PATTERNS OF TRADE SPECIALIZATION AND ECONOMIC GROWTH IN TRANSITION ECONOMIES

by

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Abstract

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In this paper, it is argued that the structure of a country's foreign trade may give understanding of its economic performance. Specifically a relation between considered in the literature determinants of economic growth and volumes of sophisticated commodities trade in 18 transition economies is studied. Using the standard growth regression framework, it is found that these volumes increase along with GDP per capita, indicating that there is a shift in trade to more high skilled products. On the basis of these results, the conclusion can be made that transition economies move to the rich countries, producing and trading all kinds of commodities. The analysis has important policy implication: the government should take care of these processes by creating favorable environment for manufacturing and high technologies development.

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Chapter 1

INTRODUCTION

The forces that influence economic growth are among the most active research topics. In this paper international trade is considered as one of such driving forces. Composition of trade implies certain patterns of country's development and may determine its future performance. This paper is empirical one, emphasizing the importance of export and import composition for growth processes.

The study is devoted to transition economies. At the beginning of transition they were somewhere in between rich countries (producing and trading all kinds of goods) and low developed countries (trading primitive products and raw materials for sophisticated commodities). Since that time the countries changed their international trade patterns, and it is challenging to see how their growth experience is related to these changes. If international specialization matters, then on the basis of trade data it is possible to conclude where transition economies transit: to the rich or to the poor world.

Although at the beginning of transition the countries were characterized by established infrastructure and human capital potential, they faced a fall in output over the transition period. For example, after the breakdown of the USSR the ties between existing enterprises were broken, so production has declined. Also significant fall in manufactured domestic demand was observed, and survival of many firms became dependent on international sales.

The newly industrialized East-Asian countries (Hong Kong, Malaysia, Singapore, South Korea, and Thailand) are the good example of how to shift from depression to expanding industrial economies in a short period of time. The state supervised economic development and became its major regulator. The favorable environment for multinational cooperation was created. Resources were directed to industries where they were used more efficiently, and such industries became strongly outward oriented. Izani (2002) concludes that "higher productivity in the export sector is associated with the size and trade orientation of a country, as well as the extent of manufacturing". Well diversified and highly sophisticated export structure seems to give externality effects on whole economy and, in general, to bring country to economic prosperity.

Introduction of market-oriented reforms and reallocation of resources on the basis of market incentives are key ingredients of the transition process. And this was successfully done in many Central-European countries. Harmonization of the domestic legislation, increasing flows of FDI, trade integration, delocalization of activities and outsourcing helped to recover production in these countries (De Simone, 2006). The manufacturing sector has been modernized and is becoming more competitive. Vertical specialization of production plays a key role. This is reflected in trade patterns, and has led to a rapid increase in trade (Kaminski et al., 1996). The similar situation is observed in Baltic states. Development of foreign trade promoted them to a great extent and helped to adjust to market conditions. Now they gain benefits from large international markets (Bernatonyte and Normantiene, 2009).

The situation in the former USSR countries may be quite different. The policy reforms have mostly failed to expose domestic producers to international

competition in many of these countries. They did not bring to the end their transition and, hence, may experience problems in their development. Unfortunately, Ukraine seems to be one of such countries. Destruction of high-tech industries (radio electronics, machine-tool manufacture etc.) and industrial degradation were observed here during the years of independence. Ukrainian production is not competitive in international market because of its low quality. However, trade sufficiently influences country's economy: export forms up to 40% of GDP[1], but its large part is metals and chemical products. From 2002 to the middle of 2008 world prices for steel increased 4 times, and many Ukrainian manufacturers were getting huge profits. The 2008 world crisis stopped this trend. A substantial decrease in levels of trade was observed. This showed that the position of Ukraine in international market is quite unstable: the smallest market conditions worsening in one or two export niches led to a sharp decline in demand for Ukrainian goods and, respectively, to serious problems for the national economy. Global demand shrinking is associated with decrease of GDP in developed countries by 5-7%. For Ukraine this decline is about 15%[2]. So, the national economy is very sensitive to the shocks in the world markets. Risk of the unstable international demand is very high. For example, China significantly increased its import of black metals from Ukraine during the crisis, but this level may decrease due to rapidly recovering Chinese manufacturing. In general Ukrainian production is characterized by low quality, contrary to that of Central-European countries with their vertical production specialization and high trade sophistication[3].

[1] We can see the ratio of exports and imports to GDP in Ukraine during 1996-2008 in the Appendix, Figure A1.

[2] The data was taken from World Economic Outlook Database, http://www.imf.org/external/ns/cs.aspx?id=28.

[3] We can see the main exported and imported products for transition countries in the Appendix, Table A1.

Much better trade experience could be observed in Ukraine if necessary reforms were introduced.

Of course, improved trade performance is not the objective of transition, but its significant component. The effect of trade composition on economic growth remains a question and is hard to estimate. This paper aims at estimation and explanation of how standard economic growth factors influence evolving of trade composition. There is no paper investigating this issue for transition economies despite numerous studies for developed and developing countries. Also, growth issues were mostly researched using data for the periods prior to the 90's. It will be interesting to consider the period of the 90-2000's that was characterized by development of information technologies, manufacturing and services.

The remainder of the paper is organized as follows. The overview of relative papers is presented in section 2. Section 3 describes estimation methodology. Description of the used data is provided in section 4, and estimation results are given and discussed in section 5. Finally, the paper is summarized, and concluding remarks are made.

Chapter 2

LITERATURE REVIEW

Existing theoretical and empirical works that establish connection between production, trade and economic performance, will be considered. Studies that provide stylized facts and understanding about the determinants of economic growth will be overviewed.

In the past decades the study of trade impact on growth has become one of the most attractive areas of economic research. Export turned out to be the force that influences per capita income levels and growth rates over the long run. Composition of export is one of the essential factors of this influence. For example, Fosu (1990) found that “the previously reported positive influence of exports on economic growth in developing economies may be attributed almost entirely to the manufacturing contents of exports”. His cross-sectional estimation for 64 developing countries over the 1960-1980’s showed a positive, but not statistically significant, estimate for the impact of the primary export sector on GDP growth, and positive and significant estimate of the differential effect of the manufacturing export sector. However, because of lack of disaggregated data it was difficult to investigate the extent, to which the effect of manufacturing exports may affect the level of development.

Further studies confirmed that the composition of exports is crucial. Availability of highly disaggregated data about countries' trade made it possible to test this fact empirically. Cuaresma and Wörz (2005) postulate and test the hypothesis “that trade in more technology-intensive industries implies a greater potential for productivity gains (due to efficiency gains, economies of

scale, etc.) and positive externalities (like technology and knowledge spillovers) than trade in less sophisticated activities". They use a panel of 45 industrialized and semi industrialized countries over the time period from 1981 to 1997 to find evidence that "there is a significant difference in the growth effect of exports when these are disaggregated according to their technological intensity". High technology intensive exports showed a significant positive impact on growth, and low tech exports did not have a significant impact. The authors also determine that efficiency of resources usage and higher productivity are more influential for the superior growth performance than learning effects and other positive externalities.

One of the surprising features of modern economic growth is that abundance in natural resources is not decisive for economic growth. Sachs and Warner (1995) show that economies with a high ratio of natural resource exports to GDP in 1970 tended to grow slowly during the subsequent 20-year period 1970-1990. A possible explanation may be that resource intensity is related to low institutional quality.

Hall and Jones (1999) found that differences in institutional and government policies have the largest effect on the production efficiency, and in its turn, on economic development. Developed social infrastructure influences growth through capital accumulation, education attainment, improvement of labor productivity, the authors claim. Yuryk (2004) stresses the fundamental role of institutions as underlying determinants of economic performance in the short run for transition countries. Macroeconomic stabilization and implementing of economic reforms lead to a sustainable growth and efficient functioning of market economy.

There are a number of studies on African countries that are characterized by low level of development and poor infrastructure. So, the question is whether it is possible for them to face economic growth and stability. For example, Njikam (2003) studies a period of the 1980s for Sub-Saharan African countries that was a decade of slow or negative growth in GDP. He founds that promotion of manufactured goods is under question as the effective strategy in many of them. Comparative advantage of the countries in the primary products sector significantly stimulates growth, and it is very difficult for most of them "to promote the exports of manufactured goods at a level that can significantly affect their economic growth". A hypothesis is suggested that a critical level of development should exist that is crucial in achieving economic growth through the manufactured products promoting policies. A strategy of primary products promoting shows its positive effect, but it may not lead to the structural transformation of the economies and have no significant impact on further economic development. Amavilah (2003) gets similar conclusions: Namibia with high level of mineral exports doesn't experience significant economic growth. Sentsho (2000) states that primary export revenues in Botswana have led to positive and significant economic growth and, in addition, effects of primary exports and manufactured exports on growth carry opposite signs. This is compatible with hypothesis that for developing countries, which have not yet achieved a critical level of economic development, primary exports are more important than manufactured exports (Dodaro, 1991).

The paper by Kylymnyuk et al. (2007b) presents a two-sector (traditional primitive production and modern sophisticated production) international trade growth model. The patterns between production specialization and economic growth are established:

– poor countries producing only primitive goods have negative or small positive growth rates;

– world-average countries produce both primitive and sophisticated goods and have positive moderate growth rates;
– countries that specialize in the production of sophisticated goods grow very fast.

In general, countries accumulate resources in the primitive sector to move them to sophisticated sector. And relative size of industrial sector, in its turn, determines how the country grows. Size of a country and richness in natural resources are not deterministic, however may facilitate evolution of industrial sector. The good pattern of growth is observed for the most developed transition countries (Czech Republic, Hungary, Poland, Slovak Republic, Baltic States), and for less developed transition countries the development patterns are not entirely clear. Many of them experience an increase in share of agriculture sector which slows down grows and is not desirable. However, introduction of the third, service sector (Kylymnyuk et al., 2007a), shows that reallocation of resources from industry and agriculture to services indicates moving to the group of rich countries. And there is no monotonic relationship between per capita income and relative share of industry sector. At first stages of development contraction of agriculture and expanding of industries is observed, but later service sector starts expanding, and other two sectors contract (Imbs and Wacziarg, 2000).

Specialization patterns are not entirely predictable. Many of the ideas in the theoretical literature on growth are difficult to test. Hausmann et al. (2007) solve the problem in such way: they state that “countries that specialize in the types of goods that rich countries export are likely to grow faster than countries that specialize in other goods”. Rich countries export products that are also exported by other rich countries, and the same for poor countries. The authors establish a hierarchy in goods space and conclude that, “everything

else being the same, an economy is better off producing goods that richer countries export". They also conclude that each country in general is able to produce more sophisticated goods than it currently produces, but because of some problems countries can get stuck with lower-income goods, that may be a burden for a higher economic growth.

The contribution of my analysis will be to trace changes in composition of trade for transition countries over the time period from 1996 to 2007, and to estimate how economic growth determinants impact the growth of volumes of trade with sophisticated goods. Importance of trade composition for growth processes will be explored.

Chapter 3

METHODOLOGY

The study of factors that impact economic growth is popular in the literature. In the empirical part of the paper the investigation of how these factors influence not only GDP per capita growth but also sophisticated trade volumes growth in transition economies will be done. Then conclusions about future countries' performance could be made.

The growth model is taken from the paper by Mankiw et al. (1992), where the growth of output per worker depends on levels of physical and human capital and population growth. This model makes it possible to get simple testable predictions about the impact of the factors using OLS estimation techniques. So, these factors are taken as determinants of growth in this investigation. Gross Domestic Product (GDP) per capita represents a dimension of country's economic development. *The GDP per capita growth* (to the previous year) enters to estimation equation as a dependent variable. It is expressed as difference between logarithms of this year level and previous year level. And explanatory variables incorporated into analysis are the following.

Logarithm of GDP per capita in the previous year (or in the base year) is included consistently in endogenous growth theory to capture the possibility of a convergence effect. The coefficient on this variable represents the rate of convergence. Its sign is expected to be negative, since economies with lower levels of GDP per capita theoretically tend to grow faster all other conditions equal.

Physical capital is a traditional explanatory variable that is expected to have a positive effect on growth; here it is proxied by *the ratio of real investment to real GDP I/Y*. The lagged level of I/Y enters the regression to avoid endogeneity problems. Also *the ratio of government consumption to real GDP G/Y* is included as reflecting distortions to productivity due to governmental activities. It also proxies the measure of political corruption and other aspects of bad government (Barro and Sala-i-Martin, 1995, chapter 12).

Human capital also should have positive effect; however, because of lack of data this effect is difficult to measure. The usual way to proxy it is to use education and health data, namely *average years of schooling* and *life expectancy at birth*. These data will be taken only for the initial year because of their low availability.

Growth of working-age population is taken in this study instead of overall population growth. It should give more precise measure of the changes in population effect on economic performance because of complicated demographic situation in transition countries (especially, in former Soviet Union republics).

Barro and Sala-i-Martin (1995, chapter 12) empirically tested these determinants of growth for developed and developing countries. As expected, a higher value of I/Y leads to a higher growth rate, and a higher value of G/Y – to a lower growth rate, and the same should be in transition countries. Theoretically the impact of schooling should be positive, and empirically it is such. But education in transition countries does not pay back the same way as it does in developed countries: a very large part of population has higher education but this does not imply higher income. So, it is difficult to predict what will be the sign of the schooling coefficient after empirical estimation for

transition countries, though it is expected to be strongly positive. The health indicator also may have ambiguous effect: from one point of view, it should decrease growth as representing initial stock of human capital (similarly to GDP per capita initial level, that may be interpreted as initial stock of physical capital); from the other point, it should proxy other features that reflect desirable performance of society (e.g. better working habits, higher level of skills etc.), and in such way be positively correlated with GDP per capita. The estimation shows a strong, positive correlation of life expectancy with growth in developed countries. Growth of working-age population theoretically and empirically has a positive impact on growth.

The hypothesis is that listed above factors affect not only GDP per capita growth but also growth of sophisticated trade levels. So, *the volumes of sophisticated trade* are the variables of interest and enter regressions instead of GDP per capita (growth of measure becomes the dependent variable and its initial level becomes explanatory variable). They are taken as volumes of exported and imported manufactured and high technology products, four measures at all.

Finally, we have five equations of such specification:

$$\log(level_{it}) - \log(level_{i,t-1}) = \alpha \cdot \log(level_{i,t-1}) + X_{it} \cdot \beta + (\eta_i + \upsilon_{it}),$$

where $\log(level_{it}) - \log(level_{i,t-1})$ denotes the growth of one of the dimensions (GDP per capita and four measures of sophisticated trade) to the previous year, $\log(level_{i,t-1})$ is its level in the previous year (taken as logarithm), X_{it} includes listed explanatory factors (shares of investment and government spending in GDP, schooling and health variables, and growth of working-age

population), η_i is country-specific time-invariant factor and υ_{it} is a disturbance term.

Further, let us move to the estimation techniques of the model. The OLS may be incorporated here, but because of structure of the dataset (18 countries, 12 years) the cross-country panel data techniques should capture the economic interactions in the used data better. Country-specific characteristics may be controlled for (opposite to simple cross-section analysis).

As it can be seen from the specification, the concerned equation is autoregressive-distributed lag model with additional explanatory variables. Even though coefficients on lagged levels are not of direct interest, the dynamics of the growth process is crucial for recovering consistent estimates of other parameters. Bond (2002) states that in this case coefficients of OLS estimation tend to be biased upwards. Static panel data technique (namely, fixed effect estimation) also gives biased estimators. So, the dynamic panel data methods should be applied. The author suggests the use of the first-differenced one-step and two-step Generalized Method of Moments (GMM) estimators for the autoregressive panel data models, developed by Arellano and Bond (1991). So they are employed in the investigation, even though they demand large number of countries in the data for efficient estimation that is not the case for the used dataset.

Chapter 4

DATA AND ANALYSIS

A sample of 26 transition countries (Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Rep., Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Rep., Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Slovakia Rep., Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan) and the time period from 1996 to 2007 were initially chosen for research. But because of lack of data on working population and human capital eight countries were removed from the sample: Albania, Azerbaijan, Bosnia and Herzegovina, Kyrgyz Rep., Macedonia, Tajikistan, Turkmenistan, Uzbekistan. So, analysis will be conducted based on the sample of 18 countries.

The data on GDP per capita, measured in current US dollars on the PPP basis, for all countries was given by International Monetary Fund. Some of information is presented in Table 4.1. Also evolution of GDP per capita levels in all countries is presented in the Appendix, Figure A2.

All countries faced economic growth, however, growth rates differ very much (from 2.22 in Slovenia to 6.41 in Armenia). There is no straightforward dependence between country's initial level of GDP per capita and its growth rate over the period (Slovenia, though facing the lowest growth rate, has the highest GDP per capita in 2007 among all the countries, and for Armenia this indicator is one of the lowest). And still, as in the base year, there is a large variation in GDP per capita levels among countries. The countries may be divided into two groups based on GDP per capita in 2007. The "rich" group

Table 4.1. Statistics on GDP per capita and growth

Country	GDP per capita in 1996, '000 USD	GDP per capita in 2007, '000 USD	GPD per capita growth over 1996-2007	Rank by GDP per capita in 2007	Rank by GDP per capita growth
Armenia	0.45	2.85	6.41	16	1
Belarus	1.43	4.67	3.27	14	12
Bulgaria	1.20	5.30	4.40	13	7
Croatia	5.20	13.21	2.54	6	17
Czech Rep.	6.01	16.88	2.81	2	15
Estonia	3.32	15.93	4.80	3	6
Georgia	0.65	2.32	3.57	17	8
Hungary	4.38	13.78	3.15	5	13
Kazakhstan	1.35	6.75	5.00	12	5
Latvia	2.30	12.62	5.49	7	2
Lithuania	2.26	11.52	5.10	8	3
Moldova	0.39	1.23	3.14	18	14
Poland	4.06	11.16	2.75	9	16
Romania	1.57	7.85	5.01	10	4
Russia	2.64	9.10	3.45	11	11
Slovak Rep.	3.93	13.92	3.54	4	9
Slovenia	10.58	23.51	2.22	1	18
Ukraine	0.88	3.10	3.50	15	10

Source: IMF Database, http://www.imf.org/external/data.htm.

includes countries with GDP per capita higher than $10,000 (Croatia, Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Rep., Slovenia) and the "poor" ones have GDP per capita lower than $10,000 (Armenia, Belarus, Bulgaria, Georgia, Kazakhstan, Moldova, Romania, Russia, Ukraine). These groups are different in other characteristics. The differences seem to stem from the fact that "rich" countries were performing better over considered period and became closer to the market-oriented economies.

To measure the volumes and shares of manufactured and high technology goods in transition countries' exports and imports the worldwide

disaggregated trade level data (6-digit level of the Harmonized System) from United Nations Commodity Trade Statistics Database was employed. The data provides values of trade levels between countries, measured in current US dollars, for more than 5000 products. Thus the dataset provides a nice opportunity to study all the aspects concerned countries' trade performance.

The data is aggregated by categories in order to account for a group of manufactured goods (all but food, agriculture, ores, fuels) – that are those of categories from 30 to 96 (e.g. chemical products, clothes, books, machinery, equipment, vehicles and others), and its subgroup of high-technology goods (produced with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, electrical machinery) – those from categories 30 (pharmaceutical products), 31 (fertilizers), 37 (photographic and cinematographic goods), 84 (nuclear reactors, boilers and related machinery), 85 (electrical machinery, equipment and parts), 88 (aircraft, spacecraft production and parts), 90 (optical, photo production), 93 (arms and ammunition). The volumes of export and import of goods from both these groups are calculated for each country and each year.

The evolutions of export and import volumes of these two groups for all countries are presented in the Appendix, Figure A3. Again, as in the case with GDP per capita, all countries faced increase in both export and import volumes of sophisticated goods. As general volumes of trade also increased over time, shares of sophisticated goods in total export and import volumes should be investigated to detect changes in trade patterns of transition economies.

Table 4.2 provides the average shares of manufactured and high-technology export in total exports for each country during the period from 1996 to 2007, and Table 4.3 presents the same information for imports. Also the evolution of

Table 4.2. Statistics on exports sophistication

Country	Manufacture export to total export		High-tech export to total export		Rank by average manufacture export	Rank by average high-technology export
	Mean	St.dev.	Mean	St.dev.		
Armenia	0.72	[0.06]	0.07	[0.06]	10	15
Belarus	0.66	[0.10]	0.2	[0.03]	13	7
Bulgaria	0.69	[0.03]	0.15	[0.01]	12	12
Croatia	0.74	[0.02]	0.19	[0.03]	9	8
Czech Rep.	0.9	[0.02]	0.33	[0.05]	2	2
Estonia	0.78	[0.05]	0.26	[0.05]	8	4
Georgia	0.52	[0.06]	0.17	[0.04]	15	11
Hungary	0.84	[0.05]	0.5	[0.09]	5	1
Kazakhstan	0.32	[0.09]	0.02	[0.01]	17	18
Latvia	0.84	[0.05]	0.12	[0.02]	6	14
Lithuania	0.66	[0.03]	0.19	[0.01]	14	9
Moldova	0.32	[0.06]	0.07	[0.03]	18	17
Poland	0.82	[0.03]	0.22	[0.04]	7	6
Romania	0.85	[0.03]	0.17	[0.04]	4	10
Russia	0.33	[0.06]	0.07	[0.02]	16	16
Slovak Rep.	0.87	[0.01]	0.23	[0.05]	3	5
Slovenia	0.93	[0.01]	0.31	[0.02]	1	3
Ukraine	0.7	[0.03]	0.14	[0.01]	11	13

Source: United Nations Commodity Trade Statistics Database, http://comtrade.un.org/db/.

shares is presented in the Appendix, Figure A4.

Those countries having high shares of manufactured and high-tech export (e.g. Slovenia, Czech Rep., Slovak Rep.), are supposed to have higher GDP per capita. Unfortunately, not all the countries are successful in this aspect (e.g. Kazakhstan, Moldova, Russia) – if they will not stop the tendency of these shares' declining, they may experience problems with their trade performance in the future.

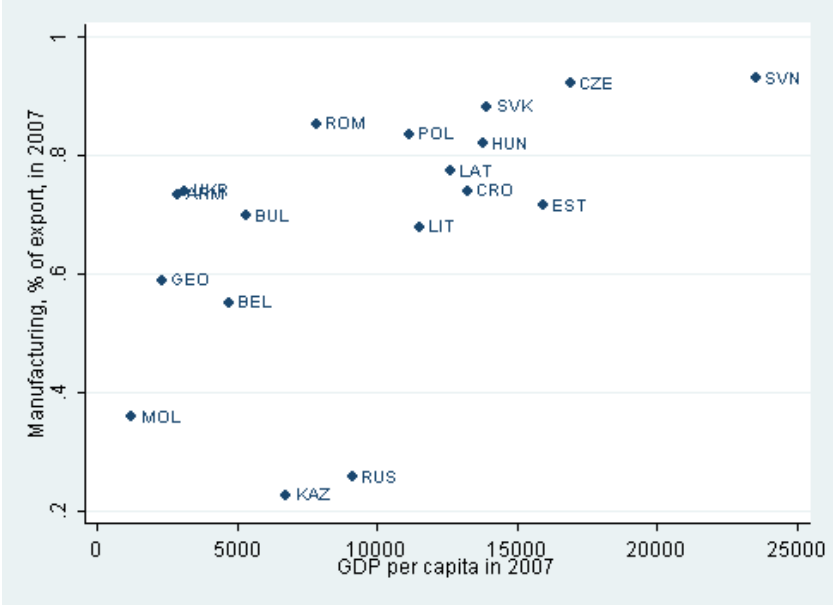
Table 4.3. Statistics on imports sophistication

Country	Manufacture import to total import		High-tech import to total import		Rank by average manufacture import	Rank by average high-technology import
	Mean	St.dev.	Mean	St.dev.		
Armenia	0.57	[0.09]	0.18	[0.02]	15	18
Belarus	0.55	[0.03]	0.19	[0.01]	16	17
Bulgaria	0.63	[0.07]	0.22	[0.03]	12	14
Croatia	0.74	[0.02]	0.26	[0.01]	8	11
Czech Rep.	0.83	[0.02]	0.38	[0.02]	1	2
Estonia	0.76	[0.05]	0.31	[0.04]	5	5
Georgia	0.53	[0.12]	0.25	[0.06]	17	12
Hungary	0.83	[0.04]	0.45	[0.05]	2	1
Kazakhstan	0.74	[0.05]	0.31	[0.04]	9	6
Latvia	0.73	[0.04]	0.27	[0.02]	10	10
Lithuania	0.68	[0.03]	0.24	[0.01]	11	13
Moldova	0.6	[0.06]	0.2	[0.02]	13	15
Poland	0.79	[0.02]	0.32	[0.01]	4	3
Romania	0.75	[0.04]	0.28	[0.01]	7	7
Russia	0.6	[0.12]	0.28	[0.05]	14	8
Slovak Rep.	0.76	[0.03]	0.32	[0.02]	6	4
Slovenia	0.81	[0.02]	0.27	[0.01]	3	9
Ukraine	0.5	[0.08]	0.2	[0.02]	18	16

Source: United Nations Commodity Trade Statistics Database, http://comtrade.un.org/db/.

As for sophisticated import shares, their high level may indicate about the process of country integrating into vertical production chains, and in such way – about adjusting to international market conditions. But the lower import share is, also combined with very high sophisticated export share, the higher economic growth should be expected.

The Figure 4.1 and the Figure 4.2 show that really there is an association between trade composition and GDP per capita for countries. As it was

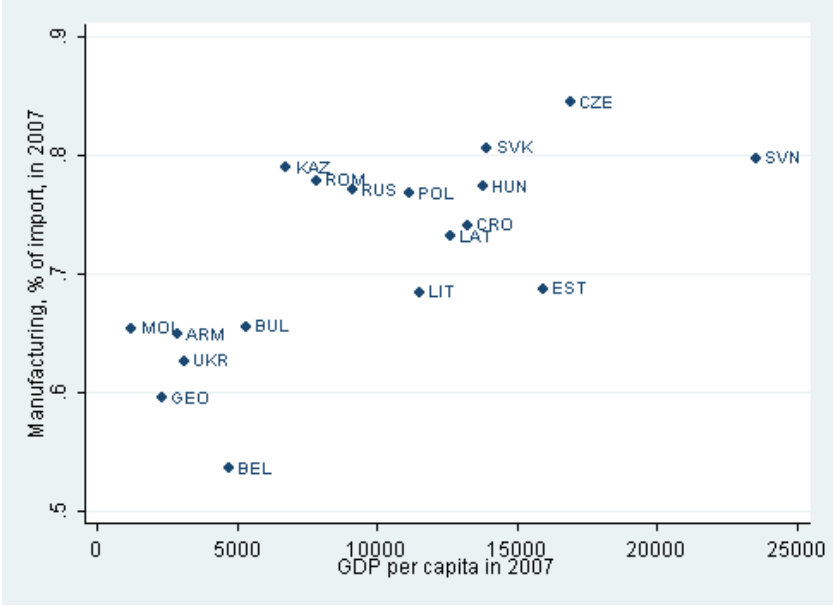


a) manufactured export/GDP per capita, in 2007

b) high-tech export/GDP per capita, in 2007

Figure 4.1. Export composition versus GDP per capita[4]

[4] The graphs were built using Stata package.



a) manufactured import/GDP per capita, in 2007

b) high-tech import/GDP per capita, in 2007

Figure 4.2. Import composition versus GDP per capita[5]

[5] The graphs were built using Stata package.

expected, export sophistication tends to be positively correlated with GDP per capita level, but nothing clear can be said about import sophistication. Anyway, further investigation conditional on other characteristics of the considered countries should follow in order to make any conclusions.

Returning to the question of this study, the data about all included growth determinants also was collected. Brief description and the sources of the used data are given in the Appendix, Table A2. Summarizing, Table 4.4 presents the descriptive statistics for the whole sample and for groups of “poor” and “rich” countries separately.

As it was expected, “rich” countries are characterized by higher investment (27.50% versus 15.73%) and lower government spending rates (21.94% versus 24.47%). Somewhat surprisingly, human capital (measured by average years of schooling) is sufficiently higher in “poor” countries (9.50 years against 8.63); however, as discussed earlier, this fact does not necessarily have positive influence on growth. Average life expectancy is lower in “poor” countries (68.92 years compared to 70.67), and they experience reduction of working-age population (-0.67% per year on average), that may be connected with outflows of qualified workers to more developed countries. “Rich” countries have positive population growth rate (0.42% a year), but for all transition countries it is negative, though low by absolute value (-0.12%). “Rich” countries have higher volumes of both sophisticated export and import and higher shares of them in total exports and imports. This fact emphasizes strong openness of their economies, vertical specialization and high sophistication of their production. Overall, sophisticated import exceeds sophisticated export by volume (17bln versus 15.3bln USD for manufactured goods and 7.3bln versus 5bln USD for high-technology production); however

Table 4.4. Descriptive statistics of the variables by GDP per capita groups

Groups	Poor	Rich	Total
GDP per capita, '000 USD	2.01 [1.68]	7.43 [4.16]	4.77 [4.19]
Ratio of investment to GDP I/Y, %	15.73 [6.16]	27.50 [5.83]	21.73 [8.39]
Ratio of government consumption to GDP G/Y, %	24.47 [7.32]	21.94 [4.58]	23.18 [6.20]
Average years of schooling, years	9.50 [0.32]	8.63 [1.21]	9.06 [0.99]
Life expectancy at birth, years	68.92 [2.25]	70.67 [1.64]	69.81 [2.15]
Growth of working age population (relative to the previous year population), %	-0.67 [3.69]	0.42 [2.31]	-0.12 [3.11]
Manufactured export volume, billion USD	10.89 [16.22]	19.56 [23.94]	15.301 [20.92]
Share of manufactured export in total export	0.56 [0.20]	0.82 [0.09]	0.69 [0.20]
High-technology export volume, billion USD	2.21 [3.21]	7.56 [10.78]	4.94 [8.44]
Share of high-technology export in total export	0.12 [0.06]	0.26 [0.11]	0.19 [0.12]
Manufactured import volume, billion USD	12.32 [21.02]	21.58 [23.60]	17.04 [22. 80]
Share of manufactured import in total import	0.61 [0.11]	0.77 [0.06]	0.69 [0.12]
High-technology import volume, billion USD	5.13 [9.31]	9.42 [10.89]	7.32 [10.35]
Share of high-technology import in total import	0.24 [0.06]	0.31 [0.07]	0.28 [0.07]
Number of observations	104	108	212
Standard deviations in brackets			

the share of manufactured export is approximately the same as the share of manufactured import (almost 70% both).

Chapter 5

ESTIMATION RESULTS

This section presents the empirical results. Using the constructed cross-country panel data sample, the regressions of growth of GDP per capita, manufactured export volume, manufactured import volume, high-tech export volume and high-tech import volume on lagged values of these indicators and such factors as ratios of investment and government spending in GDP, average rate of schooling, life expectancy at birth and working-age population growth rate, are estimated.

First, OLS estimations of five equations are performed, and results are presented in Table 5.1.

The coefficients from all regressions are quite similar. The sign of the coefficient of the initial level estimate is negative, as expected, but statistically insignificant almost in all regressions. The investment rate positively and significantly influences growth rate in all regressions (constituting that 1% growth of the rate causes from 0.5% to 0.9% growth of a volume), and government spending rate turns out to be statistically insignificant. Higher schooling also facilitates growth – one year gives a bonus of more than 3% growth (and even 4.4% of high-technology export growth). The estimates of health are negative (though mostly insignificant) in all regressions. Working-age population growth has positive effect on GDP per capita (from 1% to 1.7% higher growth for 1% increase of working population) and is statistically significant almost in all regressions (except the insignificant estimate for manufactured export growth).

Table 5.1. Results of estimation of five growth equations with OLS

Explanatory variables	Dependent variables				
	Growth of GDP per capita to previous year	**Growth of manufactured export to previous year**	**Growth of high-tech export to previous year**	**Growth of manufactured import to previous year**	**Growth of high-tech import to previous year**
Log of previous year level	-0.026 (0.019)	-0.007 (0.008)	-0.004 (0.010)	-0.019 (0.011)+	-0.019 (0.010)+
I/Y	0.006 (0.002)*	0.007 (0.002)*	0.009 (0.003)*	0.005 (0.002)**	0.006 (0.002)*
G/Y	-0.003 (0.002)	-0.000 (0.002)	0.001 (0.003)	-0.000 (0.002)	0.001 (0.002)
Schooling	0.031 (0.012)*	0.034 (0.015)**	0.044 (0.021)**	0.034 (0.015)**	0.033 (0.016)**
Health	-0.010 (0.005)+	-0.010 (0.007)	-0.004 (0.009)	-0.012 (0.007)+	-0.015 (0.007)**
Population growth	1.026 (0.299)*	0.137 (0.367)	1.517 (0.502)*	1.445 (0.373)*	1.700 (0.393)*
Constant	0.675 (0.424)	0.539 (0.496)	-0.154 (0.683)	0.900 (0.516)+	1.048 (0.541)+
Observations	193	193	193	193	193
R-squared	0.166	0.073	0.135	0.137	0.159
Standard errors in parentheses + significant at 10%; ** significant at 5%; * significant at 1%					

As mentioned earlier, the results of OLS estimation cannot be trusted. The dynamic specification requires special instrumentation of the lagged endogenous variable, for which the one-step and the-two step Arellano-Bond estimators are used. In Table 5.2 the results of OLS estimation of GDP per capita growth equation compared to Arellano-Bond estimation results are given. Since schooling and health data are taken for initial year, they do not vary for countries over time, so are dropped in panel data estimation process.

Table 5.2. Results of estimation of GDP per capita growth equation with OLS and with Arellano-Bond estimator

Explanatory variables	Dependent variable: growth of GDP per capita to previous year		
	OLS	**Arellano-Bond, one-step**	**Arellano-Bond, two-step**
Log of previous year level	-0.026 (0.019)	0.044 (0.031)*	0.040 (0.018)*
I/Y	0.006 (0.002)*	0.016 (0.004)*	0.015 (0.001)*
G/Y	-0.003 (0.002)	-0.005 (0.003)	-0.004 (0.002)**
Population growth	1.026 (0.299)*	0.855 (0.265)*	0.922 (0.133)*
Constant	0.675 (0.424)	-0.472 (0.240)**	-0.439 (0.147)*
Observations	193	175	175
Arellano-Bond test	-	(1) 0.0560 (2) 0.0073	(1) 0.0396 (2) 0.0280
Sargan test	-	-	chi2(54) = 17.19 prob>chi2 = 1.00
Standard errors in parentheses + significant at 10%; ** significant at 5%; * significant at 1%			

As it can be seen, the dynamic technique produces somewhat different results compared to OLS. Somewhat surprisingly, the convergence effect is disclaimed (coefficients 0.044 and 0.040 on previous year level). All other coefficients have the same signs as OLS ones have, but the coefficients on I/Y and G/Y are higher in absolute value (0.016 and 0.015 versus 0.006 for investment and -0.005 and -0.004 versus -0.003 for government spending), and the coefficient on population growth is lower (less than 1% of GDP per capita growth for 1% of working population increase). Although the one-step and the two-step procedures produce quite similar outcomes, further only the two-step estimator will be used as it gives more statistically significant results. It also should be preferred from theoretical point of view, though it has some

problems concerning a downward bias in its estimates of the standard errors (Arellano and Bond, 1991).

A critical assumption of the estimation is the absence of second-order autocorrelation in the residuals. The Arellano-Bond tests for first and second order serial correlation are also reported in the table. Estimates are inconsistent if the null hypothesis of no second order serial correlation is rejected at a significance level. The standard GMM test of overidentifying restrictions (Sargan test) is also reported. It is used to check the validity of estimators. The null hypothesis of no misspecification is accepted, and Arellano-Bond estimator can be applied for considered growth equation.

Further, other four growth equations with trade volumes as variables of interest are estimated using the two-step Arellano-Bond estimator. In Table 5.3 the results are presented.

As in the case with OLS estimation, again all five regressions produce similar results. Obtained estimators are almost all statistically significant, contrary to OLS estimators. Coefficient on initial level of GDP per capita is now positive, so there is no convergence effect: transition economies with lower GDP per capita do not tend to grow faster than richer ones, all other parameters equal. Higher investments are positive for growth of GDP per capita, manufactured and high-technology imports (1.5%, 1.5% and 1.9% of growth for 1% of investment rate increase respectively), and turn out to be insignificant for exports. Higher government consumption contributes to decrease of GDP per capita and sophisticated exports (by less than 1% per 1% of spending rate increase), and to growth of manufactured and high-technology imports. This is associated with inefficiency of economy structure, when sophisticated products are not produced at home in sufficient quantities, and so they are

Table 5.3. Results of estimation of five growth equations with two-step Arellano-Bond estimator

Explanatory variables	Dependent variables				
	Growth of GDP per capita to previous year	**Growth of manufactured export to previous year**	**Growth of high-tech export to previous year**	**Growth of manufactured import to previous year**	**Growth of high-tech import to previous year**
Log of previous year level	0.040 (0.018)*	0.059 (0.036)*	0.065 (0.016)*	0.038 (0.021)*	0.005 (0.025)*
I/Y	0.015 (0.001)*	0.004 (0.005)	-0.004 (0.004)	0.015 (0.003)*	0.019 (0.003)*
G/Y	-0.004 (0.002)**	-0.005 (0.001)*	-0.008 (0.002)*	0.003 (0.003)	0.008 (0.002)*
Population growth	0.922 (0.133)*	-0.496 (0.132)*	1.077 (0.154)*	1.391 (0.059)*	1.708 (0.116)*
Constant	-0.439 (0.147)*	-0.740 (0.455)	-0.495 (0.240)**	-0.850 (0.274)*	-0.526 (0.332)
Observations	175	175	175	175	175
Arellano-Bond test	(1) 0.0396 (2) 0.0280	(1) 0.0061 (2) 0.0341	(1) 0.0242 (2) 0.0423	(1) 0.0081 (2) 0.0847	(1) 0.0428 (2) 0.7156
Sargan test	chi2(54) = 17.19 prob>chi2 = 1.00	chi2(54) = 17.45 prob>chi2 = 1.00	chi2(54) = 17.78 prob>chi2 = 1.00	chi2(54) = 17.36 prob>chi2 = 1.00	chi2(54) = 16.52 prob>chi2 = 1.00
Standard errors in parentheses + significant at 10%; ** significant at 5%; * significant at 1%					

imported from abroad; this creates an obstacle for better economic performance. The increase of working-age population by 1% constitutes 0.92% growth of GDP per capita, negative growth of manufactured export (near -0.5%, very surprising result), and higher than 1% growth of other trade volumes.

In general, the coefficients on I/Y, G/Y and population growth are in line with those predicted in theory on economic growth. All these factors impact volumes of sophisticated trade growth and GDP per capita growth in the same direction (but with slightly different magnitudes).

Chapter 6

CONCLUSION

The challenge of this paper is to get understanding of development patterns in transition countries on the basis of export and import data. The question has a special significance in the light of changes in transition economies, as it helps to understand what patterns of development process they follow.

The previous studies on the composition of trade have found a consistent impact of high skilled export on economic growth. In this paper the evolution of sophisticated export and import levels over time is explored. The raised question may be formulated as follows: is there a relationship between economic growth and trade composition in transition economies? The investigation of standard growth factors' impact on sophisticated trade growth is done.

Based on the study, the conclusion can be made that in transition countries positive growths of both sophisticated exports and imports are observed along with GDP per capita growth. Overall, the reallocation of resources from primitive to more sophisticated production is usual for them. So, transition countries move to the rich world, where countries export and import both primitive and sophisticated goods and experience moderate positive growth.

Not only the alone fact of economic growth should be considered to point out whether transformation of economy moves in the right way. Even the most favorable initial conditions do not guarantee a stable growth for a country. Sound macroeconomic policies should be introduced. By attraction of

investments, controlling government consumption, creating favorable environment for society's prosperity (education attainment, health protection), not only stable economic situation is ensured, but also incentives for R&D, technological spill-over and more knowledge-intensive work are provided, which make economy more competitive and cause its further growth.

The government is a natural candidate for the role of coordinator in improving country's performance. The successful examples of such coordinating exist (e.g., newly industrialized East-Asian countries). The main purpose of economic programs should be to provide state supply of prospective fields of industry for their promotion, to introduce favorable politics for stimulation of strategic branches. The countries conducting strong reforms create environment that facilitates growth through additional channel - profits from international trade.

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APPENDIX

Table A1. The main exported and imported products for the countries

Country	Export	Import
Albania	textiles and footwear; asphalt, metals and metallic ores, crude oil; vegetables, fruits, tobacco	machinery and equipment, foodstuffs, textiles, chemicals
Armenia	diamonds, mineral products, foodstuffs, energy	natural gas, petroleum, tobacco products, foodstuffs, diamonds
Azerbaijan	oil and gas, machinery, cotton, foodstuffs	machinery and equipment, oil products, foodstuffs, metals, chemicals
Belarus	machinery and equipment, mineral products, chemicals, metals, textiles, foodstuffs	mineral products, machinery and equipment, chemicals, foodstuffs, metals
Bosnia and Herzegovina	metals, clothing, wood products	machinery and equipment, chemicals, fuels, foodstuffs
Bulgaria	clothing, footwear, iron and steel, machinery and equipment, fuels	machinery and equipment; metals and ores; chemicals and plastics; fuels, minerals, and raw materials
Croatia	transport equipment, textiles, chemicals, foodstuffs, fuels	machinery, transport and electrical equipment; chemicals, fuels and lubricants; foodstuffs
Czech Rep.	machinery and transport equipment, chemicals, raw materials and fuel	machinery and transport equipment, raw materials and fuels, chemicals
Estonia	machinery and equipment, wood and paper, textiles, food products, furniture, metals, chemical products	machinery and equipment, chemical products, textiles, foodstuffs, transportation equipment
Georgia	scrap metal, wine, mineral water, ores, vehicles, fruits and nuts	fuels, vehicles, machinery and parts, grain and other foods, pharmaceuticals

Table A1. The main exported and imported products for the countries – Continued

Country	Export	Import
Hungary	machinery and equipment, other manufactures, food products, raw materials, fuels and electricity	machinery and equipment, other manufactures, fuels and electricity, food products, raw materials
Kazakhstan	oil and oil products, ferrous metals, chemicals, machinery, grain, wool, meat, coal	machinery and equipment, metal products, foodstuffs
Kyrgyz Rep.	cotton, wool, meat, tobacco; gold, mercury, uranium, natural gas, hydropower; machinery; shoes	oil and gas, machinery and equipment, chemicals, foodstuffs
Latvia	wood and wood products, machinery and equipment, metals, textiles, foodstuffs	machinery and equipment, chemicals, fuels, vehicles
Lithuania	mineral products, textiles and clothing, machinery and equipment, chemicals, wood and wood products, foodstuffs	mineral products, machinery and equipment, transport equipment, chemicals, textiles and clothing, metals
Macedonia	food, beverages, tobacco; textiles, miscellaneous manufactures, iron and steel	machinery and equipment, automobiles, chemicals, fuels, food products
Moldova	foodstuffs, textiles, machinery	mineral products and fuel, machinery and equipment, chemicals, textiles
Poland	machinery and transport equipment, intermediate manufactured goods, miscellaneous manufactured goods, food and live animals	machinery and transport equipment, intermediate manufactured goods, chemicals, minerals, fuels, lubricants, and related materials
Romania	machinery and equipment, textiles and footwear, metals and metal products, machinery and equipment, minerals and fuels, chemicals, agriculture	machinery and equipment, fuels and minerals, chemicals, textile and products, metals, agricultural products

Table A1. The main exported and imported products for the countries – Continued

Country	Export	Import
Russia	petroleum and petroleum products, natural gas, wood and wood products, metals, chemicals, and a wide variety of civilian and military manufactures	machinery and equipment, consumer goods, medicines, meat, sugar, semifinished metal products
Slovakia	vehicles, machinery and electrical equipment, base metals, chemicals and minerals, plastics	machinery and transport equipment, intermediate manufactured goods, fuels, chemicals, miscellaneous manufactured goods
Slovenia	manufactured goods, machinery and transport equipment, chemicals, food	machinery and transport equipment, manufactured goods, chemicals, fuels and lubricants, food
Tajikistan	aluminum, electricity, cotton, fruits, vegetable oil, textiles	electricity, petroleum products, aluminum oxide, machinery and equipment, foodstuffs
Turkmenistan	gas, crude oil, petrochemicals, cotton fiber, textiles	machinery and equipment, chemicals, foodstuffs
Ukraine	ferrous and nonferrous metals, fuel and petroleum products, chemicals, machinery and transport equipment, food products	energy, machinery and equipment, chemicals
Uzbekistan	cotton, gold, energy products, mineral fertilizers, ferrous and non-ferrous metals, textiles, food products, machinery, automobiles	machinery and equipment, foodstuffs, chemicals, ferrous and non-ferrous metals

Source: World Factbook 2008.

Table A2. Data and sources used

Variable	Description	Source
GDP per capita	GDP per capita based on purchasing-power-parity in current international dollars, for a given year	IMF, http://www.imf.org/external/data.htm
I/Y	Ratio of investment to real GDP, for a given year	Penn World Tables 6.3, http://pwt.econ.upenn.edu/
G/Y	Ratio of government consumption to real GDP, for a given year	Penn World Tables 6.3, http://pwt.econ.upenn.edu/
Schooling	Average years of schooling of population over 15 years in the base year (1995), years	Barro, Robert J. and Jong-Wha Lee, "International Data on Educational Attainment: Updates and Implications" (CID Working Paper No. 42, April 2000, http://www.cid.harvard.edu/ciddata/ciddata.html
Health	Life expectancy at birth in the base year (1995), years	United Nations Database, http://data.un.org/
Population growth	Working population growth to the previous year	LABORSTA, http://laborsta.ilo.org/
Sophisticated trade volumes and shares	Volumes of export/import of manufactured/high-tech goods and their shares in total export/import, for a given year	Calculated using United Nations Commodity Trade Statistics Database, http://comtrade.un.org/db/

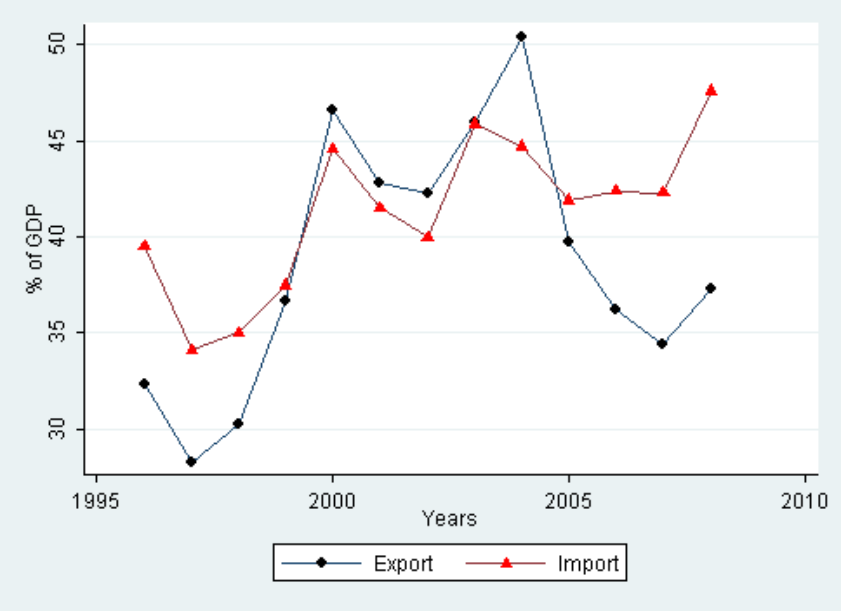


Figure A1. Exports and imports as % of GDP in Ukraine, 1996-2008

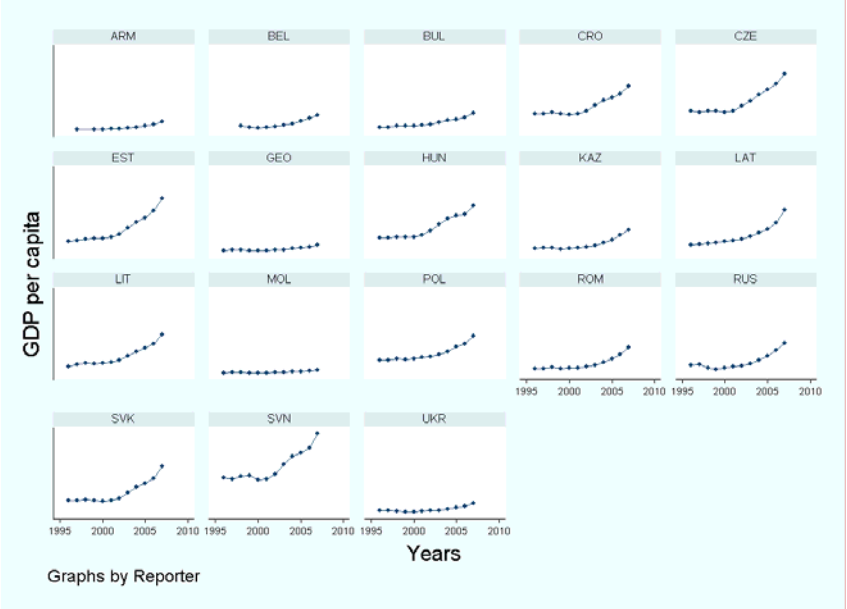
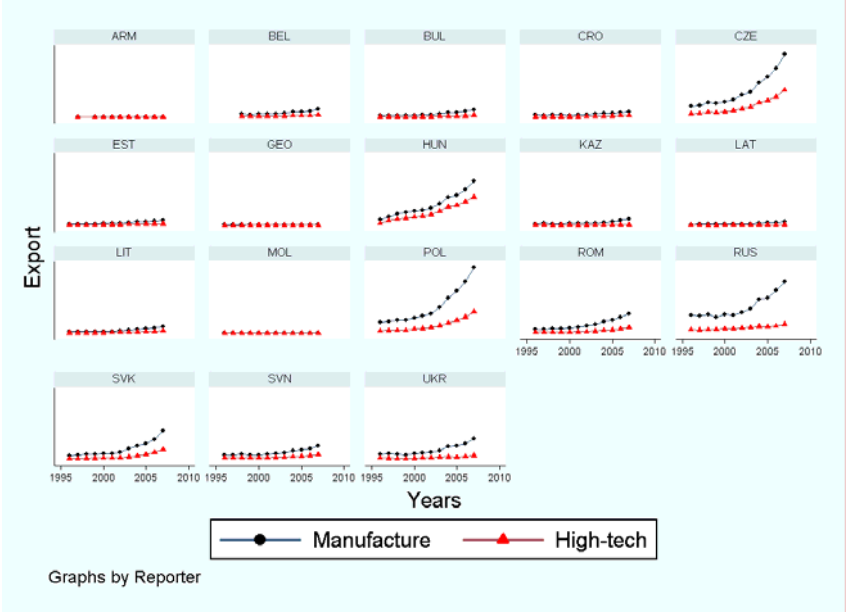
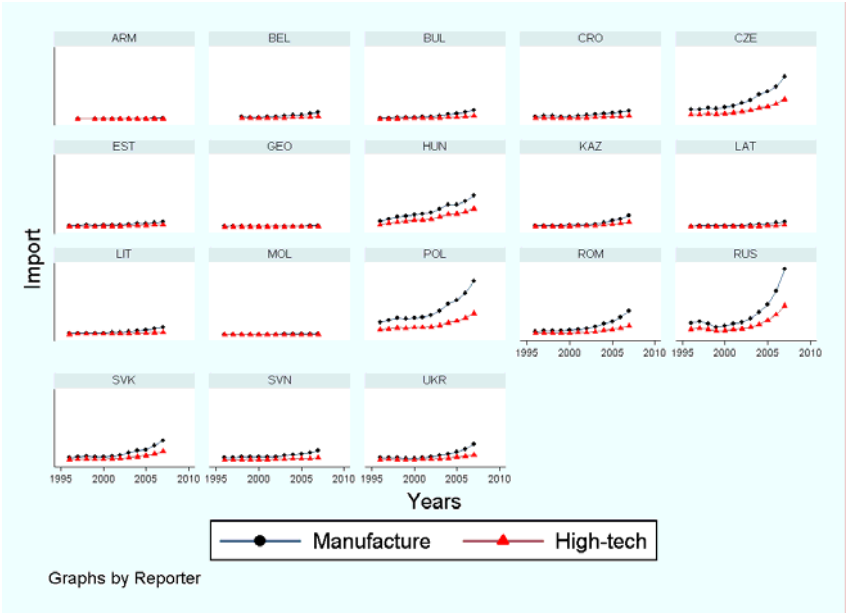


Figure A2. GDP per capita evolution over time, by countries

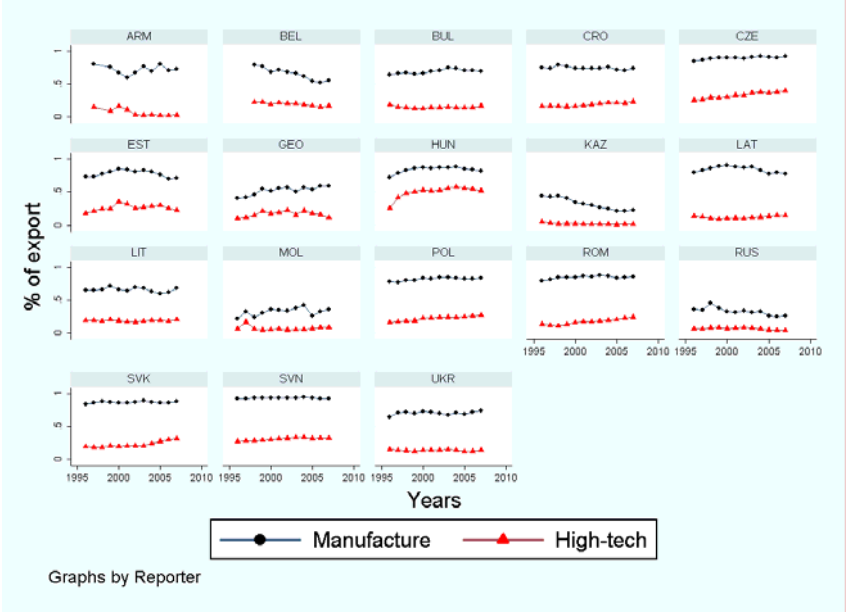


a) export of sophisticated goods

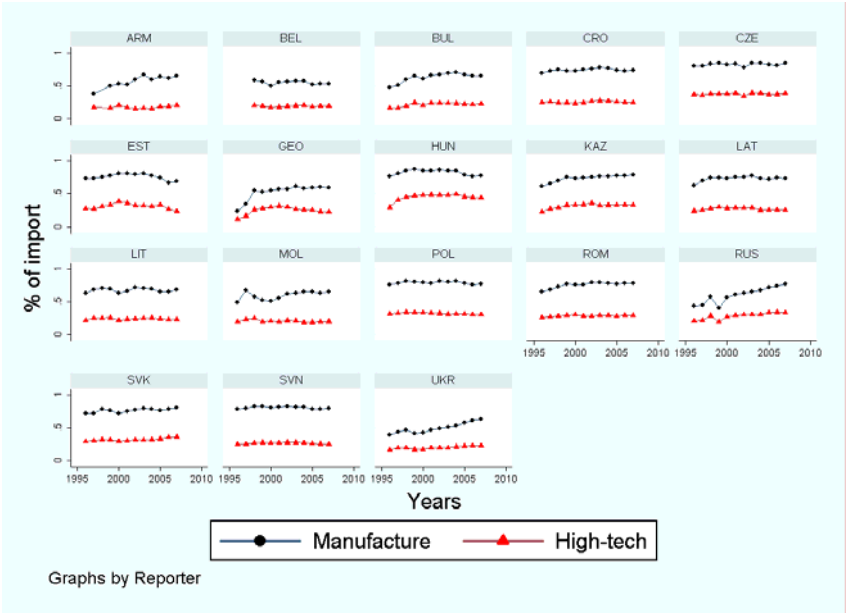


b) import of sophisticated goods

Figure A3. Sophisticated trade volumes evolution over time, by countries



a) composition of exports



b) composition of imports

Figure A4. Trade composition evolution over time, by countries