive industries (where it even became negative) in the second period. Fifths, consequently the positive employment effects for low, medium and high educated workers which have been strongest in the high skill intensive industries in the first period turned into negative in this industries in the second period whereas the employment effects have been rising (and become strongly positive) in the low skill intensive industries. This points towards a surprising pattern in the changes in the structure of internationalization of the Austrian economy.

Let us conclude that in this paper we have shown an approach to disentangle the employment effects of outsourcing and internationalization of the Austrian economy which also revealed some surprising and not expected results. However, one should also note that these employment effects are only one part of the effects of internationalization in an economy. Others, like changes in the wage structures, the effects of defensive technical progress (induced by trade integration), and other forms of integration via (inward and outward) foreign direct investments are not addressed. Nonetheless the results add to the literature on employment effects of outsourcing and trade integration by showing the relative importance of this phenomena using this approach. The use of input-output tables also allows to take employment effects of service outsourcing into account and finally also captures the direct as well as indirect employment effects. Both these aspects have found only little consideration in the actual literature.

A Technical appendix

A.1 Hierarchical Structural Decomposition Analysis

In structural decomposition analysis (SDA) the number of possible decomposition formulas is given as $n!$, where n denotes the number of variables. This non-uniqueness-problem, with an emphasis on the complications for $n > 2$, was addressed by Dietzenbacher and Los (1998). These authors recommend that studies should report the mean over all $n!$ decompositions (along with statistics on the variation such as ranges). Following this recommendation, however, might involve an excessive computational load for large n.

Instead, often a pragmatic approach is chosen to tackle the problem, e.g., by analyzing only so-called polar decompositions. The analytical consequences are not clear and depend on the application problem at hand. Furthermore, there are $n!/2$ pairs of polar decompositions and there might be no theoretical reason to prefer one pair of polar decomposition to another.[15] Seemingly, the researcher faces the choice between undergoing a heavy computational burden and the dependence on a discretionary simplification of the problem.

Hierarchical structural decomposition analysis (HSDA) offers a way out of this dilemma by imposing a hierarchical structure on the model which helps to reduce the number of decompositions to be computed. In most applications of SDA the choice of such a hierarchical structure comes as naturally as the choice of the (economic) model itself. HSDA was introduced by Chen and Wu (2008) and linked to the concept of weighted Shapley value.

Before we present HSDA two clarifying comments are appropriate. First, the approach is based on the variant of SDA without interaction terms where the decomposition contains one term for every determinant. Thus, in this respect our approach closely follows the setup used by Dietzenbacher and Los (1998). Secondly, we develop HSDA for general model formulations, i.e. models comprising non-linear operations. While models containing only multiplicative or, even more trivially, additive operations offer several simplification in formulation and notation, this is not so for non-linear operations in decomposition models. In comparison, Dietzenbacher and Los (1998) assume multiplicative operations only. A

[15] This is based on a definition of 'polar decomposition' as a relative term, i.e. two decompositions are polar to each other if the corresponding permutations are inverse to each other. Dietzenbacher and Los (1998) use an absolute concept, stating that there are two polar decompositions which are given by the original ordering and its reverse. However, this concept is treacherous since there is actually no 'original ordering'. Any model can be reformulated as to induce the desired ordering. For example by employing the transpose operator, $\mathbf{b}'\mathbf{L}_d\mathbf{f}_d$ becomes $(\mathbf{L}_d'\mathbf{b})'\mathbf{f}_d$.

typical non-linear operation arises in input-output decomposition models when the Leontief-inverse is to be decomposed.[16]

Let us start with a general decomposition model in which the change in one variable of interest (or vector or matrix of variables) Z is to be attributed to the change in $n = 3$ independent variables (or vectors or matrices of variables) A, B and C. The underlying model is

$$Z = A \circ B \circ C, \tag{A.1}$$

where $\circ$ denotes an arbitrary (eventually non-linear) operator.[17]

This is actually the short notation for

$$Z^0 = A^0 \circ B^0 \circ C^0,\ Z^1 = A^1 \circ B^1 \circ C^1, \tag{A.2}$$

since in the context of SDA the variables are observed at two distinct points in time, indicated by the superscript.

The overall change in Z between $t = 0$ and $t = 1$ is defined as

$$\Delta Z = Z^1 - Z^0 = A^1 \circ B^1 \circ C^1 - A^0 \circ B^0 \circ C^0 \tag{A.3}$$

and can be decomposed in $n! = 6$ different ways, two of which are as follows:

$$\begin{aligned}
\Delta Z = &(A^1 \circ B^0 \circ C^0 - A^0 \circ B^0 \circ C^0) \\
&+ (A^1 \circ B^1 \circ C^0 - A^1 \circ B^0 \circ C^0) \\
&+ (A^1 \circ B^1 \circ C^1 - A^1 \circ B^1 \circ C^0) \qquad \text{(A.4)} \\
= &(A^1 \circ B^0 \circ C^0 - A^0 \circ B^0 \circ C^0) \\
&+ (A^1 \circ B^0 \circ C^1 - A^1 \circ B^0 \circ C^0) \\
&+ (A^1 \circ B^1 \circ C^1 - A^1 \circ B^0 \circ C^1) \qquad \text{(A.5)}
\end{aligned}$$

Each decomposition corresponds to one permutation, so equation (A.4) corresponds to (A, B, C) and equation (A.5) to (A, C, B) where the order of appearance of the variables in the permutation indicates in which order the variables have their time superscript switched from 0 to 1 in their respective decomposition term.

[16] One consequence of non-linear operations is that Δ-notation cannot be applied in the usual way. To give an obvious example, $\Delta \mathbf{L}_d \neq (\mathbf{I} - \Delta \mathbf{D}_A \otimes \mathbf{A}^{00})^{-1} + (\mathbf{I} - \mathbf{D}_A^{05} \otimes \Delta \mathbf{A})^{-1}$, where we use the notation of our input-output model.

[17] It should be added that every instance of $\circ$ in the formulae can denote a *different* non-linear operator. In order to keep the notation simple we use only one symbol nevertheless.

Typically, from the standpoint of economic theory no decomposition (permutation) can claim priority over the others, thus the recommendation to report the mean over all $n!$ decompositions. For example, the effect of a change in A on Z is estimated as

$$\Delta Z(\Delta A, Z = A \circ B \circ C) = \frac{2}{n!}((A^1 \circ B^0 \circ C^0 - A^0 \circ B^0 \circ C^0) + (A^1 \circ B^1 \circ C^0 - A^0 \circ B^1 \circ C^0) + (A^1 \circ B^1 \circ C^1 - A^0 \circ B^1 \circ C^1)). \quad \text{(A.6)}$$

Obviously, we have

$$\Delta Z = \sum_{X=A,B,C} \Delta Z(\Delta X, Z = A \circ B \circ C). \quad \text{(A.7)}$$

If one of the variables can be decomposed further, e.g., by using $C = D \circ E$, the resulting decomposition model, based on

$$Z = A \circ B \circ D \circ E, \quad \text{(A.8)}$$

will have $4! = 24$ different decompositions producing estimates not consistent with the decomposition model based on model (A.1), i.e.,

$$\Delta Z(\Delta A, Z = A \circ B \circ C) \neq \Delta Z(\Delta A, Z = A \circ B \circ D \circ E). \quad \text{(A.9)}$$

With the help of HSDA one can (i) ascertain that the effects estimated based on model (A.1) are consistent with the effects estimated with the extended model and (ii) reduce considerably the number of decompositions to be computed. In HSDA the information on the hierarchical structure of the model is maintained. This is indicated by writing the underlying model in terms of two hierarchically linked equations:

$$Z = A \circ B \circ C,\ C = D \circ E \quad \text{(A.10)}$$

Let $\Delta Z(\Delta X, Z = A \circ B \circ C)$ and $\Delta Z(\Delta X, Z = A \circ B \circ C, C = D \circ E)$ denote the estimated effect of a change in the variable X on Z given the basic and the hierarchically extended model, respectively, where $X = A, B, C$. Then with HSDA it is guaranteed that

$$\Delta Z(\Delta X, Z = A \circ B \circ C) = \Delta Z(\Delta X, Z = A \circ B \circ C, C = D \circ E) \quad \text{(A.11)}$$

and

$$\Delta Z(\Delta C, Z = A \circ B \circ C) = \Delta Z(\Delta D, Z = A \circ B \circ C, C = D \circ E) + \Delta Z(\Delta E, Z = A \circ B \circ C, C = D \circ E). \quad \text{(A.12)}$$

This is accomplished by using only the following $2n! = 12$ decompositions (permutations) for calculating the effects,

$$(A,B,D,E),(A,B,E,D),(A,D,E,B),(A,E,D,B),(B,A,D,E),(B,A,E,D),$$
$$(B,D,E,A),(B,E,D,A),(D,E,A,B),(E,D,A,B),(D,E,B,A),(E,D,A,B),$$

and discarding the following $2n! = 12$ decompositions:

$$(A,D,B,E),(A,E,B,D),(D,A,B,E),(E,A,B,D),(D,A,E,B),(E,A,D,B),$$
$$(B,D,A,E),(B,E,A,D),(D,B,A,E),(E,B,A,D),(D,B,E,A),(E,B,D,A).$$

The approach can be generalized in various directions. Let m denote the number of variables that are used to decompose one of the n variables in the top layer of the model. Then for the calculation of the effect of a change in each of these variables on Z only $n!m!$ decompositions are used, while $(n+m-1)! - n!m!$ decompositions are not used. Generally, the hierarchy of the model can assume a tree like structure, as illustrated in 2.1. Let m_1 and m_2 denote the number of variables that are used, respectively, to decompose two different variables from the top layer of the model. Then for the calculation of the effect of a change in these variables on Z we need $n!m_1!$ and $n!m_2!$ decompositions, respectively, and can discard $(n+m_1+m_2-2)! - n!m_1! - n!m_2!$ decompositions. In a model with three layers, let k be the number of variables used to decompose one of the m variables from the middle layer. Then for the calculation of the effects of a change in these variables on Z we need $n!m!k!$ decompositions out of $(n+m+k-2)!$ decompositions that would have been necessary with conventional SDA.

Let X be one of k variables used to decompose a superordinate variable Y within a HSDA model. The set of decompositions (permutations) that are required for the calculation of the effect of X on Z given the underlying model and its hierarchical structure is found by substituting all permutations of the k variables on that level for Y in all permutations formed on the superordinate level. This process is repeated in recursive way.

A.2 Share variables versus growth variables in SDA

This section demonstrates the mathematical equivalency of using share variables and growth variables in the context of the decomposition of the employment effects of changes in final demand. In the text of the article we have used (vectors of) share variables $\mathbf{d}_h$ and $\mathbf{s}_x$ to decompose $\mathbf{h}_d$ and $\mathbf{x}_d$, respectively. We have chosen that modeling approach because it is in analogy to the approach adopted on the side of intermediate demand where we also used (a matrix of) share variables.

The alternative approach is based on growth variables and also can be couched in terms of an SDA or HSDA model. Both approaches have a tradition in SDA and have sometimes been used in parallel for different parts of SDA models (e.g. Skolka, 1989).

Intuitively, the equivalency between an approach based on share variables and one based on growth variables appears to be clear. In the decomposition based on $\mathbf{h}_d = \mathbf{d}_h \otimes \mathbf{h}$ the first component captures the effect of structural changes and the second the effect of balanced growth in $\mathbf{h}_d$, i.e. the employment change that would have occurred had the elements of $\mathbf{h}_d$ shown the same growth as $\mathbf{h}$. In the following we show the mathematical equivalency for the decomposition of $\mathbf{h}_d$. Analogously, there is also a mathematically equivalent reformulation of $\mathbf{x}_d = \mathbf{s}_x \otimes \mathbf{f}_d$.

Let $\hat{\mathbf{h}}_d$ denote the vector of final demand (without exports) for domestic goods that would have been observed with balanced growth. Since in SDA all variables are observed at two points of time we have to define the new variable for both points of time:

$$\hat{\mathbf{h}}_d^0 = \mathbf{h}_d^0,\ \hat{\mathbf{h}}_d^1 = \mathbf{h}_d^0 \otimes \mathbf{h}^1 \oslash \mathbf{h}^0 \tag{A.13}$$

Similarly we define a vector of growth deviations $\mathbf{r}_h$:

$$\mathbf{r}_h^0 = \mathbf{h}_d^0 \oslash \hat{\mathbf{h}}_d^0 = \mathbf{e},\ \mathbf{r}_h^1 = \mathbf{h}_d^1 \oslash \hat{\mathbf{h}}_d^1 \tag{A.14}$$

The model underlying the decomposition is written as

$$\mathbf{h}_d = \mathbf{r}_h \otimes \hat{\mathbf{h}}_d \tag{A.15}$$

Now it is easy to verify that

$$\begin{aligned}
\Delta\mathbf{h}_d(\Delta\mathbf{r}_h, \mathbf{h}_d = \mathbf{r}_h \otimes \hat{\mathbf{h}}_d) &= \Delta\mathbf{h}_d(\Delta\mathbf{d}_h, \mathbf{h}_d = \mathbf{d}_h \otimes \mathbf{h}),\\
\Delta\mathbf{h}_d(\Delta\hat{\mathbf{h}}_d, \mathbf{h}_d = \mathbf{r}_h \otimes \hat{\mathbf{h}}_d) &= \Delta\mathbf{h}_d(\Delta\mathbf{h}, \mathbf{h}_d = \mathbf{d}_h \otimes \mathbf{h}),\\
\Delta\mathbf{E}(\Delta\mathbf{r}_h, \mathbf{E} = \mathbf{b}'\mathbf{L}_d\mathbf{f}_d, \mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d, \mathbf{h}_d = \mathbf{r}_h \otimes \hat{\mathbf{h}}_d)&\\
= \Delta\mathbf{E}(\Delta\mathbf{d}_h, \mathbf{E} = \mathbf{b}'\mathbf{L}_d\mathbf{f}_d, \mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d, \mathbf{h}_d = \mathbf{d}_h \otimes \mathbf{h})&\\
\Delta\mathbf{E}(\Delta\hat{\mathbf{h}}_d, \mathbf{E} = \mathbf{b}'\mathbf{L}_d\mathbf{f}_d, \mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d, \mathbf{h}_d = \mathbf{r}_h \otimes \hat{\mathbf{h}}_d)&\\
= \Delta\mathbf{E}(\Delta\mathbf{h}, \mathbf{E} = \mathbf{b}'\mathbf{L}_d\mathbf{f}_d, \mathbf{f}_d = \mathbf{h}_d + \mathbf{x}_d, \mathbf{h}_d = \mathbf{d}_h \otimes \mathbf{h})&
\end{aligned}$$

and the equalities for all other decompositions that might arise in SDA hold because if one writes out

these equations the term $\mathbf{r}_h \otimes \hat{\mathbf{h}}_d$ always equals $\mathbf{d}_h \otimes \mathbf{h}$ in all corresponding combinations of time stamps:

$$\mathbf{r}_h^0 \otimes \hat{\mathbf{h}}_d^0 = \mathbf{e} \otimes \mathbf{h}_d^0 = \mathbf{d}_h^0 \otimes \mathbf{h}^0$$

$$\begin{aligned}\mathbf{r}_h^1 \otimes \hat{\mathbf{h}}_d^0 = (\mathbf{h}_d^1 \oslash \hat{\mathbf{h}}_d^1) \otimes \mathbf{h}_d^0 &= (\mathbf{h}_d^1 \oslash (\mathbf{h}_d^0 \otimes \mathbf{h}^1 \oslash \mathbf{h}^0)) \otimes \mathbf{h}_d^0 \\ &= (\mathbf{h}_d^1 \oslash \mathbf{h}^1) \oslash (\mathbf{h}_d^0 \oslash \mathbf{h}^0) \otimes \mathbf{h}_d^0 = \mathbf{d}_h^1 \otimes \mathbf{h}^0\end{aligned}$$

$$\mathbf{r}_h^0 \otimes \hat{\mathbf{h}}_d^1 = \mathbf{e} \otimes \hat{\mathbf{h}}_d^1 = \mathbf{h}_d^0 \otimes \mathbf{h}^1 \oslash \mathbf{h}^0 = (\mathbf{h}_d^0 \oslash \mathbf{h}^0) \otimes \mathbf{h}^1 = \mathbf{d}_h^0 \otimes \mathbf{h}^1$$

$$\mathbf{r}_h^1 \otimes \hat{\mathbf{h}}_d^1 = (\mathbf{h}_d^1 \oslash \hat{\mathbf{h}}_d^1) \otimes \hat{\mathbf{h}}_d^1 = \mathbf{h}_d^1 = \mathbf{d}_h^1 \otimes \mathbf{h}^1$$

However, it should be added that numerically the approach based on share variables is more robust than the one based on growth variables. With the growth variables based approach it is necessary to substitute small values for zero elements in order to avoid divisions by zero, while with the share variables based approach it is only necessary to define $0/0 = 0$.

B Table appendix

CPA	NACE rev. 1	Taxonomy[1]		E-M-S[2]	Description
01[3]	Agriculture (AtB)	7	L	M	Products of agriculture, hunting, forestry, logging and fish and other fish products
10	Mining (C)	4	M	E	Coal and lignite; peat
11		4	M	E	Crude petroleum, natural gas, metal ores
14		4	M	M	Other mining and quarrying products
15	Manufacturing (D)	6	L	M	Food products and beverages
16		6	L	M	Tobacco products
17		7	L	M	Textiles
18		7	L	M	Wearing apparel; furs
19		7	L	M	Leather and leather products
20		7	L	M	Wood and products of wood
21		4	M	M	Pulp, paper and paper products
22		4	M	M	Printed matter and recorded media
23		3	M	E	Coke, refined petroleum products
24		3	M	M	Chemicals, chemical products
25		5	M	M	Rubber and plastic products
26		6	L	M	Other non-metallic mineral products
27		6	L	M	Basic metals
28		6	L	M	Fabricated metal products
29		4	M	M	Machinery and equipment n.e.c.
30		2	H	M	Office machinery and computers
31		4	M	M	Electrical machinery and apparatus
32		3	M	M	Radio, TV and communication equipment
33		3	M	M	Med., precision, opt. instruments; watches, clocks
34		4	M	M	Motor vehicles, trailers and semi-trailers
35		3	M	M	Other transport equipment
36		5	M	M	Furniture; other manufactured goods n.e.c.
37		5	M	M	Recovered secondary raw materials
40	Energy (E)	4	M	E	Electrical energy, gas, steam and hot water
41		4	M	M	Water; distribution services of water
45	Construction (F)	6	L	M	Construction work
50	Distribution (G)	6	L	S	Trade and repair services of motor vehicles etc.
51		4	M	S	Wholesale and comm. trade serv., ex. of motor vehicles
52		5	M	S	Retail trade serv., repair serv., except of motor vehicles
55	Hotels (H)	7	L	S	Hotel and restaurant services
60	Transport (I)	5	M	S	Land transport and transport via pipeline services
61		5	M	S	Water transport services
62		3	M	S	Air transport services
63		4	M	S	Supporting transport services; travel agency services
64		4	M	S	Post and telecommunication services
65	Financial intermediation (J)	2	H	S	Financial intermediation services (ex. insurance serv.)
66		3	M	S	Insurance and pension funding services
67		3	M	S	Services auxiliary to financial intermediation
70	Real estate, renting and	4	M	S	Real estate services
70	business activities (K)	4	M	S	
71		4	M	S	Renting services of machinery and equipment
72		1	H	S	Computer and related services
73		1	H	S	Research and development services
74		2	H	S	Other business services
75	Public services (L)	3	M	S	Public administration services etc.
80	Education (M)	1	H	S	Education services
85	Health services (N)	3	M	S	Health and social work services
90	Other services (O)	3	M	S	Sewage and refuse disposal services etc.
91		3	M	S	Membership organisation services n.e.c.
92		3	M	S	Recreational, cultural and sporting services
93		3	M	S	Other services
95	Private services (P)	7	L	S	Private households with employed persons

[1] Taxonomy according to Peneder (2007) 'International classification': 1 ... very high; 2 ... high; 3 ... med-high; 4 ... intermediate; 5 ... med-low; 6 ... low; 7 ... very low. L ... low; M ... medium; H ... high

[2] Energy, Material, and Services; classification according to EU KLEMS.

[3] Includes CPA 01, 02 and 05 due to data constraints.

Table B.1: Correspondence

	Absolute changes		Absolute changes p.y.		Relative changes p.y.	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
DEFLATION 01						
Labour input coefficients	-732133	-202937	-146427	-40587	-4.07	-1.19
Domestic Leontief inverse	-2332	-23861	-466	-4772	-0.01	-0.14
.Input coefficients	42809	4351	8562	870	0.24	0.03
.Domestic share matrix	-45142	-28212	-9028	-5642	-0.25	-0.17
..Low skill intensive products	-26789	-16152	-5358	-3230	-0.15	-0.09
...Outsourcing	-54174	-40282	-10835	-8056	-0.30	-0.24
...Insourcing	27385	24130	5477	4826	0.15	0.14
..Medium skill intensive products	-3522	4595	-704	919	-0.02	0.03
...Outsourcing	-33849	-35831	-6770	-7166	-0.19	-0.21
...Insourcing	30327	40426	6065	8085	0.17	0.24
..High skill intensive products	-14830	-16656	-2966	-3331	-0.08	-0.10
...Outsourcing	-19454	-43719	-3891	-8744	-0.11	-0.26
...Insourcing	4623	27063	925	5413	0.03	0.16
Final demand	546734	344928	109347	68986	3.04	2.02
.Final domestic demand	200508	148005	40102	29601	1.11	0.87
.Final export demand	346226	196923	69245	39385	1.92	1.15
Total	-187731	118129	-37546	23626	-1.04	0.69
DEFLATION 02						
Labour input coefficients	-792848	-233370	-158570	-46674	-4.40	-1.37
Domestic Leontief inverse	31011	-11577	6202	-2315	0.17	-0.07
.Input coefficients	75578	16775	15116	3355	0.42	0.10
.Domestic share matrix	-44567	-28352	-8913	-5670	-0.25	-0.17
..Low skill intensive products	-26285	-16252	-5257	-3250	-0.15	-0.10
...Outsourcing	-55098	-40237	-11020	-8047	-0.31	-0.24
...Insourcing	28813	23984	5763	4797	0.16	0.14
..Medium skill intensive products	-3100	4530	-620	906	-0.02	0.03
...Outsourcing	-33852	-35902	-6770	-7180	-0.19	-0.21
...Insourcing	30753	40432	6151	8086	0.17	0.24
..High skill intensive products	-15181	-16630	-3036	-3326	-0.08	-0.10
...Outsourcing	-19810	-43674	-3962	-8735	-0.11	-0.26
...Insourcing	4629	27044	926	5409	0.03	0.16
Final demand	574106	363076	114821	72615	3.19	2.13
.Final domestic demand	203719	157503	40744	31501	1.13	0.92
.Final export demand	370387	205573	74077	41115	2.06	1.20
Total	-187731	118129	-37546	23626	-1.04	0.69
DEFLATION 03						
Labour input coefficients	-755358	-242675	-151072	-48535	-4.19	-1.42
Domestic Leontief inverse	8989	-10308	1798	-2062	0.05	-0.06
.Input coefficients	53878	18048	10776	3610	0.30	0.11
.Domestic share matrix	-44890	-28355	-8978	-5671	-0.25	-0.17
..Low skill intensive products	-26706	-16264	-5341	-3253	-0.15	-0.10
...Outsourcing	-54437	-40268	-10887	-8054	-0.30	-0.24
...Insourcing	27731	24004	5546	4801	0.15	0.14
..Medium skill intensive products	-3110	4494	-622	899	-0.02	0.03
...Outsourcing	-33823	-35958	-6765	-7192	-0.19	-0.21
...Insourcing	30714	40452	6143	8090	0.17	0.24
..High skill intensive products	-15074	-16585	-3015	-3317	-0.08	-0.10
...Outsourcing	-19704	-43624	-3941	-8725	-0.11	-0.26
...Insourcing	4630	27039	926	5408	0.03	0.16
Final demand	558638	371112	111728	74222	3.10	2.17
.Final domestic demand	191457	155913	38291	31183	1.06	0.91
.Final export demand	367181	215199	73436	43040	2.04	1.26
Total	-187731	118129	-37546	23626	-1.04	0.69
DEFLATION 04						
Labour input coefficients	-755454	-242704	-151091	-48541	-4.19	-1.42
Domestic Leontief inverse	-12152	-35742	-2430	-7148	-0.07	-0.21
.Input coefficients	19440	-1766	3888	-353	0.11	-0.01
.Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
..Low skill intensive products	-23950	-21591	-4790	-4318	-0.13	-0.13
...Outsourcing	-51903	-40488	-10381	-8098	-0.29	-0.24
...Insourcing	27953	18897	5591	3779	0.16	0.11
..Medium skill intensive products	661	2050	132	410	0.00	0.01
...Outsourcing	-31177	-33063	-6235	-6613	-0.17	-0.19
...Insourcing	31838	35113	6368	7023	0.18	0.21
..High skill intensive products	-8302	-14434	-1660	-2887	-0.05	-0.08
...Outsourcing	-14195	-38948	-2839	-7790	-0.08	-0.23
...Insourcing	5893	24514	1179	4903	0.03	0.14
Final demand	579875	396575	115975	79315	3.22	2.32
.Final domestic demand	209076	169518	41815	33904	1.16	0.99
.Final export demand	370799	227057	74160	45411	2.06	1.33
Total	-187731	118129	-37546	23626	-1.04	0.69

Table B.1: Results for the total economy - Decomposition by educational intensity of inputs

	Absolute changes		Absolute changes p.y.		Relative changes p.y.	
	1995-2000	2000-2005	1995-2000	2000-2005	1995-2000	2000-2005
DEFLATION 01						
Domestic share matrix	-45142	-28212	-9028	-5642	-0.25	-0.17
..Low skill intensive products	-26789	-16152	-5358	-3230	-0.15	-0.09
..Medium skill intensive products	-3522	4595	-704	919	-0.02	0.03
..High skill intensive products	-14830	-16656	-2966	-3331	-0.08	-0.10
Import shares in final demand	-39027	-15272	-7805	-3054	-0.22	-0.09
..Low skill intensive products	-21842	-16344	-4368	-3269	-0.12	-0.10
..Medium skill intensive products	-20427	-1013	-4085	-203	-0.11	-0.01
..High skill intensive products	3243	2085	649	417	0.02	0.01
Export shares in final demand	120471	80390	24094	16078	0.67	0.47
..Low skill intensive products	42370	67656	8474	13531	0.24	0.40
..Medium skill intensive products	62351	23226	12470	4645	0.35	0.14
..High skill intensive products	15750	-10492	3150	-2098	0.09	-0.06
Internationalization	36302	36906	7260	7381	0.20	0.22
..Low skill intensive products	-6261	35160	-1252	7032	-0.03	0.21
..Medium skill intensive products	38401	26808	7680	5362	0.21	0.16
..High skill intensive products	4162	-25062	832	-5012	0.02	-0.15
DEFLATION 02						
Domestic share matrix	-44567	-28352	-8913	-5670	-0.25	-0.17
..Low skill intensive products	-26285	-16252	-5257	-3250	-0.15	-0.10
..Medium skill intensive products	-3100	4530	-620	906	-0.02	0.03
..High skill intensive products	-15181	-16630	-3036	-3326	-0.08	-0.10
Import shares in final demand	-38899	-15248	-7780	-3050	-0.22	-0.09
..Low skill intensive products	-21740	-16332	-4348	-3267	-0.12	-0.10
..Medium skill intensive products	-20451	-992	-4090	-198	-0.11	-0.01
..High skill intensive products	3293	2077	659	415	0.02	0.01
Export shares in final demand	120908	80510	24182	16102	0.67	0.47
..Low skill intensive products	42336	67560	8467	13512	0.24	0.40
..Medium skill intensive products	62421	23226	12484	4645	0.35	0.14
..High skill intensive products	16151	-10276	3230	-2055	0.09	-0.06
Internationalization	37443	36910	7489	7382	0.21	0.22
..Low skill intensive products	-5689	34975	-1138	6995	-0.03	0.20
..Medium skill intensive products	38870	26764	7774	5353	0.22	0.16
..High skill intensive products	4262	-24829	852	-4966	0.02	-0.15
DEFLATION 03						
Domestic share matrix	-44890	-28355	-8978	-5671	-0.25	-0.17
..Low skill intensive products	-26706	-16264	-5341	-3253	-0.15	-0.10
..Medium skill intensive products	-3110	4494	-622	899	-0.02	0.03
..High skill intensive products	-15074	-16585	-3015	-3317	-0.08	-0.10
Import shares in final demand	-39002	-15339	-7800	-3068	-0.22	-0.09
..Low skill intensive products	-21849	-16339	-4370	-3268	-0.12	-0.10
..Medium skill intensive products	-20434	-1076	-4087	-215	-0.11	-0.01
..High skill intensive products	3280	2075	656	415	0.02	0.01
Export shares in final demand	121052	79915	24210	15983	0.67	0.47
..Low skill intensive products	42432	67574	8486	13515	0.24	0.40
..Medium skill intensive products	62546	23247	12509	4649	0.35	0.14
..High skill intensive products	16075	-10906	3215	-2181	0.09	-0.06
Internationalization	37160	36221	7432	7244	0.21	0.21
..Low skill intensive products	-6123	34971	-1225	6994	-0.03	0.20
..Medium skill intensive products	39002	26666	7800	5333	0.22	0.16
..High skill intensive products	4281	-25416	856	-5083	0.02	-0.15
DEFLATION 04						
Domestic share matrix	-31591	-33975	-6318	-6795	-0.18	-0.20
..Low skill intensive products	-23950	-21591	-4790	-4318	-0.13	-0.13
..Medium skill intensive products	661	2050	132	410	0.00	0.01
..High skill intensive products	-8302	-14434	-1660	-2887	-0.05	-0.08
Import shares in final demand	-28760	-12121	-5752	-2424	-0.16	-0.07
..Low skill intensive products	-15856	-15367	-3171	-3073	-0.09	-0.09
..Medium skill intensive products	-16772	1191	-3354	238	-0.09	0.01
..High skill intensive products	3869	2056	774	411	0.02	0.01
Export shares in final demand	118877	80343	23775	16069	0.66	0.47
..Low skill intensive products	41195	69230	8239	13846	0.23	0.41
..Medium skill intensive products	61891	22613	12378	4523	0.34	0.13
..High skill intensive products	15791	-11500	3158	-2300	0.09	-0.07
Internationalization	58526	34247	11705	6849	0.32	0.20
..Low skill intensive products	1389	32271	278	6454	0.01	0.19
..Medium skill intensive products	45779	25854	9156	5171	0.25	0.15
..High skill intensive products	11358	-23878	2272	-4776	0.06	-0.14

Table B.2: Results for the total economy - Effects of internationalization

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