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THE IMPACT OF EU-ACCESSION ON THE ESTONIAN TRADE WITH FOOD PRODUCTS – PARTIAL EQUILIBRIUM APPROACH

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THE IMPACT OF EU-ACCESSION ON THE ESTONIAN TRADE WITH FOOD PRODUCTS – PARTIAL EQUILIBRIUM APPROACH

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Abstract

The purpose of the paper is to analyse the impact of EU-accession on the Estonian food sector from the point of view of potential changes in foreign trade. Estonia has followed radical macroeconomic reforms in the 1990's and is well known by its extremely liberal trade policy including the complete absence of tariffs and quantitative restrictions.

Therefore the accession to the EU means for Estonia radical change in the trade policy regime. The most affected will be trade with food products and eventually this will cause deep changes in the Estonian agriculture. Estonia has to implement EU common external tariffs against third countries and on the other hand EU food market will be opened to Estonian exporters. In addition Estonia has to implement against third countries the whole system of non-tariff trade barriers required by EU (export subsidies, tariff quotas, sanitary requirements and etc).

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In general the analysis presented in this paper tries to quantify the effects of trade liberalisation from EU side and growing protectionism against third countries on the Estonian trade with food products. Due to a low prices and protection level at present, many food prices are expected to rise. However, this rise in prices and the consequent increase in production and export depend on the competitiveness of in Estonian products on the markets in the present EU member states.

Since January 2000 Estonia already implemented limited tariffs on food products against third countries. Implementation of partial equilibrium analyses allowed to show that trade diversion has taken place as a result of it — the import from third countries has been partly driven out by the import from the European Union and the countries Estonia has free trade agreements with. In the case of some agricultural products it can be supposed that the price increase in imports has also influenced Estonian producer and retail prices. In using of partial equilibrium model the agricultural sector is disaggregated into the dairy, meat and cereals markets. This allows incorporate into the analysis the specific characteristics of different products.

JEL classification: F15, F19

Keywords: Economic integration, agricultural trade, economic welfare

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Introduction

Since 1998 Estonia is negotiating about the joining with the European Union (EU). This means that EU membership will become one of the key factors in Estonian economy. Membership of the EU requires among others also the adoption of the principles of the EU such as external trade policy defined by the EU as the Common Commercial Policy. Also Estonia has to apply other trade-related policies such as competition policy, Common Agricultural Policy, steel and coal policy. For Estonia, as a small open economy, the changes in foreign trade situation will have an important impact on the whole economy.

The aim of this paper is to discuss and quantify the effect of accession to the EU and the accompanying implementation of import-related measures on economic welfare in Estonia using the static partial equilibrium model. Trade in agricultural and processed food products has been taken as an example as the share of food products makes up in average over 30 percent in total consumer expenditure in Estonia. Section 2 gives some theoretical background. Next section explains the relevant features of Estonia's integration with the EU. Section 4 discusses briefly theoretical viewpoints and reviews some of the empirical studies which address the issues of static effects in EU integration process. Section 5 outlines the methodology for the quantitative analysis. Section 6 gives the characteristics of data used. Section 7 discusses the results of the study. Section 8 concludes and gives some policy implications.

1. Theoretical background

Although the EU goes far beyond a traditional customs union (CU) when it comes to agriculture, the trade-related aspects of Estonia's integration can still be considered in the framework of customs union theory. Since the pioneering work of Jacob Viner

(1950), it has been commonly agreed upon among economists that customs unions can be both welfare increasing and welfare decreasing.

The principal impact of joining a CU would be to abolish all tariffs on trade between the CU members and to replace the external tariff of each of the countries with the common external tariff of the CU. Also the abolishment of export subsidies can be treated analogously with implementation of tariffs as it alters the price of imports. The literature on international trade and economic integration traditionally distinguishes between two kinds of effects of customs union, the so-called static and dynamic gains[4]. The static efficiency gains are welfare gains that exert themselves primarily through their influence on prices[5]. These price changes in turn lead to the creation and/or diversion of trade. Both of these are expected to have an effect on allocative efficiency (Molle and van Mourik, 1990). The impact of regional integration is expressed as the change in country's welfare (the changes in consumer surplus, producer surplus and tariff revenue).

Trade creation refers to the replacement of relatively high-cost domestic production with lower-cost imports from the partner country when tariffs are reduced to zero within a CU (Nicholls, 1998). Previously employed resources in the given industry are assumed to be re-employed in relatively competitive sectors (so-called production effect). The consumers in home country gain from the substitution of lower-cost for higher-cost goods, a

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[4] Baldwin and Venables (1995) and Baldwin et al. (1997) give a new direction in the theory of economic integration, distinguishing between allocation and accumulation effects (which basically capture static and dynamic effects) and adding location effects as a new element.

[5] Dynamic effects of trade liberalisation do not exert their influence through prices, but through the introduction of new products and improved production methods, the diffusion of new technologies, increased competition, economies of scale etc. (see e.g., Molle and van Mourik, 1990).

phenomenon called consumption effect (Robson, 1998). However, preferences granted to partner country may also result in the displacement of relatively efficient non-partner production by the less efficient partner production. This loss in efficiency (and in tariff revenue) is called "trade diversion". Hence, the net effect of formation of CU on static efficiency is ambiguous, depending on the magnitudes of trade creation and trade diversion effects. In general, the higher is the initial tariff level between integrating countries and the lower is the common external tariff, the more probable is the net increase in welfare.

Although the abolishment of EU export subsidies, concomitant to the introduction of the CET, yields in higher import prices, this cannot be purely considered as the increase in inefficiency. The question lays more on fair competition, as Estonia does not subsidise its agricultural production and trade. Nevertheless, as a result, the consumers will be faced with higher prices.

The analyses of the previous enlargements of the EU have been concentrated on static effects of integration (see Balassa, 1975; Georgakopoulos, 1994; Hine, 1989; Molle and van Mourik, 1990; Ponte Ferreira, 1993; Sapir, 1992). These have been mostly *ex post* analyses, using the methods of structural coefficients, income-elasticity of import demand and share of imports in consumption (for the review of different methods used, see for instance, Mayes, 1978 and Jones, 1985). Most of the *ex ante* studies on integration effects (which are made prior to integration) have measured static effects using partial and computable general equilibrium models and gravity models (see e.g. Corado and de Melo, 1985 and 1986; de Rosa, 1998 and the studies cited therein). Plummer (1991), on the other hand, has estimated trade creation and diversion for Spain and Portugal joining the European Community using the import-demand regression approach. These studies, in general, conclude that static welfare effects of EU integration are moderate, and higher impact yields if also dynamic effects are taken into account.

In the last years, the studies about the impact of EU accession on the welfare of Central and East European countries (CEECs)

have become more frequent (see Baldwin et al., 1997; Curzon Price, 1999). It has been found that in the case of EU membership, the CEECs will become more liberal with respect to foreign trade. Hence the welfare will increase. But there are some exceptions as agriculture and textiles where the welfare is predicted to decrease. Nevertheless, these studies only look at the effects of integration qualitatively (Curzon Price, 1999) or measure the real income effects on the CEECs as a whole (and on other regions) using a calibrated general equilibrium model (Baldwin et al., 1997).

The results of these studies do not generally hold in the case of Estonia, where movement towards more protectionism is expected. In the next sections, the impact of adopting the CET and the removal of EU export subsidies on Estonian economic welfare is quantitatively analysed.

2. The changes in Estonian foreign trade regime: preliminary assessment

Accession to the EU will imply the following changes in Estonia's trade regime in agricultural and food products:

- elimination of all tariffs and levies on imports of all products between Estonia and the EU;
- elimination of EU export subsidies on agricultural exports to Estonia;
- adoption of the Common External Tariff (CET) on imports from third countries.

Since Estonia does not apply tariffs on imports that originate from the EU countries, the first requirement will cause no difficulties. At the same time, joining the EU also means free access to the EU for Estonian agricultural and food products, under conditions set by the Common Agricultural Policy (CAP) of the EU[6]. Export of agricultural and processed food products has

[6] According to the European Agreement, other goods originating from Estonia are tariff-free to enter the EU market.

been restricted by tariffs and quotas into the EU market so far, although preferential treatment has been granted (see Varblane, 2000).

As a consequence of very expensive agricultural policy, the prices of agricultural products in EU internal market exceed, in most cases, the world market prices. In other cases, direct income payments are made. Where these products are exported to Estonia, the difference between EU internal market price and world market price has been covered by export subsidies. This has made the products from the EU artificially cheaper compared to internal market prices. According to the principles of common market, these measures have to be abolished with Estonia's accession to the EU. This implies that imports from the EU become more expensive. On the other hand, if Estonia's accession to the EU also implies the adoption of CAP, the prices of domestically produced goods are expected to converge to the level of EU administrative prices set by CAP. In most cases, these are higher than the producer prices currently in Estonia.

In general following changes could be expected in Estonian trade with food products in the process of joining with EU (see number on the Figure 1 accordingly):

1. Tariffs are implemented on third countries (non EU and not free trade agreement with Estonia). But tariffs are used only in few articles and their rates are lower than EU common external tariff accordingly.
2. Food products import from third countries (US, Canada, Australia, Russia etc.) are becoming more expensive and trade is diverted to the import from EU and free trade partner countries (Poland, Hungary, Ukraine etc.).
3. EU is abolishing export subsidies on food export to Estonia. It is resulting in price increase of food import from EU.
4. By many food items import is restored from third countries which products are now cheaper than EU products..
5. After joining with EU the complete list of external tariffs will be implemented by Estonia resulting in new reorientation of food import from third countries to EU member countries.

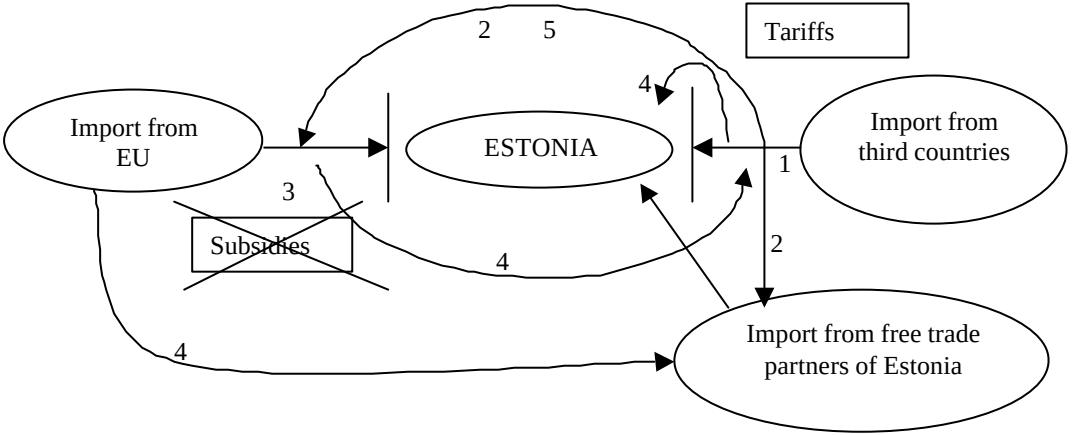

Figure 1. Change in Estonian trade with food products prior joining with EU.

The first stage of the process was passed already as since January 2000 Estonia adopted some tariffs on food import from third countries with which Estonia had no free trade agreements. The applied tariff rates were low and the number of positions relatively limited compared with EU (see Table 1).

But even such a limited implementation of tariffs caused obvious trade diversion. On the Figure 2 the structure of import by certain cereals is presented by three groups of countries — EU, free trade agreement partners of Estonia and third countries to whom tariffs were applied starting from January 2000. Especially significant is the influence of tariffs on wheat, rye, barley and proceeded oats: the import shares of countries to which tariffs were applied have declined to virtually zero in 2000 compared to 1999. In the case of wheat and rye the import share of countries subject to tariffs was over 50% in 1999 and 0% in 2000. In general the third countries share in total import and the total volume of import in tons has decreased in every single product group to which tariffs were applied (there is only one exception: residuals of cereals proceeding).

The decrease in absolute value of third countries import is presented in Table 2. It is notable that the increase in EU import has been as high as the decrease in third countries' import: accordingly +98% and –96% (the total weighted growth has been 48% for cereals imports). As well as on the general case, the total value of import of wheat, rye, barley and proceeded oat has been positive for European Union and negative for imports from countries under tariff.

In the case of milk products the import from the third countries (import under tariffs) has fallen by a quarter within period 1999 up to the end of 2000. At the same time the import from all other countries has increased and total import has increased as well (see Table 3).

Most clearly trade diversion effect can be seen in the import of butter and condensed milk. In the import of butter the total replacement has taken place (Figure 3). In the case of condensed

Table 1

The rates of import tariffs and export subsidies

Commodity	WTO binding tariffs for Estonia (%)	Actual tariff used by Estonia since 1.1.2000 (%)	Weighted average tariff rate of the EU* (%)	EU export subsidy**, Jan.- Febr. 2001 (EEK/t)
Beef	33	33	73	2520
Pork	33	25	30	0
Poultry	42	42	97	0
Milk	27	0	37	7518
Wheat	32	15	77	207
Rye	59	59	70	728
Rice	20	0	134	3536
Sugar	20	0	62	5617

Sources: Estonian Ministry of Agriculture (2000, 2001a), Commission Regulations (EC) No 66/2001, No 152/2001, No 355/2001, No 386/2001, No 403/2001, No 463/2001, No 478/2001 and No. 2261/98; author's calculations.

Notes: * Specific tariffs are transferred into *ad valorem* tariffs, based on prices of imports from third countries to Estonia in 2000.

** Applied to EU exports to Estonia.

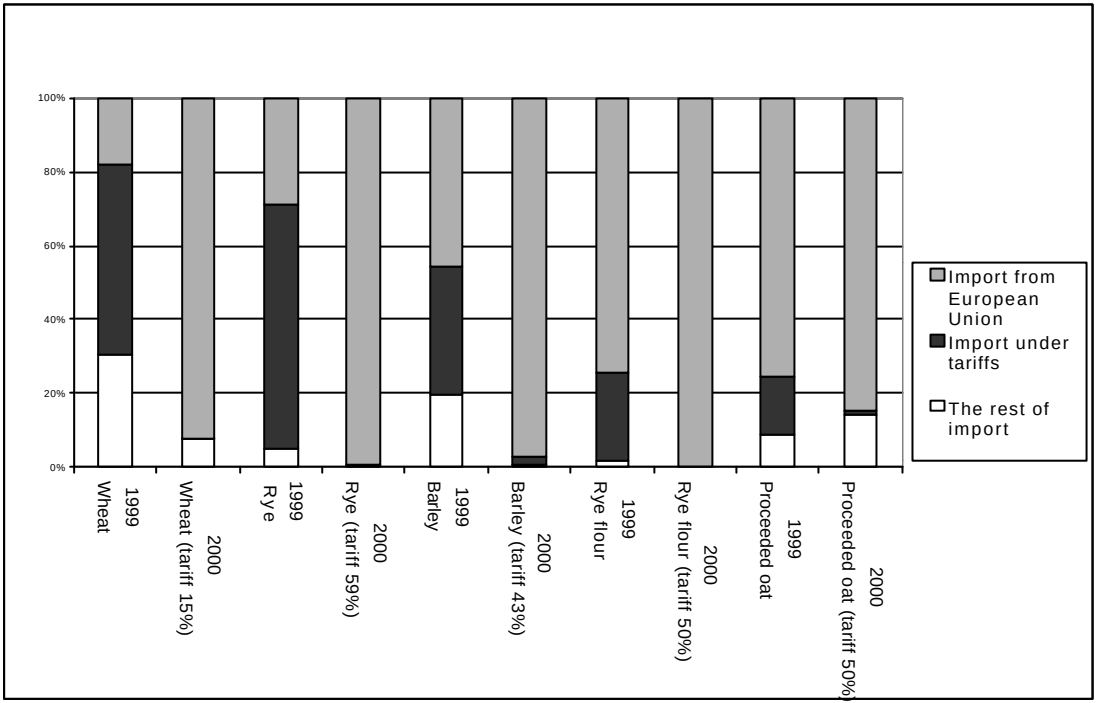

Figure 2. Change in import of cereals into Estonia after introduction of tariffs in 1.1.2000

Table 2

Changes in Cereals and Proceeded Cereals (CNN 1001–1108) Import by Country Groups 1999–2000

	Value (th. of EEK)		Share (%)		Change in Value 2000/1999 (%)
	1999	2000	1999	2000	
Import under tariffs	52662	1888	16.6	0.4	–96.4
Import from European Union	206617	408320	65.2	87.1	97.6
The rest of import	57847	58684	18.2	12.5	1.4
Total import	317126	468892	100.0	100.0	47.9

Source: Data of Estonian Ministry of Agriculture, authors' calculations.

Table 3

Changes in Import of Milk Products by Country Groups 1999–2000

	Value (th. of EEK)		Share (%)		The Change in Value (%)
	1999	2000	1999	2000	
Import under tariffs	47311.2	35645.8	21.9	13.3	–25
Import from European Union	122125.6	138174.3	56.4	51.5	13
The rest of import	47039.0	94281.5	21.7	35.2	100
Total	216475.8	268101.6	100.0	100.0	24

Source: Data of Estonian Ministry of Agriculture, authors' calculations.

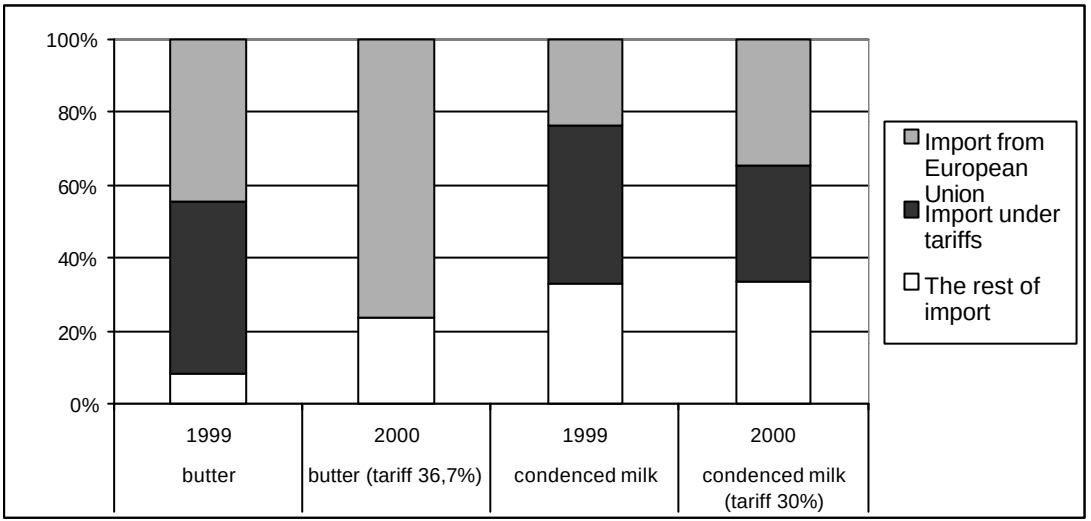

Figure 3. Change in import of certain milk products into Estonia after introduction of tariffs in 1.1.2000.

milk the import from European Union has partially replaced the import from third countries and at the same time import from other countries has stayed mostly the same.

The same is about the import of meat products. The relative changes in import costs show that the import of meat products from third countries has been replaced at the same rate with the import from European Union (Table 4).

In the case of poultry the import from third countries has been partially driven out by import from European Union. Import of prepared or preserved meat from the East-European countries has totally replaced the import from third countries (Figure 4).

Therefore it has been shown that due to the introduction of tariffs on Estonian food import some trade diversion has taken place already. Import from third countries has been replaced partially or totally by the import from European Union or from the other countries. The replacement rate depends mostly on the price differences.

The more serious changes are to be considered by the application of Estonia the common external tariffs of EU by full range combined with the elimination of EU export subsidies. It will involve a significant increase in tariffs on imports from third countries. Based on Estonia's import shares, the average tariff for agricultural products is expected to raise to more than 10 percent compared with current average tariff level of 0.57 percent[7]. This refers that Estonia will become a relatively protectionist economy in food sector. Although the CET has been falling over time in the framework of GATT and its successor WTO, the protection in agriculture has been and is expected further to remain relatively high in the EU.

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[7] The weighted average import tariff for the EU for 1997–2001 is obtained from European Commission Regulations. The weighted average tariff for Estonia is calculated by dividing the tariff revenue collected in 2000 by the value of imported agricultural products in 2000 (source: Estonian Ministry of Agriculture, 2001).

Table 4

Changes in Import of Meat Products by Country Groups in 1999–2000

	Value (th. of EEK)		Share (%)		The Change in Value (%)
	1999	2000	1999	2000	
Import under tariffs	155191.0	84564.6	31.42	13.08	–46
Import from European Union	251802.4	362207.9	50.98	56.04	44
The rest of import	86960.0	199559.2	17.6	30.88	33
Total	493953.4	646331.7	100.0	100.0	31

Source: Data of Estonian Ministry of Agriculture, authors' calculations.

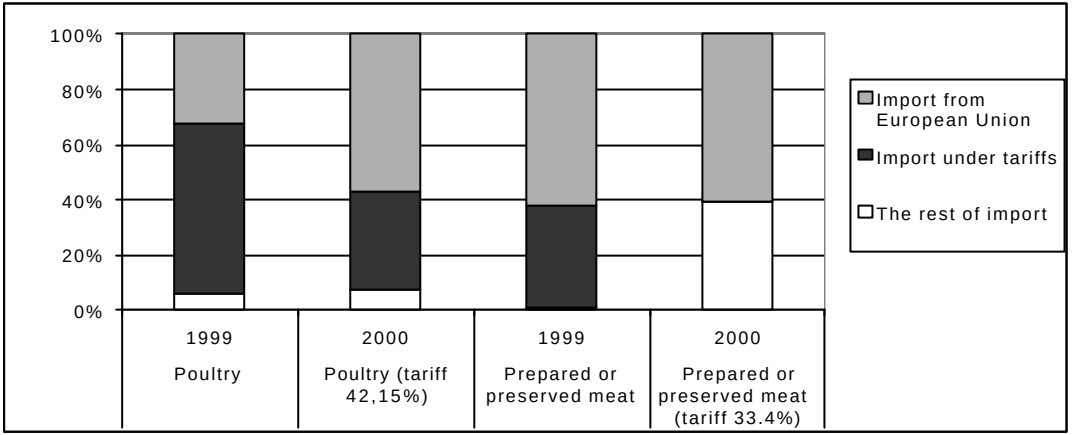

Figure 4. Change in import of certain meat products into Estonia after introduction of tariffs in 1.1.200

Hence, there are in principle, three kinds of factors that are expected to lead to the overall price increase in Estonia. First of all, imports from third countries become more expensive due to adopting the CET, leading to shift in demand towards imports from the EU[8]. On the other hand, also imports from the EU become more costly after removing the export subsidies. This implies, under normal conditions, an overall increase in import prices and decrease in imported quantities, leading to higher demand for domestic products that compete with imports. But the adoption of EU administrative prices predetermined by CAP will bring along the increase also in price level of domestically produced goods. The beneficiaries of this development will be Estonian producers, but their gains will probably not compensate the loss that Estonian consumers suffer. Furthermore, the EU will collect tariff revenue, and not the individual member states themselves. Therefore, the net loss in economic welfare due to changes in import regime is expected to occur in Estonia.

A few studies have analysed the impact of joining the EU on Estonia's trade pattern and economic welfare. Among these are the contributions by Fock 2000; Varblane 2000 and Varblane et al., 2000. Fock studies the effects of integrating Estonian agricultural sector into the EU, but he does not distinguish between the effects of adopting CET and other factors of integration. He finds that according to different scenarios, the consumer welfare in Estonia is expected to decrease by 0.22–1.78 bn EEK in 2003. Varblane (2000) gives a qualitative assessment to adopting the CET, and expects trade diversion effects to predominate over trade creation effects, hence, the welfare to decrease. Varblane et al. (2000) study quantitatively the effects of raising Estonian tariffs on imports to the bounding level agreed within the WTO. Their approach assumes perfectly substitutable products and concludes, that the adoption of tariffs in January 2000 was highly trade diverting. Unfortunately, because none of

[8] The CET of the EU equals, in principle, to the internal market price minus the world market price.

these studies deals with the same questions as the current study, the results are difficult to compare.

3. Methodology

As a basis for the *ex ante* estimation of static welfare effects related to Estonia's integration with the EU, the traditional partial equilibrium model is used. Partial equilibrium model enables to estimate the impact of changes in prices as a result of economic integration *ceteris paribus* on economic welfare. The welfare effects are defined as the amounts of money that the producers win, consumers lose, government gets as revenue and the whole society loses due to the rise in price that reduces the demand (so-called deadweight loss). Thereat only market of one commodity is taken into account. A proper measurement of integration effects requires that all factors that affect trade flows other than these related to integration be kept "aside". The impossibility of doing this implies that any attempt to quantify the impact of integration involves strong assumptions, and the results are therefore necessarily questionable.

The model assumes linear supply and demand curves. The complementarity and substitution relations between different commodity types are disregarded (the prices of other commodities are assumed to be neutral). Having ruled out substitution between different types of commodities, it is assumed that commodities are consumed in some fixed proportion which is independent of the structure of relative prices. The model also neglects the effects of changes in income (for the critique and alternatives of this approach, see for instance, Nicholls 1998: 327). The exchange rate is expected to remain constant.

As Estonia is small country, it is assumed that it faces infinite import supply elasticities. This ensures that any changes in tariffs will be reflected entirely in import prices. However, the accuracy of the ex ante forecasts of trade effects heavily depends on the reliability of the price elasticities that are used. For simplicity, the consumption is considered as a sum of final con-

sumption and a consumption of production inputs. When computing the increase in prices, the changes in input prices do not affect the prices of domestic production as they are, roughly, taken into account already in the changes in import prices.

The final demand by consumers can be analysed as a two-stage process.[9] First, the consumers decide how much to spend on each commodity group. Having ruled out the interdependence between different commodity groups (see assumptions above), this stage will be simply neglected in the following analysis.

In the second stage, the consumers decide how much to spend on domestic versus aggregate imports. The new price of imported goods will be computed as a trade weighted average of prices of imports from different countries. The changes in import price of good i from country j (due adopting the EU *ad valorem* tariff t_{ij}^{EU} on import of good i from country j, or equivalently, due abolishment of export subsidies in respective amount) are computed as follows:

$$\frac{\Delta P_{ij}^{m}}{P_{ij}^{m}} = \frac{1+t_{ij}^{EU}}{1+t_{ij}^{E}} \qquad (1)$$

if Estonia implied an *ad valorem* tariff t_{ij}^{E} on imports of good i from a country j; and

$$\frac{\Delta P_{ij}^{m}}{P_{ij}^{m}} = \left(1+t_{ij}^{EU}\right) \qquad (2)$$

if there was no tariff implied before.

[9] Based on constant elasticity of substitution (CES) utility function (see e.g. de Melo, Robinson , 1985; Rousslang, Suomela, 1993).

The aggregate imports become now relatively expensive compared to home country production (see Figure 5)[10]. Nevertheless, the effect of this change in tariff has on the price of domestically produced good (of the same commodity category) is what determines its domestic resource allocation. If the imported and domestically produced goods are perfect substitutes, then the price of domestically produced good will also increase since there is no reason to sell domestic products for lower price than the (average) price of competitors. On the other hand, if the goods are imperfect substitutes (i.e. differentiable by the country of origin), the price of domestic good may not change by the same proportion as that of the import (Kapuscinski, Warr, 1999: 259). This will shift demand from foreign production towards home production, and the average consumer price will be lower than in previous case. The shift in demand depends on the substitutability between domestic and imported sources of supply, commonly referred as Armington elasticity (see for instance, de Melo, Robinson, 1985; Welsch, 2001).

In Figure 5, the increase in the price of imports lowers the expected import quantity from M_0 to M_2. The rise in import price shifts the demand curve for the domestic substitute, D^d_0, outward to D^d_1. The shift in demand raises the price of domestic goods from P^d_0 to P^d_1, and the domestic output increases to D_1. The increase in price of domestic products can be expressed as follows:

[10] The following analysis heavily relies on Rousslang and Suomela, 1993.

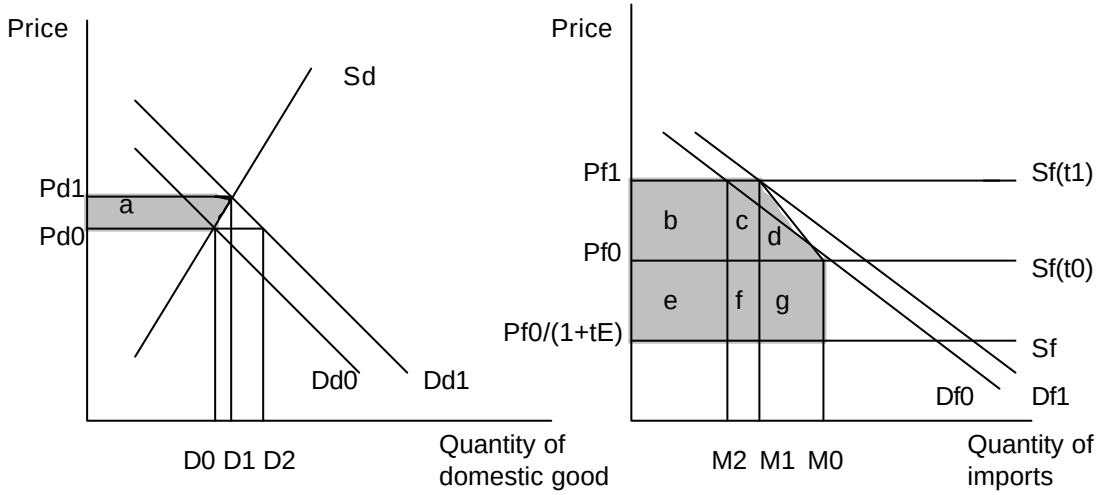

Figure 5. The partial equilibrium model of the effects of changes in prices when domestic and imported goods are differentiated.

$$\frac{P_1^d}{P_0^d} = \left(\frac{P_1^f}{P_0^f} \right)^{\frac{h_{df}}{e_{dd} - h_{dd}}}, \tag{3}$$

where h_{df} denotes cross price elasticity of demand for domestic product with respect to change in price of imports, h_{dd} the (own) price elasticity of demand for domestic product, and e_{dd} the price elasticity of domestic supply, whereas:

$$\frac{D_2}{D_0} = \left(\frac{P_1^f}{P_0^f} \right)^{h_{df}}, \tag{4}$$

$$\frac{D_1}{D_2} = \left(\frac{P_1^d}{P_0^d} \right)^{h_{dd}} \text{ and} \tag{5}$$

$$\frac{D_1}{D_0} = \left(\frac{P_1^d}{P_0^d} \right)^{e_{dd}}. \tag{6}$$

The rise in the price of domestic product, on the other hand, causes the demand for imports, D^f_0, to shift upward to D^f_1. The new consumption of imported goods will be in quantity M_1 instead of M_2, whereas:

$$\frac{M_2}{M_0} = \left(\frac{P_1^f}{P_0^f} \right)^{h_{ff}} \text{ and} \tag{7}$$

$$\frac{M_1}{M_2} = \left(\frac{P_1^d}{P_0^d} \right)^{h_{fd}}, \tag{8}$$

where h_{ff} denotes the price elasticity of demand for imports (with respect to the change in import price) and h_{fd} denotes the cross elasticity of demand for imports with respect to the price of the domestic substitute.

The consumers' welfare will be affected in both domestic and import market. In domestic market, the decrease in consumer surplus equals the area *a* in the Figure 1:

$$\Delta CS^d = \left(P_1^d - P_0^d\right)\left(D_0 + D_1\right)/2 \ . \tag{9}$$

This can be expressed through elasticities as follows:

$$\Delta CS^d = P_0^d D_0 \left[\left(\frac{P_1^f}{P_0^f}\right)^{\frac{h_{df}}{e_{dd}-h_{dd}}} - 1\right]\left[\left(\frac{P_1^f}{P_0^f}\right)^{\frac{e_{dd}h_{df}}{e_{dd}-h_{dd}}} + 1\right]/2 \ . \tag{10}$$

In the import market, the consumer surplus decreases by the area $b + c + d$:

$$\Delta CS^f = \left(P_1^f - P_0^f\right)\left(M_0 + M_1\right)/2 \ , \tag{11}$$

expressed using the elasticities as:

$$\Delta CS^f = \left(\frac{P_1^f}{P_0^f} - 1\right) P_0^f M_0 \left[\left(\frac{P_1^f}{P_0^f}\right)^{\frac{h_{ff}+h_{fd}h_{df}}{e_{dd}-h_{dd}}} + 1\right]/2 \ . \tag{12}$$

The total change in consumer surplus is the sum of ΔCS^f and ΔCS^d. The loss in efficiency for the whole economy (deadweight loss) is the sum of changes in consumer surplus (area $a + b + c + d$), domestic producer surplus (area a) and tariff revenue (area $b + c + e + f$ minus area $e + f + g$). Taking into account the fact that in the EU, all tariff revenue will be allocated to the common budget, the deadweight loss equals the area ($b + c + d + e + f + g$), which can be calculated as the sum of the change in consumer surplus in import market and the initial tariff revenue:

$$DWL = \Delta CS^f + \left(\frac{t^E}{1+t^E}\right) P_0^f M_0 \ . \tag{13}$$

4. Data characteristics

8 commodity groups were analysed: beef, pork, poultry, milk, wheat, rye, rice and sugar. The statistical data about consumption, imports, production (exports excluded), prices and tariffs in Estonia used in the analysis is obtained from the databases of Estonian Ministry of Agriculture and Estonian Statistical Office. A problem frequently encountered in welfare analyses is that the commodity classifications used to aggregate traded goods often do not correspond to the classification used for domestic production and consumption. For the purpose of estimation, a data set from the original data was constructed, consisting of quantities and prices of imports subdivided into sectors corresponding to the classification of commodities in consumption and domestic production reviews. The year 2000 was chosen as a base year, assuming for simplicity that the economic relations will not change considerably when CET has to be implemented and EU export subsidies removed relative to the situation in 2000[11].

It is assumed that the common external tariff and export subsidies of the EU will remain unchanged for the time Estonia becomes a member. The data for EU tariffs and export subsidies were obtained from the European Commission Regulations. The tariffs for a given commodity group were calculated as a weighted average of tariffs implied to different subgroups (on three-digit SITC classification) from different sources. Where there was a specific tariff in the EU, this was transformed to the *ad valorem* tariffs. The formula used for that is:

$$AT = 100 \cdot \frac{10 \cdot ST}{IP \cdot E}, \qquad (14)$$

where: AT - *ad valorem* tariff, ST - specific tariff per 100 kilo of import (EURO), E the exchange rate (1 EEK = 1/15.6466 EURO), IP the price of 1 ton import in EEK.

[11] Still, this is very questionable assumption since in transition country as Estonia, the economic environment can change considerably within a short time period.

The price elasticity estimates for demand for composite product and domestic supply used in this analysis are based on the results of case study about Estonia done by Fock (2000). The linear demand and supply functions are not constant elasticity functions, but a simplification has been made assuming that the price elasticity of the linear function is constant on a section that is short enough.[12] [13]

As there are no studies that have estimated the own-price and cross-price elasticities of demand for Estonia, the approximations have been used as suggested in Haley (1995):

$$h_{dd} = -S_f s + S_d h \ , \tag{15}$$

$$h_{df} = S_f (s + h) \ , \tag{16}$$

$$h_{ff} = -S_d s + S_f h \ , \tag{17}$$

$$h_{fd} = S_d (s + h) \ , \tag{18}$$

where S_f and S_d denote the expenditure share of imports and domestic supply in total consumption, respectively ($S_f + S_d = 1$), and $ç$ is the price elasticity of demand for a given product (composite of imports and domestically produced sub-

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[12] This statement holds only, if the change in price or in quantity is very small. The larger the change, the larger will be the error. Therefore, instead of using point approximations for the elasticities, the following formula is used (as suggested by Rousslang and Suomela, 1993): $\frac{Q_1}{Q_0} = \left(\frac{P_1}{P_0} \right)^{(e)}$, where Q the quantity, P the price of a given good, $å$ the price elasticity.

[13] Still, as argued by Goldstein and Khan (1985), the price elasticity of demand for imports will be larger for large price changes than for small price changes. However, as the evidence on this effect is somewhat mixed, it is assumed here that the price elasticities are constant.

stitutes). *ó* denotes the elasticity of substitution between domestically produced and imported goods.

As suggested in the literature (see e.g. Corado and de Melo, 1985; Kapuscinski and Warr, 1999), the substitution elasticities between imported and domestically produced competing goods range from 0 to 3. On the other hand, the imports and domestic production in agricultural products are often considered as perfect substitutes (see e.g. Rutherford et al., 1997; Goldstein and Khan, 1985), implying that the substitution elasticity should be infinitive and the domestic prices adjust entirely to the changes in import prices. The actual data, nevertheless, shows intra-industry trade flows in agriculture, suggesting that there must some degree of differentiability between products from different origin. Therefore, different values for *ó* are taken to build up different scenarios with respect to the domestic price feedback: 1, 4 and infinity (i.e. the case of homogeneous goods)[14] (see Annex 2 for review of elasticity values).

The elasticities calculated according to the equations (12)–(15) vary proportionally with the value of *ó*. As pointed out in Goldstein and Khan (1985) and Tyers and Anderson (1989), trade elasticities show considerably higher values in long run. This suggests that the outcomes with higher *ó* (and, hence, higher degree of homogeneity) should be taken as more reliable. The fact that small open countries show large domestic price feedbacks also supports this argument (see Goldstein and Khan, 1985).

[14] In case of rice and sugar, where domestic production is missing, it is assumed that these products are perfecty heterogeneous.

5. Results and discussion

The main results of the analysis are given in Table 5[15]. As the table reveals, the decrease in consumer surplus is expected to be the larger, the more homogeneous goods are with respect to their origin, and the more the average consumer price is expected to increase. If the elasticity of substitution between domestic and imported goods of the analysed commodity groups is equal to four, the decrease in consumer welfare amounts in average to about 143 percent of initial consumption expenditure of all eight commodity groups per year. In case when the value of elasticity of substitution is one, the expected losses will be approximately 135 percent of initial consumption expenditure per year. The more homogeneous goods are (i.e. the higher the elasticity of substitution), the higher are the (own and cross) price elasticities of demand. Although the (own) price increases lead to larger response in demand, higher cross price elasticities also imply larger substitution effects as a result of change in price of competing products from different origin. As the Annex 5 reveals, the new total consumption quantity will be larger in the case of higher substitution elasticity, the result of interplay by own and cross price elasticities. Therefore, also the decrease in consumer surplus will be larger.

The new import quantities are in total higher in case of lower substitution elasticity, the result of lower cross price elasticities. This implies that the share of domestic production in total consumption is higher in case of $\acute{o} = 4$, but the increase in producer surplus will be balanced out by the decrease in consumer surplus in the market for domestically produced goods. Hence, the deadweight loss from changes in trade policy varies positively with the loss in consumer surplus in the market for import

[15] Before that the price rise and DWL of the economy in the case of selected food products were found out considering no product differentiation between import and domestic products, i.e. the demand elasticities for import and domestic products were equal. The analysis and the results can be seen in Annex 1.

goods, and is therefore higher in case of higher substitution elasticity. As can be seen from Table 5, the deadweight loss in case of $\acute{o} = 4$ and $\acute{o} = 1$ is expected to reach approximately 1.4 and 0.7 percent of GDP in 2000 in Estonia, respectively.

Table 5 also indicates that the decrease in consumer surplus is highest in the case of milk, beef, rice and sugar. In these commodity groups, the price increases will be the largest (see Annex 5). In case of milk and beef, the new domestic price will be higher than the average import price after change in trade regime. In case of beef, the quantity of consumption is expected to fall relatively a lot (33–38 percent), and the (quantity) share of domestic production is expected to fall from 85 to 62 percent of total consumption. Hence the resulting increase in producer surplus will be lower than it would have been if the initial consumption level and domestic share would have remained, and the uncompensated fall in consumer surplus relatively high.

In case of milk products, the average consumer price is expected to rise about three times. The largest part of this increase is due to the implementation of EU administrative prices on domestic production. Yet, the consumption of milk is not very (own) price elastic. To hold the level of desired consumption not to fall drastically (the quantity of consumption is expected to fall by 11–32 percent), the imports increase to compensate the fall in consumption of domestic goods (the share of domestic production in total consumption is expected to fall from 97 to 85 percent). In case of rice and sugar, no domestic production exists which could balance out the effects of increase in import prices.

The share of imports in final consumption will fall and the share of domestic products will increase in every commodity group as a result of increase in import prices (see Annex 5). The changes in relative shares are the bigger, the more homogeneous goods are. Yet, the largest changes in relative shares of imports and domestic products are expected to appear in milk and beef, owing to the largest changes in average consumer prices. In case of poultry, the fall in consumption will be considerable —

Table 5

Summary of changes in economic welfare due to adopting the CET and abolishing EU exports subsidies (assuming the implementation of EU administration prices)

Commodity	*ó* = 4		*ó* = 1	
	Decrease in consumer surplus (% of initial consumption expenditure)	Deadweight loss (% of GDP)	Decrease in consumer surplus (% of initial consumption expenditure)	Deadweight loss (% of GDP)
Beef	91.8	0.06	91.1	0.04
Pork	–0.9	0.00	–0.9	0.00
Poultry	27.1	0.08	27.5	0.08
Milk	194.7	0.95	182.4	0.23
Wheat	8.4	0.01	8.3	0.01
Rye	30.5	0.00	30.5	0.00
Rice	80.1	0.02	80.1	0.02
Sugar	118.3	0.30	118.3	0.30
Total	142.9	1.42	135.3	0.68

about 40 percent. This is due to the significant increase in consumer price (about 35 percent) and the relatively high own price elasticity of demand for domestically produced goods, although the composition of consumption remains relatively unchanged.

In case of pork, the implementation of EU administrative prices implies a fall in domestic prices, leading to increase in consumer surplus (which will be balanced out by the fall in producer surplus). Due to the relatively large share of imports in total consumption, and relatively modest price changes, however, the total change in welfare will be negligible.

In the case of rice and sugar, no domestic production exists to compensate the fall in imports as a consequence of price increase, and hence, the loss is relatively high. Taking into account the very restrictive import regime of sugar in the EU, it is not likely that the expensive sugar from the EU (after removing high export subsidies) could be replaced by cheaper imports from third countries. As the demand for sugar is relatively inelastic (besides final consumption, sugar is also indispensable input to industry), the consumption expenditure will increase considerably.

The total welfare results are smaller than some would anticipate, but the losses in consumer surplus significant. These estimates follow for a number of reasons. First, the change in total welfare consists of changes in consumer surplus, producer surplus and tariff revenue. As the changes in consumer surplus on the market for domestically produced goods are totally offset by changes in producer surplus (on the same market) of opposite sign, the net change in welfare (i.e. deadweight loss) only depends on changes in consumer surplus on market for imports and changes in tariff revenue. Hence, the deadweight loss is assumed to be the higher the larger was the share of imports in consumption before change in policy.

Second, in the base year data, the total value of imports from non-EU countries (excluding candidate countries) was only 9.4 percent, and hence, the tariff implementation induced losses small. This can be explained by the fact that Estonia already in-

troduced tariffs on agricultural imports in January 2000, and a large fraction of trade diversion from third countries towards the EU had already occurred.

Third, as the current study only focused on the impact of changes in import regime, it neglected the effects of price increases on the excess of domestic supply over domestic demand, i.e. exports. Also the impact of possible producer subsidies granted by the CAP were not considered. These would contribute to the further change in producer surplus, in most cases considered increasing it. Nevertheless, these changes are not due to the change in import regime, and require a further study.

Fourth, tariffs and export subsidies are not the only trade-distorting instruments. Also the import quotas, technical barriers to trade, voluntary export restraints etc. have an effect on trade, which can outweigh the effect of tariffs and subsidies. Also the costs related to the building-up the customs system were not considered here.

Fifth, the deadweight loss of applying the CET is even lower if also the tariff revenue collected and passed on to the common budget is returned to Estonia as net transfers from the budget.

Finally, one has to keep in mind that the accuracy of the *ex ante* forecasts of trade effects heavily depends on the reliability of the elasticities that are used. Therefore, the estimates derived in the study are only as good as the estimates of substitution and price elasticities. Hence, there is a wide margin of uncertainty about the correct results.

Conclusions

This paper has discussed and quantified the static welfare effects induced by the changes in import regime in agricultural and food products accompanying Estonia's accession to the EU. The analysis allowed for different values of elasticity of substitution between imported and domestically produced goods, yielding in somewhat different outcomes.

Since the average tariff on agricultural imports in the EU is higher than in Estonia, and the export subsidies given by the EU to agricultural products entering Estonia have to be abolished, the overall price increase in Estonia is expected as a result of change in trade regime due to Estonia's accession to the EU. Furthermore, it was assumed that for Estonia and CEECs, the accession to the EU will bring along the adoption of administrative prices in agricultural sector, set by CAP. In case of Estonia, these prices in general exceed the domestic producer prices. As a consequence, the consumer surplus will decrease in average by 135–143 percent of total consumption expenditure of analysed agricultural products per year, and the deadweight loss for the whole economy amounts to 0.7–1.4 percent of GDP per year. The consumer loss and net change in welfare are the bigger, the more homogeneous products are expected to be, i.e. the higher the substitution and price elasticities.

Yet, the estimates on net welfare changes are relatively small, reflecting previous trends in trade and assumptions made in the analysis. Nevertheless, the key to understanding the results for Estonia is to recognise that, contrary to many other small countries implementing preferential trade agreements, Estonia starts with a relatively free external trade regime. Therefore, the static effects from the change in import regime as a result of accession to the EU are negative. Although the domestic producers will benefit from these developments, nevertheless, the losses in consumers' welfare must be recognised in Estonia. The impor-

References

Balassa, B. Trade Creation and Trade Diversion in the European Common Market: An Appraisal of the Evidence. In Balassa, B. European Economic Integration, 1975, pp. 79–118.

Baldwin, R. E., Francois, J., Portes, R The Costs and Benefits of Eastern Enlargement: the Impact on the EU and Central Europe. Economic Policy. 24, 1997, pp. 127–176.

Baldwin, R. E., Venables, A. J. Regional Economic Integration. In Grossman, G.M., Rogoff, K. Handbook of International Economics, 1995, pp. 1597–1644.

Commission Regulation (EC) No 66/2001 of 12 January 2001 fixing the export refunds on beef and veal.

Commission Regulation (EC) No 152/2001 of 25 January 2001 fixing the export refunds on milk and milk products.

Commission Regulation (EC) No 355/2001 of 22 February 2001 fixing the export refunds on products processed from cereals and rice.

Commission Regulation (EC) No 386/2001 of 26 February 2001 fixing the export refunds on rice and broken rice and suspending the issue of export licences.

Commission Regulation (EC) No 403/2001 of 28 February 2001 altering the export refunds on white sugar and raw sugar exported in the natural state.

Commission Regulation (EC) No 463/2001 of 7 March 2001 fixing the export refunds on white sugar and raw sugar exported in its unaltered state.

Commission Regulation (EC) No 478/2001 of 8 March 2001 fixing the export refunds on cereals and on wheat or rye flour, groats and meal.

Commission Regulation (EC) No. 2261/98 of 26 October 1998 amending Annex I to Council Regulation (EEC) No. 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff.

Corado, C., de Melo, J. A Simulation Model to Estimate the Effects of Portugal's Entry into the Common Market. Economia, Vol. 9, No. 3, 1985, pp. 403–430.

Corado, C., de Melo, J. An Ex-Ante Model for Estimating the Impact on Trade Flows of a Country's Joining a Customs Union. Journal of Development Economics, No. 24, 1986, pp. 153–166.

Curzon Price, V. Reintegrating Europe: Economic Aspects. In Curzon Price, V., Landau, A., Whitman, R. G. The Enlargement of the European Union. Issues and Strategies, 1999, pp. 25–55.

De Melo, J., Robinson, S. Product Differentiation and Trade Dependence of the Domestic Price System in Computable General Equilibrium Trade Models. In: International Trade and Exchange Rates in the Late Eighties. Ed. by Peeters, T., Praet, P., Reding, P. Elsevier Science Publishers B. V., 1985, pp. 91–107.

DeRosa, D. A. Regional Integration Arrangements: Static Economic Theory, Quantitative Findings, and Policy Guidelines. World Bank Policy Research Working Paper No. 2007, 1998.

Estonian Ministry of Agriculture. (2001a) Data on Estonian Agricultural and Food Import in 2000.

Estonian Ministry of Agriculture. (2001b) Data on Producer Prices in the EU and Estonia in 1998.

Estonian Ministry of Agriculture. (2000) Data on WTO tariff ceilings for Estonia.

Fock, A. Integrating Estonia into the EU: Quantitative Analysis of the Agricultural and Food Sector. – Studies on the Agricultural and Food Sector in Central and Eastern Europe. Ed. by IAMO, Vol. 5. Wissenschaftsverlag Vauk Kiel KG, 2000, 275 p.

Georgakopoulos, T. (1994) Economic Integration and Unequal Development: the Experience of Greece. In Georgakopoulos, T., Paraskevopoulos, C. C., Smithin, J. Economic Integration between Unequal Partners. Edward Elgar Publishing, pp. 98–109.

Goldstein, M., Khan, M. S. Income and Price Effects in Foreign Trade. In: Handbook of International Economics. Vol. II. Ed. by Jones, W. R., Kenen, P. B. Elsevier Science Publishers B. V., 1985, pp. 1041–1105.

Haley, S. L. Product Differentiation in Wheat Trade Modeling. Technical Bulletin No. 1838, United States Department of Agriculture, New York, 1995, 25 p.

Hansen, J. D., Heinrich, H., Nielsen, J. U.-M. An Economic Analysis of the EC. UK: McGraw–Hill International Limited, 1991, 247 pp.

Hine, R. C. Customs Union Enlargement and Adjustment: Spain's Accession to the European Community. Journal of Common Market Studies. 27(1), 1989, pp. 1–27.

Jones, A. J. The Theory of Economic Integration. – El-Agraa, A. M. The Economics of the European Community, 2nd Ed., New York: Philip Allan/St Martin's Press, 1985, pp. 71–92.

Kapuscinski, C. A., Warr, P. G. Estimation of Armington elasticities: an application to the Philippines. Economic Modelling, No. 16, 1999, pp. 257–278.

Mayes, D. G. The Effects of Economic Integration on Trade. Journal of Common Market Studies, Vol. XVII, No. 1, 1978, pp. 1–25.

Molle, W., van Mourik, A Internal Market Policy. In Wolters, M., Coffey, P. The Netherlands and EC Membership Evaluated, 1990, pp. 25–32.

Nicholls, S. Measuring Trade Creation and Trade Diversion in the Central American Common Market: A Hicksian Alternative. World Development, Vol. 26, No. 2, 1998, pp. 323–335.

Plummer, M. G. Efficiency Effects of the Accession of Spain and Portugal to the EC. Journal of Common Market Studies, Vol. XXIX, No. 3, 1991, pp. 317–325.

Ponte Ferreira, M Integration Effects and Commodity Exports: The Case of the Nordic Countries. In Fagerberg, J., Lundberg, L. European Economic Integration: A Nordic Perspective. Aldershot: Avebury Ashgate Publishing Ltd., 1993, pp. 13–37.

Robson, P. The Economics of International Integration. 1998, 334 p.

Rousslang, D. J., Suomela, J. W. Measuring the Costs and Benefits of Protection. A Partial Equilibrium Approach. Turku School of Economics and Business Administration Series Discussion and Working Papers 12, 1993, 104 p.

Rutherford, T. F., Rutström, E. E., Tarr, D. Morocco's Free Trade Agreement with the EU: A Quantitative Assessment. Economic Modeling, No. 14, 1997, pp. 237–269.

Sapir, A. Regional Integration in Europe. The Economic Journal, No. 102, 1992, pp. 1491–1506.

Tyers, R., Anderson, K. Price Elasticities in International Food Trade: Synthetic Estimates from a Global Model. Journal of Policy Modeling. A Science Forum of World Issues. Vol. 11, No. 3, 1989, pp. 315–344.

Varblane, U. Trade policy implications from EU membership for Estonia. – *Baltic Journal of Economics*, Vol. 2., No. 2., Winter 1999, Riga, 2000, pp. 249–267.

Varblane, U. The Trade Policy Implications of Joining European Union: Poland and Estonia compared. Chapter in book: Foreign Direct Investment in a Transition Economy. The Polish Case. Ed. By M. Waresa. London, SSEES, 2000, pp. 177–199.

Varblane, U. Muutused Eesti väliskaubanduspoliitikas Euroopa Liiduga ühinemisel. (Changes in Estonian Trade Policy on Joining the EU) Euroopa Kolledži loengud, vihik nr. 2. Tartu, 2000. 31 p.

Varblane, U., Toming, K., Selliov, R., Riik, H., Tamm, D. Võimalikud majanduspoliitilised instrumendid Eesti põllumajandussaaduste ja -toodete hindade ühtlustamiseks Euroopa Liidu hindadega. (Possible Instruments of Economic Policy for Harmonisation of Prices of Estonian Agricultural Products with EU Prices) Tartu, 2001, *mimeo*.

Viner, J. The Customs Union Issue. Carnegie Endowment for International Peace, New York, 1950.

Annex 1

Partial equilibrium analysis of the effects of policy changes due to Estonia's accession to EU. Selected food products, domestic and imported goods are not differentiated

The products that will be taken under consideration are chosen from the set of such products, which prices will rise the most when the European Union policies will totally be implemented on Estonian agriculture: i.e. sugar, butter, poultry, beef. The data used are those of year 2000 (sugar, poultry, butter and beef produced, exported and imported). The domestic demand is considered to be production plus import minus export. The average price of buying up is considered as the price of production. The average import prices over the countries before and after applying the tariffs are calculated as weighted averages (see Figure 1). The rise in import price will be calculated taking into account that in short run the import price will rise by the tariff and the quantity of import stays the same because of the inertia of the trade agreements etc. Only in the long run the price will lower but still stay higher than before the change in policy. But the price lowering and change in import partners cannot be calculated out exactly, only the first change can be observed.

The changes in prices due to the change in policy are shown in Table 1. In the case of butter and beef the intervention price is taken into account on the side of production and both the abolishment of export subsidies and implementation of tariffs on the side of import. It has to be added that it's quite possible that the price of beef will not rise to the intervention price because the most part of beef buyed up in Estonia does not have the quality needed for intervention. Butter is the most important milk product for Estonia where the intervention price and export subsidies are used in EU. As raw milk is mostly produced in Estonia and import of raw milk makes only about one percent of the total demand, then the price don't have to rise so quickly to the level of EU. In the case of sugar tariffs and abolishment of export subsidies are the instruments that will cause price rise.

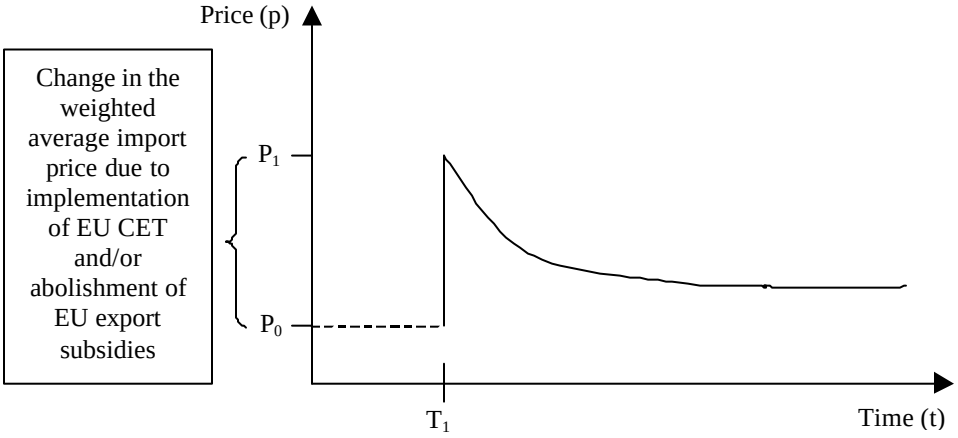

Figure 1. The dynamics of import price.

Table 1

Changes in domestic price of selected food products after change in policy

	Domestic production			Export		Import			Production +Import, – Export			New price/ old price (%)
	Quantity (t)	Price before change in policy (EEK/t)	Price after change in policy (EEK/t)	Quantity (t)	Price (EEK/t)	Quantity (t)	Price before change in policy (EEK/t)	Price after change in policy (EEK/t)	Quantity (t)	Price before change in policy (EEK/t)	Price after change in policy (EEK/t)	
Sugar	–	–	–	…	…	61465	4014	10355	61465	4014	10355	258
Poultry	8100	16500	–	2386	22893	16342	10694	14313	22056	11507	14188	123
Butter	8800	28530	51000	4619	31498	856	23230	41889	5037	24908	67335	270
Beef	14400	17850	47140	188	21930	2645	24120	28467	16857	18788	44491	237

Source: authors' calculations, data of Estonian Statistical Office.

In the case of poultry only tariffs influence the price because a large part of import still comes from the third countries although this part has reduced a lot since Estonia introduced the tariffs on import in 2000. EU doesn't intervene in the poultry market.

The model used is a static linear partial equilibrium model where there is no differentiation between domestic and imported goods (Figure 2). To find out the possible change in the quantity demanded several demand elasticities are used assuming that foodstuffs are normal goods with demand elasticities between 0 and −1 at the same time supposing that poultry and beef may be more elastic than sugar and butter.

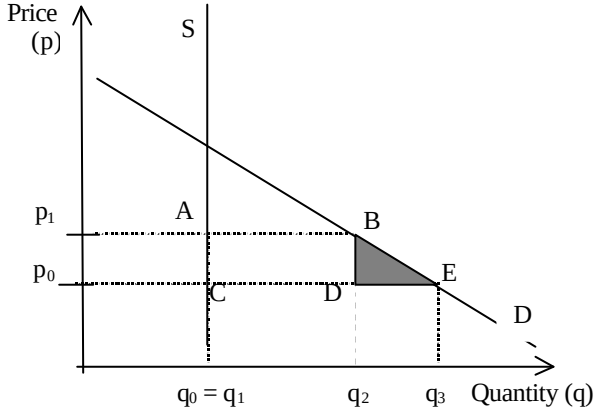

Figure 2. The partial equilibrium model of the effects of changes in prices when domestic and imported goods are not differentiated.

As the supply function is assumed to be inelastic, we will concentrate only on the demand side. The demand function has linear form:

$$q = a - bp \qquad (1)$$

where q quantity demanded with the price p, and a, b the parameters.

The price elasticity has expression:

$$e = \frac{\partial q}{\partial p}\frac{p}{q}, \tag{2}$$

where $\frac{\partial q}{\partial p}$ the derivative from the demand function with respect to price.

The price elasticity of demand in point E (Figure A.1) is:

$$e = -b\frac{p_0}{q_3}, \tag{3}$$

from what b can be expressed as:

$$b = -e\ \frac{q_3}{p_0}, \tag{4}$$

The difference between quantities demanded before and after applying the tariff is:

$$\Delta q = \frac{\partial q}{\partial p}\ \Delta p, \tag{5}$$

and for the demand function in the present work:

$$\Delta q = -b \cdot \Delta p, \tag{6}$$

As we know the total quantity demanded q_3, the price p_0, the price elasticity of demand e, at the point where p_0 and q_3 are known, we can first calculate out the parameter b of the demand function with the formula 8. After that we can find out the change in quantity demanded with the formula 10.

The deadweight loss will be calculated using the formula:

$$DWL \cong \frac{1}{2}\Delta q \cdot \Delta p + G, \tag{7}$$

that equals the area under the triangle BDE (Figure 2). The results can be seen in Table 2.

The DWL that will occur is very small forming even in the case of sugar only 0.2% of the Estonian GDP in 2000[16]. But thinking only of the food market these changes are remarkable as the decrease in DWL in sugar market with demand elasticity of –0.6 makes about 75% of the total sugar demand. It's reasonable to think that the decrease of the quantities will not be as large as it turns out to be considering the results of the linear model The analysis would have much more reasonable results if the demand function had constant elasticity. This will be the task of future analysis.

[16] GDP in 2000 was 85346.3 mln EEK.

Table 2

Changes in demand of selected food products and DWL

	Price before the change in policy (EEK/t)	Price after the change in policy (EEK/t)	Quantity before the change in policy (t)	Quantity after the change in policy (t)			DWL (million EEK)		
				e = -0.1	e = -0.4	e = -0.6	e = -0.1	e = -0.4	e = -0.6
Sugar	4014	10355	61465	51755	22627	3208	31	123	185
Poultry	11507	14188	22056	21542	20000	18972	1	3	4
Butter	24908	67335	5037	4179	1605	0	18	73	107
Beef	18788	44491	16857	14551	7632	3020	30	119	178

Source: authors' calculations, data of Statistical Office of Estonia.

Annex 2

The prices and quantities of imports across different sources

Commodity	Initial quantity (tons)	Initial share in total import quantity (%)	Initial price*** (EEK/t)	Price after change in policy (EEK/t)	Change in price (%)
Beef					
EU	129	4.9	39204	41724	6.4
I wave*	123	4.7	24814	41724	68.1
II wave**	2125	80.3	23628	41724	76.6
Non-EU	268	10.1	21057	21112	0.3
Total	2645	100.0	24184	39639	63.9
Pork					
EU	8186	66.9	19683	19683	0.0
I wave	3045	24.9	21563	19683	–8.7
II wave	20	0.2	20106	19683	–2.1
Non-EU	980	8.0	18713	23885	27.6
Total	12230	100.0	20074	20019	–0.3
Poultry					
EU	10934	58.6	11101	11101	0.0

Commodity	Initial quantity (tons)	Initial share in total import quantity (%)	Initial price*** (EEK/t)	Price after change in policy (EEK/t)	Change in price (%)
I wave	592	3.2	23356	11101	–52.5
II wave	71	0.4	34323	11101	–67.7
Non-EU	7074	37.9	10718	21067	96.6
Total	18670	100.0	11433	14877	30.1
Milk					
EU	4514	35.2	28109	35627	126.7
I wave	463	3.6	20835	35627	0.0
II wave	4675	36.5	15132	35627	0.1
non-EU	3172	24.7	18517	18566	0.3
Total	12823	100.0	18269	31407	71.9
Wheat					
EU	38083	96.5	2909	3116	7.1
I wave	23	0.1	3241	3116	0.0
II wave	1319	3.3	3249	3116	0.0
Non-EU	52	0.1	2422	6591	172.2
Total	39477	100.0	2920	3121	6.9

Commodity	Initial quantity (tons)	Initial share in total import quantity (%)	Initial price*** (EEK/t)	Price after change in policy (EEK/t)	Change in price (%)
Rye					
EU	1261	100.0	2125	2853	34.3
Total	1261	100.0	2126	2854	34.3
Rice					
EU	560	17.1	10418	13954	33.9
I wave	3	0.1	9401	9401	0.0
II wave	3	0.1	12030	12030	0.0
Non-EU	2714	82.8	4670	10929	134.0
Total	3280	100.0	5662	11445	102.1
Sugar					
EU	54573	88.8	4036	9653	139.2
Total	61465	100.0	4014	…	…

Source: own calculations based on Estonian Ministry of Agriculture (2001a, 2001b).

Notes: * Czech Republic, Hungary, Poland and Slovenia

** Latvia and Lithuania

*** 1 EEK=1/15.6466 EUR

Annex 3

Import shares, demand and supply elasticities according to different elasticities of substitution

Com-modity	S_f (%)	ç	$\mathring{a}_{fd}$	ó = 4				ó = 1			
				$ç_{dd}$	$ç_{ff}$	$ç_{fd}$	$ç_{df}$	$ç_{dd}$	$ç_{ff}$	$ç_{fd}$	$ç_{df}$
Beef	18.7	–0.64	0.46	–1.27	–3.37	2.73	0.63	–0.71	–0.93	0.29	0.07
Pork	25.5	–0.55	0.57	–1.43	–3.12	2.57	0.88	–0.66	–0.89	0.34	0.11
Poultry	67.7	–0.77	0.70	–2.96	–1.81	1.04	2.19	–0.93	–0.84	0.07	0.16
Milk	0.1	–0.35	0.59	–0.35	–4.00	3.65	0.00	–0.35	–1.00	0.65	0.00
Wheat	0.4	–0.20	0.58	–0.21	–3.99	3.79	0.01	–0.20	–1.00	0.80	0.00
Rye	0.0	–0.20	0.58	–0.20	–4.00	3.80	0.00	–0.20	–1.00	0.80	0.00
Rice	100.0	–0.80	–	–	–	–	–	–	–	–	–
Sugar	100.0	–0.41	–	–	–	–	–	–	–	–	–

Source: own calculations based on Fock (2000).

Definitions:

σ – the elasticity of substitution between domestically produced and imported goods,

S_f – the expenditure share of imports in total consumption,

γ – the price elasticity of demand for a given product (composite of imports and domestically produced substitutes),

ε_{dd} – (own) price elasticity of domestic supply,

η_{dd} – (own) price elasticity of demand for domestic product,

η_{ff} – (own) price elasticity of demand for imports,

η_{df} – cross price elasticity of domestic demand with respect to the change in price of imports,

η_{fd} – cross price elasticity of demand for domestic product with respect to the change in price of domestic product.

Annex 4

Producer prices in the EU and Estonia in 1998

Commodity	EU average* (EEK/t)	Estonia (EEK/t)	Estonia/EU average (%)
Beef	40463	20830	51.5
Pork	23617	25250	106.9
Poultry	23500	19800	84.3
Milk	4631	3080	66.5
Butter	56273	31360	55.7
Rye	1754	1463	83.4
Wheat	1756	1793	102.1

Source: Estonian Ministry of Agriculture (2001b).

Note: * 1 EEK = 1/15.6466 EU

Annex 5

A summary of changes in imports and domestic production due to the change in trade policy

	Quantity in 2000 (tons)	Share in total consump-tion (%)	Average price in 2000 (EEK/t)	Price after adopting CET/ abolishing EU export subsidies (EEK/t)		Change in price (times)		New quantity (tons)		New share in total consumption (%)	
				ó = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1
Beef											
Imports	2645	14.6	24184	39639	39639	1.64	1.64	4569	2114	37.3	19.0
Domestic production	15455	85.4	18000	40463	40463	2.25	2.25	7547	9010	62.3	81.0
Consumption	18100	100.0	18903	40152	40306	2.12	2.13	12116	11124	100.0	100.0
Pork											
Imports	12230	29.0	20074	20019	20019	1.00	1.00	11976	12213	28.3	28.8
Domestic production	29970	71.0	23890	23617	23617	0.99	0.99	30393	30190	71.7	71.2
Consumption	42200	100.0	22784	22600	22581	0.99	0.99	42370	42403	100.0	100.0

	Quantity in 2000 (tons)	Share in total consump-tion (%)	Average price in 2000 (EEK/t)	Price after adopting CET/ abolishing EU export subsidies (EEK/t)		Change in price (times)		New quantity (tons)		New share in total consumption (%)	
				ó = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1
Poultry											
Imports	18670	75.3	11433	14877	14877	1.30	1.30	10902	10048	73.6	68.5
Domestic production	6130	24.7	16600	23499	23499	1.42	1.42	3901	4629	26.4	31.5
Consumption	24800	100.0	12710	17149	17596	1.35	1.38	14804	14678	100.0	100.0
Milk											
Imports	12823	2.9	18269	31407	31407	1.72	1.72	109117	16066	27.6	5.3
Domestic production	433177	97.1	10940	35627	35627	3.26	3.26	286234	286493	72.8	94.7
Consumption	446000	100.0	11151	34462	35403	3.09	3.17	395351	302559	100.0	100.0
Wheat											
Imports	39477	25.5	2920	3121	3121	1.07	1.07	42354	39647	27.2	25.9
Domestic production	115523	74.5	1607	1756	1756	1.09	1.09	113456	113485	72.8	74.1

	Quantity in 2000 (tons)	Share in total consump-tion (%)	Average price in 2000 (EEK/t)	Price after adopting CET/ abolishing EU export subsidies (EEK/t)		Change in price (times)		New quantity (tons)		New share in total consumption (%)	
				ó = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1	*ó* = 4	*ó* = 1
Consumption	155000	100.0	1941	2127	2109	1.10	1.09	155810	153132	100.0	100.0
Rye											
Imports	1261	1.8	2126	2854	2854	1.34	1.34	1092	1168	1.7	1.8
Domestic production	67739	98.2	1336	1754	1754	1.31	1.31	64152	64150	98.3	98.2
Consumption	69000	100.0	1350	1772	1774	1.31	1.31	65244	65318	100.0	100.0
Rice											
Imports	3280	100.0	5662	11445	11445	2.02	2.02	1868	1868	100.0	100.0
Sugar											
Imports	61465	100.0	4014	9653	9653	2.4	2.4	38169	38169	100.0	100.0

KOKKUVÕTE

Euroopa Liiduga ühinemise mõju Eesti ¾ osalise tasakaalu lähenemisviis

Käesolevas töös käsitletakse Euroopa Liiduga ühinemise mõju Eesti väliskaubandusele. Erilise tähelepanu alla on võetud toidukaubad, sest nende osas muutused kõige suuremad. Seni on Eesti rakendanud ühte kõige liberaalsemat väliskaubandusrežii - mi kogu maailmas. Kuni 2000. aastani puudusid Eestis täie likult tollimaksud kui väliskaubanduspoliitika vahendid ja samuti ei rakendatud kvantitatiivseid kaubandusmeetmeid.

Seetõttu toob Euroopa Liiduga ühinemine kaasa radikaalsed muutused. Eesti peab rakendama Euroopa Liidu ühtse välistolli kolmandate riikide suhtes ja samas avaneb Euroopa toidukaupade turg Eesti toodetele. Käesolevas töös püüti kvantitatiivselt hinnata mõjusid Eesti toidukaupade turule, mis tulenevad ühelt poolt Euroopa turu liberaliseerimisest ja teiselt poolt kasvavast protektsionismist kolmandate riikide suhtes.

Jaanuarist 2000 hakkas Eesti rakendama tolle teatud kaupade impordile kolmandatest riikidest. Osalise tasakaalu mudeli rakendmiine võimaldab näidata, et teatud kaubanduse ümbersuunamine leidis aset juba 2001. aastaks. Kolmandatest maadest toidukaupade import asendus Euroopa Liidu kaupadega.

Eesti toidukaupade turg jaotati piima, liha ja teravilja sektoriteks ja analüüs viidi läbi igas sektoris eraldi. Osalise tasakaalu mudeli puhul kasutati töös erinevaid toidukaupade asendatavuse elastsusi kodumaiste ja importkaupade vahel. Kõige tugevamat mõju avaldab Eesti toidukaupade hindadele EL ekspordisubsiidiumite kaotamine. Tervikuna on tarbijate heaolu kaotus kõigi kaubaruppide osas kokku 0.7–1.4% sisemajanduse koguproduktist.