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Welfare Impact of Trade Liberalization

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Abstract

This paper constructs a static Applied General Equilibrium Model and analyzes the distributional impact of trade reforms. To calibrate our model, we work with the Household Expenditure Survey to disaggregate household groups by income, age, and skill intensity, and the Input-Output table to construct a Social Accounting Matrix. Our benchmark simulation looks at Slovenia joining the European Union. We then compare with two alternative scenarios: a free trade agreement between Slovenia and the EU, and an alternative fiscal arrangement of distributing tariff revenues under the EU. While trade reforms lead to falling prices in the import sector, rising production in the export sector, and improvement in aggregate welfare, the distributional impacts across household groups vary in its degree. [1]

JEL classification: D58, F14, F15.

Keywords: Trade Liberalization, Free Trade Agreement, Customs Union, Social Accounting Matrix, Household welfare.

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1 Introduction

On May 2004, Slovenia, along with nine other countries, joined the European Union (EU) in its biggest enlargement to date. Accession to the European Union implies, among many other things, an important transformation for the foreign sector of the Slovenian economy. In particular, the accession requires Slovenia to adopt the European Union tariff schedule with the rest of the world, and renounce to its previous tariff structure. In principle, this is implies an enormous trade liberalization reform for Slovenia: it removes all tariffs with its most important trade partner.

While it is widely accepted among economists that liberalized trade improves the aggregate welfare of an economy, it is also understood that it might affect different agents in a dissimilar way. For example, some agents might benefit more than others from free trade, or, more drastically, some people benefit from free trade while others are hurt by it.

The objective of the paper is to analyze the effect of this trade liberalization episode on Slovenian households. We construct a static applied general equilibrium model and include a variety of households, differentiated by their income levels, skills and age. Using several data sources, we construct a Social Accounting Matrix for Slovenia, and we use the information contained in this table to calibrate the main characteristics that define the behavior of the different types of households.

Once the model has been constructed, and all its parameters have been calibrated, we conduct a simple experiment, that we call the "benchmark" experiment, that consists in Slovenia and the European Union simultaneously eliminating the tariffs that they impose on their respective imports. Additionally, at the moment of accession, Slovenia adopts the EU tariff profile with the rest of the world. We then track the changes in consumption patterns and through real income indices are able to identify the welfare gains or losses that arise from this reform.

We find that for Slovenia, consumption goods prices fall in the food and beverage, textile, leather, and transport sectors. However, prices in the primary goods sector, which is subject to large trade diversion from the rest of the world to the European Union, rise. All factor prices increase as a result of trade liberalization, ranging from 1.12% for the rental rate to 1.60% for the wages of unskilled and skilled labor. In terms of welfare, the aggregate consumer welfare increases by 1.42% while the government welfare increases by 2.88%. The larger gain in the government side is partly attributable to the fact that adopting the European Union's protectionist tariff schedule

actually increases the government tariff revenue. Coupled with increases in both the consumer and the government welfare, the social welfare also increases by 1.72%. Looking at disaggregated household groups, while the welfare gains are proportional to the income level, younger households benefit more than the older households and labor earners benefit more than the non-labor earners. For example, the rich old households, who have the highest average income, gains 1.21%, whereas the middle-income young households record higher gains at 1.46%.

To complement the analysis, we perform several additional numerical experiments. In the benchmark numerical experiment, all the elasticities of substitution (for both imports and exports) were assumed to be the same across sectors. We perform a sensitivity analysis with differentiated values for the import elasticities of substitution for each sector, and explore the implications on prices and welfare. We take two sets of values from the literature, one from Hummels (2001) and the other from Rolleigh (2003). The quantitative implications are further amplified for sectors with higher elasticities of substitution. For example, Rolleigh (2003) reports import elasticities of substitution parameter ρ_m to be 0.95 in the food and beverage sector. Compared to the benchmark case where $\rho_m = 0.8$ for all sectors, the prices in the food and beverage sector falls by more than 1.87%, which is 85 percent larger than the magnitude under the benchmark case (-1.01%). Effects on factor prices differ with the changes in the rental rate being 0.47% increase under the elasticities taken from Rolleigh (2003) compared to 1.11% increase under the elasticities taken from Hummels (2001). As for welfare impact, for the elasticities taken from Rolleigh (2003), the effects are smaller, especially for older households relying more on non-labor earnings as a source of their income.

Another experiment looks at an alternative type of trade liberalization for Slovenia. We discover that, by joining the European Union, Slovenia must adopt a tariff schedule that is more protectionist than the one it previously had. This is especially important for the case of primary goods, which Slovenia mainly imports from countries outside the European Union. The numerical experiment that we perform allows Slovenia to mutually eliminate its tariff barriers with the European Union while retaining its tariff schedule with the rest of the world. Under this 'free trade agreement' experiment, the price of primary goods decreases, contrary to the case under the benchmark simulation. In addition, the magnitude of price decrease in the main import sectors are larger, while the increases in factor prices are larger than the benchmark customs union simulation.

Aggregate consumer welfare is approximately 27 percent larger under the free trade agreement than under the customs union case. However, due to tariff revenue loss, government welfare gain is significantly lower. For disaggregated household groups, the patterns are similar to the benchmark case, but the margins differ by age groups. While older households gain between 21 to 24 percent more under the free trade agreement than under the customs union, for younger households, the additional gains range from 27 to 30 percent.

Our final experiment involves a sensitivity analysis on the fiscal arrangements under the trade liberalization. In the benchmark scenario, the government welfare gain is more than twice the level of aggregate consumer gain. We conduct a numerical experiment where all the additional tariff revenues from the rest of the world are re-distributed to the households directly as lump-sum transfers, instead of being added as government revenue. While prices are unchanged from the benchmark scenario, the welfare changes are significant. Aggregate consumer welfare gain of 2.05% is 44 percent higher than the gain recorded under the benchmark scenario and even 13 percent higher than the FTA scenario. Distributional impacts are even more striking as the largest gain is attributed to the poor households, regardless of age differential. Welfare gain for the poor unskilled young households and the poor old households are 2.66% and 2.38%, respectively, which is 40 percent and 57 percent higher than their rich counterparts, making the re-distributive fiscal policy as 'pro-poor' in its stance.

This paper represents a valuable complement to the work originally presented in Cho and Díaz (2008). In that paper, Cho and Díaz (2008) analyze the economy-wide effects of the accession of Slovenia into the European Union, but they make no specific analysis of its impact of the different types of households. In this article, we explicitly model differentiated households and therefore we are able to identify the welfare consequences of trade liberalization on diverse agents. In the literature, Porto (2006), among others, analyze the general equilibrium distributional effects of trade policies using different waves of household survey data to directly estimate the impacts of trade on the prices of different goods and factor inputs. While the purpose is similar, our methodology diverges by combining the household survey data and the social accounting matrix for calibration of the model, and then perform numerical experiments to simulate and directly compare the general equilibrium distributional effects of different trade policies.

The remainder of this paper is organized as follows: Section 2 discusses the sectoral disaggregation that is used, and details the sources and features of the data that are used. Section 3 presents the model, and Section 4 describes the calibration results; Section 5 discusses the results of the benchmark numerical experiment, as well as the results of the additional sensitivity experiments mentioned above; Section 6 presents some concluding remarks, and lays out some possible extensions for future research.

2 Data

2.1 Sectoral Disaggregation

As mentioned earlier, the main objective of this paper is to quantify the impact of these trade liberalization reforms on the different productive sectors and on different household groups. Therefore, an important factor in this analysis is finding the correct level of sectoral disaggregation. We used a variety of criteria (i.e., the relative importance of the sector in the total economy, the level of tariff protection that the sector enjoys, the relative importance of the sector in the total imports or exports, and so on), to determine the number of sectors. The sectoral disaggregation we choose for Slovenia is shown in Table 2.1.

Table 2.1 Sectoral Disaggregation for Slovenia

Slovenia
Primary Goods
Food and Beverages
Leather
Wood and Furniture
Textiles
Transportation Equipment
Other Manufactures
Services

The model presented in the next section is flexible enough that it allows us to use a finer or coarser level of disaggregation than the one we have chosen here, in case a specific sector needs to be highlighted or a more compact aggregation is desired.

2.2 Social Accounting Matrices

The construction of an applied general equilibrium model requires that all the parameters that govern the preferences of the agents and the technologies of the firms, as well as the different tax rates and tariff rates must be numerically specified. In order to calibrate the parameters, we use a Social Accounting Matrix (SAM) for Slovenia. The use of Social Accounting Matrices for applied general equilibrium models is relatively common, and is discussed, for example, in Kehoe (1996).

Our starting point is the Social Accounting Matrix for the year 2001 constructed for Slovenia in Cho and Díaz (2008). Using a variety of data sources, Cho and Díaz (2008) construct a Social Accounting Matrix that disaggregates the Slovenian economy into 8 different production sectors. This SAM, however, treats Slovenian households as a single entity, and provides no explicit information about differentiated households.

In order to disaggregate the household sector into households differentiated by their income, skills and age, we use the Households Budget Survey produced by the Statistical Office of Slovenia. Similarly, the factors of production account is now broken down into three factors: skilled labor, unskilled labor and capital.

2.3 Slovenia Household Budget Survey (HBS)

The Slovenia Household Budget Survey (HBS) for the reference year 2004 contains data on household level income and consumption expenditure for 3725 households. From the survey we categorize the households into 9 groups according to the socio-demographic characteristics: age, income level, and skill level. For age, we divide working households aged 65 and below against retired households aged 65 and above. For income level, we divide into three groups: 1st quartile corresponding to the poorest households, 2nd and 3rd quartiles for middle-income households, and the 4th quartile for the rich 25 percent. Finally, for skill level, we divide working households into skilled versus unskilled. Skilled working households have attained education level higher than post-secondary education, while unskilled households have secondary general education or below. For the share of labor earning, I extract income from work under employment, work under contract, student payment, as well as half of the income from self-employment. The descriptive statistics for the different household groups are shown in the Table 2.2 below, which reports the number of households,

average income as well as the share of labor income in each household group.

Table 2.2 Descriptive Statistics : Slovenian Household Budget Survey

	No. of households	Average Income †	Labor Share
Old poor	314	0.419	0.040
Old middle-income	375	0.817	0.132
Old rich	95	2.129	0.196
Young poor unskilled	594	0.411	0.393
Young poor skilled	24	0.404	0.344
Young middle-income unskilled	1265	0.840	0.633
Young middle-income skilled	222	0.919	0.711
Young rich unskilled	498	1.779	0.722
Young rich skilled	338	2.006	0.799
Total	3725	1	0.586

† Normalized by the total average income.

2.4 Combining Household Budget Survey and Social Accounting Matrix

As for household consumption expenditure, the household survey contains information on more than 70 goods and services. To comply with the sectoral dissagregation made under the Social Accounting Matrix, we aggregate into 8 consumption groups consistent with the sectoral disaggregation made under the Social Accounting Matrix. Since the input-output table deals with productive sectors while the household survey concentrates on consumption expenditures, there are some sectors that needed adjustment. For example, "food" category in the household survey does not have a single corresponding category in the input-output table, and had to be imputed between "primary" and "food and beverage" sectors. The sectoral matching is shown in Figure 1 of the Appendix 1-1. Next, we calculate the share of consumption expenditure in each sectors from the aggregate of the household survey and check whether this matches well with the share of consumption expenditure shown in the Social Accounting Matrix. Given the sectoral matching, the share of expenditures for disaggregated sectors from the Household Survey aggregates and the Social Accounting Matrix turned out to be similar in its pattern as shown in the Table 2.3 below.

Table 2.3 Aggregate Consumption : Household Budget Survey vs. SAM

	Expenditure Survey	Social Accounting Matrix
Primary	8.0%	5.4%
Food and beverage	16.0%	19.4%
Textile	7.0%	5.6%
Leather	1.7%	1.8%
Wood	2.3%	0.1%
Transport	8.9%	6.8%
Other manufacturing	22.5%	20.6%
Service	33.7%	40.4%

Given that the Household Budget Survey enables us to disaggregate household groups by age, income and skill level, we are also interested in the share of expenditure for different household groups. This is shown in the following Table 2.4. For example, we note that poor households and old retired households in general spend more on primary and food and beverages than the rich. On the other hand, rich households spend more on transport equipments. Differences are observed across different skill level. For example, in the young and poor category, skilled households spend insignificant amount on transport while unskilled households spend around 3 percent of the total expenditure on transport equipment. Given that household groups have different composition of consumption basket, price changes due to trade liberalization is expected to have different impact on the household groups.

Table 2.4 Expenditure Shares - Disaggregated Households

	Primary	Food & bev.	Textile	Leather	Wood	Transport	Other man.	Service
Old poor	0.123	0.199	0.047	0.011	0.013	0.022	0.203	0.383
Old mid-income	0.105	0.170	0.056	0.013	0.016	0.043	0.204	0.393
Old rich	0.080	0.160	0.066	0.016	0.018	0.060	0.244	0.356
Yng poor unsk.	0.099	0.187	0.054	0.014	0.016	0.033	0.217	0.379
Yng poor sk.	0.087	0.188	0.103	0.012	0.028	0.002	0.217	0.363
Yng middle unsk.	0.081	0.164	0.072	0.018	0.020	0.088	0.222	0.335
Yng middle sk.	0.073	0.149	0.074	0.020	0.021	0.074	0.244	0.347
Yng rich unsk.	0.067	0.146	0.075	0.019	0.029	0.135	0.226	0.303
Yng rich sk.	0.059	0.138	0.088	0.022	0.031	0.109	0.241	0.311

In the Appendix 1-2, we show the Social Accounting Matrix for Slovenia before disaggregating factor income and consumption by different household groups. Appendix 1-3 and 1-4 show how sectoral factor payments (labor and capital) are distributed to different household groups and how different household groups make consumption expenditures of disaggregated sectors.

3 The Model

3.1 Overview

The model we use is a standard static applied general equilibrium model that follows the tradition of Shoven and Whalley (1984). There are several agents in the Slovenian economy: nine representative consumers (differentiated by their levels of income, skills and age), producers, a domestic government and foreign trade partners. We provide a more detailed explanation of their features below.

3.2 Domestic Production Firms

We assume that the final goods are produced combining a locally-produced component and an imported component. The domestic production firms produce the local component of the final goods. They use intermediate inputs from all sectors in fixed proportions, and also combine capital and skilled and unskilled labor using a Cobb-Douglas technology for output. The production function of the domestic firm producing good i is:

$$y_{i,d} = \min \left\{ \frac{x^d_{1,i}}{a^d_{1,i}}, \ ..., \frac{x^d_{i,i}}{a^d_{i,i}}, \ ..., \frac{x^d_{n,i}}{a^d_{n,i}}, \ \beta_i k_i^{\alpha_{k,i}} \ell_{s,i}^{\alpha_{s,i}} \ell_{u,i}^{\alpha_{u,i}} \right\} \tag{1}$$

with $\alpha_{k,i} + \alpha_{s,i} + \alpha_{u,i} = 1$, $\forall i = 1, ..., n \in \mathsf{G_P}$, the set of production goods; $y_{i,d}$ is the output of the domestic firm i, $x^d_{m,i}$ is the amount of intermediate inputs of good m used in the production of good j, $a^d_{m,i}$ is the unit-input requirement of intermediate good m in the production of good i, and k_i, $\ell_{s,i}$ and $\ell_{u,i}$ are, respectively, the capital, skilled labor and unskilled labor inputs used to produce good i.

3.3 Final Production Goods Firms

The firm that produces the final production good i combines the domestic component with the imported goods using an Armington aggregator of the form:

$$y_i = \gamma_i \left[\delta_{i,d} y_{i,d}^{\rho_{m,i}} + \sum_{f \in \mathsf{T}} \delta_{i,f} y_{i,f}^{\rho_{m,i}} \right]^{\frac{1}{\rho_{m,i}}} \tag{2}$$

where $\sigma_{m,i} = 1/(1-\rho_{m,i})$ is the elasticity of substitution between domestic and imported goods (note that we allow for possibly different elasticities of substitution for different production goods), y_i is the output of the final good i, $y_{i,d}$ is the domestic component in final good i, and $y_{i,t}$ is the imported component from each of the trade partners. Note that when $\rho_{m,i} \to 0$, the production function takes the usual Cobb-Douglas form, i.e., $y_i = \gamma_i \left[y_{i,d}^{\delta_{i,d}} \times \prod_{f \in \mathsf{T}} y_{i,f}^{\delta_{i,f}} \right]$. Finally, imports of good i from country f are subject to an ad-valorem tariff rate $\tau_{i,f}$. The set of production goods will be denoted by $\mathsf{G_p}$.

3.4 Consumption Goods Firms

We assume that the goods that the households purchase are different from the goods that production firms purchase in their intra-industries transactions. In particular, the goods that consumers purchase have a very high service component embedded in them. Therefore, we assume that consumers purchase goods that we label as "consumption goods". The consumption goods firms combine the final production goods using a fixed proportion technology:

$$y_{i,c} = \min \left\{ \frac{x_{1,i}^c}{a_{1,i}^c}, \ ... \ , \frac{x_{i,i}^c}{a_{i,i}^c}, \ ... \ \frac{x_{1,n}^c}{a_{1,n}^c} \right\} \tag{3}$$

where $\{1, 2, ..., n\}$ are the goods in $\mathsf{G_c}$, the set of consumption goods. We make an additional assumption: $x_{i,j}^c = 0$ for $i \neq j, ser$. This implies that the consumption good i firm only uses as inputs final goods of the same sector and services.

3.5 Investment Good Firm

This models includes an investment good in order to account for the savings observed in the data. In a dynamic model, agents save in order to enjoy future consumption. In our static model, agents derive utility from consuming the investment good, just as they derive utility from the consumption goods. The investment good y_{inv} is produced by a firm that combines the final goods as intermediate inputs using a fixed proportions technology, as shown:

$$y_{inv} = \min \left\{ \frac{x_{1,inv}}{a_{1,inv}}, \ \dots, \frac{x_{i,inv}}{a_{i,inv}}, \ \dots, \frac{x_{n,inv}}{a_{n,inv}} \right\} \tag{4}$$

3.6 Consumers

As we previously specified, we disaggregate Slovenian households into 9 different representative consumers, characterized by their income, age and education (see Table 2.2). We denote the set of households by H. The motivation of this disaggregation is to explicitly trace the effects of liberalized trade on the different types of consumers. Household preferences are represented by Cobb-Douglas utility functions defined over the consumption goods and savings. The problem of representative household j is:

$$\begin{aligned} \max \quad & \sum_{i \in \mathsf{G_C}} \theta_i^j \log c_i^j + \theta_{inv}^j \log c_{inv}^j + \sum_{f \in \mathsf{T}} \theta_{inv,f}^j \log c_{inv,f}^j \\ \text{s.t.} \quad & \sum_{i \in \mathsf{G_C}} p_{c,i} c_i^j + p_{inv} c_{inv}^j + \sum_{f \in \mathsf{T}} e_f \bar{p}_{inv,f} c_{inv,f}^j = (1 - \tau_d^j)(w_s \bar{\ell}_s^j + w_u \bar{\ell}_u^j + r \bar{k}^j) \end{aligned} \tag{5}$$

where c_i^j is the consumption of good i by household j, p_c, i is the price of consumption good i; τ_d^j is the direct tax rate imposed on household j, w_s and w_u are, respectively, the wage rate for skilled and unskilled labor, and r is the rental rate of capital; $\bar{\ell}_s^j$, $\bar{\ell}_u^j$, $\bar{k}^j$ are, respectively, the endowments of skilled, unskilled and capital. Note that given our disaggregation of households, we must have that either $\bar{\ell}_s^j > 0$ and $\bar{\ell}_u^j = 0$, or $\bar{\ell}_s^j = 0$ and $\bar{\ell}_u^j > 0$, but any household cannot have a positive endowment of both skilled and unskilled labor.

Since this is a static setup, we model household savings as purchases of the investment good. Then, c_{inv}^j represents the purchases of the investment good by household j, and p_{inv} is the price

of the investment good. Additionally, if Slovenia is running a trade surplus with a trade partner, we model this as household purchases of a foreign investment good (i.e., Slovenian households are saving abroad). Then, $c^j_{inv,f}$ represents the purchases of the investment good from country f by household j, $\bar{p}_{inv,f}$, its price (which is assumed to be exogenous) and e_f is the bilateral real exchange rate.

3.7 The Government

A look at the SAM shows that the Slovenian government makes purchases of goods and also that it runs a fiscal surplus. To account for these observations, we assume that, in the model, the government is an agent that enjoys utility from consuming the production goods and the investment good. Purchases of these goods must be financed by the revenues collected from direct and indirect taxes and tariffs imposed on imports.

The problem of the government is then:

$$\max \quad \sum_{i \in \mathsf{G_p}} \theta^g_i \log c_{ig} + \theta^g_{inv} \log c^g_{inv} \tag{6}$$

$$\text{s.t.} \quad \sum_{i \in \mathsf{G_p}} p_i c^g_i + p_{inv} c_{inv} = \sum_{j \in \mathsf{H}} \tau^j_d (w_s \bar{\ell}^j_s + w_u \bar{\ell}^j_u + r\bar{k}^j) + \sum_{i \in \mathsf{G_p}} t_{p,i} p_{d,i} y_{i,d} + \sum_{i \in \mathsf{G_c}} t_{c,i} p_{c,i} y_{i,c} + \sum_{f \in \mathsf{T}} \sum_{i \in \mathsf{G_p}} \tau_{i,f} e_f \bar{p}_{i,f} y_{i,f}$$

The left-hand side of the budget constraint of the government includes the purchases of goods and the investment good. The right-hand side of the equation includes the tax and tariff revenues: the first term is the direct taxes collected from the income of the nine different households; the second and third terms are the revenues collected from taxing the domestic and consumption goods firms, respectively; the last term represents the tariff revenues collected.

3.8 Foreign Trade Partners

In our model, Slovenia trades with two trade partners: the European Union (EU) and the Rest of the World (ROW). We denote the set of trade partners by $\mathsf{T} = \{\text{EU, ROW}\}$. In each one of these trade partners countries $f \in \mathsf{T}$ there is a representative consumer that purchases imported

goods $x_{j,f}$ from Slovenia, and consumes the local good $x_{f,f}$. If this particular trade partner is running a trade surplus with Slovenia, we model these savings as foreign purchases of the Slovenian investment good $x_{inv,f}$. The problem of the representative household in the foreign country f is

$$\max \quad \left[\sum_{j \in \mathsf{G_P}} \theta_{j,f} x_{j,f}^{\rho_x} + \theta_{inv,f} x_{inv,f}^{\rho_x} + \theta_{f,f} x_{f,f}^{\rho_x} - 1 \right] / \rho_x \tag{7}$$

$$\text{s.t.} \quad \sum_{j \in \mathsf{G_P}} (1 + \tau_j^f) p_j x_{j,f} + p_{inv} x_{inv,f} + e_f x_{f,f} = e_f I_f$$

where τ_j^f is the ad-valorem tariff rate that country f imposes on the imports of good j, ρ_x is the parameter that determines the exports elasticity of substitution σ_x (i.e., $\sigma_x = 1/(1-\rho_x)$), e_f is the bilateral real exchange between Slovenia and country f, and I_f is the (exogenous) income of the household in country f. Note that for the foreign trade partners, we do not make any kind of differentiation.

3.9 Definition of Equilibrium

An equilibrium for this economy is a set of prices for the domestic goods $\{p_{i,d}\}_{i \in \mathsf{G_p}}$; prices for the final goods $\{p_i\}_{i \in \mathsf{G_p}}$; a price for the investment good p_{inv}; prices for the consumption goods $\{p_{c,i}\}_{i \in \mathsf{G_c}}$; factor prices w_s, w_u, r; bilateral exchange rates $\{e_f\}_{f \in \mathsf{T}}$; foreign prices $\{\bar{p}_{i,f}\}_{i \in \mathsf{G_p},\ f \in \mathsf{T}}$; a consumption plan for each type of household $\{c_i^j, c_{inv}^j\}_{i \in \mathsf{G_c},\ j \in \mathsf{H}}$; a consumption plan for the government $\{c_i^g, c_{inv}^g\}_{i \in \mathsf{G_p}}$; a consumption plan for the household in country f $\{x_{i,f}, x_{inv,f}, x_{f,f}\}_{i \in \mathsf{G_p},\ f \in \mathsf{T}}$; a production plan for the domestic good i firm $(y_{i,d}, x_{1,i}^d, ...x_{n,i}^d, k_i, \ell_{u,i}, \ell_{s,i})$; a production plan for the final good i firm $(y_i, y_{i,d}, \{y_{i,f}\}_{f \in \mathsf{T}})$; a production plan for the investment good firm $(y_{inv}, x_{1,inv}, ..., x_{n,inv})$; a production plan for the consumption good i firm $(y_{i,c}, x_{1,i}^c, ..., x_{n,i}^c)$; such that, given the tax rates and the tariff rates:

- The consumption plan $\{c_i^j, c_{inv}^j, c_{inv,f}^j\}_{i \in \mathsf{G_c},\ f \in \mathsf{T}}$ solves the problem of household j.
- The consumption plan $\{c_i^g, c_{inv}^g\}_{i \in \mathsf{G_p}}$ solves the problem of the government.

– The consumption plan $\{x_{i,f}, c_{inv,f}\}_{i\in \mathsf{G_c}}, x_{f,f}$ solves the problem of the representative household in country f .

– The production plan $(y_{i,d}, x^d_{1,i}, ..., x^d_{n,i}, k_i, \ell_{u,i}, \ell_{s,i})$ satisfies

$$y_{i,d} = \min\left\{\frac{x^d_{1,i}}{a^d_{1,i}},\ ...\ , \frac{x^d_{i,i}}{a^d_{i,i}},\ ...\ , \frac{x^d_{n,i}}{a^d_{n,i}},\ \beta_i k_i^{\alpha_{k,i}} \ell_{s,i}^{\alpha_{s,i}} \ell_{u,i}^{\alpha_{u,i}}\right\} \quad \text{and}$$
$$(1+t_{p,i})p_{i,d}y_{i,d} - \sum_{j\in \mathsf{G_p}} p_j x^d_{j,i} - w_u\ell_{u,i} - w_s\ell_{s,i} - rk_i \leq 0,\ = 0 \ \text{ if } \ y_{i,d} > 0$$

– The production plan $(y_i, y_{i,d}, \{y_i, f\}_{f\in \mathsf{T}})$ satisfies

$$p_i y_i - p_{i,d}y_{i,d} - \sum_{f\in \mathsf{T}} (1+\tau_{i,f}) e_f \bar{p}_{i,f} y_{i,f} \leq 0,\ = 0 \ \text{ if } \ y_i > 0$$

where $y_{i,d}$ and $\{y_i, f\}_{f\in \mathsf{T}}$ solve

$$\begin{aligned} \min \quad & (1+t_{p,i})p_{i,d}y_{i,d} + \sum_{f\in \mathsf{T}} (1+\tau_{i,f}) e_f \bar{p}_{i,f} y_{i,f} \\ \text{s.t.} \quad & \gamma_i \left[\delta_{i,d} y_{i,d}^{\rho_{m,i}} + \sum_{f\in \mathsf{T}} \delta_{i,f} y_{i,f}^{\rho_{m,i}}\right]^{\frac{1}{\rho_{m,i}}} = y_i \end{aligned}$$

– The production plan $(y_{inv}, x_{1,inv}, ..., x_{n,inv})$ satisfies

$$y_{inv} = \min\left\{\frac{x_{1,inv}}{a_{1,inv}},\ ...\ , \frac{x_{i,inv}}{a_{i,inv}},\ ...\ , \frac{x_{n,inv}}{a_{n,inv}}\right\} \ \text{ and}$$
$$p_{inv}y_{inv} - \sum_{j\in \mathsf{G_p}} p_j x_{j,inv} \leq 0, = 0 \ \text{ if } \ y_{inv} > 0$$

– The production plan $(y_{i,c}, x^c_{1,i}, ..., x^c_{n,i})$ satisfies

$$y_{i,c} = \min\left\{\frac{x^c_{1,i}}{a^c_{1,i}},\ ...\ , \frac{x^c_{i,i}}{a^c_{i,i}},\ ...\ \frac{x^c_{1,n}}{a^c_{1,n}}\right\} \ \text{ and}$$
$$(1+t_{c,i})p_{i,c}y_{i,c} - \sum_{j\in \mathsf{G_p}} p_j x^c_{j,i} \leq 0,\ = 0 \ \text{ if } \ y_{i,c} > 0$$

– The factor markets clear:

$$\sum_{i\in\mathsf{G_p}} \ell_{u,i} = \sum_{j\in\mathsf{H}} \bar{\ell}_u^j, \qquad \sum_{i\in\mathsf{G_p}} \ell_{s,i} = \sum_{j\in\mathsf{H}} \bar{\ell}_s^j, \qquad \sum_{i\in\mathsf{G_p}} k_i = \sum_{j\in\mathsf{H}} \bar{k}^j$$

– The goods markets clear:

$$\begin{aligned} y_i &= \sum_{j\in\mathsf{G_p}} x_{j,i}^d + \sum_{j\in\mathsf{G_c}} x_{j,i}^c + x_{i,inv} + c_i^g + \sum_{f\in\mathsf{T}} x_{i,f} \\ y_{i,c} &= \sum_{j\in\mathsf{H}} c_i^j \\ y_{inv} &= \sum_{j\in\mathsf{H}} c_{inv}^j + c_{inv}^g + \sum_{f\in\mathsf{T}} x_{inv,f} \end{aligned}$$

– The balance of payments condition for each trade partner country f is satisfied:

$$\sum_{i\in\mathsf{G_p}} e_f \bar{p}_{f,i} y_{i,f} + \sum_{j\in\mathsf{H}} e_f \bar{p}_{inv,f} c_{inv,f}^j = \sum_{i\in\mathsf{G_p}} p_i x_{i,f} + p_{inv} x_{inv,f}$$

4 Calibration

We calibrate the parameters of the model so that, in equilibrium, the agents of the model replicate the same transactions that their counterparts in the real world undertake according to the Social Accounting Matrix. The Appendix contains the values of the calibrated parameters in the model economies. Most of the parameters can be directly calibrated from the SAM. For those parameters that cannot be calibrated from the data, we explain how we chose those values.

Trade Partners' Income. The incomes of the trade partners are extracted from the *International Financial Statistics* published by the International Monetary Fund.

Tariff Rates. The tariff rates that Slovenia impose on the imports from its trade partners are

extracted implicitly from the Input-Output tables. To determine the tariff rates that the trading partners impose on imports from Slovenia, the most recent editions of the *Trade Policy Reviews* by the World Trade Organization are used. The tariff rates imposed by Slovenia and the European Union are shown in Table 4.1 and Table 4.2, respectively. To determine the tariff rates imposed by the "rest of the world", we assume that the tariffs from the rest of the world are a simple average of the tariffs imposed by Japan and the United States.

Table 4.1 Tariff Rates - Slovenia

Sectors	Tariff Rates (%)
Primary	3.0%
Food & Beverages	9.2%
Textiles	1.5%
Leather	2.3%
Wood Products	0.4%
Transport	0.6%
Other Manufactures	0.6%
Services	0.0%

Table 4.2 Tariff Rates - European Union

Sectors	Tariff Rates (%)
Primary	17.2%
Food & Beverages	12.6%
Textiles	9.5%
Leather	2.6%
Wood Products	2.3%
Transport	6.4%
Other Manufactures	5.1%
Services	0.0%

Direct Tax Rates. From the Households Budget Survey we observe that the different types of households pay different amounts of direct taxes to the government. We compute a specific direct tax rate for each type of household as the proportion of disposable income that is destined to direct tax payments. In that sense, the tax rates that we calibrate are *effective* rates, rather than *nominal* rates.

Elasticities of Substitution. Given the static nature of our model, the elasticities of substitution for exports and imports cannot be calibrated directly from the IO tables. Instead, we set different sets of values for these parameters. For our "benchmark" case, we set $\rho_{m,j} = 0.8 \ \forall j \in \mathsf{G_p}$, and $\rho_x = 0.9$, implying elasticities of import and export substitution of 5 and 10, respectively. Additionally, we take two sets of values from the literature, one from Hummels (2001) and the other from Rolleigh (2003) [2]. The values used are the following:

[2]Rolleigh provides estimates for elasticities of substitution for manufacturing industries only. In this case, we use the same value of $\rho_{m,j}$ for the primary goods and services used in the benchmark experiment.

Table 4.3: Slovenia - Import Elasticities of Substitution ($\rho_{m,j}$)

Sector	Hummels (2001)	Rolleigh (2003)
Primary	0.77	0.80
Food & Beverages	0.79	0.95
Textiles	0.84	0.93
Leather	0.89	0.93
Wood Products	0.74	0.91
Transport	0.86	0.91
Other Manufactures	0.82	0.90
Services	0.80	0.80

For all cases, the export elasticity of substitution ρ_x is fixed to be 0.9.

5 Results and Numerical Experiments

This section presents the results from the benchmark simulation, which examines the impact of trade liberalization on prices and welfare of different household groups. For Slovenia, this implies joining the European Union as a full-fledged member. For welfare analysis, we construct a social real income index that uses both the consumer real income index and the government real income index to look at the aggregate welfare index. The consumer real income index is given by $\prod_j c_j^{\theta_j}$, where j ranges over the consumption goods and the investment good. The government real income index is given by $\prod_j c_{g,j}^{\theta_{g,j}}$, where j ranges over the production goods and the investment good consumed by the government. The social real income index is defined as $\prod_j \mathbb{C}_j^{\Theta_j}$, where $\mathbb{C}_j = c_j + c_{g,j}$ and $\Theta_j = \frac{c_j + c_{g,j}}{\sum_j c_j + \sum_j c_{g,j}}$. For welfare analysis of disaggregated households, we only look at the consumer real income index for the specific household group. For the benchmark simulation, we also trace out the overall macroeconomic impact of joining the European Union.

Next, with the benchmark simulation as a reference, we conduct numerical experiments, each of which explores the implications on prices and welfare.

First, we analyze how the benchmark results change when we allow for import elasticities of substitution that are different across sectors (as opposed to a uniform Armington elasticity for all

sectors as in the benchmark case). For sectoral import elasticities, we take estimated numbers from Rolleigh (2003) and Hummels (2001), respectively.

Second, we look at the hypothetical case of Slovenia signing a free trade agreement with the European Union instead of joining the European Union. This experiment could provide a useful comparison on the different types of trade liberalization.

In the benchmark scenario, due to government budget balance assumption, the increase in the tariff revenue from the the rest of the world would increase government expenditure as well as government welfare. In the third experiment, we look at the case where the additional tariff revenues from the rest of the world are lump-sum redistributed to the consumers directly.

5.1 Benchmark Results

Table 5.1 and Table 5.2 below show the percent change in the price of consumption goods and factor prices after Slovenia joins the European Union, respectively. The largest decline in prices takes place in the leather and food and beverages sectors, falling by more than 1 percent. The main import sector, which is transport sector, also shows price decline of 0.87 percent. On the other hand, another main import sector, which is primary goods sector, recorded an increase of 0.62 percent. As for factor prices, wages increase more than the rental rate. Wages of unskilled and skilled labor increase by 1.60 percent while the rental rate increases by 1.12 percent. This has different implications for labor earners vs. rental earners.

Table 5.1 Effect of Customs Union on Consumption Good Prices

	Consumption Good Price
Primary	0.62%
Food & Beverages	-1.01%
Textiles	-0.28%
Leather	-1.23%
Wood Products	0.29%
Transport	-0.87%
Other Manufactures	0.07%
Services	0.71%

Table 5.2 Effect of Customs Union on Factor Prices

	Factor Price
Rental rate	1.12%
Wage (unskilled)	1.60%
Wage (skilled)	1.60%

For production, domestic production increases in the primary, textile, transport, and other manufacturing sectors. The largest gains are recorded in the textile and transport sectors, increasing by 31.71 percent and 21.57 percent, respectively. The effects on exports and imports are large for Slovenia, with exports to and imports from the European Union increasing by 46.66 percent and 31.47 percent, respectively. However, adopting European Union's tariff policy causes trade to be diverted from the rest of the world as exports declines by 11.73 percent and imports decreases by 4.87 percent. On the other hand, government tariff revenues from the rest of the world increases by a significant 290 percent.

Finally, we look at the welfare impact of joining the European Union. Table 5.3 shows the percent change in aggregate welfare as well as disaggregated household groups. For aggregate welfare, we report the overall consumers' welfare gain and the government's welfare gain, as well as the social gain which is a weighted sum of consumer and government welfare. Note that in Slovenia, the total tariff revenue increases by around 4% as the country adopts the protectionist tariff policy of the European Union. This is due to the fact that despite elimination of tariff revenues from the European Union, the tariff revenue from the rest of the world explodes by more than 290 percent. While the aggregate consumer welfare increases by 1.42 percent, the government welfare increases even more by 2.88 percent. The overall social welfare also shows an increase of 1.72 percent. For disaggregated household groups, we report the gain in consumer welfare for each group. Young households benefit more than old households, as younger households rely more on labor earnings with increases in wage rates outweighing the increase in rental rate. As a result, the old rich group, which has the highest average income, has less gain than any of the younger household groups, even young and poor households. In addition, the increase in consumer welfare is proportional to income level, while the relation to skill intensity is mixed. For middle and high-income households,

there is not much difference in welfare gains between skilled and unskilled households. However, it's interesting to note that young, poor, and skilled households gain less than the unskilled counterpart.

Table 5.3 Effect of Customs Union on Welfare

Welfare	Change
Aggregate Consumer Welfare	1.42%
Government Welfare	2.88%
Social Welfare	1.72%
Old poor	1.07%
Old middle-income	1.11%
Old rich	1.21%
Young poor unskilled	1.28%
Young poor skilled	1.21%
Young middle-income unskilled	1.46%
Young middle-income skilled	1.46%
Young rich unskilled	1.54%
Young rich skilled	1.55%

5.2 Sector-by-Sector Elasticity of Import Substitution

Table 5.4 and Table 5.5 below show the percent change in the price of consumption goods and factor prices after Slovenia joins the European Union, respectively, when the Armington elasticities of import substitution are differentiated sector by sector, rather than set uniformly for all sectors, as in the benchmark simulation. Due to differentiated elasticities, the results on consumption good prices are mixed. For example, in the textile sector, one of the main trade sectors, the signs of price changes are sensitive to the elasticities chosen. As for factor prices, the rental rate changes are more sensitive to the choices of elasticities than the wages of skilled and unskilled labor.

Table 5.4 Effect of Customs Union on Consumption Good Prices ($\sigma_{mi} \neq \sigma_{mj}$)

	Consumption Good Price	
	"Rolleigh" elasticities	"Hummels" elasticities
Primary	0.78%	0.68%
Food & Beverages	-1.87%	-0.97%
Textiles	0.07%	-0.30%
Leather	-0.77%	-1.29%
Wood Products	0.45%	0.31%
Transport	-0.13%	-0.84%
Other Manufactures	0.35%	0.08%
Services	0.62%	0.69%

Table 5.5 Effect of Customs Union on Factor Prices ($\sigma_{mi} \neq \sigma_{mj}$)

	Factor Price	
	"Rolleigh" elasticities	"Hummels" elasticities
Rental rate	0.47%	1.11%
Wage (unskilled)	1.42%	1.53%
Wage (skilled)	1.42%	1.52%

Table 5.6 shows the percent change in aggregate welfare as well as disaggregated household groups. For aggregate welfare, we report the overall consumers' welfare gain and the government's welfare gain, as well as the social gain which is a weighted sum of consumer and government welfare. For disaggregated household groups, we report the gain in consumer welfare for each group. For different household groups, we find larger differences in welfare gain among old households than for younger households. This may be due to the fact that the changes in the rental rate under "Rolleigh" elasticities are less than half the magnitude under "Hummels" elasticities.

Table 5.6 Effect of Customs Union on Welfare ($\sigma_{mi} \neq \sigma_{mj}$)

	Welfare Change	
	"Rolleigh" elasticities	"Hummels" elasticities
Aggregate Consumer Welfare	1.06%	1.37%
Government Welfare	0.67%	2.70%
Social Welfare	0.98%	1.65%
Old poor	0.55%	1.06%
Old middle-income	0.60%	1.10%
Old rich	0.67%	1.20%
Young poor unskilled	0.93%	1.24%
Young poor skilled	0.88%	1.18%
Young middle-income unskilled	1.14%	1.41%
Young middle-income skilled	1.16%	1.40%
Young rich unskilled	1.20%	1.48%
Young rich skilled	1.25%	1.49%

5.3 Free Trade Agreement vs. Customs Union

In this section, we look at the hypothetical case of Slovenia signing a free trade agreement with the European Union, instead of joining the European Union as a full member. This implies that Slovenia and the European Union eliminate their tariffs on each other, while Slovenia retains its own tariff policy with the rest of the world, instead of adopting the tariff policy of the European Union. This comparison could provide a useful insight on the welfare effects of different trade liberalization arrangements. Table 5.7 and Table 5.8 below show the percent change in the price of consumption goods and factor prices after Slovenia joins the European Union, respectively. The largest decline in prices takes place in the leather and food and beverages sectors, falling by more than 1 percent. The main import sector, which is transport sector, also shows price decline of 0.87 percent. For main import sectors, the degree of price decline under the hypothetical free trade agreement scenario is larger than the case of joining the customs union. In addition, the other main imports, primary sector, now records a small decline in its price, as compared to an increase

shown under the benchmark simulation. As for factor prices, wages increase more than the rental rate. Compared to the benchmark case, all factor prices increase by a larger margin. Wages of unskilled and skilled labor increase by 2.09 percent and 2.08 percent, respectively, while the rental rate increases by 1.34 percent. On average, consumers would enjoy higher income and face lower prices in their consumption goods under the free trade agreement than under the customs union scenario.

Table 5.7 Effect of FTA on Consumption Good Prices

	Consumption Good Price
Primary	-0.17%
Food & Beverages	-1.17%
Textiles	-0.68%
Leather	-1.14%
Wood Products	0.32%
Transport	-1.09%
Other Manufactures	-0.03%
Services	0.90%

Table 5.8 Effect of FTA on Factor Prices

	Factor Price
Rental rate	1.34%
Wage (unskilled)	2.09%
Wage (skilled)	2.08%

Table 5.9 shows the percent change in aggregate welfare as well as disaggregated household groups. For aggregate welfare, we report the overall consumers' welfare gain and the government's welfare gain, as well as the social gain which is a weighted sum of consumer and government welfare. For disaggregated household groups, we report the gain in consumer welfare for each group. Compared to the benchmark case, the consumer welfare increases more under free trade agreement. The consumer welfare increase under the free trade agreement is approximately 27% larger than under the customs union. However, the increase in government welfare is significantly less than under the customs union case, reflected in the government tariff revenue loss. The overall

social welfare also shows an increase of 1.62%, slightly less than the customs union scenario. For disaggregated household groups, the patterns are similar to the benchmark case with higher gains for all household groups. However, the margins differ by age groups. For older households, the gains under the free trade agreement ranges between 21 to 24 percent. For younger households, the gains are larger ranging from 27 to 30 percent. In addition, among older households, the additional gains are inversely related to income. For poor and old households, the additional gain in welfare (24 percent more gain than the benchmark case) under the free trade agreement is larger than the rich counterparts (21 percent).

Table 5.9 Effect of FTA on Welfare

Welfare	Change
Aggregate Consumer Welfare	1.80%
Government Welfare	0.92%
Social Welfare	1.62%
Old poor	1.33%
Old middle-income	1.37%
Old rich	1.47%
Young poor unskilled	1.63%
Young poor skilled	1.58%
Young middle-income unskilled	1.86%
Young middle-income skilled	1.87%
Young rich unskilled	1.96%
Young rich skilled	1.99%

5.4 Tariff Revenue Rebate under Customs Union

In the benchmark simulation, we notice that by joining the European Union and adopting European Union's tariff rates, the tariff revenues from the rest of the world increases significantly by around 290 percent. As a result, total tariff revenues will increase as well. In this section, we consider a hypothetical case where this additional tariff revenues from the rest of the world are instead lump-sum redistributed to the consumers directly. By passing on the revenues to the consumers directly, this experiment could provide an alternative policy insights on the welfare effects of different fiscal

arrangements under trade liberalization framework. Table 5.10 and Table 5.11 below show the percent change in the price of consumption goods and factor prices, respectively. Compared to the benchmark simulation, we note that rebating tariff revenues to households makes no significant change in the prices of consumption goods nor different factor prices.

Table 5.10 Effect of Customs Union with Rebate on Consumption Good Prices

	Consumption Good Price
Primary	0.62%
Food & Beverages	-1.01%
Textiles	-0.28%
Leather	-1.22%
Wood Products	0.29%
Transport	-0.86%
Other Manufactures	0.07%
Services	0.70%

Table 5.11 Effect of Customs Union with Rebate on Factor Prices

	Factor Price
Rental rate	1.11%
Wage (unskilled)	1.58%
Wage (skilled)	1.59%

Table 5.12 shows the percent change in aggregate welfare as well as disaggregated household groups. For aggregate welfare, we report the overall consumers' welfare gain and the government's welfare gain, as well as the social gain which is a weighted sum of consumer and government welfare. For disaggregated household groups, we report the gain in consumer welfare for each group. We note that the lump-sum rebate policy has a more significant impact on the aggregate consumer welfare. The increase of 2.05 percent under the rebate policy is 44 percent higher than the gain under the benchmark scenario, and even 13 percent higher than the free trade agreement scenario. Government welfare gain, on the other hand, is lower than both the benchmark and the free trade agreement scenario. However, the overall gains are the highest under this alternative fiscal policy scenario, with gains of 1.79 percent. This is 4 percent higher than the benchmark case and 10.5

percent higher than the free trade agreement case. The effect on disaggregated households are more interesting under the rebate scenario. The group that receives the largest gain in welfare are the poor households, namely, the old poor, young poor unskilled, and young poor skilled households, implying that the fiscal arrangement is pro-poor in its re-distributive stance. For the old and poor households, the welfare gain of 2.38 percent is more than 2.2 times the gain recorded under the benchmark scenario. In addition, benefits are accrued more on unskilled households than on skilled counterparts with the gap declining as income grows.

Table 5.12 Effect of Customs Union with Rebate on Welfare

Welfare	Change
Aggregate Consumer Welfare	2.05%
Government Welfare	0.80%
Social Welfare	1.79%
Old poor	2.38%
Old middle-income	1.82%
Old rich	1.52%
Young poor unskilled	2.66%
Young poor skilled	2.20%
Young middle-income unskilled	2.21%
Young middle-income skilled	2.14%
Young rich unskilled	1.90%
Young rich skilled	1.87%

6 Conclusions

This paper analyzes the potential distributional effects of Slovenia joining the European Union as a full member. Using a calibrated Applied General Equilibrium Model as our tool of analysis, we provide quantitative measures of the effects of these trade liberalization policies on prices and welfare of the domestic disaggregated consumer groups.

It is important to note that this paper abstracts from several issues. Among others, due to the static nature of the model, this paper is not designed to capture the dynamic aspects of trade

liberalization policies. Thus, some important issues of trade liberalization reforms, such as capital flows, foreign direct investment, and productivity gains and losses across sectors are beyond the scope of this paper. Adding dynamic features to the model would help shed light on these issues and capture the long term effects that these types of trade liberalization reforms encompass.

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Appendix 1-1 Sectoral Matching of Consumption

Figure 1: Sectoral Matching of Consumption : Social Accounting Matrix vs. Household Budget Survey

SAM 8 sector	HH survey		
Primary	0.0110	Food	**(only one half imputed)**
Food & Beverage	0.0110	Food	**(only one half imputed)**
	0.0120	Non alcoholic beverages	
	0.0200	Alcoholic, tobacco	
	0.1110	Restaurant meal	
Textile	0.0310	Clothing	
	0.0520	Household textiles	
Leather	0.0320	Footwear	
Wood product	0.0510	Furniture and furnishings, carpets and other floor coverings	
Transport	0.0710	Purchase of vehicles	
Other manufacture	0.0431	materials for the maintenance and repair of the dwelling	
	0.0530	household appliances	
	0.0540	Glassware, tableware and household utensils	
	0.0550	Tools and equipment for house and garden	
	0.0560	Goods and servies for routine household maintenance	
	0.0610	Medical products, appliances and equipment	
	0.0720	Operation of personal transport equipment	
	0.0812	Telephone and telefax equipment	
	0.0910	audio-visual, photographic and information processing equipment	
	0.0920	Other major durables for recreation and culture	
	0.0930	other recreational items and equipment, gardens and pets	
	0.0950	newspapers, books and stationery	
	0.1210	personal care	
	0.1220	personal effects	
Service	0.0410	Rentals for housing	
	0.0432	services for maintenance and repair of the dwelling	
	0.0440	water suppy services	
	0.0450	electricity, gas and other fuels	
	0.0620	Outpatient services	
	0.0630	Hospital services	
	0.0730	Transport services	
	0.0811	Postal services	
	0.0813	Telephone and telefax services	
	0.0940	recreational and sporting services	
	0.0960	package holidays	
	0.1000	Education	
	0.1120	Accomodation services	
	0.1230	social protection	
	0.1240	insurance	
	0.1250	Financial services	
	0.1260	other services	

Appendix 1-2 Social Accounting Matrix

APPENDIX 1-1 - SOCIAL ACCOUNTING MATRIX SLOVENIA 2001, current prices, Million USD

		Production								Consumption								L	K	C	G	I	X			TOTAL
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8						Total	EU	ROW	
Production	1	335.3	387.9	15.2	19.2	57.1	0.4	166.6	430.5	375.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	46.1	21.7	24.4	1,833.4
	2	0.0	611.6	6.0	0.0	3.3	0.4	10.9	593.6	0.0	1,607.7	0.0	0.0	0.0	0.0	0.0	0.0				0.0	29.6	346.2	62.3	283.9	3,209.4
	3	6.9	0.0	740.6	0.0	1.4	19.3	103.0	157.2	0.0	0.0	436.1	0.0	0.0	0.0	0.0	0.0				2.1	0.0	638.9	498.0	140.8	2,105.6
	4	1.8	10.6	18.4	81.1	5.2	1.3	46.5	31.3	0.0	0.0	0.0	148.1	0.0	0.0	0.0	0.0				0.0	0.0	161.4	117.3	44.1	505.8
	5	3.7	1.3	0.8	0.0	188.3	4.8	97.3	73.7	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0				0.0	0.0	282.7	216.4	66.3	656.3
	6	2.4	0.4	0.0	0.0	0.5	589.5	0.0	223.8	0.0	0.0	0.0	0.0	0.0	570.2	0.0	0.0				0.0	491.8	1,199.9	1,092.2	107.7	3,078.6
	7	173.2	198.0	35.6	26.7	37.6	537.3	5,237.6	2,636.9	0.0	0.0	0.0	0.0	0.0	0.0	1,054.5	0.0				233.0	1,632.3	6,599.7	4,353.7	2,246.0	18,402.4
	8	222.2	624.9	170.6	34.7	59.7	199.4	1,684.1	7,572.3	156.7	488.5	143.3	38.6	2.5	157.2	876.4	3,288.4				3,780.1	2,556.9	2,030.7	1,428.1	602.6	24,087.2
Consumption	1																			**592.0**						592.0
	2																			**2,144.4**						2,144.4
	3																			**613.5**						613.5
	4																			**196.4**						196.4
	5																			**7.7**						7.7
	6																			**747.7**						747.7
	7																			**2,273.0**						2,273.0
	8																			**4,463.0**						4,463.0
L		**188.2**	**300.0**	**286.7**	**78.4**	**123.6**	**134.5**	**2,194.6**	**7,601.0**																	**10,907.1**
K		**413.9**	**181.8**	**54.2**	**18.5**	**42.2**	**68.2**	**1,227.0**	**4,145.4**																	**6,151.1**
Households																		10,907.1	6,151.1							17,058.2
Government		-23.7	351.4	84.3	27.8	3.1	177.5	766.9	-504.9	60.2	48.2	34.1	9.7	1.7	20.3	342.2	1,174.6									2,573.3
Direct Tax																				1,497.2						1,497.2
Indirect tax		-39.1	301.7	74.1	22.7	2.6	168.8	726.4	-505.0	60.2	48.2	34.1	9.7	1.7	20.3	342.2	1,174.6									2,443.1
Tariff	**TOTAL**	15.4	49.7	10.2	5.1	0.5	8.6	40.6	0.1																	130.2
	EU	8.8	34.5	8.0	3.9	0.4	7.8	32.2	0.1																	
	ROW	6.6	15.2	2.2	1.2	0.1	0.8	8.4	0.0																	
Capital																				4,523.4	55.3		132.0	845.6	-713.6	4,710.6
IM	**TOTAL**	509.5	541.4	693.2	219.3	134.2	1,345.8	6,867.8	1,126.5																	11,437.7
	`	291.2	375.8	541.9	167.7	103.3	1,214.2	5,288.4	652.8																	8,635.3
	ROW	218.3	165.5	151.3	51.6	30.9	131.6	1,579.4	473.7																	2,802.4
TOTAL		1,833.4	3,209.4	2,105.6	505.8	656.3	3,078.6	18,402.4	24,087.2	592.0	2,144.4	613.5	196.4	7.7	747.7	2,273.0	4,463.0	10,907.1	6,151.1	**17,058.2**	4,070.5	4,710.6	11,437.7	8,635.3	2,802.4	

1	Primary	**L**	payment to labor
2	Food & beverages	**K**	payment to capital
3	Textile	**C**	Final consumption
4	Leather	**G**	Government expenditure
5	Wood products	**I**	Final investment
6	Transport equipments	**X**	Exports
7	Other manufacturing	**IM**	Imports
8	Service	**EU**	European Union
		ROW	Rest of the world

Appendix 1-3 Social Accounting Matrix - Factor Income

		PRODUCTION							
		Primary	Food &Bev	Textile	Leather	Wood prod.	Transport	Other man.	Service
Labor Input		**188.2**	**300.0**	**286.7**	**78.4**	**123.6**	**134.5**	**2,194.6**	**7,601.0**
Old	Poor	0.4	0.7	0.7	0.2	0.3	0.3	5.2	18.2
	Middle-income	3.5	5.6	5.3	1.5	2.3	2.5	40.8	141.2
	Rich	3.4	5.4	5.2	1.4	2.2	2.4	39.8	138.0
Young	Poor unskilled	8.3	13.2	12.6	3.4	5.4	5.9	96.3	333.7
	Poor skilled	0.3	0.5	0.4	0.1	0.2	0.2	3.4	11.6
	Middle-income unskilled	58.0	92.4	88.4	24.2	38.1	41.4	676.2	2,342.1
	Middle-income skilled	12.5	19.9	19.0	5.2	8.2	8.9	145.8	504.9
	Rich unskilled	55.1	87.8	84.0	23.0	36.2	39.4	642.6	2,225.7
	Rich skilled	46.7	74.4	71.1	19.5	30.7	33.4	544.4	1,885.7
Capital Input		**413.9**	**181.8**	**54.2**	**18.5**	**42.2**	**68.2**	**1,227.0**	**4,145.4**
Old	Poor	34.0	14.9	4.4	1.5	3.5	5.6	100.7	340.1
	Middle-income	71.4	31.4	9.3	3.2	7.3	11.8	211.7	715.2
	Rich	43.6	19.2	5.7	2.0	4.5	7.2	129.4	437.1
Young	Poor unskilled	39.8	17.5	5.2	1.8	4.1	6.6	118.0	398.5
	Poor skilled	1.7	0.8	0.2	0.1	0.2	0.3	5.1	17.1
	Middle-income unskilled	104.8	46.0	13.7	4.7	10.7	17.3	310.6	1,049.4
	Middle-income skilled	15.9	7.0	2.1	0.7	1.6	2.6	47.0	158.8
	Rich unskilled	66.2	29.1	8.7	3.0	6.7	10.9	196.2	662.9
	Rich skilled	36.6	16.1	4.8	1.6	3.7	6.0	108.4	366.3

Appendix 1-4 Social Accounting Matrix - Household Consumption

		C	Consumption								
			Old			Young					
			Poor	Middle-income	Rich	Poor		Middle-income		Rich	
						Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled
CONSUMPTION	**Primary**	**592.0**	44.6	76.2	26.6	62.3	3.8	169.8	30.6	102.9	75.2
	Food &Bev	**2,144.4**	128.8	219.4	93.8	213.2	14.4	626.8	114.2	414.2	319.6
	Textile	**613.5**	19.4	46.3	24.6	38.6	5.1	177.3	36.3	135.8	130.1
	Leather	**196.4**	6.0	13.9	7.6	13.3	0.7	56.2	12.6	44.7	41.4
	Wood prod.	**7.7**	0.2	0.5	0.3	0.5	0.0	1.9	0.4	2.1	1.8
	Transport	**747.7**	8.6	31.7	18.2	21.8	0.1	210.8	33.9	254.2	168.3
	Other man.	**2,273.0**	95.4	195.5	109.4	183.3	12.4	630.4	138.7	482.2	425.9
	Service	**4,463.0**	243.7	518.2	209.3	416.9	28.1	1243.6	262.3	842.7	698.0

Appendix 2 Calibrated Parameters

Table A1. Preference Parameters (θ) - Aggregate Consumer and Government

	Consumer	Government
Primary	0.0380	0.0000
Food & Beverages	0.1378	0.0000
Textiles	0.0394	0.0005
Leather	0.0126	0.0000
Wood Products	0.0005	0.0000
Transport	0.0480	0.0000
Other Manufactures	0.1461	0.0572
Services	0.2868	0.9287
Investment Good	0.2907	0.0136

Table A2. Preference Parameters (θ) - Old households

	Old poor	Old middle-income	Old rich
Primary	0.07	0.0547	0.0335
Food & Beverages	0.2023	0.1576	0.1179
Textiles	0.0305	0.0333	0.031
Leather	0.0094	0.01	0.0096
Wood Products	0.0003	0.0004	0.0003
Transport	0.0136	0.0228	0.0229
Other Manufactures	0.1498	0.1404	0.1376
Services	0.3827	0.3723	0.2633
Investment Good	0.1414	0.2085	0.384

Table A3. Preference Parameters (θ) - Young households

	Poor		Middle-income		Rich	
	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled
Primary	0.0544	0.0589	0.0384	0.0354	0.0294	0.0275
Food & Beverages	0.1862	0.2223	0.1416	0.1319	0.1184	0.1168
Textiles	0.0337	0.0785	0.04	0.0419	0.0388	0.0476
Leather	0.0116	0.0111	0.0127	0.0145	0.0128	0.0151
Wood Products	0.0004	0.0008	0.0004	0.0005	0.0006	0.0007
Transport	0.0191	0.0011	0.0476	0.0391	0.0727	0.0615
Other Manufactures	0.16	0.1919	0.1424	0.1601	0.1378	0.1557
Services	0.364	0.4355	0.2809	0.303	0.2408	0.2552
Investment Good	0.1706	0.0	0.2959	0.2736	0.3487	0.32

Table A4. Domestic Goods Firm Parameters (α, β)

	α	β
Primary	0.6875	4.9155
Food & Beverages	0.3774	15.5485
Textiles	0.1589	10.7697
Leather	0.1911	7.8275
Wood Products	0.2546	8.8326
Transport	0.3364	24.3702
Other Manufactures	0.3586	9.6259
Services	0.3529	5.6021

Table A5. Armington Aggregators (γ, δ)

	γ	δ_{dom}	δ_{EU}	δ_{ROW}
Primary	2.8647	0.4028	0.3072	0.29
Food & Beverages	2.7933	0.4221	0.3126	0.2653
Textiles	2.8242	0.4018	0.3371	0.2612
Leather	2.9223	0.3771	0.348	0.2749
Wood Products	2.6693	0.4354	0.3162	0.2484
Transport	2.7735	0.3937	0.3694	0.2368
Other Manufactures	2.8469	0.3941	0.3395	0.2664
Services	2.2782	0.5126	0.2515	0.2359