COMPETITIVENESS OF UKRAINIAN PRODUCTS

by

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Abstract

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This study examines the competitiveness of Ukrainian products on the world market, as measured by Balassa index of Revealed Comparative Advantage. I find that in 2004 beverages were the most competitive; while in the previous years iron and steel were heading the leading positions. The dynamics of competitiveness and trade patterns for the period 1992-2000 are analyzed by means of Galtonian regression and stochastic kernels. The results suggest that specialization of Ukrainian trade is widening. In attempt to determine the factors that influence competitiveness, I follow Neo-Shumpetarian approach, which predicts that competitiveness on the macro level is determined by the process of innovation and acquisition of new technology. Thus the hypothesis that the competitiveness of Ukrainian products is influenced by FDI and use of imported products in the production process is tested. The results are compared to the ones of Hungary. I find that in Ukraine FDI has influenced competitiveness negatively and very little, and the role of imported inputs in production is also negative. The results are completely opposite for Hungary.

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I also thank Michael Porter and Paul Krugman for posing seemingly confusing questions and Bella Balassa for answering them in a simple and elegant way.

The remaining gratitude goes to the rest of economists, who contributed to the development of international trade theory, an also mathematicians and physicists who have contributed to the development of economic thought.

GLOSSARY

CIS Commonwealth of Independent States

CEE Central and Eastern Europe

CU Customs Union

EU 15 European Union members before the enlargement of 2004

HM Harmonic mass Index

HS Harmonized system of commodities

NBER National Bureau of Economic Research

NES Not elsewhere specified

OPT Outward processing trade

OECD Organization of Cooperation and Economic Development

RCA Balassa Index of Revealed Comparative Advantage

RCAS Balassa Index of Revealed Comparative Advantage (symmetric)

RTA Revealed Technical Advantage

SITC Standard International Trade Classification

SCS State Committee on Statistics

UN United Nations

WTO World Trade Organization

Chapter 1

INTRODUCTION

The world economy is becoming more globalized every year. For many years economists have spoken of competition on the world market rather than on the country level. Most developed economies are recognized for the products they export. This recognition serves as an indication of quality and in many cases opens the doors for other products of the country, making them more competitive on the world market. However, this phenomenon is less true for developing and transition economies due to the fact that they remained closed to the world for a long period of time. Thus, it would be particularly interesting to determine which industries are the most competitive on the world market for Ukraine, which has opened its borders to foreign trade 14 years ago.

There is a general agreement in international trade literature that specialization matters for economic growth, and it was even tested empirically by Dalum, Laursen, Vestpagen (1999). Some economists argue that economic growth often leads to a general decrease in specialization. Kelleher (2002) finds that richer countries are less specialized than low income countries, and there is a 'positive relationship between mobility in specialization and growth for low income countries.' Thus it would be worthwhile to determine whether Ukrainian economy exhibits a high degree of specialization in trade, and examine what kind

of changes in specialization patterns have occurred during the period of transition. Trade performance has already made a contribution to Ukraine's economic growth. About 40 percent of GDP growth in 1999-2003 has been attributed to an increase in net exports (World Bank, 2005 pp xviii). Thus it would be worth to study whether the current trade patterns are sustainable.

There is no general agreement among economists regarding theoretical explanations of competitiveness. According to Hekscher-Ohlin-Samuelson model, specialization and trade is determined by relative factor endowments. According to Ricardo (1817) and neoclassical trade theory, pattern of specialization depends on technical comparative advantage. Krugman (1980) argues that trade specialization is determined by economies of scale. Stokey (1988) emphasises the importance of learning by doing.

According to the neo-Schumpeterian view, competitiveness and international trade specialization is linked to the process of leaning and acquiring new technology (Hanusch and Pyka, 2005). In my study this view is tested empirically in the context of transition economy, Ukraine. Foreign direct investment and use of imported products in the production serve as indicators of the process of innovation acquisition, and the hypothesis that they are important is tested. The results are compared to the ones of Hungary, the transition economy which has moved closer to market economy in the period under investigation.

This paper aims to discover which Ukrainian products are the most competitive, describe the dynamics of Ukraine's trade specialization patters, and test whether

FDI and imported inputs for production determine the competitiveness of Ukrainian products.

The first question is answered by computing the index of revealed comparative advantage (RCA, defined as one industry's share of a country's export relative to this industry's share of world's total exports) To describe the patterns specialization, Galtonian regression analysis and stochastic kernels are used. In order to find out which factors determine Ukraine's competitiveness we will use OLS regression with RCAS as a dependent variable.

The paper is organized as follows: chapter 2 presents the literature review, chapter 3 presents the estimates of competitiveness index for Ukrainian products, chapter 4 discusses the dynamics of competitiveness for Ukraine and compares results to the US and Hungary . In chapter 5 the determinants of competitiveness on macro level are estimated for Ukraine and Hungary. Chapter 6 concludes and poses questions for further research.

Chapter 2

LITERATURE REVIEW

It is commonly agreed that trade performance of a country reflects the level of development of its economy. This is due to the fact that the country usually exports the goods in which it has comparative advantage over the other countries. In the literature on international trade there are two major approaches to evaluate the comparative advantage of a country: revealed comparative advantage (RCA) approach and Hecksher-Ohlin model (Yeats 1985). The latter determines relative labour and capital inputs for certain goods; thus it focuses on the initial endowment of the country. In this study we want to analyze not the initial endowment and structure of economy, but the results which these endowment and structure produce along with other factors. Thus we will follow the first approach.

The difference between comparative advantage and competitiveness is that the former is a reflection of structural changes in resources, while the latter in addition reflects macroeconomic situation (Lafay 1987). In this chapter the most widely used measure of competitiveness will be discussed, as well as its advantages and disadvantages, the methods of analysis of its dynamics, and the determinants of competitiveness.

2.1 The measure of competitiveness

The most widely used measure of competitiveness of country's trade specialization is the Balassa index of revealed comparative advantage. It was introduced by Liesner (1958) and popularized by Balassa (1965). The index measures the ratio of relative trade structure. Initially Balassa suggested two ways to measure it.

The first method is the share of total trade in the commodity group:

$$xij=(Xij-Mij)/(Xij+Mij)$$

X and M represent exports and imports, i and j the commodity and the country respectively. The index measures the significance of net flows in any commodity group, and ranges between -1 (no exports by country j in commodity i) and 1 (no imports by country j in commodity i). It shows the scale of trade flows in a commodity group. It also represents the degree of intra-industry trade in the group of products. However, this measure is not widely used because of the difficulty in interpretation and the fact that a country may use import restrictions, thus the measure would not reflect the actual competitiveness of the product.

The second method to measure trade structure proposed by Balassa is the export performance ratio, which does not take into account imports, thus is free of trade restriction bias (Lim 1997). It shows the degree with which a commodity can compete on the world market even when trade partners use protectionist measures.

Export performance ratio for commodity i country j is defined in the following way:

$$RCA_{ij} = \frac{X_{ij} / \sum_{i} X_{ij}}{\sum_{j} X_{ij} / \sum_{i} \sum_{j} X_{ij}}$$

X stands for exports, I and j represent commodity and country respectively. Where RCA is above 1 the country is said to be specialized in that sector (or to be competitive). The industries of products for which RCA is below 1 are considered uncompetitive. Export performance ratio will be used in this study to measure the competitiveness of products and will be referred to as Balassa index of Revealed Comparative Advantage or RCA.

Hinloopen and Marrewijk (2001) have found that "widely used criterion "RCA > 1" to identify sectors with a comparative advantage selects about one third of the exporting industries." This means that one third of country's products will be shown as competitive on the world market, even if the country is not exporting a lot. Proudman and Redding (1998) have divided the RCA into four classes to ensure that the number of observations is roughly equal for each class, but they have not provided any interpretation of these classes. They have not explained what it would mean for a commodity to belong to a certain class. Therefore they were criticized by Hinloopen and Marrewijk (2001) who have analysed the empirical distribution of Balassa Index of revealed comparative advantage. They

examined the export performance of similar countries (the Member States of the European Union) as the reference countries to a third market (Japan), using monthly data from 1992 to 1996. They have divided RCA into 4 classes with the following interpretation:

Class a	0 < RCA <1	industries without a comparative advantage (not competitive)
Class b	1 < RCA < 2:	"weak comparative advantage" (weakly competitive)
Class c	2 < RCA < 4	"medium comparative advantage"
Class d	4 < RCA	"strong comparative advantage" (strongly competitive)

Hinloopen and Marrewijk (2001) have also found that "the distribution of the RCA is highly skewed with a median well below one, and a mean well above one." Laursen (1997) have also argued that "the Balassa measure has the disadvantage of an inherent risk of lack of normality because it takes values between zero and infinity with a (weighted) average of 1.0." This means that when used in regression analysis, the index may produce unreliable t-statistics since the assumption of normal distribution is violated. He proposed to normalize RCA in the following way:

$$RCAS=(RCA-1)/(RCA+1)$$

Alternative normalization (around the sectoral mean) was proposed by Proudman and Redding (1998). Advantages and disadvantages of normalization of RCA are discussed in detail by Benedictis and Tamberi (2001), who also believe that the original RCA is still the best measure. They argue that "The forced symmetry

(imposed by Laursen, 1997) may obscure some of RCA dynamics… and does not imply normality, and its use may induce bias associated with extreme values of distribution." However, Laursen has used Jarque-Bera test for normality of error terms in the regression with RCA and RCAS as dependent variables. The results show that hypothesis of normality of the error terms can be rejected for 2 out of 19 regressions (10 per cent level), when using RCAS, while the hypothesis can be rejected for 8 out 19 regressions, when using RCA.. The evidence from Laursen (1998) is convincing, moreover most of the studies use RCAS for regression analysis, and therefore in this research RCAS will be used.

2.2 Dynamics of competitiveness.

In the recent years there has been a lot of interest among international trade economists regarding empirical research of the dynamics of competitiveness and trade patterns. Different methods were applied, ranging from transition probability matrices (Proudman and Redding 1998), and Hinloopen and Van Marrewijk (2001), to stochastic kernels (Brasili, Epifani and Heng 2000), probability-probability plots (Hinloopen and Van Marrewijk 2004), and Galtonian regression analysis (Dalum, Laursen and Villumsen 1996), Uchida and Cook (2004), Borbely (2004). Many studies use several techniques and the conclusions most of the time are similar for different methods. In this section I examine the most interesting studies, outlining the methods, countries and periods under investigation, and their main results.

Hart and Prais (1956) were first to discuss 'Galtonian' regression model, which became a widely used procedure for examining to which extent the phenomena are correlated through time and whether they converge through time. In 1989 Galtonian regression was used by Pavitt to examine technological specialization patterns.

For empirical testing of the degree of international trade specialization patterns, Galtonian regression was used by Dalum, Laursen and Villumsen (1996). In their work the trends in trade specialization and stability of competitiveness are tested by the regression equation, where dependent variable is the index of revealed comparative advantage symmetric (RCAS) for industries of one country in the final year under investigation and the explanatory variable is the same index for the initial year. In general, if $\beta=1$ (or close to unity), the pattern of specialization is considered to be unchanged, while if it is close to zero, the specialization patterns are considered to have changed significantly. The interpretation of β coefficient is discussed in more details in chapter 4, where the abovementioned method is applied to examine Ukraine's specialization patterns. Dalum, Laursen and Villumsen (1996) examine export specialization of 20 OECD countries during 1965 to 1992 time period. They find that there is a tendency for countries to de-specialize in terms of exports.

Proudman and Redding (1998) were first to use transition probability matrices to investigate the persistence and mobility of RCA over time. They characterised

international specialisation at any point in time by the distribution of RCA across industries, and analyzed the dynamics of patterns of international specialisation as evolution of the entire distribution of RCA over time. Essentially they were interested in the probability of each industry sector to move from one quartile of the RCA distribution to another. This would indicate the changes in competitiveness of sectors. They have used data for five industrialized countries form OECD's Bilateral Trade Database for 22 manufacturing industries for the period 1970-1993. They concluded that there was considerable mobility in patterns of international specialisation in the period under investigation. They found no evidence for an increase in the degree of international specialisation for France, Germany, the United Kingdom and the United States. However, there was evidence in Japan that the distribution of RCA tends towards extreme values at high and low values of RCA.

Brasili, Epifani and Helg (2000) analyzed the dynamics of trade patterns for industrialized countries and Asian economies. They have used both RCA and RCAS to test the stability of trade specialization patterns by means of transition probability matrices, stochastic kernels and regression analysis. Two groups of countries were examined in the time period of 1970-1995. Their major conclusion was that industrialized countries have highly persistent trade pattern, while emerging economies show rapidly changing trade specialization. From their analysis they also concluded that emerging economies are more specialized than

industrialized countries, but "both groups show a tendency toward reduced polarization and more symmetric distribution of the specialization index."

Hinloopen and Marrewijk (2004) have measured the Chinese comparative advantage with RCA, and concluded that "at the sector level, China's stronghold in primary products gradually reduced and its high grip on unskilled-labour intensive products increased, as did its grip on natural resource intensive products and human-capital intensive products in the 1990s." The industries classified as 3-digit and 4-digit sectors for the period 1970 – 1997 were examined. To investigate the dynamics, Hinloopen and Marrewijk have used Galtonian regressions, probability-probability (p-p) plots, the Harmonic Mass index and Markov transition matrices. From the results of Galtonian regressions they conclude that dispersion of distribution of RCA diminishes over time for Chinese economies. Advantages and disadvantages of the methods for investigation were discussed, concluding that Markov transition matrices are the most difficult to compute. I therefore prefer to use Galtonian regression in my analysis.

Uchida and Cook (2004) examined the trends of technological and trade specialization among East Asian countries. They use the data on exports from National Bureau of Economic Research to investigate the changes of RCA during four periods (1978-1982, 1983-1987, 1988-1993, 1992-1997). The major novelty of this study was that the authors discuss the relationship between technological and trade specialization and in addition to RCA analysis, also analyze the changes in technological comparative advantage (TCA). They find that South Korea,

Hong Kong and Singapore have been reinforcing the pattern of their technological specialization over time. South Korea has experienced diversification in trade specialization patterns, while Hong Kong and Singapore had more stable trade patterns. From the industry level analysis they conclude that earlier in the development of these economies "success in trade was required in order to establish competitive advantage in technology," but in the later periods technological specialization determined trade specialization.

Borbely (2004) investigates the competition among EU accession countries, Hungary, Poland and Czech Republic, and on four cohesion countries, Spain, Portugal, Ireland and Greece. She analyses whether these countries converge to the EU15 specialization patterns, finding that Hungary has the fastest speed of convergence to the EU trade patterns among three countries under investigation. Using Galtonian regression in her analysis, Borbely concludes that at the inter-sectoral cross country level there is an overall tendency in industries towards de-concentration. She also states that 'although there is great body of literature on RCAs, there is hardly any complete and comprehensive *explanation* of national comparative advantages for the countries considered,' and addresses this question for further research. This appeal will be addressed in my study in chapter 5.

It was discussed by Brasili, Epifani and Heng (2000) and Hinloopen and Van Marrewijk (2004), that the major difference in the methods of the analysis of trade patterns is the relative complexity of computation and interpretation. These methods explain slightly different aspects of trade patterns, but their results are

not contradictory, therefore I will use only two methods: stochastic kernels and Galtonian regression in my analysis, based on the ease of computation and interpretation. According to theoretical literature, advanced economies are expected to have stable trade patterns (Krugman, 1987). High degree of change in specialization is the feature of catching-up economies (Vespagen, 2000). The same conclusions were made in empirical studies which used RCAS to characterize export structure. Since Ukraine is a transition economy, I expect that export structure has been changing in the period of transition; however, the type of the change needs to be investigated. The methodology for analysis will be presented in chapter 4.

2.3 Determinants of competitiveness

Although many studies examined the dynamics of competitiveness, much less attention was paid to empirical investigation of the factors that determine it.

The major contribution in this field is Hoekman and Djankov (1997). The authors have used RCAS to analyze the magnitude of the change in export structure across the Central and Eastern European (CEE) countries in 1990–95. They have found that 'inflows of foreign direct investment are statistically insignificant or negatively associated with measures of revealed comparative advantage' in all countries except for Poland. They concluded that 'foreign investors have chosen sectors in which the Central and Eastern European countries were not relatively specialized under central planning.' This study is

particularly useful for our research since we also want to analyze the recent changes in Ukrainian export structure.

Another empirical study making use of Balassa Index was done by Dalum, Laursen and Vespagen (1999). They used RCA as an index of specialization to show that specialization matters for economic growth. They have used data for 11 manufacturing sectors for 1965-1988 for OECD countries. Their findings confirm that specialization matters for economic growth, but this effect has been decreasing during the 1980's.

Tochitskaya and Aksen (2001) have analyzed the economic effects of Belarus' participation in the CIS countries Customs Union (CU) in 1995 – 2000, identifying how the competitiveness of Belarusian products was affected. They have evaluated the impact of the CU on revealed comparative advantage, and concluded that "Belarus' participation in the CIS Customs Union does not facilitate the improvement in the domestic exports structure, the formation of the new comparative advantages both in trade with CU member countries and the rest of the world."

Chapter 3

COMPETITIVENESS RANKING

In this chapter the products which are exported from Ukraine to the world are ranked according to Balassa index of revealed comparative advantage. The index is defined as one industry's share in a country's total exports relative to this industry's share in the world's total exports. The following formula is used to compute RCA:

$$RCA_{ij} = \frac{X_{ij} / \sum_{i} X_{ij}}{\sum_{j} X_{ij} / \sum_{i} \sum_{j} X_{ij}}$$

X stands for exports, i and j represent commodity and country respectively.

To compute the index for Ukrainian products, I use data on exports of major products, defined at the two-digit level of Harmonized system (HS) of commodities. This includes 97 commodities (1-98, excluding 77). Annual data on exports from Ukraine for the years 2001- 2004 was provided by the State Committee on Statistics. Data on exports for 2001-2004 for the rest of the world are taken from UN Commodity Trade Statistics Database. Since they are defined in the same classification, the two datasets can be combined.

Descriptive statistics are provided in table 1.

Table1. Descriptive statistics for exports of Ukraine and world in 2001-2004

Ukraine	2001	2002	2003	2004
Std	3321,68	1845704,11	2348081,55	2515704,11
Min	258,00	5,00	0,22	528,00
Max	16264734,34	17957094,85	23080187,31	31140582,59
Mean	7112,29	454832,69	580102,76	317761,05
Number of observations	99	99	99	99
World	2001	2002	2003	2004
Std	4254544174	3793146444	7735169697	160565310959
Min	1	1	1	2
Max	151347989570	129957333348	552117010485	916585593000
Mean	533105410	525990361	661069185	77472896411
Number of observations	10011	11990	9250	10051

The most interesting would be to know the most recent ranking, thus RCA index for 2004 is provided in table 2. Only the products which exhibit medium and strong comparative advantage, as defined by Hinloopen and Marrewijk (2001), are listed, while all the values of the index for 4 years are provided in the appendix 1.

In table 2 the products are ranked from the most competitive to (relatively) the least competitive.

Table 2. Exports and competitiveness of Ukrainian products in 2004

	Value of Ukrainian exports, mln $	Share of commodity in Ukrainian exports	Share in world exports	RCA
22 Beverages, spirits and vinegar	266631,78	0,01	0,0003	31,05
33 Essential oils and resinoids; perfumery, cosmetic	192391,45	0,01	0,0002	31,01
86 Railway or tramway locomotives, rolling-stock and parts thereof	1492777,47	0,05	0,0025	18,23
35 Albuminoidal substances; modified starches; glues; enzymes	99508,67	0,0001	0,0002	12,67
72 Iron and steel	10768277,10	0,33	0,0277	11,89
31 Fertilizers	751048,43	0,02	0,0025	9,15
41 Raw hides, skins and leather	177857,70	0,01	0,0006	9,13
36 Explosives; pyrotechnic products; matches	5285,38	0,00002	0,0000	8,41
10 cereals	844273,63	0,03	0,0049	5,29
15 Animal or vegetable fats and oils	546113,79	0,02	0,0037	4,47
26 Ores, slag and ash	679379,52	0,02	0,0050	4,17
28 Inorganic chemicals	785607,96	0,02	0,0063	3,80
17 sugars and sugar confectionary	119636,20	0,0001	0,0011	3,52
19 Preparations of cereals, flour, starch or milk; bakers' wares	82511,88	0,00003	0,0008	3,15
25 Salt; sulfur; earths and stone; plastering materials	257621,59	0,01	0,0025	3,12
04 Dairy produce; birds eggs; natural honey	445995,20	0,01	0,0050	2,72

The most competitive Ukrainian products in 2004 were beverages. It is interesting to note that beverages comprised only 1% or Ukrainian exports in 2004. Thus, the share of a commodity in the country's exports doesn't always say much about its competitiveness.

Iron and steel were the most competitive in the years 2001-2003, and only third in the year 2004. However, iron and steel still have the largest share in Ukrainian exports among the most competitive products. This suggests that along with export diversification of Ukraine, some changes have occurred on the world market in 2004.

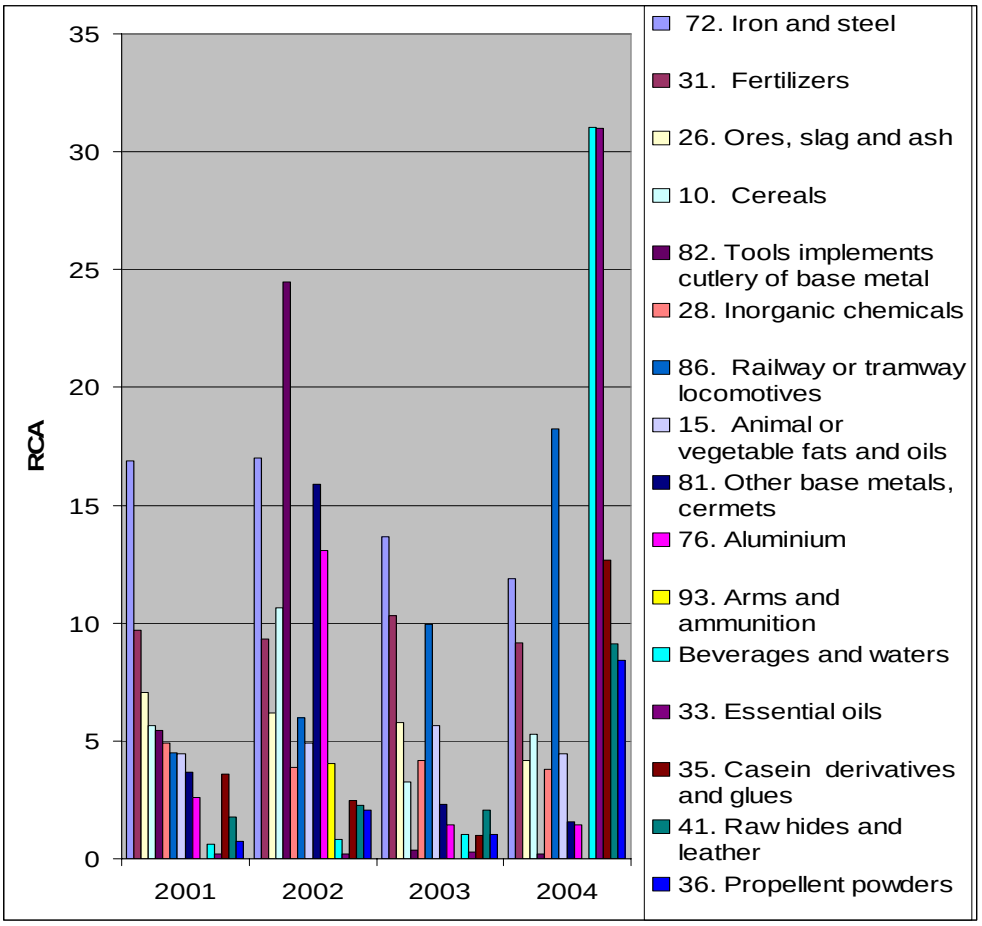
The descriptive statistics for RCA index for these years are provided in table 3

Table 3. Descriptive statistics of RCA index

	2001	2002	2003	2004
Std	2,34	5,64	2,18	5,18
Min	0,00	0,00	0,00	0,00
Max	5,43	44,46	9,94	18,23
Mean	0,84	4,62	0,81	1,09
Skewness	4,09	5,31	3,67	4,31
Kurtosis	22,01	34,62	15,57	20,41

Figure 1 illustrates the evolution of rankings of the most competitive products over time. It represents the value of RCA index for the products which reveal strong comparative advantage (as defined by Hinloopen and Marrewijk 2001) in at least one of the years.

Figure 1. Changes in competitiveness rankings 2001-2004



Chapter 4

DYNAMICS OF COMPETITIVENESS

The general conclusion in theoretical and empirical literature about international trade specialization is that advanced economies are expected to have stable trade patterns (Krugman, 1987), while high degree of change in specialization is the feature of catching-up economies (Beelin and Vespagen, 1994). In this chapter I want to see whether these findings are consistent with Ukrainian data and how much, relative to other countries, specialization in Ukraine has changed during the transition period.

4.1 Methodology and data.

Different methods are used to analyse the patterns of trade specialization. They range from transition probability matrices to probability-probability plots, Galtonian regression analysis and stochastic kernels. In this chapter the last two will be used to analyze Ukraine's trade patterns. For illustrative purposes the results for Ukraine will be compared to trade patterns of the US, an industrialized economy, and Hungary, a transition economy which has moved closer to market economy along the transition path than Ukraine.

Galtonian regression is the regression equation, where the dependent variable represents an index or a measure of a certain phenomena in the final period and the explanatory variable is the same index in the initial period. In our case the

index of revealed comparative advantage symmetric (RCAS) for industries of one country in the final year is regressed on RCAS of the initial year.

RCAS is the symmetric index of revealed comparative advantage, computed in the following way:

$$RCAS=(RCA-1)/(RCA+1)$$

RCAS is used for regression analysis instead of RCA, since its distribution is closer to normal. The same normalization procedure was performed by Dalum, Laursen and Villumsen (1996). They examined the trade patterns of OECD countries by means of Galtonian regression, the results of their study were discussed in chapter 2.

$$RCAS_{ij}^{t2} = \alpha + \beta RCAS_{ij}^{t1} + \xi \qquad (1)$$

Equation (1) represents Galtonian regression for trade patterns. The dependent variable, RCAS at the year t_2 for sector i, country j, is tested against the independent variable which is the value of the RCAS in the year t_1. α and β are standard linear regression parameters and ε is a residual. β measures how stable the specialization pattern of a country has been, between the two periods.

$\beta=1$ corresponds to unchanged patterns from t_1 to t_2. More specific interpretations are the following:

- If $\beta>1$, the country has become more specialized in the sectors where it was specialized already;

- If $0<\beta<1$ – the existing trade pattern changes: on average, the sectors with high specialization decrease their values and sectors with low specialization increase their values;
- If $\beta<0$, the ranking of sectors has been reversed, meaning that industries with high value of RCAS have become very uncompetitive, while the industries with low value of RCAS have become competitive.

Uchida and Cook (2004), use the same method to analyze trade and technological specialization for East Asian economies. They also measure ρ, correlation coefficient of RCAS between two periods, and distinguish between 'regression effect', measured by $(1-\beta)$ and 'mobility effect,' measured by $(1-\rho)$.

A high value of β (low regression effect) means that specialization is becoming more concentrated, while high regression effect indicates diversification.

A high value of ρ (low mobility effect) indicates stability in specialization pattern; this means that there is no or very little movement of industries along the distribution of the index. Low ρ shows that industries move along the distribution a lot.

The variance of RCAS, which can be measured by β/ρ, as was shown by Hart (1974) can indicate the widening or narrowing of specialization.

$\beta/\rho<1$ suggests the widening of specialization, since regression effect outweighs the mobility effect. When $\beta/\rho>1$, mobility effect outweighs the regression effect, suggesting the narrowing of specialization.

The most interesting is to use this methodology to analyze the changes that have occurred in the structure of Ukrainian exports since 1992, when the borders were open to trade.

Data.

World trade flows in 1962-2000, were collected and documented by National Bureau of Economic Research. The data are organized by the 4-digit Standard International Trade Classification, revision 2, with country codes similar to the United Nations classification. I use this dataset to compute RCAS index for Ukraine, Hungary and the US for three periods1992-1998, 1998-2000, 1992-2000.

4.2 Results of Galtonian regressions.

I estimate nine regression equations as in (1) with RCAS for the last period as a dependent variable and RCAS for the previous period as an explanatory variable. Table 4 reports the results of Galtonian regressions for three countries during three periods. I also estimate the correlation coefficient.

Table 4. Dynamics of trade patterns.

Country	**Period**	β	ρ	β/ρ	1–β	1–ρ	R^2
Ukraine	1992-1998	0,2984**	0,3369	0,8859	0,7015307	0,6631	0.1135
	1998-2000	0,6374**	0,6402	0,9957	0,362548	0,3598	0.4098
	1992-2000	0,1629**	0,1863	0,8744	0,8370859	0,8137	0.0347

Hungary	1992-1998	0,3963**	0,4179	0,9484	0,603654	0,5821	0.1747
	1998-2000	0,6203**	0,6308	0,9834	0,379634	0,3692	0.3994
	1992-2000	0,2703**	0,3535	0,76491	0,729604	0,6465	0.1250
US	1992-1998	0,6636 **	0.7046	0,9419	0,336303	0,2954	0.4965
	1998-2000	0,81462**	0.8035	1,0138	0,18537	0,1965	0.6457
	1992-2000	0,6573**	0,5482	1,1990	0,342672	0,4518	0.3005

*- 5% significance, ** - 1% significance

1-β – regression effect, 1-ρ – mobility effect

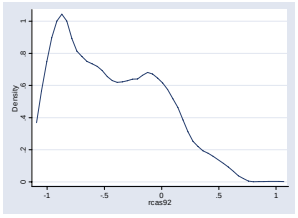
We can see that for all the periods, β is the lowest for Ukraine, and the highest for the US which suggests that specialization of Ukrainian exports has changed a lot during these periods, while trade patterns have been more stable for the US.

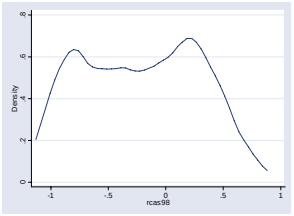
In all the periods for Ukraine $\beta/\rho<1$, mobility effect has been lower than regression effect, which suggests that specialization is widening. If we assume that the pattern has been continuing in the later years, this result is consistent with the results of previous chapter, where we could see that new products enter the top list of competitiveness for Ukraine.

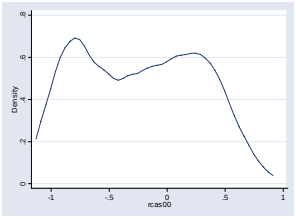
4.3 Results of stochastic kernels

Figure 2. Shape of RCAS distribitions

US

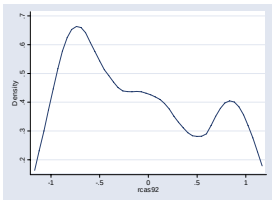


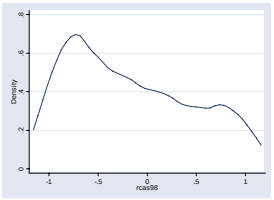


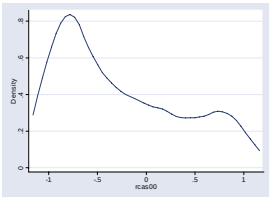


1992 1998 2000

Hungary

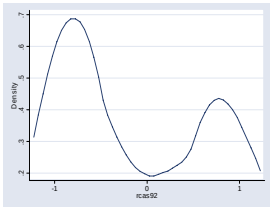


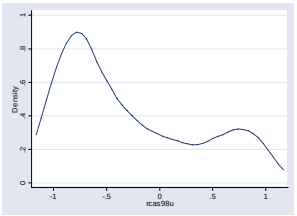


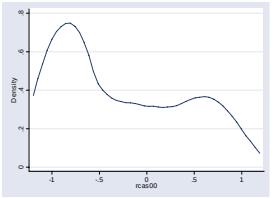


1992 1998 2000

Ukraine





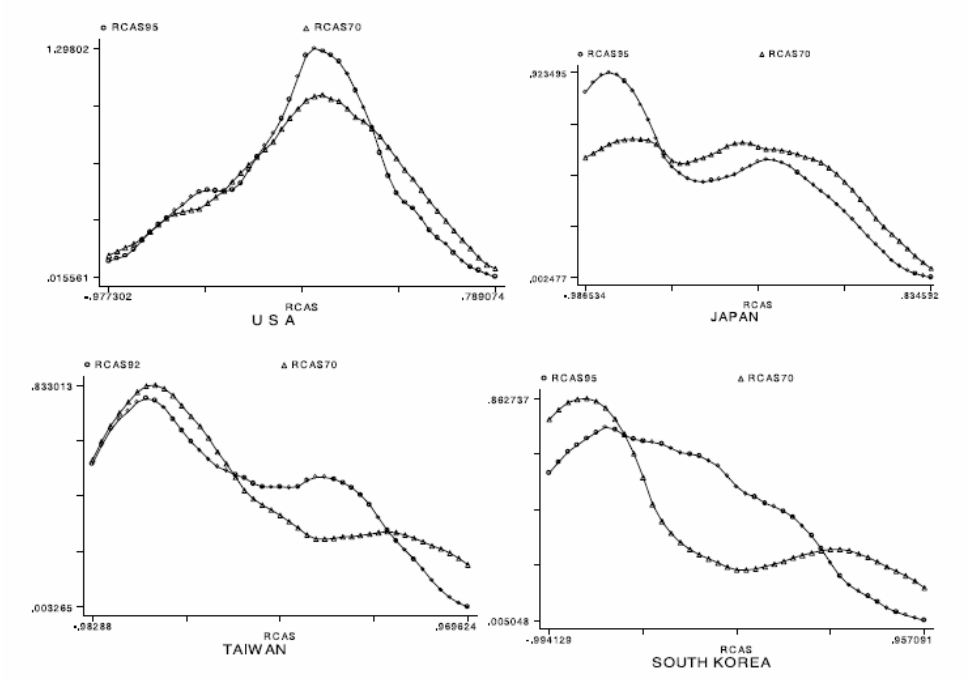


1992 1998 2000

It can be observed that the distribution of RCAS index for Ukraine is highly skewed, but it has become more smooth since 1992. The distribution looks

similar to the one of Hungary. If we compare the results with other economies using the results of Brasili, Epifani P. and Helg R. (2000), given in figure 3, we can notice that trade patterns of Ukraine and Hungary are similar to the ones of Japn and South Korea in 1970.

Figure 3. Kernel densities for US, Japan, Taiwan and South Korea
Source: Brasili, Epifani P. and Helg R. (2000)



Chapter 5

DETERMINANTS OF COMPETITIVENESS

In this chapter I examine what factors determine the competitiveness of Ukrainian products. According to neo-Schumpeterian theory, international trade specialization is linked to the process of leaning and acquiring new technology. Thus I want to test empirically whether foreign direct investment and use of imported products in the production of goods, as indicators of the process of innovation acquisition, have an impact on competitiveness for transitional economy, Ukraine. I test the same hypothesis for Hungary in order to find out whether relative place on the transition path has an impact on the determinants of competitiveness.

5.1. Methodology

To analyze the determinants of competitiveness, I use pooled OLS regression with RCAS as a dependent variable. The major variables in the model are the same as suggested by Hoekman and Djankov (1997). They have investigated that export structure (measured by RCAS) of Central and Eastern European (CEE) countries is explained by outward processing trade (OPT), foreign direct investment (FDI), and imports of inputs (IMP). Hoekman and Djankov have used data on exports for 23 industries in five CEE countries during the years 1990-1995. They found that these variables explain from 34 % of variation in the

dependent variable (for Bulgaria) to 55 % of variation in the dependent variable (for Romania).

The model should also be suitable for Ukraine. The model is also consistent with the belief that the process of learning by acquiring new technology through FDI and sourcing imports from abroad explains the competitiveness of Ukrainian products. However, the outward processing trade variable is not applicable. OPT is a customs regime under which "enterprises based in the European Union may ship components abroad for processing and re-import the processed commodities free of duty or quantitative restrictions" (Hoekman and Djankov, 1997). Since we are analyzing the ability of Ukrainian products to compete on the world market, not only with the goods from the EU, this variable can not be used, since the data for OPT to other countries than the EU is not available. Moreover, OPT is correlated with imports of inputs, so it is partially included in IMP variable. Hoeckman and Djankov estimated that correlation coefficient between OPT and IMP is 0.43.

I also add the variable tax_net: the total amount of taxes minus subsidies which an industry receives during the year. It was shown by Baxter (1992) that taxes can influence specialization. In addition, subsidy may positively influence the amount of production, and therefore exports of subsidized commodity may decrease. Moreover, heavy taxation on certain goods may discourage the production at all.

So, the following regression equation will be estimated:

$$RCAS = \alpha + \beta_1 FDI + \beta_2 IMP + \beta_3 tax\_net + \xi$$

The expectations about the sign of the variables are the following.

IMP is the share of imports in total intermediate inputs. This is a measure of importing new technology from abroad, which should have an impact on competitiveness. Thus I expect the sign of the coefficient of this variable to be positive.

The sign of the coefficient for tax_net is expected to be negative.

According to neo-Schumpeterian theory, the sign of the coefficient for FDI should be positive since it represents the process of new technology acquisition. There are some other explanations for an impact of FDI on trade. It can be either substitute or a complement to export, thus the sign for this variable alone is indeterminate. If the location of production in the country is done in order to access Ukrainian market and thus bypass trade barriers, the sign will be negative. However, if the plant is located in a country in order to exploit the low cost of production (which is likely to be the case in Ukraine), FDI should create trade and thus the coefficient will be positive. Thus the sign of the coefficient of imports of inputs may also help to explain the relationship of exports and FDI. If they are positively correlated, then FDI should also be correlated with exports and therefore, RCAS.

5.2 Data

State Committee on Statistics (SCS) of Ukraine provides FDI data by industries since 1998. The data for 4 years (2001-2004) is available for 12 aggregated industries. For the years 2000 and 1998 (1999 is missing), the classification is slightly different, and only seven industries correspond to the ones in 2001-2004. Statistics on imports used in production and intermediate consumption, taxes and subsidies, are taken from Input-Output tables published by State Committee on Statistics since 1998. The classification of industries is the same as that for FDI. To sum up, there are 62 observations for Ukraine.

The summary of statistics for variables FDI, IMP and tax_net are provided in table 5.

Table 5. Summary of statistics for explanatory variables for Ukraine

	Tax_net (in mln Hryvnia)	Imp (a fraction)	FDI (in mln USD)
Std	2361,58	0,707106781	117055,0087
Min	-13	0	-27462,58
Max	10005	1	869954,92
Mean	1552,84	0,5	52741,69323
Number of observations	62	62	62

The list of aggregated industries is provided in appendix 2.

In order to increase the number of observations, data for other transition economies was intended to be added. The statistics for FDI for transition countries are available WIIW Handbook on Statistics. From all the transition

countries Input-Output tables are available only for Hungary for 2000-2002 (from Hungarian Central Statistical Office) and 1998 (from OECD Statistics Division), Czech Republic 2003 (Central Statistical Office of Czech Republic), and Estonia 1997(Central Statistical Office of Estonia). In order to combine the countries in one dataset, similar trade patterns need to be assumed, which includes the rate of trade expansion to the EU, membership in WTO, amount of inward FDi. However, Hungary, Estonia and Czech Republic have received the largest amounts of FDI in the period under consideration and have the highest rate of trade expansion to the EU. All of them are members of WTO and have joined the EU in 2004. These facts suggest that their trade patterns should be different from the ones of Ukraine thus I can not add them in one model and therefore will estimate it separately for Hungary.

The descriptive statistics for variables FDI, IMP and tax_net for Hungary are provided in table 6. There are 60 observations since industries for Hungary are aggregated to 15.

Table 6 Summary of statistics for explanatory variables for Hungary

	Tax_net (in mln Euro)	Imp (a fraction)	FDI (in mln Euro)
Std	792,49756	0,67929	578,91290
Min	0,00001	0,00682	-132,77952
Max	3247,48100	4,25345	2110,01312
Mean	656,91588	0,74083	336,96986
Number of observations	60	60	60

5.3 Model estimation, Ukraine

First I estimate pooled OLS regression for Ukraine only.

The results of pooled OLS are the following:

Model	1.96887451	3	.656291503	F(3, 58) =	2.22
Residual	17.1562774	58	.295797887	Prob > F =	0.0956
				R-squared =	0.1029
Total	19.1251519	61	.313527081	Adj R-squared =	0.0565
				Root MSE =	.54387

rcas	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fdi_defl_hr	**-1.37e-07**	**2.14e-07**	**-0.64**	**0.523**	**-5.66e-07**	**2.91e-07**
imp	**-.2872967**	**.1223656**	**-2.35**	**0.022**	**-.5322379**	**-.0423554**
tax_net_defl	-6.35e-09	3.28e-08	-0.19	0.847	-7.21e-08	5.94e-08
_cons	.420784	.110991	3.79	0.000	.1986112	.6429567

However, pooled OLS is appropriate only if parameter values are common to all industries at all times. Therefore I estimate fixed effects regression to check this.

The results of fixed effects:

Fixed-effects (within) regression — Number of obs = 62
Group variable (i): ind — Number of groups = 12

R-sq: within = 0.1688 — Obs per group: min = 4
between = 0.0000 — avg = 5.2
overall = 0.0123 — max = 6

F(3,47) = 3.18
corr(u_i, Xb) = -0.4784 — Prob > F = 0.0324

rcas	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fdi_defl_hr	**-2.55e-07**	**1.34e-07**	**-1.91**	**0.062**	**-5.25e-07**	**1.36e-08**
imp	**-.1636211**	**.1440772**	**-1.14**	**0.262**	**-.4534671**	**.1262248**
tax_net_defl	**-1.37e-07**	**6.90e-08**	**-1.99**	**0.052**	**-2.76e-07**	**1.38e-09**
_cons	.5713322	.125723	4.54	0.000	.3184102	.8242542
sigma_u	.60041022					
sigma_e	.31407694					
rho	.78515263	(fraction of variance due to u_i)				

F test that all u_i=0: F(11, 47) = 11.54 — Prob > F = 0.0000

On the basis of F-test pooled OLS is biased. However, fixed effects estimator is inefficient if industry-specific effects vary both across time and over industries, or

if there are no common events that influence all industries at each time. To check this, I perform random effects regression.

The result of random effects:

```
Random-effects GLS regression                   Number of obs      =        62
Group variable (i): ind                         Number of groups   =        12

R-sq:  within  = 0.1522                         Obs per group: min =         4
       between = 0.0179                                        avg =       5.2
       overall = 0.0488                                        max =         6

Random effects u_i ~ Gaussian                   Wald chi2(3)       =      8.21
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0419

------------------------------------------------------------------------------
        rcas |      Coef.   Std. Err.       z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 fdi_defl_hr |  -2.36e-07   1.33e-07    -1.78   0.076    -4.96e-07    2.44e-08
         imp |  -.2143512   .1288151    -1.66   0.096    -.4668241    .0381218
tax_net_defl |  -6.95e-08   5.23e-08    -1.33   0.184    -1.72e-07    3.30e-08
       _cons |   .4231969   .1872968     2.26   0.024      .056102    .7902919
-------------+----------------------------------------------------------------
     sigma_u |  .54096925
     sigma_e |  .31407694
         rho |  .74790103   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Then I test which approach is better by Hausman test:

Hausman test, Ho: difference in coefficients not systematic

Prob>chi2 = 0.4318

The hypothesis of appropriateness of random effects is not rejected by Hausman test, so these are the results that I should interpret.

Since the results are contradictory with theory for developed countries, I also perform Ramsey test for omitted variables.

Ramsey RESET test using powers of the fitted values of rcas

Ho: model has no omitted variables, **Prob > F = 0.0097**

The hypothesis of no omitted variables is rejected on 1% level, which means that other factors indeed have impact on competitiveness of Ukrainian products.

Several models with year dummies were also estimated; however, they did not influence the results. Moreover, in the period under investigation no important events that could significantly influence trade structure of Ukraine have happened, except for financial crisis in Russia in 1998. In the models with different dummy specifications, dummy for 1998 was never significant, therefore models with dummies are not presented.

The interpretations of results are the following.

1) FDI has negative and very small impact on competitiveness at 10% level of significance. This means that the process of technology transfer is either not occurring in Ukraine yet, or is occurring through different channels. Similar results were found by Hoeckman and Djankov (1997) for Bulgaria, Hungary and Czech Republic for the years 1990-1995.

Sourcing inputs from abroad also has negative impact on competitiveness, which indicates that some inputs may be imported from less developed countries and be of quality lower than row materials in Ukraine.

The magnitude of the effect of sourcing inputs from abroad is difficult to interpret because of the nature of RCAS index. We can say that inputs from abroad worth one million Hryvnia decrease the competitiveness index of the product, for production of which they are used, by 0.21 point, and in some cases move the product from 'competitive' to 'uncompetitive' group.

2) Taxes on production and subsidies do not play the significant role in competitiveness of Ukrainian products although they may in fact have impact, since they are significant at 'unconventional' 20% level. It should be also taken into consideration that some variables are omitted.

The results show that other factors, such as business environment and institutions may play more important role in transition economies than factors proposed by traditional theories.

Some more explanations should be added. The results of chapter 3 can also shed some light on the issue. Beverages became the most competitive in 2004, after large investments were made by foreign companies into this sector. In this case FDI is a complement of foreign trade, since these products were produced both for home and foreign markets. While for other sectors it could serve as a substitute – investments were made in order to gain Ukrainian market, rather than to export. If these two effects have approximately the same size, the impact of FDI on competitiveness is insignificant, which could be the case for Ukraine. Unreliable statistics for FDI also need to be taken into consideration.

5.4 Model estimation, Hungary

It would be worth to know whether the same result holds for other transition countries. Given the availability of data, I test the same model for Hungary:

there are 60 observations: 4 years X 15 industries.

Pooled OLS

```
      Source |       SS       df       MS              Number of obs =      60
-------------+------------------------------           F(  3,    56) =    1.20
       Model |   1.5125708     3  .504190267           Prob > F      =  0.3181
    Residual |  23.5216413    56  .420029309           R-squared     =  0.0604
-------------+------------------------------           Adj R-squared =  0.0101
       Total |  25.0342121    59   .42430868           Root MSE      =   .6481

------------------------------------------------------------------------------
        rcas |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         imp |   .1096704   .1290512     0.85   0.399    -.1488502    .3681909
         fdi |   .0001505   .0001129     1.33   0.188    -.0000757    .0003768
     tax_net |  -.0001568   .0001587    -0.99   0.328    -.0004748    .0001612
       _cons |   .0090722   .1503206     0.06   0.952     -.292056    .3102005
------------------------------------------------------------------------------
```

Fixed Effects

```
Fixed-effects (within) regression               Number of obs      =        60
Group variable (i): ind                         Number of groups   =        15

R-sq:  within  = 0.2164                         Obs per group: min =         4
       between = 0.0302                                        avg =       4.0
       overall = 0.0525                                        max =         4

                                                F(3,42)            =      3.87
corr(u_i, Xb)  = -0.4494                        Prob > F           =    0.0157

------------------------------------------------------------------------------
        rcas |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         fdi |   .0004799   .0001721     2.79   0.008     .0001327    .0008272
         imp |   .2716238   .0970792     2.80   0.008     .0757101    .4675375
     tax_net |  -.0002037   .0001416    -1.44   0.158    -.0004895    .0000821
       _cons |  -.3114767   .1562126    -1.99   0.053    -.6267265    .0037731
-------------+----------------------------------------------------------------
     sigma_u |  .63830731
     sigma_e |  .36229473
         rho |   .75634118   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(14, 42) =     9.80                 Prob > F = 0.0000
```

On the basis of F test, pooled coefficients are biased.

Random Effects

```
Random-effects GLS regression                   Number of obs      =        60
Group variable (i): ind                         Number of groups   =        15

R-sq:  within  = 0.2120                         Obs per group: min =         4
       between = 0.0314                                        avg =       4.0
       overall = 0.0552                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(3)       =      9.96
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0189

------------------------------------------------------------------------------
        rcas |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         fdi |   .0003291    .000135     2.44   0.015     .0000645    .0005936
         imp |   .2184144   .0897421     2.43   0.015     .0425231    .3943057
     tax_net |  -.0001671   .0001306    -1.28   0.201     -.000423    .0000888
       _cons |  -.1852758   .2012968    -0.92   0.357    -.5798103    .2092588
```

Hausman test, Ho: difference in coefficients not systematic
Prob>chi2 = 0.5287

On the basis of Hausman test I do not reject random effects model.

Moreover, on the basis of Ramsey test, hypothesis that model is well specified is not rejected.

Ramsey RESET test using powers of the fitted values of rcas

Ho: model has no omitted variables

Prob > F = 0.1577

The results suggest that in 1998-2002 in Hungary both FDI and import of inputs made positive impact on competitiveness of products. It is worth to remind that during the period of 1990-1995, investigated by Hoeckman and Djankov (1997), the results for Hungary regarding FDI were similar to the ones in Ukraine, although imports of inputs already then had positive, but much smaller impact on

competitiveness of Hungarian products. This illustrates that Hungary has made a significant step along the transition path. In the field of international trade it exhibits the performance consistent with modern theoretical predictions for market economies.

This significant improvement can be explained by trade policy of Hungary in the late 1990s. In November 1998, Hungary has started accession negotiations with EU, and in March 1999 it had become a member of WTO (EU Commission reports). It is possible that these events have facilitated more efficient process of technology transfer, which may lead to sustainable long-term improvement of competitiveness of Hungarian products. From my research it can not be stated for sure that these are the only, or even the major, factors which led to economic development of Hungary. Thus, the issue needs further investigation, and can be tested using the approach of Tochitskaya and Aksen (2001) applied to Belarus's participation in CIS customs union.

Chapter 6

CONCLUSIONS

In study the competitiveness of Ukrainian products on the world market, measured by Balassa index of Revealed Comparative Advantage was examined. It was found that in 2004 beverages, essential oils and resinoids; perfumery, cosmetics, railway or tramway locomotives were the most competitive, while in the previous years iron and steel were heading the leading positions. This finding, along with the results of chapter 4 regarding widening of specialization of Ukrainian trade, suggest that Ukrainian export structure is not locked in the export structure, which was prevalent in the earlier periods of transition. Thus, if Ukraine looses its positions on the world steel market, there is a hope that its exports will still remain substantial, but the product range will change.

In attempt to determine the factors that influence competitiveness, I followed Neo-Shumpetarian approach, which predicts that competitiveness on the macro level is determined by the process of innovation and acquisition of new technology. The results show that FDI has negative and very small impact on competitiveness. This means that the process of technology transfer is either not occurring in Ukraine yet, or is occurring through different channels and competitiveness in Ukraine is not innovation-driven. It can not be explained by Neo-Shumpetarian approach, and thus the impact of microeconomic factors, such as business environment and institutions need further investigation.

Given that the results for Hungary show that FDI and imported inputs influence competitiveness positively, it would be worth to recommend policy-makers in

Ukraine to follow international trade policy of Hungary. Since the negotiations for the accession to the EU have already started, and membership in WTO is already a priority of international policy of Ukrainian government, we may hope that in several years Ukraine will exhibit the performance consistent with modern theoretical predictions for market economies the field of international trade.

Since competitiveness have not been researched in Ukraine, there are many implications for further investigation in this field. It would be worth to develop a model which explains competitiveness on micro level, especially taking into account that this issue has been ignored in the literature as of now.

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APPENDICES

Appendix 1
RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
01. Live animals	0,0700	0,1784	0,2800	0,0800
02. Meat and edible meat offal	1,4600	1,9188	1,5400	0,7800
03. Fish and crustaceans molluscs and other aquatic invertebrates	0,2400	0,1280	0,0800	0,0600
04. Dairy products, eggs, honey, edible animal product	3,1400	1,7593	2,2000	2,7200
05. Products of animal origin not elsewhere specified	0,5800	0,7185	0,9100	0,7300
06. Live trees and other plants	0,0000	0,0074	0,0000	0,0001
07. Edible vegetables and certain roots and tubers	0,4100	0,4243	0,1600	0,2800
08. Edible fruit and nuts; peel of citrus fruit or melons	0,2500	0,4165	0,3700	1,0000
09. Coffee, tea, mate and spices	0,0600	0,0475	0,0600	0,1100
10. Cereals	5,6500	10,6674	3,2600	5,2900
11. Milling products, malt, starches, inulin, wheat glute	0,7500	0,8854	0,8200	0,9800
12. Oil seed, oleagic fruits, grain, seed, fruit, etc, ne	3,0400	0,7083	2,9500	1,4700
13. Lac; natural gums resins gum-resins and oleoresins	0,2600	0,0901	0,0010	0,0000
14. Vegetable materials primarily for plaiting	0,0000	0,3489	1,4900	0,1700
15. Animal,vegetable fats and oils, cleavage products, et	4,4400	4,9086	5,6400	4,4700
16. Preparations of meat, of fish or of crustaceans	0,3800	0,3407	0,3400	0,0200
17. Cane or beet sugar and pure sucrose in solid form.)	1,9100	2,6319	3,5600	3,5200

Appendix 1, continued. RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
18. Cocoa beans, whole or broken, raw or roasted	3,5400	3,0151	3,1700	0,1000
19. Malt extract; food preparations of flour	0,5600	0,5245	0,6700	3,1500
20. Preparations of vegetables fruit or nuts	0,6400	0,6980	0,9600	0,8500
21. Miscellaneous edible preparations	0,2600	0,3053	0,9300	1,0000
22. Waters including natural or artificial mineral waters	0,6200	0,8116	1,0300	31,0500
23. Residues and waste from the food industries	1,1400	1,3314	2,1900	1,5900
24. Tobacco and manufactured tobacco substitutes	0,7100	0,7936	0,7800	0,7700
25. Salt; sulfur; earths and stone; plastering materials	3,2000	3,4075	3,4000	3,1200
26. Ores, slag and ash	7,0600	6,2071	5,7600	4,1700
27. Mineral fuels, oils, distillation products, etc)	0,8600	1,1248	1,5000	1,4200
28. Inorganic chemicals	4,9300	3,8682	4,1600	3,8000
29. Organic chemicals	0,4600	0,5256	0,5700	0,5500
30. Pharmaceutical products	0,1400	0,1009	0,0900	0,0700
31. Fertilizers	9,6900	9,3207	10,3000	9,1500
32. Tanning or dyeing extracts	1,1700	0,8175	0,8200	0,8300
33. Essential oils (terpeneless or not) including concretes	0,1900	0,1912	0,2900	31,0100
34. Soap organic and surface-active agents	0,2200	0,2814	0,3700	0,4800

Appendix 1, continued. RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
35. Casein caseinates and other casein derivatives; casein glues	3,5900	2,4623	0,9700	12,6700
36. Propellent powders	0,7600	2,0492	1,0500	8,4100
37. Photographic or cinematographic goods	0,0300	0,0203	0,0400	0,0001
38. Miscellaneous chemical products	0,3000	0,5631	0,3800	0,6700
39. Plastics and articles thereof	0,2400	0,2898	0,3400	0,2800
40. Rubber and articles thereof	0,9300	0,6605	0,4500	0,4200
41. Raw hides and skins (other than fur skins) and leather	1,7800	2,2734	2,0600	9,1300
42. Articles of leather; saddlery and harness	0,1400	0,1532	0,1500	0,1600
43. Fur skins and artificial fur; manufactures thereof	0,9000	1,0143	0,5400	0,3600
44. Wood and articles of wood, wood charcoal	1,3800	1,5284	1,6300	1,4800
45. Cork and articles of cork	0,0003	0,0021	0,0000	0,0000
46. Manufactures of straw of esparto or of other plaiting materials	0,0000	0,0093	0,0000	0,0001
47. Pulp of wood or of other fibrous cellulose material	0,0000	0,0052	0,0001	0,0001
48. Paper and paperboard; articles of paper pulp of paper or of paperboard)	0,9300	0,8694	0,7500	0,6800
49. Printed books newspapers pictures and other products of the printing indu	0,3900	0,3158	0,3200	0,3500
50. Silk-worm cocoons suitable for reeling	0,0000	0,0009	0,0000	0,0003
51. Wool fine or coarse animal hair; horsehair yarn and woven fabric	0,2400	0,3927	0,3000	0,3100

Appendix 1, continued. RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
52. Cotton	0,0200	0,0458	0,0300	0,0400
53. Vegetable textile fibres nes, paper yarn, woven fabrics	0,6900	1,0116	0,6300	0,4500
54. Man-made filaments	0,6900	0,7122	0,7400	0,4700
55. Man-made staple fibers	0,0900	0,2035	0,0300	0,0400
56. Wadding felt and non-wovens; special yarns twine cordage ropes and cables	0,6500	0,7191	0,8500	0,7300
57. Carpets and other textile floor coverings	0,3000	0,2765	0,3000	0,3400
58. Special woven fabrics; tufted textile fabrics; lace tapestries; trimmings	0,0001	0,0212	0,0003	0,0001
59. Impregnated coated covered or laminated textile fabrics	0,5300	0,6879	0,2200	0,1700
60.Knitted or crocheted fabrics	0,0500	0,0255	0,0400	0,0500
61. Articles of apparel and clothing accessories knitted or crocheted	0,3300	0,3088	0,2600	0,2400
62. Articles of apparel, accessories, not knit or crochet	1,4600	1,4904	1,2500	1,1500
63. Other made up textile articles; sets; worn clothing and worn textile articles	0,4600	0,4988	0,7400	0,6800
64. Footwear gaiters and the like; parts of such articles	0,6700	0,5606	0,5200	0,5400
65. Headgear and parts thereof	0,2400	0,2884	0,2200	0,2200
66. Umbrellas sun umbrellas walking sticks seat sticks whips riding-crops	0,0005	0,1544	0,0020	0,0020
67. Prepared feathers and down and articles made of feathers or of down	0,0004	0,0256	0,0002	0,0002
68. Articles of stone plaster cement asbestos mica or similar materials	0,7400	0,7215	0,7600	0,5700

Appendix 1, continued. RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
69. Ceramic products	0,7500	0,7764	0,6500	1,0400
70. Glass and glassware	0,7000	0,7356	1,4100	0,8900
71. Natural or cultured pearls, precious or semi-precious stones				
72. Iron and steel	16,8700	17,0195	13,6600	11,8900
73. Articles of iron or steel	2,6300	1,6447	3,0900	2,3900
74. Copper and articles thereof	2,2000	0,7446	1,7700	0,8700
75. Nickel and articles thereof	0,2200	0,0329	0,2800	0,0500
76. Aluminum and articles thereof	2,5900	13,0920	1,4400	1,4600
78. Lead and articles thereof	0,8300		1,2700	0,0010
79. Zinc and articles thereof	0,0003	0,0802	0,0001	0,0001
80. Tin and articles thereof	0,0001	0,1477	0,0000	0,0000
81. Other base metals, cermets, articles thereof	3,6900	15,8702	2,3200	1,5700
82. Tools implements cutlery spoons and forks of base metal	5,4300	44,4596	0,3700	0,2200
83. Miscellaneous articles of base metal	0,2100	0,1946	0,2300	0,3000
84. Nuclear reactors, boilers, machinery, etc	0,5000	19,1051	0,4300	0,3700
85. Electrical machinery and equipment and parts thereof; sound recorders	0,2300	0,1916	0,2800	0,2700

Appendix 1, continued. RCA index for Ukrainian products in 2001-2004

Commodity	2001	2002	2003	2004
86. Railway, tramway locomotives, rolling stock, equipment	4,4800	0,1224	9,9400	18,2300
87. Vehicles other than railway or tramway rolling stock	0,1100	5,9967	0,0600	0,0800
88. Aircraft spacecraft and parts thereof	0,3600	0,0774	0,4500	0,2900
89. Ships boats and floating structures	0,7000	0,3228	0,6700	0,6500
90. Optical, photo, technical, medical, etc apparatus	0,1400	1,4026	0,4400	0,5400
91. Clocks and watches and parts thereof	0,0000	0,0001	0,0000	0,0000
92. Musical instruments; parts and accessories of such articles	0,0004	0,0055	0,0003	0,0004
93. Arms and ammunition; parts and accessories thereof	0,0000	4,0267	0,0000	0,0020
94. Furniture; bedding mattresses cushions and similar stuffed furnishing	0,3000	0,1382	0,2800	0,2400
95. Toys games and sports requisites; parts and accessories thereof	0,2500	0,0115	0,2300	0,0002
96. Miscellaneous manufactured articles	0,0400	0,0021	0,0500	0,0000
97. Works of art collectors' pieces and antiques	0,3300	0,2384	0,0000	0,0040
98. Commodities not specified according to kind	0,0700	0,0112	0,0032	0,0800

Appendix 2. List of products aggregated for Ukraine

a agriculture. hunting and forestry
b fishing
da food products. beverages & tobacco
di other non-metallic mineral products
df coke.refined petrol.prod.& nuclear fuel
e electricity. gas and water supply
dg_dh chemicals & prod.. rubber & plastic
db_dc textiles & products. leather & prod.
dd wood and wood products +de pulp.paper.pap.prod. publish.& printing
dn manufacturing n.e.c.
dj basic metals & fabricated metal prod.
dk_dm machinery. elect.equi.. transp.equip.