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INTRA-INDUSTRY TRADE AND INPUT DEMAND

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Abstract:

This paper presents a static CGE model of intra-industry trade differentiating between final and intermediate goods. It makes use of the detailed information about the distribution of imports among demand categories available in input – output tables. Final goods trade and trade in intermediate goods are shown to have different economic impacts. Intermediate goods trade is the consequence of input substitution of firms causing a factor as well as a cost saving effect. Final goods trade is the consequence of product substitution of consumers and increases consumers´ welfare. Results for skilled and unskilled labour and for production patterns of both types of intra-industry trade are quantified in a model version with and without full employment assumptions.

Key words: Intermediates trade, input demand, CGE modelling

JEL Code: F16, F17, D5

1. Introduction

The standard method for modelling trade in single country CGE models follows the Armington (1969) assumption that imports and domestic goods are imperfect substitutes and distinguished by country of origin. This assumption is applied to each composite good, i.e. the total demand in the commodity balance. The main advantage of the Armington approach is its 'convenience' (Springer, 2002) once the substitution elasticity has been determined and its usefulness for describing the phenomenon of intra-industry trade. The corresponding feature to the Armington import function on the export side in CGE models is the constant elasticity of transformation (CET) approach. This model can be shown to represent the main features of a price taking economy with well-behaved reaction patterns (s.: De Melo, Robinson, 1989).

Although the Armington import function and the CET export function allow to model intra-industry trade, the splitting up of the whole composite good between imports and domestic goods does not make full use of input-output data, which often contain a detailed import matrix. In this matrix the imports of a commodity are distributed among the intermediate inputs of the different industries and the different final demand categories. Each cell in the input-output matrix represents therefore a composite good of imported and domestic origin. A recent large CGE model that makes use of this import distribution between intermediate and final demand is the GTAP model (s.: Hertel, Tsigas, 1997). Both for final demand as well as for production the Armington approach is applied in GTAP. In the production structure that applies to the allocation of intermediate inputs into domestic and imported products. This specification does not include broader substitution processes in production like a direct substitution between labour and imported intermediate products.

From a theoretical perspective the substitution processes in firms between imports and other factors can be assumed to be different from substitution processes in final demand (e.g. consumption). The Armington assumption perfectly fits for consumption goods (e.g. wine from different regions), but might be an inadequate description of firms decisions in the production process. The demand for intermediate inputs (e.g. different components of cars) of a firm is driven by the substitution possiblities among different factors of production. This incorporates the Armington approach concerning commodities from different origins (e.g. domestic and imported components of cars) as well as the substitution process between intermediates and other inputs (labour, energy). This substitution includes the phenomenon of fragmentation of the value added chain and international outsourcing. Only few studies are explicitly treating with final and intermediate goods. The seminal papers in this line of research are Sanyal and Jones (1982) and Markusen (1989), the integration of final and intermediate goods trade into an analytical general equilibrium model can be found e.g. in Bergstrand and Baier (2000). Part of the literature on outsourcing (e.g. Kohler, 2002) shows that final goods trade and outsourcing might be accompanied by rather different impacts on the labour market and on income distribution. This issue becomes particularly interesting, if we allow for imperfection in factor markets. Egger and Egger (2003) have recently discussed the role of market imperfections for the impact of outsourcing in a model with skilled and unskilled labour.

The main purpose of this paper is to transfer these results from theoretical (analytical) trade models into a simple static CGE model of a small open economy that incorporates different forms of intra-industry trade. One part of intra-industry trade consists in imports linked to final demand (mainly private consumption), where consumers substitute domestic against imported commodities. The other one consists in imports linked to intermediate demand, where firms substitute different factors of production against imported intermediates. These different types of imports within the same commodity are treated like different sub-products with independent world market prices. For trade liberalization (lower trade costs) it can be distinguished, if it leads to an import price decrease for final goods or for intermediate goods. Concerning factors of production we differentiate skilled and unskilled labour, energy, domestic intermediates and imported intermediates. The capital stock is assumed to be fixed. Two different version of the model are set up concerning macroeconomic closure rules and the full employment assumption. One is the standard version of the closure of an open economy model with fixed foreign savings (current account) and full employment at the labour market. In this model version factor prices for skilled and unskilled labour clear the corresponding factor markets. In the other model version the wage rates are fixed and part of the labour force is unemployed, so that shocks can lead to changes in total employment and income. In model simulations intermediate goods trade is compared with final goods trade, which reveals important differences with respect to the impact on labour and production patterns.

The paper is organized as follows. In section 2 the main building blocks of the model are presented. Section 3 describes the data base and the main parameter values to calibrate the model to the benchmark data set (year 2000). In section 4 model simulations are presented for the impacts of final goods trade and of intermediate goods trade. Section 5 summarizes the main results and concludes.

2. The Model

The model used in this study is a static CGE model of the Austrian economy for the benchmark year 2000. The first standard small open economy CGE model of Austria using Armington import functions and CET export functions has been constructed and published by Breuss and Tesche (1991). This study relies on their work, but deviates concerning the specification of import functions by (i) making use of the data set of import matrizes in Austrian input-output tables and (ii) allowing for a broad range of substitution processes betweeen imported intermediates and other production inputs. Exports are modelled via CET (constant elasticity of transformation) export functions like in the standard model. The closure rule of a constant current account deficit determines price adjustment in the 'real exchange rate'. Another departure from the standard model consists in allowing for unemployment in a segmented labour market for skilled and unskilled labour with fixed wage rates.

2.1 Consumers

The model of private consumption starts from the indirect utility function of the Almost Ideal Demand System (AIDS, s.: Deaton and Muellbauer, 1980):

$$V = (\log C(U,\mathbf{p}) - \log(P_1))*(P_2)^{-1} \qquad (1)$$

The level of utility U and the vector of commodity prices **p** are the arguments of the expenditure function C. The two price aggregator functions P_1 and P_2 are defined by the following expressions:

$$\log a(\mathbf{p}) = \log P_1 = a_0 + \sum_{i=1}^{n} \alpha_i \log p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{m} \gamma_{ij}^{*} \log p_i \log p_j \qquad (2)$$

$$P_2 = \log b(\mathbf{p}) - \log a(\mathbf{p}) \quad ; \quad \log b(\mathbf{p}) = \log a(\mathbf{p}) + b_0 \prod_{i=1}^{n} p_i^{\beta_i} \qquad (3)$$

That is, log[a(**p**)] is a translog-function and log[b(**p**)]-log[a(**p**)] is a Cobb-Douglas type function. The indirect utility function corresponds to the PIGLOG-specification of the expenditure function C in the AIDS which is usually written as:

$$\log C(u,\mathbf{p}) = (1-u)\log[a(\mathbf{p})] + u \log[b(\mathbf{p})], \qquad (4)$$

It must be noted here that the commodity classification *i* in this model includes the *1 ...n* domestic goods as well as the *1 ...n* imported goods. By virtue of Shepard’s Lemma and the indirect utility function we get the demands stated in terms of budget share equations for the AIDS:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log\left(\frac{C}{P_1}\right) \qquad p_j = p_j^D \, , \; p_j^{MF} \qquad (5)$$

with $\gamma_{ij} = ½(\gamma_{ij}^* + \gamma_{ji}^*) = \gamma_{ji}$ and C as the level of total consumption expenditure.

Consumption for commodity *i* is then given by:

$$C_i^d = (w_i C)/\, p_i^D \qquad (6)$$

$$C_i^M = (w_i C)/\, p_i^{MF} \qquad (7)$$

The different commodities are domestic consumer goods valued at the price of products produced and sold domestically p_i^D (specified as usually in the Armington function) and imported consumer goods valued at import prices for final demand p_i^{MF} (derived from world market import prices).

The budget share equations satisfy the standard properties of demand functions given by three sets of restrictions, namely adding-up, homogeneity in prices and total expenditure and symmetry of the Slutsky equation:

$$\sum_{i=1}^{n}\alpha_i = 1;\ \sum_{i=1}^{n}\gamma_{ij} = 0;\ \sum_{i=1}^{n}\beta_i = 0 \quad ; \quad \sum_{j=1}^{n}\gamma_{ij} = 0 \quad ; \quad \gamma_{ij} = \gamma_{ji}.$$

A further assumption concerning the parameters γ_{ij} is that for the same commodity *i* imports and domestic deliveries are much closer substitutes than is another commodity *j* for commodity *i*. This substitution potential is condensed in these parameters γ_{ij} that can be used to define the price elasticities. An approximation to the uncompensated price elasticity in AIDS can be derived as (s.: Greene and Alston, 1990):

$$\eta_{ij} = \frac{\partial \log C_i}{\partial \log p_j} = \frac{\gamma_{ij} - \beta_i w_j}{w_i} - \delta_{ij}. \tag{8}$$

where δ_{ij} is the Kronecker delta and δ_{ij} = 1 for $i = j$ and δ_{ij} = 0 for $i \neq j$.

The simultaneous treatment of imported and domestic goods within the consumers' choice can be seen as one main deviation from the traditional Armington approach, where imports are determined at the aggregate and in a two step procedure applying the usual separability assumption.

2.2 Other Final Demand

The other final demand components considered are investment (including changes in stocks and inventories) *I* and public consumption *G*. The level of these aggregates is directly linked to savings and taxes according to the closure rule of the model (s. below 2.5) :

$$I = S^{HH} + S^{F} \quad (9)$$

$$G = T \quad (10)$$

Investment is driven by total savings (the sum of households' (S^{HH}) and foreign (S^{F}) savings) and in the case of a balanced public sector budget we have G = T.

Investment and public consumption by commodity *i* is as for consumption given by value shares w_{ii} and w_{ig} for domestic and imported goods:

$$I_i^d = (w_{ii}I)/\, p_i^D \quad (11)$$

$$I_i^M = (w_{ii}I)/\, p_i^{MF} \quad (12)$$

$$G_i^d = (w_{ig}G)/\, p_i^D \quad (13)$$

$$G_i^M = (w_{ig}G)/\, p_i^{MF} \quad (14)$$

These value shares are assumed as independent on prices and fixed. Like in the case of consumption domestic and imported demand is determined in one allocation process.

2.3 Production Structure

Production of all sectors is described in the dual framework starting from a Generalized Leontief (GL) short-run cost function (*SC*) in each industry, which can be seen as a flexible functional form without excessively restricting parameters a priori (s.: Morrison ,1989 and 1990). The capital stock is assumed as fixed and the variable factor inputs *k* are unskilled labour (*L*), skilled labour (*H*), energy (*E*), domestic non-energy intermediates (M^d), imported non-energy intermediates (M^M) and services (*S*) with the corresponding prices p_k and gross output, *X*:

$$SC = X \sum_j \alpha_{kj} (p_k\, p_j)^{½} \qquad k, j = H, L, E, M^d, M^M, S \qquad (15)$$

The input prices p_k are composite good prices (p_i^Q) for energy (*E*) and services (*S*), commodity prices produced and sold domestically (p_i^D) for domestic non-energy intermediates (M^d), import prices (p_i^{MV}) for imported non-energy intermediates (M^M) and wage rates for skilled (w_H) and unskilled labour (*w*). With Shephard's lemma the input demand equations for an input factor x_k are derived in the form of input coefficients (input per unit of gross output *X*):

$$\frac{x_k}{X} = \alpha_{kk} + \sum_j \alpha_{kj} \left(\frac{p_j}{p_k} \right)^{1/2} \qquad (16)$$

The factor demand equation (16) can be further directly used to calculate own and cross price elasticities of factor demand $\varepsilon_{kj} = \partial \log(x_k)/\partial \log p_j$. Concavity restrictions of the underlying cost function imply, that $\Sigma\, \varepsilon_{kj} > 0$ for $i \neq j$ and $\Sigma\, \varepsilon_{kj} = 0$ for all *k* and *j* as well as symmetry of the Hicksian cross price effects. These conditions guarantee negative own price elasticities and are introduced in the GL model by the symmetry restriction on the α_{kj} parameters:

$\alpha_{kj} = \alpha_{jk}$.

In the case of the GL function derivation of elasticities yields:

$$\varepsilon_{kj} = (\alpha_{kj}/2)\, (X/x_k)(p_j/\, p_k)^{½} \qquad \text{for } k \neq j \qquad (17)$$

for the cross price elasticities. The necessarily negative own price elasticities are then simply given from the condition $\Sigma\, \varepsilon_{kj} = 0$.

Once the factor input demands are given from (16) the underlying structure of technical coefficients of the input-output model also changes. The standard treatment of this stage are Leontief aggregation functions with fixed shares $s_{\_,ij}$. Therefore the technical coefficients of the input-output model for domestic (a_{ij}^{D}) and imported products (a_{ij}^{M}) is given by:

$$a_{ij}^{D} = s_{kD,ij} \frac{x_{kj}}{X_j} \qquad ; \qquad a_{ij}^{M} = s_{kM,ij} \frac{x_{kj}}{X_j} \tag{18}$$

This simultaneous determination of the input-output structure by factor demand represents an important general equilibrium feedback effect.

Actually in this study the commodity and sector aggregation has been chosen identical with the factor disaggregation, so that energy, manufacturing (=intermediates) and services are the commodities/sectors of the input-output model. In the input demand functions (16) two of these commodities, namely energy (E) and services (S) are treated at the aggregate level of composite goods ($E^d + E^M$ and $S^d + S^M$) and have to be further allocated by Leontief aggregation functions as in (18). The other two factors of production, domestic and imported non-energy intermediates ($M^d,\ M^M$) are single commodities and therefore treated at the same aggregation level as in the input – output table. Changes in the factor input coefficients of these two factors therefore directly apply to the corresponding technical coefficient in the input-output table.

As (15) represents a short run cost function for fixed capital stock the factor reward coefficient for capital in each sector (r_i) is treated as a residual for given output prices p_i :

$$r_i = p_i - \sum_k \frac{x_k}{X_i} p_k \tag{19}$$

2.4 Foreign Trade

The main deviation from the standard CGE model in the model presented here occurs in the specification of detailed import demand by categories. Imports in intermediate demand of each industry are directly given by the factor input coefficient equation (16) and total intermediate demand imports of a commodity (IM_i^V) might be expressed as:

$$IM_i^V = \sum_j a_{ij}^M X_j \tag{20}$$

Imports in final demand are given from the demand models in 2.1 and 2.2. The *i* commodities there also include imports for each commodity. We must add the import content of exports (EX_i) to that (also considered by fixed import shares w_{iEX}^M) in order to arrive at total final demand imports of a commodity (IM_i^F) :

$$IM_i^F = C_i^M + I_i^M + G_i^M + w_{iEX}^M EX_i \tag{21}$$

Equation (20) and (21) determine total imports $IM_i = IM_i^V + IM_i^F$ and substitute the import function derived from the Armington model traditionally used in CGE models. Total domestic demand of a commodity (Q_i) is then given by total domestic demand produced domestically and by imports. In analogy to imports total domestic demand produced domestically comprises intermediate demand and final demand elements:

$$D_i^V = \sum_j a_{ij}^D X_j \tag{22}$$

$$D_i^F = C_i^D + I_i^D + G_i^D + (1 - w_{iEX}^M)EX_i \qquad (23)$$

Concerning the system of prices the model lined out here has the same structure as the usual CGE model. Given by world market prices we have exogenous export prices p_i^E and final goods (p_i^{MF}) as well as intermediate goods (p_i^{MV}) import prices for commodity *i*. These exogenous prices determine together with the (endogenous) price for commodity *i* produced and sold domestically (p_i^D) the two composite prices in the model. One is the composite good *i* price of total demand p_i^Q (including domestic and imported commodities), the other one is the domestic output price p_i (including domestic and exported commodities). As in the usual CGE model these prices are given by commodity balances for imported, exported and domestic deliveries, but now differentiating between the two types of imports:

$$p_i^Q = \frac{p_i^D D_i + p_i^{MV} IM_i^V + p_i^{MF} IM_i^F}{Q_i} \qquad (24)$$

$$p_i = \frac{p_i^D D_i + p_i^E EX_i}{X_i} \qquad (25)$$

Note that it is assumed that the price for a certain commodity produced and sold domestically (p_i^D) is the same for final and intermediate demand, but not for imports, where the corresponding prices are differentiated (p_i^{MF} and p_i^{MV}) .

The model is complemented by one additional equation that describes export supply, which is usually done by the CET function:

$$EX_i = D_i \left[\frac{1-\gamma_i}{\gamma_i} \left(\frac{p_i^E}{p_i^D} \right) \right]^{\frac{1}{\rho_i - 1}} \qquad (26)$$

For given demand of domestically produced and sold quantities D_i export supply EX_i is a function of relative prices ($\frac{p_i^E}{p_i^D}$), the substitution elasticity (ρ_i) and the share of exports in gross output (γ_i). In this model D_i is determined from the demand side and the commodity balance is closed by the output equation:

$$X_i = EX_i + D_i \tag{27}$$

This can also be seen as a deviation from the standard CGE approach, where the CET function is also used to determine the supply of gross output X_i .The price p_i of this output is chosen as the numéraire.

2.5 Labour Market and Closure Rules

Factor demand for skilled and unskilled labour follows from the input demand equations combined with all variables that determine the output by sector. Full employment in both segments of the labour market requires:

$$\overline{L} = \sum_i l_i(p_E^Q, p_S^Q, p_M^{MV}, p_M^D, w_H, w) X_i \tag{28}$$

$$\overline{H} = \sum_i h_i(p_E^Q, p_S^Q, p_M^{MV}, p_M^D, w_H, w) X_i \tag{29}$$

where l_i and h_i are the input coefficients and $\overline{L}$ and $\overline{H}$ are the respective factor endowments for unskilled and skilled labour. For both types of labour an average wage rate over the sectors is specified which is the equilibrating variable in order to arrive at full employment. Both wage rates w_H and w have to be chosen to guarantee full employment for both types of labour in this model version.

An alternative model version assumes that wages are fixed ($\overline{w}_H, \overline{w}$) and part of each labour force is unemployed (U_L , U_H):

$$\overline{L} = U_L + \sum_i l_i(p_E^Q, p_S^Q, p_M^{MV}, p_M^D, \overline{w}_H, \overline{w})X_i \quad (30)$$

$$\overline{H} = U_H + \sum_i h_i(p_E^Q, p_S^Q, p_M^{MV}, p_M^D, \overline{w}_H, \overline{w})X_i \quad (31)$$

Both model versions arrive at different levels of employment and wage rates in simulations. For the benchmark year the difference is only based on the assumption of full employment or unemployment at given benchmark wage rates.

Factor income determines together with exogenous taxes disposable income of households:

$$YD = \sum_i l_i w X_i + \sum_i h_i w_H X_i + \sum_i r_i X_i - T \quad (32)$$

Households consume and save part of their disposable income, determined by a fixed marginal propensity to consume (*mc*):

$$C = (mc)YD \quad , \qquad S^{HH} = (1 - mc)YD \quad (33)$$

As outlined before total savings determine total nominal investment and consist of households' savings and foreign savings. The closure rule applied is the one of a fixed trade balance and fixed foreign savings (the 'neoclassical closure') according to the benchmark year current account balance :

$$\overline{CA} = p_i^E EX_i - p_i^{MV} IM_i^V - p_i^{MF} IM_i^F = -S^F \quad (34)$$

Investment might change due to changes in savings, i.e. it is savings driven and the real exchange rate adjusts to achieve equilibrium. Nominal disposable income might change with shocks and therefore induce changes in savings and in the real exchange rate. As Robinson

(2004) has pointed out recently this neoclassical closure rule represents one out of four different potential closure mechanisms in a small open economy model. There are two alternative 'Keynesian' closure rules with fixed foreign savings and with fixed investment respectively but without assuming full employment of labour. In this model one of these 'Keynesian' closure rules is applied in alternative simulations, namely the one with fixed foreign savings. In that case also the real exchange rate (and therefore prices) adjusts to achieve equilibrium and a positive macroeconomic shock is able to increase employment together with a simultaneous decrease in the real wage. This type of adjustment is represented here in the model version with fixed wage rates (equation (30) and (31)).

3. Data Base and Calibration

The main database for this model is the recently published input-output table for the year 2000 by Statistics Austria. The data published there also contain complementary information on investment and employment by industries. The sectoral data on employment, wages and unemployment by skills are from the Austrian microcensus.[1] Parameter values for calibration have been taken from recent literature.

3.1 Input – Output Data

Table 1 contains the main variables used in this model from input-output statistics and national accounting. As has been emphasized all deliveries for the different demand

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[1] I am heavily indebted to Andrea Poeschl, who provided these data in the sectoral detail necessary for this study.

categories are fully split up into domestic and imported products. The main relationships for macroeconomic equilibrium can also be taken from the data provided in Table 1. These are:

(i) disposable income as the balance of factor incomes and (exogenous) taxes

(ii) households' savings as the (benchmark year) equilibrium condensed in the propensity to consume

(iii) the current account balance determining foreign savings

As in the year 2000 the public budget was balanced, we have $G = T$ and only households' and foreign savings are relevant for determining investment. One can also observe that intermediate demand is important as a share of total import demand. For manufacturing commodities 54 percent of imports are intermediate demand by industries.

<<<<Table 1: Austrian Input – Output Table 2000 <<<<<<<

3.2 Elasticities

The parameter values for the elasticities are mainly taken from the recent literature. As far as private consumption is concerned there are econometric estimates available for an AIDS model for Austria that have been built into a disaggregated macroeconometric model of the Austrian economy (Kratena and Zakarias, 2001). That includes the income elasticities shown in Table 2 as well as the cross price elasticities in Table 3.

<<<<Table 2: Income Elasticities in Private Consumption <<<<<<<

<<<<*Table 3: Cross Price Elasticities in Private Consumption* <<<<<<<<

The econometric estimation of the AIDS model in Kratena and Zakarias (2001) actually had to be carried out at the level of composite goods only as time series of input-output tables with detailed information about imports in private consumption are not available for Austria. The difference in income elasticities (Table 2) between domestic and foreign goods is therefore approached by taking into account results from aggregate import equations at the level of composite goods (also described in Kratena and Zakarias, 2001). In manufacturing the income elasticitity of imports is considerably higher than for domestic goods and only domestic service demand is more than unitary elastic. Cross price elasticities in private consumption (Table 3) are also derived from a combination of the econometric estimation results for the AIDS model and for import equations in Kratena and Zakarias (2001). The general assumption concerning the latter is that imports and domestic goods are very close substitutes except for services, where no substitution potential is assumed.

For factor demand different recently published studies have been taken into account. Falk and Koebel (2002) present estimation results of the substitution potential between services, domestic and imported non-energy intermediates, energy and labour of three different skill categories for German manufacturing. Tombazos (1999) shows the empirical estimates for substitution elasticities between skilled and unskilled labour, capital and imports for the US. He finds important substitution potential between unskilled labour and imports. This result is not reassured by the estimations of Falk and Koebel (2002), where unskilled labour and imported non-energy intermediates turn out to be complements. Falk and Koebel (2002) attribute this result to the underlying sample of data (1976-1985), where no important increase in imports from newly industrialised countries has taken place. For Austria we have ample evidence on the increase of foreign outsourcing to Eastern Europe during the nineties. The data in Table 1 based on the input-output table for the year 2000 also clearly show the macroeconomic importance of imported intermediates. Therefore the result of a high substitution elasticity between imported intermediates and unskilled labour of Tombazos (1999) has been combined with the other results of Falk and Koebel (2002) in order to arrive at the cross price elasticities of factor demand in manufacturing presented in Table 4. In the other two sectors (energy, services) the parameter values corresponding to the elasticities are assumed to be half of the manufacturing sector values. A high substitution potential according to these figures also exists between high skilled labour on the one hand and unskilled labour, services and domestic non-energy intermediates on the other hand. High skilled labour and imported non-energy intermediates are complements. The main idea about the production process behind these figures is that manufacturing output can either be produced unskilled labour - intensive using domestic resources (services, intermediates) and energy or skilled labour - intensive by outsourcing part of the domestic production and importing intermediates.

<<<<Table 4: Cross Price Elasticities in Factor Demand: Manufacturing <<<<<<

The parameters for the CET functions for exports have been fixed as averages of the parameter data base in Reinert and Roland-Holst (1992).

4. Simulations of Trade Liberalization

In this section the simulation results for trade liberalization in final goods trade and in intermediate goods trade are presented. Each of these simulations is carried out with the two different model versions: (i) 'Neoclassical' closure and (ii) Keynesian closure. Both simulations start from a scenario, where lower trade barriers and lower real trade costs lead to a 10 percent decrease in the import price in domestic currency.

4.1 Final Goods Trade

In the case of final goods trade the import price for final manufacturing goods (p_i^{MF}) decreases by 10 percent. Again in both model versions the equilibrating variable in the price system is the 'real exchange rate'. In the model version with Neoclassical closure the decrease in the import price leads to important substitution processes on the final demand side, especially in private consumption. Consumers' demand for manufacturing imports increases and leads to a decrease in domestic output. The change in output however exerts a feedback effect on imports via intermediate import demand. In the new equilibrium manufacturing imports have increased by 4 percent and manufacturing output as well as domestic manufacturing demand have decreased by 3.2 and 5.6 percent respectively (Table 5).

Table 5: Simulations:10 Percent Import Price Decrease of Manufacturing Final Goods

Feedback effects from input-output links also lead to a slight decrease of service sector output. The positive welfare effect of 1.5 percent is directly calculated as the change in utility derived from the indirect utility function of the AIDS model (equation (1)).[2] Both unskilled and skilled wage rates decrease due to this type of trade liberalization, as domestic output is substituted by imports thereby lowering labour demand.

In the model version with Keynesian closure the model results for welfare and production patterns are almost identical and the negative labour demand impact now translates into an increase of unemployment rates. The unemployment rate for unskilled labour increases by 1.5 percentage point above the benchmark value of 6.5 percent and the unemployment rate for skilled labour by 0.7 percent above the benchmark value of 2.5 percent.

4.2 Intermediate Goods Trade

In the case of intermediate goods trade the import price for intermediate manufacturing goods (p_i^{MV}) decreases by 10 percent. Again in both model version the equilibrating variable in the price system is the 'real exchange rate'. In the model version with Neoclassical closure the decrease in the import price leads to substitution of unskilled labour by imported non-energy intermediates. Imports increase almost by the same as in the final goods trade case, namely by 4.3 percent (Table 6). The production process changes significantly as far as factor inputs are concerned and imported intermediates also partly substitute domestic intermediates, that are complementary to unskilled labour. That explains why manufacturing output is affected negatively and decreases slightly by 0.1 percent. In general the lower input price of imported intermediates creates a factor savings effect for unskilled labour and a cost savings effect in all sectors leading to a 'outsourcing surplus' (Kohler, 2002). That allows the energy and

[2] For this calculation the β_0 parameters have been normalized. Alternatively the change in utility could also have been further translated into the corresponding change in expenditure by calculating Hicks equivalent variation

services sector to expand their production by more than 3 percent. This can be seen as an important feedback effect that can only be captured by a general equilibrium model. It is this general equilibrium feedback that in turn compensates the factor savings effect for unskilled labour allowing for a 1.2 percent unskilled wage increase. The skilled wage rate expands heavily by 11.3 percent, as skilled labour is also complementary to imported intermediates. The welfare effect is still positive (0.2 percent) as in the final goods trade case but much smaller, as import prices for consumption have not changed in this scenario. The positive welfare effect mainly captures the 'outsourcing surplus'.

Table 6: Simulations:10 Percent Import Price Decrease of Manufacturing Intermediate Goods

In the model version with Keynesian closure the model results for welfare and production patterns are different due to different substitution processes in factor demand. Without feedbacks from wages the factor substitution of the decrease in p_i^{MV} is different. The manufacturing sector contracts more (minus 0.7 percent) than in the neoclassical model version and the welfare increase is slightly higher (0.4 percent). Therefore also all general equilibrium feedback effects of the 'outsourcing surplus' are different. Contrary to the neoclassical model version for unskilled labour these feedbacks are not large enough to compensate for the factor savings impact of outsourcing, thereby leading to a 3.2 percentage points rise in the unskilled unemploymemt rate. For skilled labour the positive effects of complementarity with imported intermediates are again at work and lead to an extinction of unemployment in this labour market segment.

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measure.

5. Conclusions

In this paper an alternative static CGE model of a small open economy with different forms of intra-industry trade (final and intermediate goods) was set up. The specification allows for substitution of different factors of production against imported intermediates. The model was specified in two different versions (Neoclassical vs. Keynesian) concerning the full employment assumption. In an empirical application two cases of trade liberalization were distinguished, leading to import price decreases for final goods or for intermediate goods.

The results of the different model simulations reveal important differences of the macroeconomic impact of final goods and intermediate goods trade. Final goods trade significantly rises welfare and hurts labour, both in the neoclassical and in the Keynesian model. Intermediate goods trade creates an 'outsourcing surplus' (Kohler, 2002) due to the cost savings effect, that is able to compensate unskilled labour for the factor savings effect in the neoclassical model. Skilled labour significantly gains from intermediate goods trade both in the neoclasical and in the Keynesian model. Unskilled labour is not compensated by general equilibrium feedbacks from intermediate goods trade in the Keynesian model and the unskilled unemployment rises more than in the final goods trade case in this model version.

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Tables:

Table 1: Austrian Input – Output Table 2000

	INTERMEDIATE	DEMAND				FINAL	DEMAND		
	domestic					domestic			
	E	M	S	TOTAL	C	I	EX	G	OUTPUT
E	2996	1977	3215	8188	3294	-147	882	0	12217
M	256	19321	14106	33682	9524	6181	60222	275	109884
S	1046	17358	53861	72266	76613	27783	15936	38674	231273
	imported					imported			IMPORTS
E	3103	700	715	4517	589	26	0	0	5132
M	316	27452	9690	37458	14603	11604	4992	749	69406
S	56	1577	7791	9424	22	371	11	1	9830
	VALUE	ADDED							
w_H H	2272	19589	69061	90923					
w L	69	3883	12666	16619					
R	2103	18028	60167	80297					

E = Energy, *M* = Manufacturing, *S* = Services, *wL* = unskilled wages, $w_H H$ = skilled wages,

R = Capital Income (residual).

$YD = GDP - T = 148140$

$S^{HH} = YD - C = 43495$

$IM - EX = S^F = 2324$

Table 2: Income Elasticities in Private Consumption

w_{1d}	0,90
w_{1m}	0,50
w_{2d}	0,20
w_{2m}	1,00
w_{3d}	1,11
w_{3m}	1,00

Table 3: Cross Price Elasticities in Private Consumption

	w_{1d}	w_{1m}	w_{2d}	w_{2m}	w_{3d}	w_{3m}
w_{1d}	-0,203	0,159	-0,626	-0,621	0,391	0,000
w_{1m}	0,904	-0,464	-0,843	-0,819	0,721	0,000
w_{2d}	-0,195	-0,050	-1,312	1,210	0,146	0,000
w_{2m}	-0,143	-0,036	0,717	-1,360	-0,177	0,000
w_{3d}	0,010	0,002	-0,064	-0,049	-1,007	0,000
w_{3m}	0	0	0	0	0	-1

Table 4: Cross Price Elasticities in Factor Demand: Manufacturing

	H/X	L/X	E/X	S/X	M^d/X	M^m/X
H/X	-0,878	0,177	-0,028	0,392	0,392	-0,056
L/X	0,894	-1,341	0,112	-0,224	-0,447	1,007
E/X	-0,205	0,162	-0,368	1,026	-0,205	-0,411
S/X	0,406	-0,046	0,145	-0,418	0,058	-0,145
M^d/X	0,398	-0,090	-0,028	0,057	-0,820	0,483
M^m/X	-0,040	0,142	-0,040	-0,100	0,340	-0,303

Table 5:Simulations: 10 Percent Import Price Decrease of Manufacturing Final Goods (percentage difference to benchmark solution)

Neoclassical Closure			
w, unskilled	-2,4		
w_H, skilled	-1,7		
Welfare	1,5		
By Industries	E	M	S
Output	0,5	-3,2	-0,3
Domestic Demand	0,5	-5,6	-0,3
Imports	0,3	4,0	-0,9
Keynesian Closure			
u, unskilled	1,5		
u, skilled	0,7		
Welfare	1,5		
By Industries	E	M	S
Output	0,2	-3,2	-0,6
Domestic Demand	0,2	-5,5	-0,6
Imports	0,1	4,0	-0,9

Table 6:Simulations: 10 Percent Import Price Decrease of Manufacturing Intermediate Goods (percentage difference to benchmark solution)

Neoclassical Closure			
w, unskilled	1,2		
w_H, skilled	11,3		
Welfare	0,2		
By Industries	E	M	S
Output	3,1	-0,1	3,6
Domestic Demand	3,3	0,4	3,9
Imports	2,9	4,3	5,2
Keynesian Closure			
u, unskilled	3,2		
u, skilled	-2,4		
Welfare	0,4		
By Industries	E	M	S
Output	4,8	-0,7	3,7
Domestic Demand	5,2	-1,3	4,0
Imports	4,7	4,7	3,5