HOW CLOSE TO EUROPE IS UKRAINE: TRADE POLICY ANALYSIS

by

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Abstract

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The future of the relations between Ukraine and the enlarged European Union is often discussed in media. EU officials repeatedly stress the need for reducing trade restrictiveness from the side of Ukraine in order to improve bilateral cooperation. The purpose of the thesis is to reveal whether Ukraine follows the requirements of the EU and tries to decrease the barriers to trade. Trade regime of Ukraine (system of tariffs and quotas) in the years 1994-2003 is analyzed. The year-to-year changes in trade policy are measured by the Trade Restrictiveness Index, which is calculated using CGE approach. As a result, permanent rise in restrictiveness of Ukrainian trade policy with regard to the EU is uncovered starting 1997, with major increase following the adoption of the new basic law in year 2001. As for year 2003, the overall level of trade restrictiveness is comparable with benchmark levels for Poland and Hungary in the beginning of their way to Europe. The conclusion is that though Ukraine's trade regime overall is not very hard, there is really no movement towards less restrictive trade policy with regard to the EU.

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GLOSSARY

CES	Constant elasticity of substitution
CET	Constant elasticity of transformation
CGE	Computable general equilibrium
EU	European Union
FSU	Former Soviet Union
GDP	Gross domestic product
NTB	Non-tariff barriers
TRI	Trade restrictiveness index
UTS	Uniform tariff surcharge
WTO	World Trade Organization

Chapter 1

INTRODUCTION

This year the largest expansion of the European Union has taken place: 10 countries became full members of the EU. The economic effect of this event can be different for separate countries and regions, but according to Francois and Rombout (2001) the overall impact on European trade will be huge. Ukraine, which after May 1, 2004 directly borders the EU, will doubtless feel the changes. As the theory of international trade suggests, there will be trade diversion after Ukraine's trade partners enter the EU, which means Ukraine's firms will lose ties with some of their counterparts in those countries. Having announced its objective to become a member of the EU, Ukraine should take some actions to prevent the loss of the important links. A possible way would be to become more open to the EU, implying changes in trade policy. This is exactly what the European officials expect from Ukraine. At the latest EU/Ukraine Summit in Yalta in October 2003, the head of European Commission Romano Prodi has stressed the importance of removing existing trade barriers for the improvement of bilateral cooperation[1].

Legally, the relations between Ukraine and the EU have been established by the Partnership and Cooperation Agreement (1994). This agreement calls for cooperation in the wide field of political, economic, commercial and humanitarian issues, especially stressing the need for trade liberalization (Preamble) and the possibility of creating a free trade area (Article 4). In 1998 the President of Ukraine has accepted the Strategy for European Integration of

[1] Ukraine-EU Summit (2003)

Ukraine and in 2000, the Program of Ukraine's Integration into the EU. The program is realized via annual action plans and has its aim in achieving the Copenhagen criteria for EU membership. The EU puts the following requirements for potential candidates (Copenhagen European Council, 1993):

- Democratic regime, protection of minorities' rights, respect for human rights.
- Market economy, competitive industries capable to compete with European ones.
- Readiness to accept *acquis communautaire* (laws, which regulate EC's life).

In 2002 Ukrainian side has for the first time stressed the need to further develop the relations between Ukraine and the EU from cooperation and development to association. The tasks of the nearest future for Ukraine are entering WTO in 2004 and getting the status of an associate member within the EU in 2007.

One can see that on paper the relations with the EU are of strategic importance to Ukraine. However, because European politicians repeatedly stress the importance of reducing the extent of trade restrictiveness from the side of Ukraine, one may infer that there is no movement towards trade liberalization.

The purpose of this thesis is to analyse and quantify the changes in foreign trade policy of Ukraine in the last decade. A computable general equilibrium model of Ukrainian trade with the EU will be built in order to estimate the degree of change in trade restrictiveness over time. The degree of protection will be measured with the help of Trade Restrictiveness Index. Then the extent of reduction in trade barriers for a hypothetical case of full trade liberalization will be estimated. The results of calculations will be followed by international comparison (with accession countries) in order to provide an indication of how much should Ukraine liberalize foreign trade in order to meet the expectations of

the EU authorities. This will be done to answer the following questions: How did the trade policy of Ukraine develop? Does the evolution of Ukrainian trade policy answer the purpose of becoming closer to Europe?

I expect to get the result that despite many changes in trade regime over time, there are no apparent signs of policy movement in favour of trade with the EU, which can be explained by influence of vested interests.

Chapter 2 is a brief look at the evolution of theory of measurement of trade restrictiveness, and at the relevant literature concerning trade policy in transition. Chapter 3 defines Trade Restrictiveness Index and presents theory underlying the CGE model. Chapter 4 is devoted to data description. Chapter 5 presents the algorithm of solving the CGE model given the available data. Chapter 6 presents the results of estimation of policy changes and their interpretation, as well as some implications.

Chapter 2

LITERATURE REVIEW

This section starts with an overview of works on measurement of the extent of trade restrictiveness. The literature focusing on trade policy in transition that is relevant for analysis of Ukrainian situation is then discussed. Finally, the literature that suggests the direction for further development of this research is highlighted.

Economic theory gives researches traditional and powerful tools to study different trade policy effects. The theoretical framework for this field of analysis is given, for example, in Krugman and Obstfeld (2000). Applying general and partial equilibrium models of international trade, these authors describe the concepts of trade creation and trade diversion, which arise in result of increases or decreases in trade restrictiveness. The general prediction of economic theory is that additional tariffs and quotas increase the producer surplus, but lower the consumer surplus. Government revenue is increased in case of introduction of a tariff, but it does not change in case of new quota, as the license holders keep all revenues.

How can the restrictiveness of a country's trade policy be measured? This question often turns out to be important in international trade negotiations. In the realistic case when trade in many commodities is restricted by tariffs, quotas and other non-tariff barriers there is no easy way to calculate an aggregate measure of the extent of protection. Laird (1997) is an overview of existing measures: average tariffs, subsidy equivalents, effective protection etc, discussed next.

As no alternative measures existed until 1960s, analysts used and even today continue to calculate trade-weighted average tariffs or (in the case of quotas) average tariff equivalents. However, these measures have an evident drawback, being subject to downward biases. A simple demonstration of this is that highly restricted imports that should have a higher weight in an aggregate indicator in fact have a low weight, because they are likely to have low levels of imports. To solve this problem, the weights should be given by the economic effects of the policy measures.

A successful attempt to provide a theoretically founded measure of an industry protection against import competition was by Corden (1966). In his seminal paper, that gave impetus to rapid development of literature on the estimation of the extent of protection, Corden introduced the concept of the effective rate of protection (ERP). ERP indicates the extent to which the producer's value added in the industry is increased, taking into account the tariffs on imported intermediate inputs and the share of this industry in the whole economy. In other words, ERP measures assistance to value added in an industry. ERP is not quite suitable for the explicit estimation of trade effects of distortionary policies, although it is likely to be correlated with the more appropriate measures. Nevertheless, it is important to mention here, because the development of literature on ERP with time led to appearance of more sophisticated measures of trade restrictiveness.

ERP tells one nothing about the tariff's distortionary effect on consumption. Simple comparisons of the domestic wholesale price and the border price are more appropriate for this purpose. This approach was developed to calculate so-called consumer subsidy equivalent (CSE) of agricultural policies, which is used in OECD trade negotiations. CSE measures the net implicit tax imposed on consumers by domestic production support measures. A negative CSE implies

consumers are being taxed by the government trade policies. This measure has a weakness similar to that of ERP in that the trade costs of policy distortions depend not only on difference in prices, but also on the elasticities of substitution in consumption and production.

While being useful as a measure of degree of assistance a certain industry gets, ERP does not give policy makers an explicit indication of trade and welfare effects of protective policies. Using another approach, Anderson and Neary in a series of papers for the World Bank developed a single indicator of the trade-distorting and welfare-reducing effects of trade policy. Their Trade Restrictiveness Index (TRI) requires more computation than just the ERP, but it provides an indication of these effects on trade and welfare. My thesis is mainly based on Anderson and Neary (1994, 1995, 1996), discussed in much detail in the methodology section.

Anderson and Neary follow Corden (1966) in their suggestion that a more satisfactory approach to measuring trade restrictiveness is to find a uniform tariff for all goods that would be equivalent – in a sense of bringing the same domestic welfare – to the actual system of applied tariffs.

According to Anderson and Neary (1996), the elements that define a theoretically consistent policy index of trade restrictiveness, include:

- A comprehensive policy coverage (tariffs, import quotas, domestic policies, etc);
- A benchmark for "equivalence" we are interested in (same welfare, same trade volume, same income level, etc);
- A policy instrument into which all the policy coverage is translated (choice between tariff-equivalent, subsidy-equivalent, quota-equivalent measures).

From a theoretical point of view, TRI approach links the literature on the theory of quantitative trade restrictions to the works on scalar "distance function" measures of efficiency.

In the empirical part of their article, Anderson and Neary (1996) calculate an index for the restrictiveness of U.S. imports of textiles from Hong-Kong. For six successive years (1983-1988) the value of change in TRI is given, with overall rise equal to 16%. These calculations suggest that there was a marked increase in the protectionism of the trade regime. This corresponds to the tightening of quotas that took place in reality. By contrast, the traditional measure, the average tariff equivalent, fluctuated widely over the same period, with a cumulative fall of 23%. This finding confirms the authors' assertion that standard measures are inappropriate and can give misleading results.

Anderson (1995) also includes the application of TRI for two transition countries – Hungary and Poland – as well as for 26 other countries. The author's conclusion is that the TRI measures differ significantly from standard measures, as the latter generally underestimate the actual restrictiveness of the system of protection. The benchmark levels of the TRI calculated in this work will be later used in this thesis for the purpose of international comparison.

In the last sections Anderson and Neary (1996) show how TRI can be operationalized, using two different approaches: linear approximation (used for a single industry analysis) and general equilibrium modeling. As I want to estimate the restrictiveness of the Ukrainian trade policy for a very wide specification of goods (more than 1200), I will use the latter method.

Devarajan (1996) is the introduction to simple general equilibrium modelling. The basic model refers to one country with two producing sectors and three goods (the "1-2-3 model"). The country produces an export good and a non-tradable

good. It purchases an import good that is not produced domestically. With the "small country" assumption, world prices are fixed. The production function is specified as a constant elasticity of transformation function, and expenditure is characterized by constant elasticity of substitution function. Equilibrium conditions are that supply equals demand in the markets for traded and non-traded goods, and balance of trade constraint is satisfied. The author then describes how the effects of shocks (e.g. change in trade policy) are determined, and shows how this model can be solved using "Solver" package in Microsoft Excel. The model I use is different from 1-2-3 model by highly disaggregated composition of import goods and their separation into final and intermediate imports. In addition, some oversimplifying assumptions are rejected. However, it is still possible to solve the model with the help of a spreadsheet program, such as MS Excel.

I leave the extended description of CGE approach until the next section and now I would like to stop on the literature describing trade policy in transition.

When analysing the trade policy of formerly centrally planned economy, such as Ukraine, one should look at the progress in implementing market reforms in the sphere of foreign trade. Michalopoulos (1999) analyses trade policies and future challenges the transition economies, especially FSU countries, face in their integration into the world trading system. The author asserts that the problem of large FSU countries such as Russia, Ukraine and Kazakhstan is not the trade regime alone, but also the weakness in the operation of fundamental market institutions. After the breakup of the FSU, Ukraine has chosen the pattern of trade policy, which was very different from the policy of Baltic states, Armenia or Kyrgyzstan (FSU countries with most liberal trade regimes, according to EBRD (2002)). State organizations continued to control the bulk of foreign trade as late as to mid 1994. Though the import tariffs were low, protection was provided

through the highly depreciated exchange rates and exchange controls in the context of balance-of-payments problems. The main policy response to the trade decline soon after 1991 was the establishment of a network of state trading agreements, as well as of an ill-functioning free trade area for the Commonwealth of Independent States. These measures did not really answer the purpose of trade liberalization with the rest of the world. The author concludes that Ukraine needs to continue efforts to strengthen institutional framework in such areas as financial sector development, customs administration and trade facilitation, which would increase chances of effective participation in the world trade.

Hare (2001) also notes the importance of institutional barriers to trade for transition countries. These include inadequacy of banking systems, especially in handling international transactions reliably and at reasonable cost, the lack of export credit guarantee schemes and other forms of trade promotion, poor insurance and other business-related services. The barrier to trade often takes the form of unreasonable customs delays at borders, accompanied by widespread demand for bribes to expedite the movement of goods. All these problems are relevant for Ukraine since the early 1990s.

Although the institutional development is important for trade facilitation, there is no other way of comparing the achievements in this sphere across countries except for using expert evaluation. And as noted in Michalopoulos (1999), this evaluation can be contentious. That is why during international trade negotiations the restrictiveness of trade policy is still measured based on actual system of tariffs and NTBs.

Beghin and Bereau (2001) present a survey of various existing methods that can be used to measure the trade effects of non-tariff barriers (NTBs). Sanitary, phytosanitary, technical regulations, etc can have an impact on trade. Given the heterogeneous nature of such regulations, a unifying methodology does not exist.

However, quantitative analysis would help to inform governments of the costs of their policies and provide tools necessary to define regulations that are more efficient. This paper suggests the direction of further elaboration of my thesis. Quantifying NTBs is indeed a very timely problem, but this task is not in the scope of this thesis and is a direction of future research.

Summarizing, it can be noted that among existent measures of trade restrictiveness, TRI has the most rigorous theoretical foundation. This measure can be operationalized with the help of a CGE model, solved in MS Excel. In the next sections, I present the model and the methodology of estimation.

Chapter 3

THE COMPUTABLE GENERAL EQUILIBRIUM APPROACH TO ESTIMATING TRADE RESTRICTIVENESS

In this section the core CGE model is described, which is derived from Anderson (1995).

The economy produces two final composite goods: an exportable not consumed at home and a non-traded good. The rationale for the assumption of no domestic consumption of the export is that packaging, safety and other requirements differentiate it from home goods. The inputs include a bundle of non-traded factors of production in fixed supply, hence reducible to a single input; a vector of imported inputs subject to binding quota constraints; and a vector of imported inputs subject to tariffs. The technology exhibits constant returns to scale. Exports are chosen as a numeraire (price of the export good is equal to unity).

The economy is assumed to be in competitive equilibrium, to have no distortions other than tariffs and quotas, and to be characterized by a single representative consumer. All tariff revenue is costlessly redistributed to the representative consumer. The economy is assumed to loose all quota rents to rent-seeking foreigners. It is also assumed a "small" country, facing fixed international prices. The consumer gains utility from consumption of imported final goods and domestically produced goods. In general equilibrium, the level of utility of consumer is determined by the balance of trade constraint, simultaneously with market clearance for non-traded goods.

Net imports of tariff-constrained goods are denoted by the vector m and their domestic and world prices by π and π^*, respectively, where $t = \pi - \pi^*$ is the

tariff vector. For the quota-constrained goods, q is the vector of permitted import volumes, p^* the world prices and p the endogenous domestic prices. Markets for non-traded goods are assumed undistorted, with their market-clearing prices denoted by h. The superscripts F and M stand for only final and only intermediate imports, respectively.

The behaviour of the private sector is described by the trade expenditure function[2]:

$$E(p,\pi,u,\lambda) \equiv \max_h \left[e(h, p^F, \pi^F, u, \lambda) - g(h, p^M, \pi^M, Y, \lambda) \right], \text{ where}$$

$e(\cdot)$ is consumer's expenditure function;

$g(\cdot)$ is GDP function;

u is the utility of the representative consumer;

Y is calculated production level;

λ is a vector of exogenous parameters (such as the levels of factor endowments, tastes, world prices, etc., all assumed constant).

In equilibrium, this is interpreted as: net expenditure on trade is equal to total income needed to sustain utility level u minus expenditure on the domestic product.

The function E has standard properties of an expenditure function: it is concave in prices[3]. The derivatives of E with respect to π and p give the economy's general equilibrium utility-compensated (Hicksian) import demand functions.

$$E_\pi(p,\pi,u) = m(p,\pi,u)$$

[2] See, for example, Martin (1997) for discussion of trade expenditure function

[3] For reference on the properties of expenditure function see Varian (1992)

$$E_p(p,\pi,u) = q(p,\pi,u)$$

As q is not the true level of demand, but only the quota level, the prices that are implicitly defined by the last identity are the "virtual prices" of quotas (terminology of Anderson and Neary): $\tilde{p}(q)$. In equilibrium, the virtual prices equal the domestic market-clearing prices. The exogenous variables are suppressed to economize on notation.

The trade expenditure function completely summarizes private sector behaviour in this model of economy. In the presence of trade policy, we should account for the government, whose sole activity is to collect tariff revenue and to rebate it in a lump-sum manner to the representative household. The activity of public and private sector is summarized by the *distorted* (by quotas) balance of trade function:

$$\tilde{B}(q,\pi,u) \equiv \max_p \{E(p,\pi,u) - p \cdot q\} + \tilde{p}(q,\pi,u) \cdot q - t \cdot m$$

Finally, equilibrium utility is determined implicitly by the balance of trade equilibrium condition:

$$\tilde{B}(q,\pi,u) = \beta \text{, where}$$

β is the (exogenous) trade deficit, interpreted as an lump-sum income received from abroad.

Next, to introduce TRI itself, we need to define the undistorted balance of trade function.

$$B(p,\pi,u) \equiv E(p,\pi,u) - t \cdot m$$

Clearly, the undistorted and distorted balance of trade functions will coincide when the domestic prices for quota-constrained goods equal their virtual prices:

$$\tilde{B}(q,\pi,u) = B(\tilde{p},\pi,u), \text{ when } p = \tilde{p}(q)$$

Now the Trade Restrictiveness Index (TRI) is defined as the factor of proportionality Δ by which period-1 prices (actual prices for tariff-constrained goods and virtual prices for quota-constrained goods) must be deflated to ensure that equilibrium prevails with utility at its period-0 level:

$$\Delta(q^1,\pi^1,u^0,\gamma^0) \equiv \left[\Delta : B(\tilde{p}/\Delta,\pi^1/\Delta,u^0,\gamma^0) = \beta\right].$$

Since Δ deflates period-1 prices to attain period-0 utility, it is a compensating variation (in contrast to equivalent variation) type of measure.

If trade policy does not change between the two periods, Δ equals one. A movement towards free trade causes Δ to fall below one and, conversely, a move away from free trade causes Δ to rise above unity.

Anderson (1995) solves for TRI in two steps. The first step is to obtain the virtual prices $\tilde{p}$, associated with the new policy instruments and old utility. These are found simultaneously with the non-traded good price *h*, which is determined by the requirement that the non-traded good market clears:

$$\tilde{E}_h(h,q^1,\pi^1,u^0) = 0$$

The implicit solution for *h* is substituted into $\tilde{E}$ at the point (q^1,π^1,u^0) to evaluate the virtual prices $\tilde{p}$ equal to $-\tilde{E}_q(q^1,\pi^1,u^0)$.

The second step is to calculate the equilibrium non-traded good price and the TRI. The new levels of the instruments imply domestic prices equal to $(\tilde{p}, \pi^1)$. Deflating the domestic prices of tariff and quota constrained goods by Δ, the non-traded good market clearance equation is:

$$E_h(h, \tilde{p}/\Delta, \pi^1/\Delta, u^0) = 0$$

This equation is solved for h and Δ simultaneously with the balance of payment constraint:

$$B(\tilde{p}/\Delta, \pi^1/\Delta, u^0, \gamma^0) = \beta$$

The main features of this core model, concerning the structure of the economy and equilibrium conditions, remain unchanged in the empirical part of this thesis. However the peculiarities of Ukrainian data should be accounted for. In the next section, I comment on the changes that should be made in this regard.

The model is solved on a Microsoft Excel spreadsheet. The data are entered into the corresponding worksheets. Chapter 5 will describe the process, incorporating the changes stressed in the next chapter.

Chapter 4

DATA DESCRIPTION

The primary data for calculations consists of trade flows, tariffs and non-tariff barrier classification for a detailed set of imports in Ukraine, consisting of 1239 4 digit code categories for the years 1994-2003. The starting point is the year in which the Partnership and Cooperation Agreement between the EU and Ukraine was signed.

The source of data on tariffs is the Decree of the Cabinet of Ministers of Ukraine N4-93 of January 11, 1993 "On a single customs tariff of Ukraine", which entered into force February 12, 1993, with near 70 amendments. The quantity of amendments adopted gives an opportunity to have a list of tariffs that is different for each year.

The rates of the Single Customs Tariff of Ukraine are single for all the foreign trade business entities regardless of their ownership type, organization of economic activity and territorial location, except for the cases foreseen by Ukrainian legislation and Ukraine's international treaties.

Ukrainian legislation foresees application of the following rates of import duty:

- preferential rates for the commodities manufactured in developing countries;
- preferential rates for the commodities manufactured in countries enjoying maximal favoring treatment in Ukraine (these include the EU countries);
- general rates for the commodities manufactured in other countries.

By just looking at the tariff series for successive years one can notice that the quantity of goods subject to tariffs increases, as well as that the tariff rates become more diverse. Since 1994, 52% of the goods categories were subject to changes in tariff rates. In the period 1994-2000 certain dynamics took place. The tariff rates on the following categories of products notably decreased: fish and shellfish, dairy products, fat and oil, beverages. However much more categories of goods were subject to increase in rates of protection: vegetables and plants, cereals, paper and cardboard, woodwork, wool, cloths, means of transport, furniture, building materials etc. The category of machinery, engines and mechanical devices incurred changed many times with tariffs on some goods rising and on other falling. Zero tariff rates were kept unchanged on the following classes of goods: works of art, toys, medical equipment, non-ferrous metals, instruments, man-made fiber. Overall, the number of changes was not large save for the period 1994-1995, when 83 of total 1239 categories of goods were subject to changes in tariff rates.

On April 5, 2001 new Law of Ukraine "On customs tariff of Ukraine" was adopted. It cancelled the former system of trade restrictions and introduced the one that corresponded to WTO requirements. This new customs tariff is based on the Ukrainian classification of foreign trade commodities. Adoption of the national classifier corresponding to international standards is one of the preconditions for Ukraine's participation in the international convention on the harmonized system of description and coding of products, as well as for integration to the WTO.

The Uniform Customs Tariff consists of 21 chapters comprising 97 groups of goods and lists over 10,000 customs rates. The highest degree of goods

specification is a 10-digit code, which stands for the goods subcategory and serves as a basis for the calculation of taxes and customs clearance of goods.

The new Uniform Customs Tariff imposes three kinds of customs tax rates (preferential, reduced and full). Preferential rates, including tax exemption, are imposed on goods imported from countries which are party to customs unions or customs zones with Ukraine or if stipulated by Ukraine's international agreements (the place for these rates is actually empty now). Reduced rates are imposed for goods imported from countries or economic communities that award Ukraine a most-favored-nation status. Full rates usually exceed reduced rates two times (but sometimes the reduction is as large as from 50% to 0%). Full rates are imposed for goods imported from countries that do not award Ukraine a most-favored-nation status and for goods imported by Ukraine's natural persons. Many goods are subject to combined or special rates of the customs tax, namely, farming products, food, alcoholic beverages, cigarettes, consumer goods, cars, video equipment and other high-liquidity goods which are traditionally subject to lower taxes. These rates of the customs tax are set in euro.

The new Uniform Customs Tariff introduced changes to almost 50% of goods categories in 2001. In two consequent years the number of changes was much smaller (about 70 of 1240 categories were subject to changes) but still very considerable, compared to the period 1995-2000. For many categories the changes were dramatic: maximum tariff for meat products rose from 20% to 70%, sunflower seed was made practically impossible to import by imposing 300% tariff, duties on import of cereals averaged 75%. At the same time, the textiles became much less protected with average tariff falling from 30% to 12%.

Thus, the picture of policy changes is quite diverse and the conclusion about overall pattern demands estimation in the next chapters.

The data on quotas is given in the Regulations of Cabinet of Ministers of Ukraine "About the list of goods, export and import of which is subject to quotas and licensing", adopted each year for the next year. Before 1993, there were no quotas established. In 1994, some agricultural goods, pharmaceutical products, chemicals and metal production were protected in this way. Later on, the majority of quotas were cancelled, and the list now includes some cosmetic products, compact disks and particulate pollutants. The overall number of imported goods subject to quotas in Ukraine is insignificant, compared, for example, to the multiplicity of quotas on export of metal production only. Table 1 provides some descriptive statistics of the data on trade restrictions.

Table 1. Descriptive statistics

Year	**1994**	**1995**	**1996**	**1997**	**1998**
Data on tariffs					
Simple mean	5.98%	6.67%	6.47%	6.29%	6.41%
Standard deviation	6,07%	7,38%	7,16%	6,66%	6,73%
Maximum	60.00%	60.00%	60.00%	60.00%	60.00%
Proportion of nonzero tariffs	78.00%	77.00%	76.00%	77.50%	78.50%
Data on quotas					
Proportion of goods subject to quotas	9.00%	1.85%	1.20%	0.80%	0.80%

Year	**1999**	**2000**	**2001**	**2002**	**2003**
Data on tariffs					
Simple mean	6.46%	6.36%	10,52%	10,67%	10,24%
Standard deviation	6,74%	6,48%	19,86%	22,11%	18,47%
Maximum	60.00%	50.00%	300,00%	300,00%	300,00%
Proportion of nonzero tariffs	79.00%	79.00%	78,75%	84,67%	84,67%
Data on quotas					
Proportion of goods subject to quotas	0.80%	0.80%	0.80%	0.80%	0.80%

As can be inferred from this table, quotas do not play an important role in Ukraine. Only about 10 categories of goods are subject to import quotas, which is an insignificant amount. None of the quotas is binding, according to data on imports (the actual volumes of imports are less than the amount set by the law). Moreover, all quota-constrained goods are also tariff-constrained. That is why in the estimation I use only information on tariffs. Anderson and Neary (1996) provide an application of TRI model to Columbia, in which 70% of imports are subject to quotas.

With the information on tariffs and quotas alone, the trade regime of Ukraine does not seem particularly restrictive. The average tariff is much lower than in many developing countries (16% in Peru, 18% in Argentina, 13% in Indonesia) and is comparable to that of Poland and Hungary. The average tariffs in developed countries like USA, Canada, Norway, and New Zealand are less than 5%.[4] Though average tariff is not a theoretically proper measure, the large differences in it provide indication of how different the trade policies of some countries are. The dynamics of the regime will be analyzed in the next chapter, but now it can be inferred that EU's claims are most probably not only about the tariff regime but rather some other factors. The EU officials should disagree with the practice of negotiable customs rules and policy changes led by private interests.

The amount of imports for 4-digit HC categories of goods is taken from the dataset of Ukrainian State Customs Committee. This dataset allows separating the trade flows by countries, years, categories of goods, imports and exports. The imports data is split into final and intermediate imports on the basis of the definition of the various product lines. Not all goods are imported each year, so the data on tariffs and import volumes has to be matched accurately.

In addition to the primary data for the calculation, it is necessary to enter commonly available data on GDP, total exports and the current account surplus, all of which is available from the Derzhkomstat website. All data is in US dollars.

Table 2. Data on GDP and trade flows, $ thousand

Year	**1994**	**1995**	**1996**	**1997**	**1998**
GDP	37973785	36969558	44558076	50150400	41833241
Total exports	16641000	17090000	20346000	20355000	17621000
Total imports	18007000	18280000	21468000	21891000	18828000
Current account surplus	-1366000	-1190000	-1122000	-1536000	-1207000
Goods imports from the EU	962315	1799503	2541811	2876477	2210407

Year	**1999**	**2000**	**2001**	**2002**	**2003**
GDP	31580961	31261718	38009345	42392896	49361111
Total exports	16332000	19248000	21086000	23351000	28953000
Total imports	15237000	18116000	20473000	21494000	27665000
Current account surplus	1095000	1132000	613000	1857000	1288000
Goods imports from the EU	1956431	2706530	2116908	1986046	3054216

The elasticities for CES and CET functions are assumed rather than estimated. Empirically, input substitution elasticities (in production) have to be lower than final substitution elasticities (in consumption). Sensitivity analysis in Anderson and Neary (1998) shows that changes in parameter values do not affect the basic findings of the model.

I have to modify the empirical model in order to meet Ukrainian data.

1. With no data on prices (only values of imports are given) I have to normalize all initial domestic prices to one. Thus, units of account change, but the TRI deflator (independent of scale) is not affected.
2. Trade with the EU is separated because the tariff rates applied (preferential) are different from the general tariffs. The data allows

[4] Numbers from Anderson (1998)

performing this separation. All other trade operations are aggregated in the current account surplus value.

3. Quotas are excluded from estimation, based on their insignificant amount, so there is no need to calculate the virtual prices.

Having described the overall pattern of Ukrainian trade policy, I now move to more detailed presentation of the CGE model.

Chapter 5

SOLVING THE TRI MODEL

5.1. Expenditure function.

The notation for *final* goods is the following: domestic prices of tariff-constrained goods are denoted by π; market-clearing price for non-traded good is denoted by *h*. Consumer's demand for tariff-constrained imports is denoted by *D*, and the demand for the non-traded good by *H*.

The expenditure function is assumed to have CES form:

$$e(p,\pi,h,u) = (\sum \alpha_j \pi_j^{1-\sigma} + \gamma \cdot h^{1-\sigma})^{\frac{1}{1-\sigma}} \cdot u \text{, where} \quad (1.1)$$

j counts the tariff-constrained goods;

α, γ are expenditure shares;

σ is the assumed value of elasticity of substitution in demand;

u is utility level.

The corresponding true cost of living index is thus:

$$P = (\sum \alpha_j \pi_j^{1-\sigma} + \gamma \cdot h^{1-\sigma})^{\frac{1}{1-\sigma}} \quad (1.2)$$

Using the properties of expenditure function, we find the consumer demand functions by taking derivatives with respect to prices:

$$D_j = \alpha_j \left(\frac{P}{\pi_j} \right) u \quad (1.3)$$

$$H = \gamma \left(\frac{P}{h} \right) u \quad (1.4)$$

5.2. Total cost function.

The joint production level of exports (X) and non-traded good (Z) is denoted by Y. The joint output is produced via CES/CET technology (assumed constant elasticity of substitution between inputs and constant elasticity of transformation of outputs). The notation for intermediate imports is the following: domestic prices of tariff-constrained goods are denoted by *s*; S is the vector of import demands for tariff-constrained goods; market-clearing price for fixed domestic factor L is denoted by *w*.

The total cost of producing activity level Y is given by:

$$C(s,n,w) = (\sum a_k s_k^{1-\phi} + \delta \cdot w^{1-\phi})^{\frac{1}{1-\phi}} \cdot Y \text{ , where} \quad (2.1)$$

a, δ are cost share parameters;

ϕ is elasticity of technical substitution;

Y is initial activity level, equal to GDP plus total value of imported goods.

Unit cost of production is then given by:

$$c(s,n,w) = (\sum a_k s_k^{1-\phi} + \delta \cdot w^{1-\phi})^{\frac{1}{1-\phi}} \quad (2.2)$$

Using Shephard's lemma, we find the demands by taking derivatives of (2.1) with respect to prices:

$$S_k = a_k (\frac{s_k}{c})^{-\phi} \cdot Y \quad (2.3)$$

We also need to express the unknown price of domestic factor and substitute it in (2.2).

$$w = c(\frac{Y \cdot \delta}{L})^{1/\phi} \quad (2.4)$$

Substituting (2.4) into (2.2), we get an expression for unit cost that does not include *w*.

$$c = \left(\frac{\sum a_k s_k^{1-\phi}}{1 - Y^{\frac{1-\phi}{\phi}} \delta^{1/\phi} \cdot L^{\frac{\phi-1}{\phi}}} \right)^{\frac{1}{1-\phi}} \tag{2.5}$$

Marginal cost is given by differentiating $c \cdot Y$ with respect to Y:

$$\mathrm{MC} = \left(\frac{\sum a_k s_k^{1-\phi}}{1-F} \right)^{\frac{1}{1-\phi}} \cdot \frac{1}{(1-F)}, \text{ where} \tag{2.6}$$

$$\mathrm{F} = Y^{\frac{1-\phi}{\phi}} \delta^{1/\phi} \cdot L^{\frac{\phi-1}{\phi}} \tag{2.7}$$

5.3. Joint product and GDP functions.

Prices of numeraire export good (X) and non-traded good (Z) are combined in the function $\psi(p_x, h)$. The value of total output is thus given (assuming CET production frontier):

$$\psi \cdot Y = \left((1-\mu) p_X^{1+\theta} + \mu \cdot h^{1+\theta} \right)^{\frac{1}{1+\theta}} \cdot Y, \text{ where} \tag{3.1}$$

μ is is a share parameter;

θ is the constant elasticity of transformation.

Profit maximization implies that for given Y, the output of the non-traded good is given by:

$$Z = \psi_h Y \tag{3.2}$$

We solve for Y from the profit maximizing condition **P=MC**, which is given by:

$$\psi(\mathrm{h}, \mathrm{p_X}) = \left(\frac{\sum a_k s_k^{1-\phi}}{1-F} \right)^{\frac{1}{1-\phi}} \cdot \frac{1}{1-F} \tag{3.3}$$

Equations (3.3) and (2.7) are used to solve for activity level Y (p_x is equal to unity):

$$Y = \left(\frac{1 - (\psi^{\phi-1} \sum a_k s_k^{1-\phi})^{\frac{1}{2-\phi}}}{\delta^{1/\phi} \cdot L^{\frac{\phi-1}{\phi}}} \right)^{\frac{\phi}{1-\phi}} \quad (3.4)$$

Gross domestic product is equal to the value of payments to domestic factors:

$$g(h,s,N,Y) = w \cdot L = (\sum a_k s_k^{1-\phi})^{\frac{1}{1-\phi}} \cdot (1-F)^{1/\phi-1} \cdot Y^{1/\phi} \cdot \delta^{1/\phi} L^{1-1/\phi} \quad (3.5)$$

5.4. Equilibrium conditions.

The general equilibrium is achieved when balance of trade constraint is satisfied and the market for non-traded good clears.

The market for non-traded good clears when:

$H = Z$, or applying (3.1) and (3.2)

$$\gamma \left(\frac{P}{h} \right)^{\sigma} \cdot u = \psi_h(p_X, h) \cdot Y = \mu \left(\frac{h}{\psi} \right)^{\theta} \cdot Y \text{, where} \quad (4.1)$$

P is determined by (1.2), Y is determined by (3.4) and ψ is determined by (3.1).

The balance of trade is given by:

$e(h, p, \pi, u) - g(h, s, N, Y) - TR = \beta$, where (4.2)

TR stands for tariff revenue.

Expenditure function is equal to Pu_0 and can be estimated using (1.1). GDP is given by (3.5).

Finally, the tariff revenue is gathered from two import flows: tariff-constrained final goods and tariff-constrained inputs. Shephard's lemma is used to derive the demands for tariffs-constrained goods from (1.2) and (2.5).

5.5. TRI calculation.

The TRI is calculated by modifying the previous model, so that the initial level of *u* is fixed, and the level of TRI (equal to one before) is variable together with *h*, the price of nontraded good. The prices of traded goods are deflated by TRI and the system is:

$$\begin{cases} Pu_0 - g - TR - \beta = 0; \\ \delta\left(\frac{h}{P}\right)^{-\sigma} \cdot u_0 = \mu\left(\frac{h}{\psi}\right)^{\theta} \cdot Y \end{cases},$$

where P, g, TR, Y, ψ are functions of Δ and *h* only, using steps in parts 1-4.

The main modified identities are presented below:

$$P = \left(\Delta^{\sigma-1}\sum \alpha_j \pi_j^{1-\sigma} + \gamma \cdot h^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

$$g = (\Delta^{\phi-1}\sum a_j s_j^{1-\phi})^{\frac{1}{1-\phi}} \cdot (1-F)^{\frac{1}{\phi-1}} \cdot Y^{1/\phi} \cdot (\delta^{1/\phi} L^{1-1/\phi})$$

$$Y = \left(\frac{1-\Delta^{\frac{\phi-1}{2-\phi}}(\psi^{\phi-1}\sum a_k s_k^{1-\phi})^{\frac{1}{2-\phi}}}{\delta^{1/\phi} \cdot L^{\frac{\phi-1}{\phi}}}\right)^{\frac{\phi}{1-\phi}}$$

$$\psi = \left((1-\mu) + \mu \cdot h^{1+\theta}\right)^{\frac{1}{1+\theta}}$$

In the absence of information on domestic prices of goods and actual quota levels (in physical units), the way to achieve computable formulas is to normalize initial domestic prices to one. This normalization is appropriate as we look for a uniform deflator that is independent of scale. Then,

$\pi_k^1 = \frac{1+\tau_k^1}{1+\tau_k^0}$, $\quad s_j^1 = \frac{1+\tau_j^1}{1+\tau_j^0}$, where

τ^0, τ^1 stand for old and new values of tariff, respectively.

By (1.1), then initial utility level is equal to initial expenditure. Calculated initial expenditure (on goods) is equal to GDP minus value of exports plus total value of imported goods.

Tariff revenue from final goods:

$$TR_1 = (\Delta \cdot P)^{\sigma} u_0 \sum \left(\frac{1+\tau_j^1}{\Delta} - 1 \right) \frac{\alpha_j}{1+\tau_j^0} \left(\frac{1+\tau_j^1}{1+\tau_j^0} \right)^{-\sigma}$$

Tariff revenue from intermediate inputs:

$$TR_2 = (1-F)^{\frac{\phi}{\phi-1}} \Delta^{\phi} Y \sum \left(\frac{1+\tau_k^1}{\Delta} - 1 \right) \frac{a_k}{1+\tau_k^0} \left(\frac{1+\tau_k^1}{1+\tau_k^0} \right)^{-\phi}$$

After all the formulas are entered in the MS Excel worksheet, the Solver add-in is used to solve for Δ and h.

The model converges quickly to a unique solution despite large changes in the system of tariffs and simplifications of the model.

Chapter 6

RESULTS AND INTERPRETATION

TRI is calculated for each pair of years starting 1994. The exact expressions used to calculate TRI from equilibrium conditions are given in the previous section. The estimation results together with standard statistical measures are given in Table 3.

Table 3. Calculation results

Analyzed policy change	**Number of changed tariff rates**	**Uniform Tariff Surcharge**	Change in Coefficient of Variation	Change in Average Weighted Tariff	Change in the EU import share
1994-95	83	**0.67%**	49,82%	-0,99%	4.50%
1995-96	21	**0.19%**	3,12%	-0,25%	2.00%
1996-97	28	**0.21%**	-34,16%	1,65%	1.30%
1997-98	18	**-0.05%**	-10,05%	0,70%	-1.40%
1998-99	16	**-0.03%**	14,29%	-0,78%	1.10%
1999-00	6	**-0.01%**	-7,70%	0,23%	2.10%
2000-01	608	**-3.25%**	167,19%	0,86%	-4.60%
2001-02	69	**-0.11%**	-28,04%	3,64%	-1.10%
2002-03	64	**-0.05%**	-11,56%	-0,57%	1.80%

Uniform tariff surcharge (UTS) is equal to inverse of TRI minus 1. This is a theoretically founded measure of trade restrictiveness change we are looking for. It shows by how much each of the new instruments (tariffs) should be changed in order to bring initial level of utility. Therefore, positive value of UTS tells about decrease in trade restrictiveness between two periods. Negative value is an evidence of trade policy becoming more restrictive. Statistical coefficient of variation is a standard measure of how disperse the system of tariffs is. Increasing

values correspond to more variation in tariffs, generally considered as a sign of tougher trade policy.

The results are quite intuitive. We can conclude that in the period 1994-1996 the trade regime became closer to free trade, but then since 1997 movement towards more restrictive trade policy takes place. As suggested by Anderson and Neary (1996), the average weighted tariff reveals the changes incorrectly. In years 1996-1997 there was reduction of trade restrictiveness, as evidenced by uniform tariff surcharge. Simultaneously, expansion of import volumes took place, following increase in credibility to Ukraine after introduction of hryvnia. The value of imports increased relatively more than tariffs fell, that is why the change in average tariff shows the increase in trade restrictiveness (+1.65%). The opposite occurred in 1998-1999. Following the economic crisis, amount of imports shrank significantly. This reduction overweighted actual tightening of trade regime and again change in average tariff provided misleading result (-0.78%).

Larger absolute values of UTS correspond to cases where more changes were implemented. However, the large amount of changes in the last two years (compared with period 1995-2000) did not result in substantial increase in restrictiveness. This is explained by the fact that most innovations concerned textiles and took form of very small change in tariff rate (for example, from 12.2% to 12.1%).

In 2001 new basic law was adopted that substantially redefined the tariff rates. The maximum tariff rate grew to 300%. The system overall became quite more dispersed. A lot of tariff rates rose significantly (especially it concerns food, grain, sunflower seed, alcohol etc). These changes are represented by a large value of a uniform tariff surcharge (-3.25%). In the last two years only minor changes were introduced.

An important question to be asked here is what changes in the trade policy did EU itself made during the period under analysis. However, the data on European Common External Tariff is not freely available in a convenient form. The TARIC database that contains all applied policy instruments is accessible via Internet[5], but it only allows looking at a single good (specified to 10 digit HS code) at a time. Thus, aggregating the data on European trade policy would require even more time than it took me to collect Ukrainian data.

Comparing the results of application of different measures given in Table 3 with the change in the share of goods imports from the EU, it becomes clear that TRI is theoretically consistent in evaluating the annual movement of trade restrictiveness. Table 4 contains the results of correlation analysis. CV stands for coefficient of variation; AWT stands for average weighted tariff.

Table 4. Correlation analysis

	Spearman's rank correlation	P-value
UTS and EU import share	0.8034	0.0091
CV and EU import share	0.0500	0.8984
AWT and EU import share	-0.6000	0.0876
UTS and AWT	-0.4603	0.2125
UTS and CV	-0.0084	0.9830
CV and AWT	-0.5333	0.1392

One can see that UTS tends to truly convey the prediction of economic theory that less restriction leads to more imports, which is evidenced by correlation of 80%. Of course, it fails to match the dynamics of import flows in case of sudden crisis (1999) or boom (2003), but it corrects the bias of average weighted tariff in such cases (discussed above), revealing actual change in trade restrictiveness.

[5] http://europa.eu.int/comm/taxation_customs/dds/en/tarhome.htm

Until now all results analyzed concerned the changes in trade policy. However it is also very important to evaluate the overall **level of trade restrictiveness** and to compare this level with the values for other countries.

The basis for comparison is the hypothetical case of complete cancellation of all tariffs (free trade). This is achieved by simply setting all new policy instruments equal to zero in the CGE model. Then the calculated TRI can be compared to benchmark levels in Anderson (1998). This paper reports on measures of the distance of trade policy from free trade for a 27 country sample.

My estimation resulted in the **value of UTS for the free trade with the EU following year 2003 equal to 9.1%**. That is, abolition of all tariffs is equivalent to reduction of all actual tariffs by 9.1%. The benchmark level for Poland and Hungary in 1991 (before establishing free trade with the EU) is 15%. Therefore, Ukraine is now even "closer" to the EU than those two countries in the beginning of their way towards Europe. However, as evidenced by previous analysis, no movement to less restrictive trade policy takes place. Unfortunately, no recent figures are available on Romania and Bulgaria that are next candidates to enter EU. These countries are even better comparable with Ukraine, because their movement towards Europe started much later.

The implication of this result is that Ukraine is not very far from Europe, if one considers only the policy of tariffs and quotas. The reforms reducing the level of protection in the sectors of agriculture and food products will alone substantially accelerate convergence to free trade. However, these are exactly the sectors that are represented by powerful producers' lobbies in Ukrainian legislative authority and therefore such reforms are not likely to take place in the near future.

All the results prove to be robust to the choice of parameter values in the sense that the direction of effect is not reversed by the changes in the values of

elasticities (see Table 5). The base case is in bold. The results show that elasticity variation is not very influential even if significant changes in the parameter values are assumed. Only the values of input substitution elasticity approaching 1 (which is not common for such models) seem to bring substantial variation.

Table 5. Sensitivity analysis of TRI estimation, 2001-2002.

	Parameters	**TRI**
Final substitution elasticity	1.05	1.022
	2	**1.011**
	3	1.008
Input substitution elasticity	0.2	1.009
	0.5	1.010
	0.7	**1.011**

CONCLUSIONS

After all the results are obtained, it is possible to answer the questions posed in the introduction.

1. How did trade policy of Ukraine with regard to the EU develop?

There was much dynamics in the tariff rates, 52% of which changed more than once during the period 1994-2003. Substantial changes concerned almost all agricultural products, spirituous liquors, wood, textiles, machinery, and means of transport. In the period 1994-1997 trade restrictiveness was falling. In the next three years not many changes were introduced. However, the new law of 2001 brought a huge increase in trade restrictiveness, measured by uniform tariff surcharge of 3.25%. The interesting fact is that this law was adopted in consequence of WTO's requirement to bring the Ukrainian legislation in conformity with international standards. Since then the trade restrictiveness increases slowly. Import quotas are few and nonbinding.

2. Is Ukraine becoming "closer" to Europe in terms of trade policy?

Definitely not. There was no aggregate movement towards more free trade with the EU since 1997. Now the distance from trade without tariff barriers is measured by the UTS of 9.1%, which is not a very large number, but the dynamics of trade restrictiveness suggests that Ukraine is moving away from free trade.

The results of this work confirm the conclusion of a series of papers by Anderson and Neary (1994, 1996, 1998) about the inappropriateness of using the standard purely statistical measures of trade restrictiveness. These measures are

shown to bring misleading results, whereas TRI approach provides a researcher with a measure that is strongly correlated with the actual movement of trade flows and is easy to interpret.

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