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Ukraine's Foreign Trade Developments and Forecasts

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Abstract

This paper discloses major developments of Ukrainian foreign trade for the recent years, shows the behavior of main factors which influenced foreign trade, presents results of modeling as well as short-term forecasts.

In this paper we describe the structure of Ukrainian merchandise trade, exchange rate movements and their impact on the merchandise trade balance. Then we discuss developments of the world economy and forecasts for international trade. Finally, we present the model of Ukrainian merchandise foreign trade followed by the forecasts produced by the model.

From the practical point of view, our work was aimed at building a model that would help to predict the influence of the price (real exchange rate) and income (GDP) changes both domestically and abroad on the Ukrainian Merchandise Trade. The results were planned to use in the monthly and quarterly models of Ukrainian economy developed and operated by CASE and Ukrainian government.

1. Introduction

Starting in 1994, Ukraine has decreased its trade with other countries. Its share of exports to GDP has decreased from 44% in 1994 to 42% in 1999 and its share of imports from 47% to 44% respectively. Despite the adverse development, foreign trade significantly influences domestic production and is viewed as an important contributor to growth in the future.

Merchandise trade remains a major part of Ukrainian foreign trade comprising about 80% of exports and about 90% of imports. Despite the small share of services in foreign trade, it was the sole contributor to the positive balance of Ukrainian foreign trade since for the most of the period of 1994–1999 net export of merchandise was negative.

Recently economists in Ukraine were trying to find out the factors, which could explain the movements of trade flows. At CASE, for example, a quantitative analysis has been produced based on the results of econometric modeling of the general trade flows. As in previous works, we have attempted to use modern theory and practice of international trade modeling. The novelty of our work lies in the more thorough approach to the analysis of the structure of merchandise trade. In our work we used the techniques, which allowed for the time-series as well as cross-sectional analysis of data. The work resulted in the development of the model that allows producing a forecast intended to supplement 'expert appraisement' of Ukrainian foreign trade.

In this paper we will disclose the major developments of Ukrainian foreign trade for the recent years, show the behavior of the main factors which influenced foreign trade, present the outcome of the modeling as well as the forecast for the near future.

In the next two sections we will describe the structure of Ukrainian merchandise trade. This will be followed by a description of the exchange rate movements and the consequences for the merchandise trade balance. Then we will discuss developments of the world economy and the forecasts for international trade. Finally, we present the model of Ukrainian merchandise foreign trade followed by the forecasts produced by the model.

Classification of the Goods for the Foreign Economic Activity

For accounting purposes, the Ukrainian statistical office uses a classification called 'Merchandise Nomenclature of Foreign Economic Activity – ТНЗЕД', developed based on the six-digit 'Harmonized System of description and codification of goods – HS' and eight-digit 'Combined nomenclature of European Community', which is a detailed list of HS for the EC countries. It should be noted that, while being roughly comparable to Standard International

Trade Classifications (SITC) at the two-digit level, the system adopted in Ukraine has about twenty categories, which do not correspond to ten SITC categories at one-digit level. The description of Ukrainian classification system at a category, as well as, at a group (two-digit) level is given in the appendix. When mentioned for the first time, the titles of the categories are accompanied by their codes according to the Ukrainian classification. Later, to save space, while describing trade flows, we provide only the codes of the respective categories or goods.

2. Exports of Goods

During 1997–1999 Ukrainian exports continued to decrease. In 1998, they dropped by more than 20% compared to the previous year and, in the first ten months of 1999, by almost 14% compared to the same period in the previous year.

In 1998 this fall was a reflection of declining exports of goods which are grouped into five categories (see Table 1).

Table 1. Development of merchandise export in 1998

Category	Change over year, %	Share in total decrease, %
Merchandise exports	**-20**	**100**
'Nonprecious metals – C15'	-10	36
'Food industry products – C04'	-52	22
'Machinery and equipment – C16'	-19	17
'Chemical products – C06'	-15	14
'Live animals and animals husbandry products – C01'	-38	10
'Leather, skins, furs – C08'	-31	-
'Miscellaneous manufactured goods – C93'	-20	-
'Stone, gypsum and cement products – C13'	-19	-
'Plastics and rubber – C07'	-14	-

Source: State Statistical Committee (Derzhkomstat), author's calculations

Despite the general decline, some branches of industry have increased their exports in 1998. They contributed to the increase of 'Vegetable products' – C02 (6% over year), 'Road vehicles' – C17 (5%), 'Textile articles' – C11 (3%). However, due to the low share of these goods in total exports (below 5%), the effect was not significant.

Figure 1. Export trends, H1 1997=100
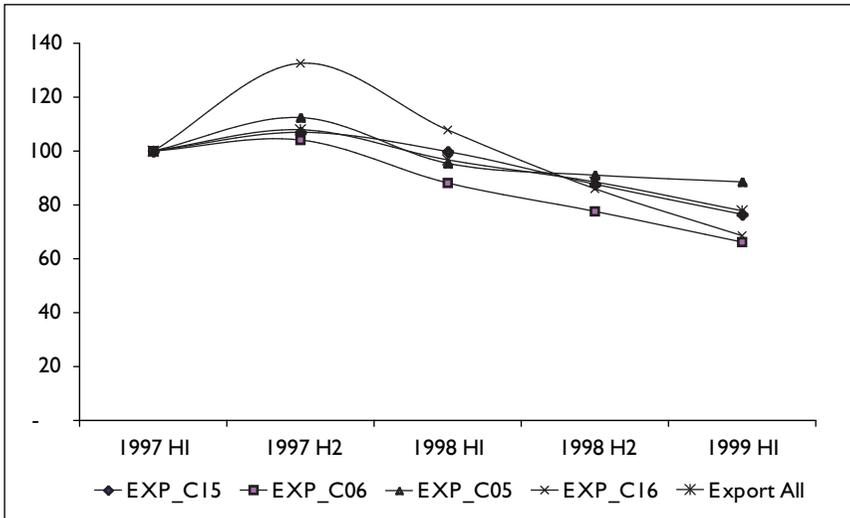
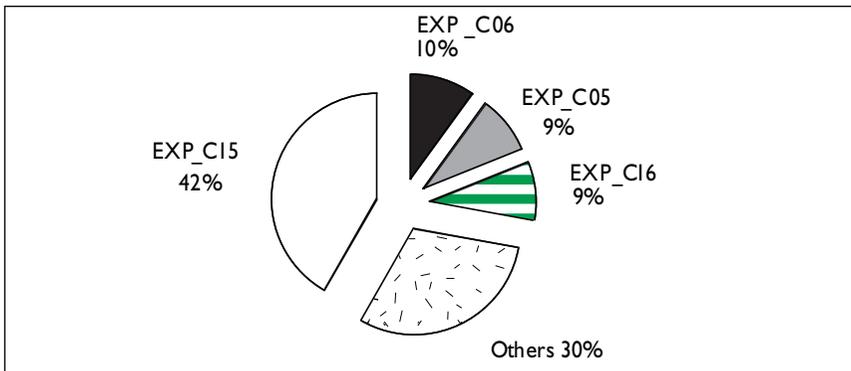Source: Derzhkomstat, own calculations

As in the previous year, the decline in exports of the major 'contributors' counts for the high portions of the exports' decrease (about 86%) in 1999. During ten months of 1999 exports of C15 decreased by 19%, keeping near its 1998's trend (see figure 'Export trends'). The rate of decrease of C05 in 1999 has been half from 12% in 1998. Exports of C06 has retarded the drop also, falling by 27% over the year, comparing to fall by 35% in 1998.

It is noteworthy that exports of 'Vegetable products' have been constantly increasing (25% for the ten months of 1999, compared to about 16% during the same period of 1998) and reached a share of 7% in Ukrainian merchandise exports. Exports of the category 'Other export' has stopped its downward trend of almost 13% in 1998 and increased by 52% for the three quarters of 1999. This change, while considered, a success of Ukrainian exporters, can not be assessed unambiguously due to reasons mentioned bellow. Another desirable change for the Ukrainian economy in 1999 was the increase in 'Animal and vegetable fats' – (EXP_15) (+17% to the same period of 1998), which replaced downward trend in the previous year (9.1% over the period). Exports of 'Timber and woodwork' – C09 has jumped by 56% from January till August 1999, which was just slightly below its increase by 59.3% recorded for the same period of 1998. Despite doubling its share (to 1.4% of merchandise exports in 1999), currently, producers of timber and woodwork can not be regarded as crucial for Ukrainian economy.

The general trend of falling exports, taking place for the first two quarters of 1999, has been slightly mitigated in the third quarter. The authorities have related this issue to the renaissance of the Ukrainian exports, which is highly questionable from our point of view. The slowing rate of decline can not be a predictor of growth, especially if it is registered after sharp drop and does not poses a stable nature.

Many reasons, notably poor economic planning, high labor intensity of production, soft budget constraints, etc., contributed to slow structural changes of Ukrainian merchandise exports. About 70% of the exported goods consist of goods, which could be grouped into four categories.

**Figure 2. Structure of Export**

Source: Derzhkomstat, own calculations

As can be seen from Figure 1, 42% of merchandise exports consist of items represented in Category 15 (C15) – Nonprecious metals and related articles, 10% – in C06 – Chemical and related industries' products, 9% – in C16 – Machinery, equipment and electrical appliances, and another 9% – in C05 – Mineral products.

As was mentioned earlier, the negative trends in Ukrainian merchandise exports are caused by adverse developments in a few export-oriented Ukrainian industries. All of these were developed in the times of Soviet Union, according to the 'central planning' system of intra-economic relations of Soviet Union. It is known that 'Gosplan of the USSR' did not always consider true economic costs for the development of the economy (many studies reveal that it had underestimated transportation costs as a result of low costs of energy). After the collapse of Soviet Union Ukrainian enterprises lost a source of cheap energy and had to cut their transportation costs.

Figure 3. Geographical structure of export
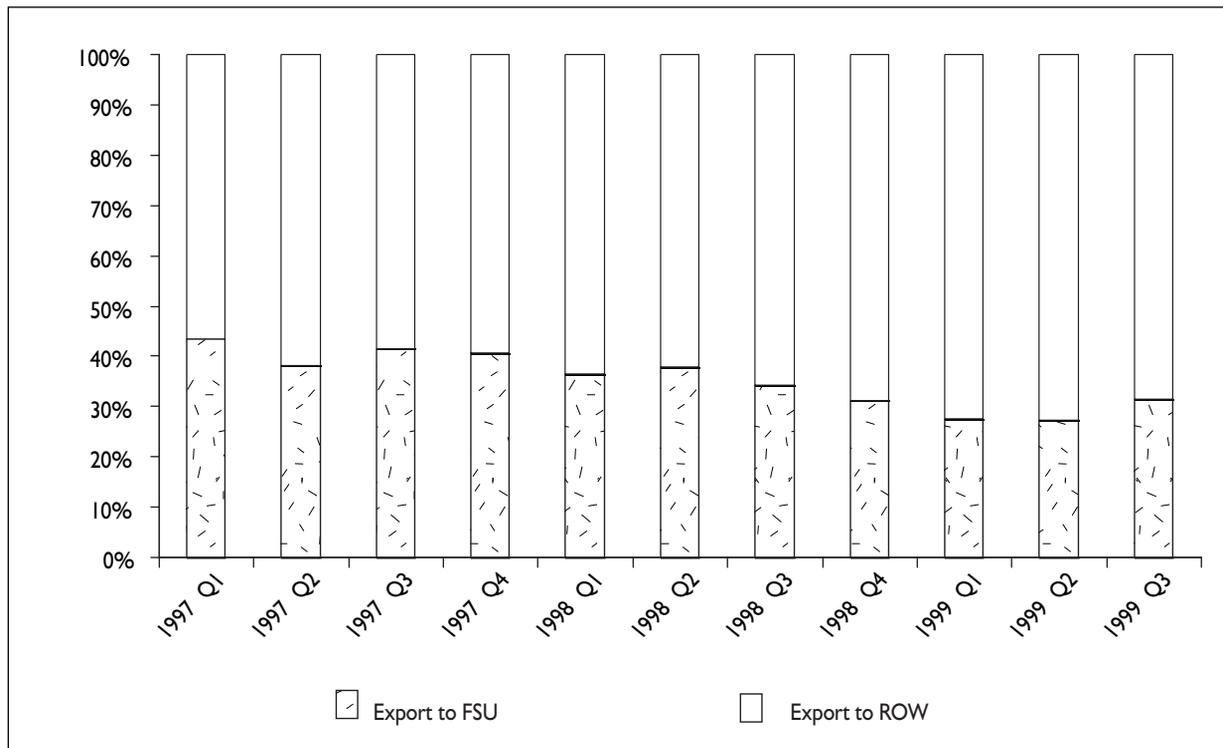
Source: Derzhkomstat, own calculations

Figure 4. Export of goods to FSU, mn. US$

Legend:
- 97 (10)
- 1997
- 98 (10)
- 1998
- 1999 (10 months)
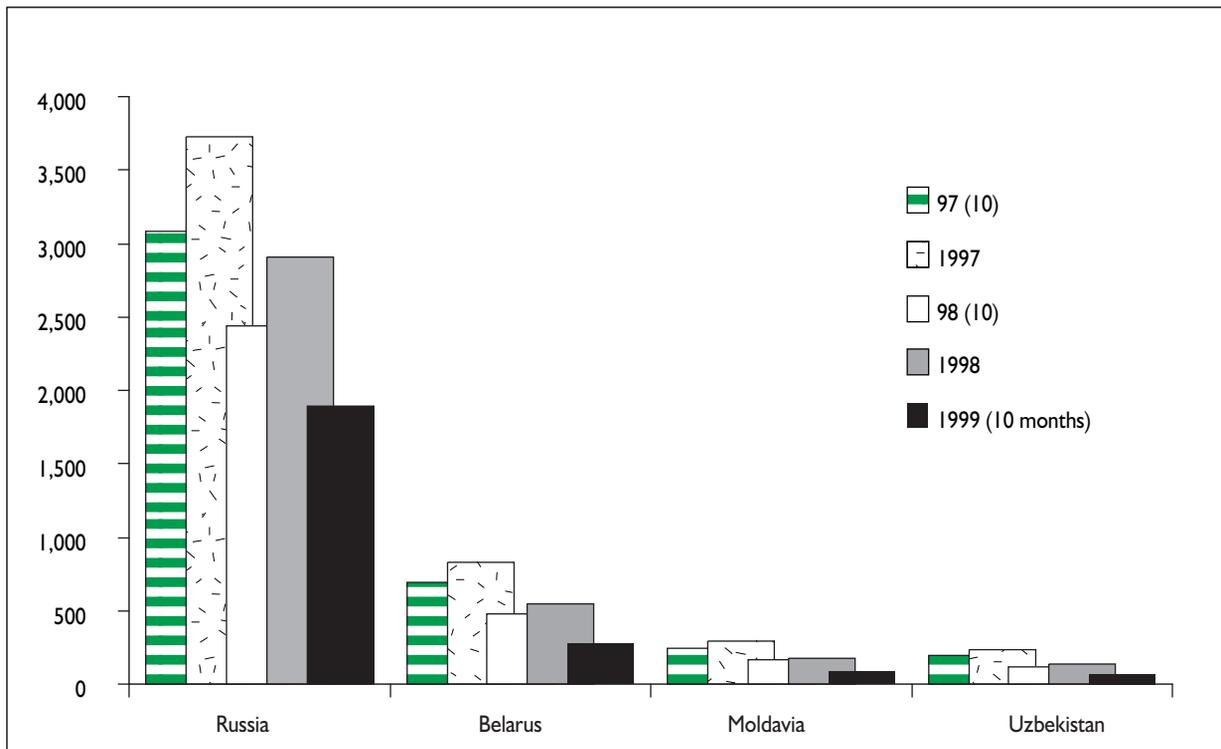
Source: Derzhkomstat, own calculations

Figure 5. Export of goods to ROW, mn. US$
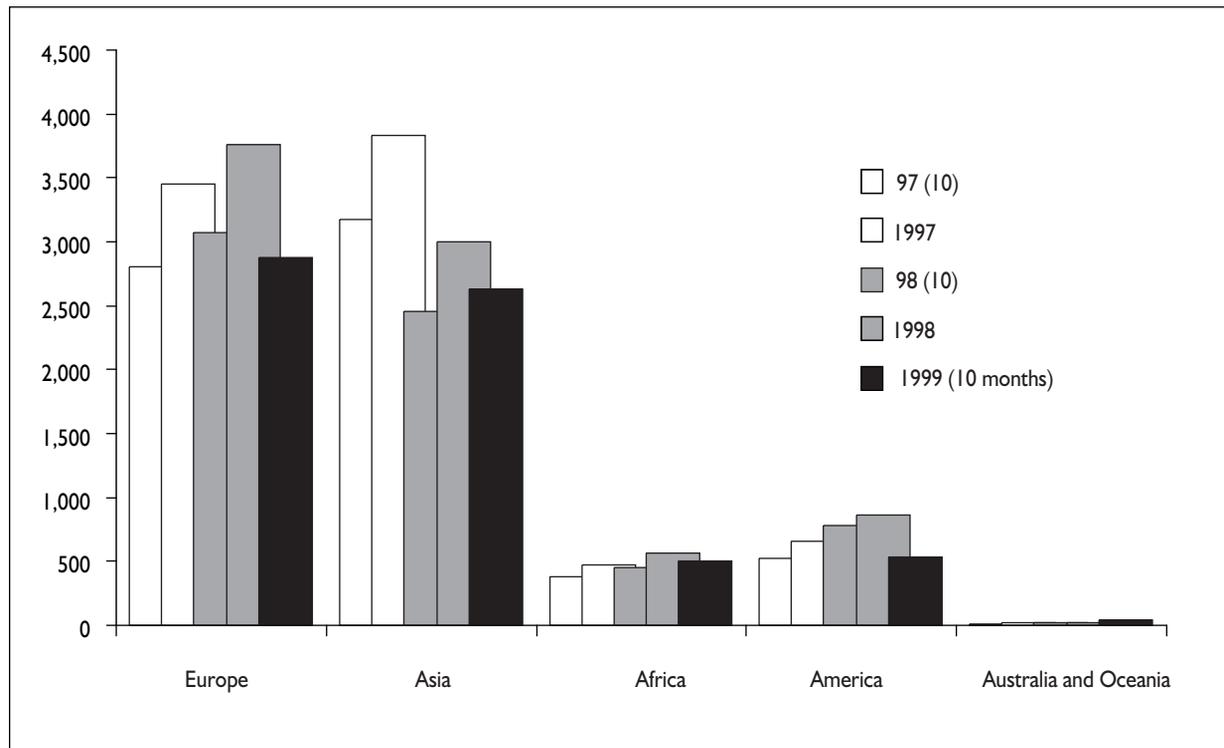

Source: Derzhkomstat, own calculations

Currently, Ukraine exports its goods to more than 210 countries. About 36% of its goods go to the countries of Former Soviet Union (FSU). As can be seen from Figure 2, during the last three years Ukraine was redirecting its exports from the FSU countries towards the Rest of the World countries (ROW).

In this period, exports to FSU countries decreased from 41% of merchandise exports in 1997 to 35% in 1998. The decline continued at the same rate in 1999, when the share of goods exported to FSU countries for the first three quarters reached 28.4%. For the first ten months of 1999, total Ukrainian merchandise exports dropped by 21.5% compared to the same period of 1997. During this period exports to FSU countries dropped by 45% and exports to ROW countries – by 5%.

Among FSU countries, major drops in Ukrainian exports occurred in Russia, Belarus, Moldavia and Uzbekistan which import above 30% of the goods exported (see Figure 3). Among the reasons of such a decrease one can name strong currency devaluation and payments crisis in Russia accompanied by increased protectionism and decrease of GDP in the mentioned countries of FSU.

Not every FSU country, however, decreased import of Ukrainian goods. Kyrgyzstan and Armenia have increased their imports from Ukraine, but this increase was not crucial for the Ukrainian economy, since these countries together buy only 1.5% of all goods Ukraine sells abroad.

Through Ukraine decreased its exports to ROW, this was not a stable trend (see Figure 4). In 1998 Ukraine decreased its exports to Asia, but increased to Europe. This was due to the Asian crisis, when Ukrainian producers have redirected their exports towards Europe and America. The trends of Ukrainian exports to these regions have changed. As a result of strong currency devaluations and recovery in the banking sector in Asian countries, Ukrainian goods have became more competitive in this region compared to the countries of Europe and America. Simultaneously Ukrainian exports to Africa increased by 19% in 1998 and by 28% for the eight months of 1999. The expansion of exports to Africa is viewed as an outcome of the new markets' development in the process of export reorientation carried by Ukrainian enterprises as well as continuation of the GDP increase resulted in the increase of import by the countries of Africa.

The relative increase of exports to America compared to Europe in 1999 has been based primarily on two factors. The first was relative GDP increase in America compared to Europe. According to JPMorgan estimations, real GDP in America has grown by 3.2% over year in 1999 and in Europe by 1.9%. The second reason was a relative appreciation in real terms of US$ compared to Euro. According to JPM, real effective exchange rate index of US$ for ten months of 1999 decreased by 1% and the one of Euro – by 7% comparing to the same period of the previous year.
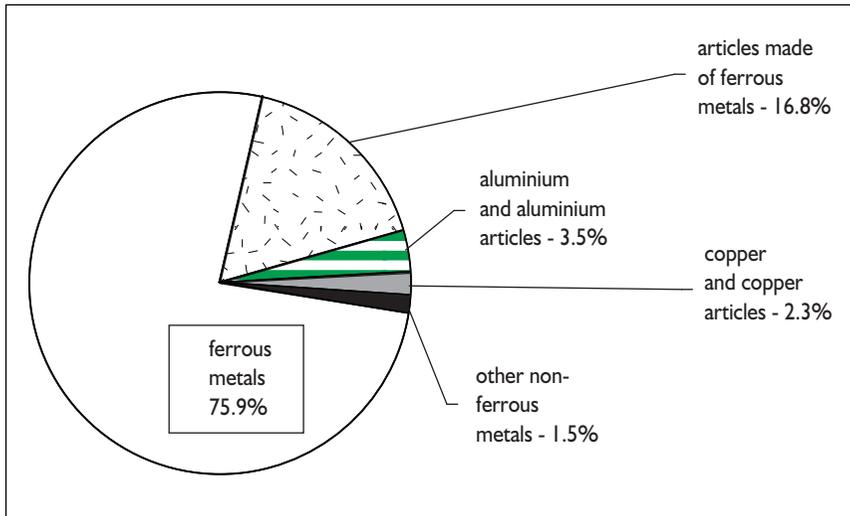
Figure 6. Export to selected countries, mn. US$
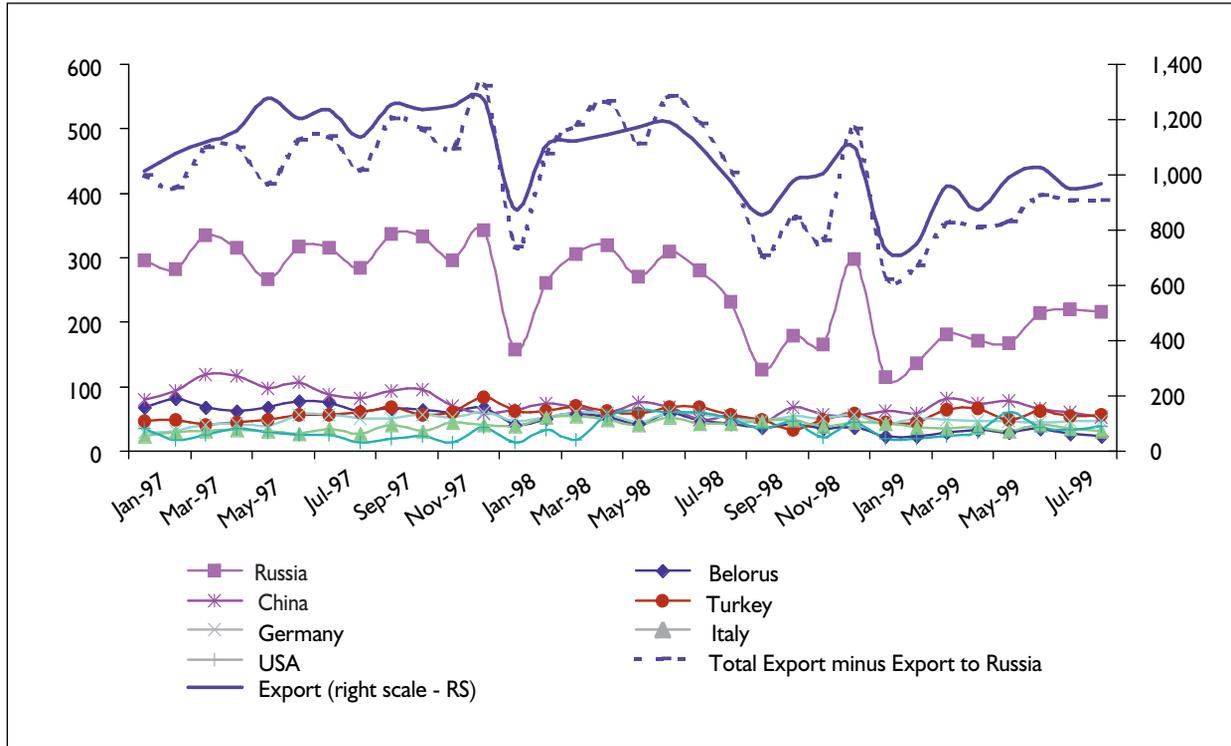
Source: Derzhkomstat, own calculations

Despite the large number of countries, which import Ukrainian goods, seven of them absorb more than half of Ukrainian exports. Among the biggest importers are Russia (23.6% of merchandise exports for the last two and a half years), Belarus (4.7%), China (6.9%), Turkey (5.3%), Germany (4.6%), Italy (3.6%), USA (3.1%). Figure 7 shows that fluctuations of Ukrainian export to these countries almost perfectly synchronize with the fluctuations of total Ukrainian merchandise exports. It might be noticed that if there were no swings in the exports to Russia, total Ukrainian merchandise exports would perfectly repeat (at the lower level, of course) the fluctuations of Ukrainian exports to the other six countries.

Figure 7. Export of ferrous and non-ferrous metals in 1998 (*42% of total Ukrainian Export

articles made of ferrous metals - 16.8%

aluminium and aluminium articles - 3.5%

copper and copper articles - 2.3%

ferrous metals 75.9%

other non-ferrous metals - 1.5%

Source: Derzhkomstat, own calculations

2.1. Some Notes on the Exports' Structure

As was mentioned above, Ukrainian exports remain very segmented. About 42% of all Ukrainian exports are nonprecious metals (C15). C15 consists of eleven groups. More than 99% of nonprecious metals, which Ukraine sells abroad are ferrous metals and articles made of them (91%), aluminum and the articles (5%), copper and copper articles (2%) (see figure 'Export of nonprecious metals in 1998').

Ferrous metals and related articles are often regarded as crucial for Ukrainian exports, since they represent about 33% of total merchandise exports. This view becomes popular owing to good organization of the exporters (producers) when it comes to defending their rights in the government or the Parliament. It is noteworthy that two metallurgical combines in Ukraine produce about 60% of the exported goods in this category. Both of these two ('MMK im. Illicha' and 'Azovstal', which are regarded as the most successful of fourteen metallurgical combines in Ukraine) are situated in the city of Mariupol. Russia traditionally has been the main importer of Ukrainian metallurgical products (see figure 'Geographical structure of the main metallurgical products'), but due to the Russian Ruble devaluation, which undermined the competitiveness of all Ukrainian goods, and, particularly, energy-consuming metallurgical products, and payment crisis, the presence of Ukrainian metallurgists in Russian market is diminishing. For the last two years Ukraine was benefiting from the increase of the world metal prices and increased its exports to the Asian countries, Italy, USA and Egypt. However, due to constant anti-dumping investigations, the future of Ukrainian exporters at these markets will depend on the success of the court hearings and the entry to WTO. The latter depends, however, on the outcome of the strategic game of Ukrainian metallurgists. On the one hand, they proven to be very organized in lobbying their interest with the highest Ukrainian authorities (for example, Verkhovna Rada (the

Figure 8. Geographical structure of the main metallurgical products
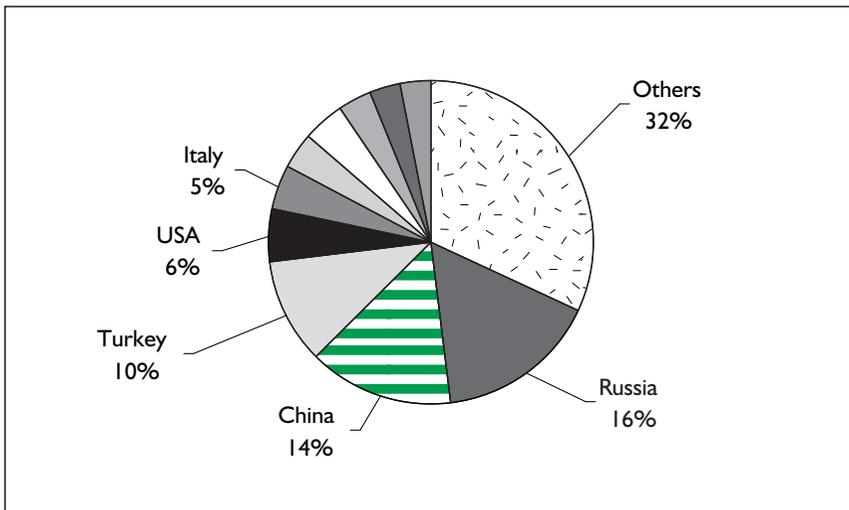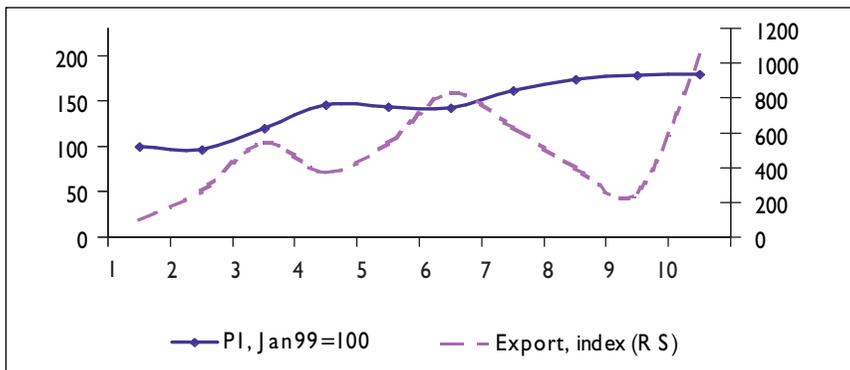

Source: Derzhkomstat

Parliament of Ukraine) has recently adopted the law 'On metal wastes', that places additional obstacles to the exports of the metal debris). On the other hand, they are not reciprocal in the export policy and the anti-dumping investigation is a clear evidence for that.

The next biggest category of Ukrainian exports is 'Chemical and related industries' products' (C06), which takes about 10% of merchandise exports. The main groups here are 'non-organic chemicals' (39%), 'fertilizers' (27%) and 'organic chemicals' (13%). During the last two years exports of these products has been decreasing. This decrease touched the majority of the exported items, but not all of them were decreasing at the same rate. Starting in 1997 their downtrends were not stable and the larger categories of exports were deviating more from their trend.

Exports of 'Machinery, equipment and mechanical devices, appliances, tape recorders, videos, televisions' (C16) comprises about 9% of merchandise exports. Two thirds of it is taken by 'machinery and equipment' and the rest by 'electric machines'. It is noticeable that the downtrend of C16 (19% over 1998 and 23% over ten months of 1999) was defined by the decline of the larger category – 'machinery and equipment', which rate of change is increasing (16% and 28%), while for the smaller category it is decreasing (26% and 13%). The main goods Ukraine exports abroad within this category are: pumps, hoists, electric compensators, transformers and decoders, twin-axial wires and cables, etc.

The category called 'Mineral products' (C05) also comprises about 9% of Ukrainian merchandise exports. It consists of: 'mineral fuels, petroleum, and petroleum products' (about 50% of the category), 'ores, slags and ashes' (about 40%), and 'salt, sulfur, lime and cement'. Exports of C05 decreased by 9.3% in 1998 and by 2.6% over ten months

Figure 9. World prices for petroleum and its export by Ukraine (months starting Jan 99)

Source: Derzhkomstat

Figure 10. Exports of 'Other items', mn. US$
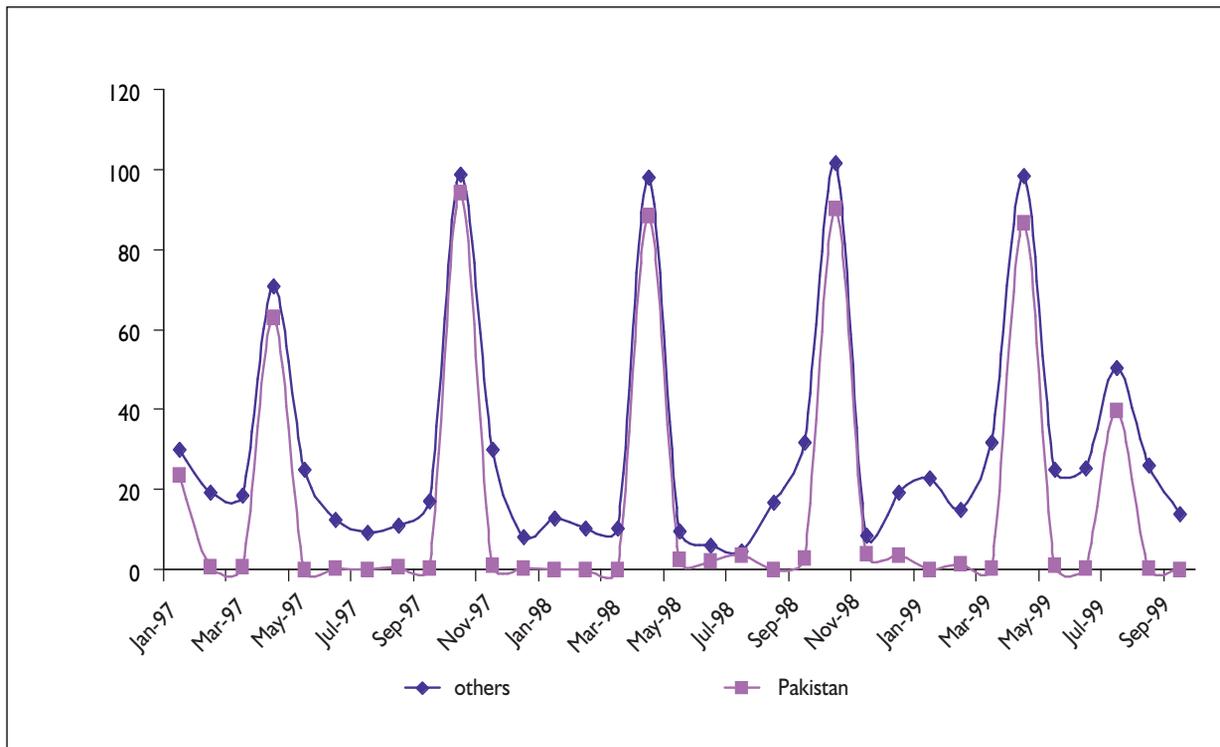
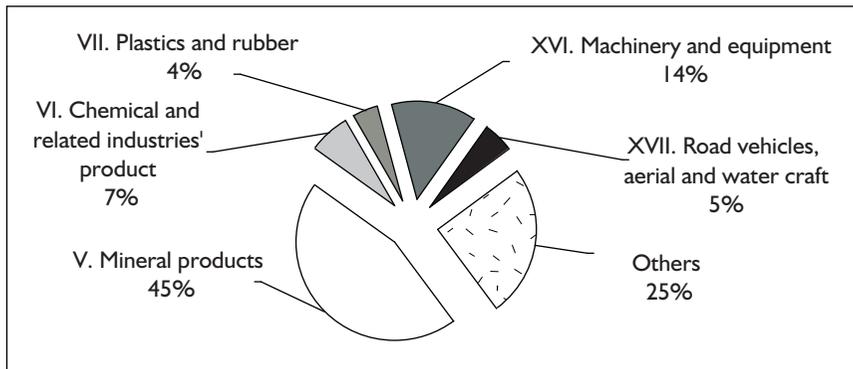Source: Derzhkomstat, own calculations

of 1999. This deceleration was caused by the sudden increase of exports of crude petroleum in the March, June, July and August of 1999, which was a major contribution to the increase of exports of 'mineral fuels' in 1999 (over 36% for the first ten months). It can be seen from the figure 'World prices of petroleum and Ukrainian export of petroleum' that these jumps coincide with the increases of oil prices, which grow constantly from the beginning of 1999.

The other noticeable trends of Ukrainian merchandise exports can be traced within the last category of classification, called 'Other items exported' (C97). According to international standards, this item should represent the leftovers from the other exports, errors and omissions in the previous periods. Naturally, this does not represent a high share of exports. In Ukraine, however, the exports of goods recorded within this category has the high share in merchandise exports (about 10% in May and November) and unusual stability. Despite the very limited transcript of this item, one can find a close relationship (see figure 10) between this kind of exports and Ukrainian exports to Pakistan). Here we present it merely as a fact and not a judgement of the precision typical for the Ukrainian statistical office. Besides, the intransparency of the exports greatly influences the quality of its forecasts.

3. Imports of Goods

Similarly to the structure of exports, structure of Ukrainian merchandise imports from the beginning of 1997 and till October 1999 remained almost unchanged. Figure

Figure 11. Structure of import

Source: Derzhkomstat, own calculations

'Structure of import ' shows that almost half of Ukrainian imports consists of goods called as 'Mineral products' (C05). The next biggest categories are 'Machinery, equipment and mechanical devices, appliances, tape recorders, videos, televisions' (C16) (15% of merchandise imports); 'Chemical and related industries' products' (C06) (7%); 'Road vehicles, aerial and water craft' (C17) (5%); 'Plastics and rubber' (C07) (4%).

During 1997–1999 Ukrainian imports of goods continued was decreasing. In 1998 it dropped by 14% compared to the 1997 and for the ten months of 1999 by 24% compared to the same period of 1998.

During 1998–1999 the major decreases of imports have been recorded for several categories of goods (see Table 2).

Table 2. Trends of merchandise import in 1998–1999

| Category	1998		1999 (ten months)	
	Change to the previous year, %	Share in total decrease , %	Change to the previous year, %	Share in total decrease , %
Mineral products - C05	22	74	11	19
Chemical and related industr. products – C06	20	10	29	9
Machinery and equipment - C16	12	13	42	27
Road vehicles, aerial and water crafts - C17	-	-	45	12

Source: State Statistical Committee (Derzhkomstat), author's calculations

The other drastic drops, which have not had a significant impact on merchandise imports in 1999 due to their low share, were registered for 'Animal and vegetable fats and oils' (39% comparing to the ten months of 1998), 'Timber and woodwork' (34%), 'Miscellaneous manufactured goods' (35%) and 'Work of art' (50%).

Despite the general downtrend, imports of some categories was increasing. The major growth of imports in 1998 was recorded for 'Textile and the articles – C11' (10% over year), 'Food industry products – C04' (10%), 'Live animals and animal husbandry products – C01' (16%) and 'Animal and vegetable fats and oils' (135%).

For the first ten months of 1999 Ukrainian official statistics recorded no increase of imports at the level of categories. Nevertheless, imports of some items was increasing. These trends were registered for the categories called 'Aircraft, space apparatuses, and
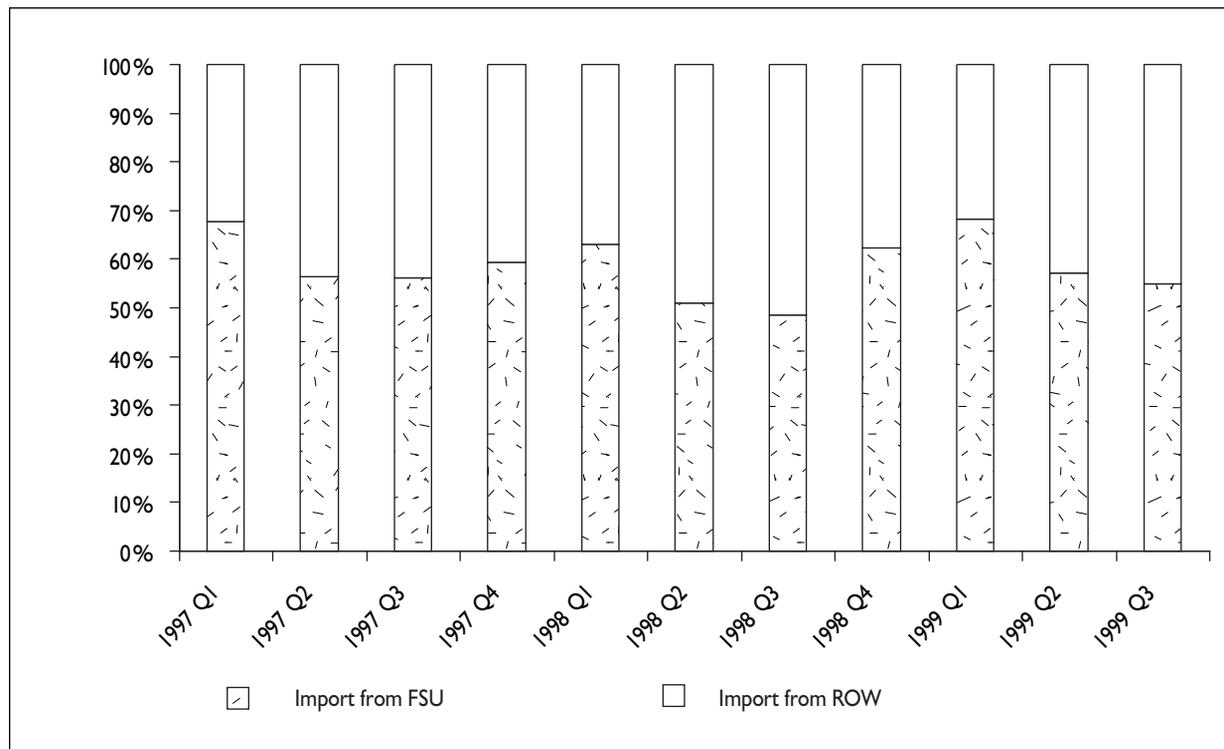
Figure 12. Import trends, H1 1997=100
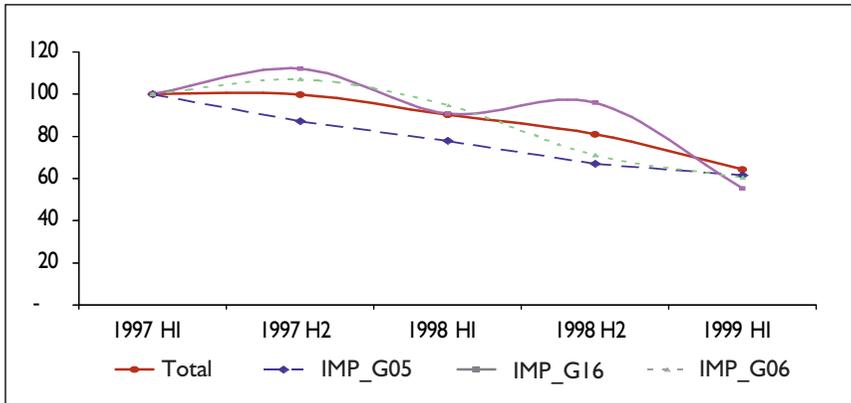
their craft' (203% for the first ten months of 1999 comparing to the same period of 1998), 'Food mixes' and 'Sugar' (each about 50%), 'Knitwear and knitted accessories' (25%).

Geographical structure of Ukrainian merchandise imports is quite reversal to the structure of exports. The larger part of its imports (about 59% in average for 34 months starting January 1997) Ukraine buys from the countries of FSU. About 96% of imports bought from FSU are delivered from the Commonwealth of Independent States (CIS) and the rest from Baltic States. Figure 'Geographical structure of import' shows that the share of FSU in the merchandise imports decreased to 56% in 1998, but returned to its 34 months average in 1999. It is very likely that this decrease is related to the currency and banking crisis in Russia taken place in summer of 1998.

Besides Russia, whose share in Ukrainian imports from FSU countries is about 83%, the other major suppliers of goods from the FSU countries are Turkmenistan (5.7%), Belarus (2.3%) and Kazakhstan (2.4%). As it was noted above, imports of goods has decreased by14% in 1998 and by 24% for the ten months of 1999. For that period Ukrainian imports of goods from Russia has fallen by 10% and 22% respectively. As can be seen from figure 'Import of goods from FSU', imports from Turkmenistan, which share comprised about 10% of imports from FSU in 1997, has fallen to almost zero in 1998, but almost recovered in 1999 (9%). Decrease of imports from Belarus was about 10% in 1998 and 2% for the ten months of 1999. Kazakhstan has decreased its exports to Ukraine by 14% in 1998 and by more than half (59%) for January – October of 1999.

About 40% of the merchandise imports Ukraine are delivered from the ROW countries. The major supplier are Europe (72% of imports from ROW), America (12%)

Figure 13. Geographical structure of import

Source: Derzhkomstat, own calculations

Figure 14. Import of goods from FSU, mn. US$

Legend:
- 97 (10)
- 1997
- 98 (10)
- 1998
- 1999 (10 months)

Categories: Russia, Turkmenistan, Belarus, Kazakhstan
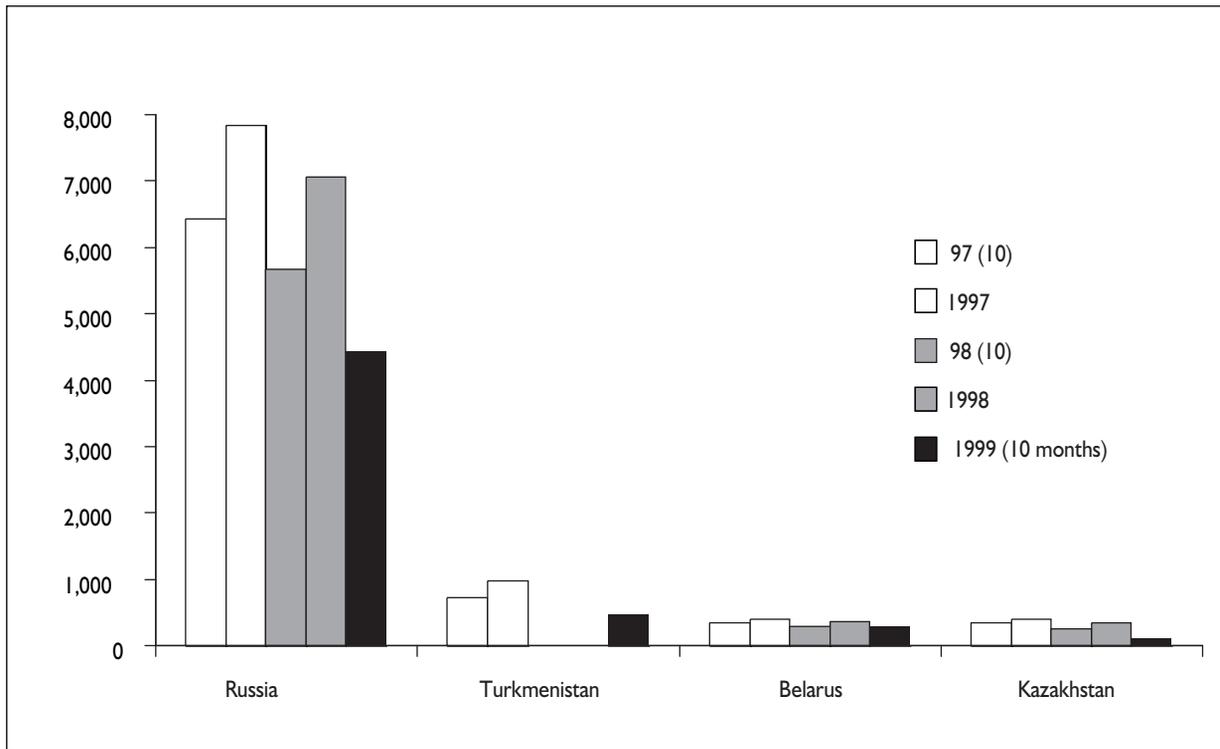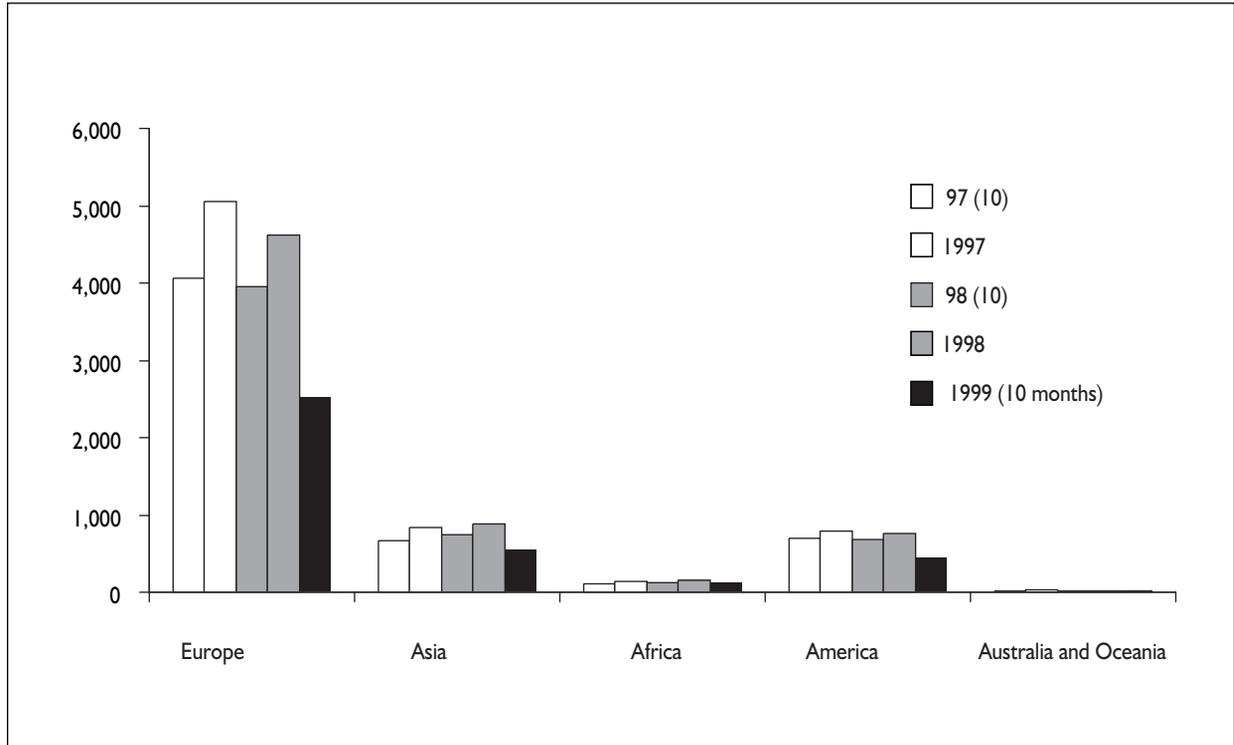
Source: Derzhkomstat, own calculations

**Figure 15. Import of goods from ROW, mn. US$**

Source: Derzhkomstat, own calculations

and Asia (13%). The share of imports bought from Africa, Australia and Oceania remains insignificant. The value of imports from ROW countries has decreased in 1998 by 6% comparing to 1997 and by 33% for the ten months of 1999. For that period, Ukraine was importing less goods from Europe (by 9% and 27%, correspondingly in 1998 and ten months of 1999) and America (by 5% and 34%). The higher decrease of import from the America's countries than from European countries in 1999 was caused by the strengthening of the US$, that appreciated this year against European currencies in real terms.

Imports from Asian countries increased by 6% comparing to the previous year in 1998 and decreased for ten months of 1999 by 27% comparing to the same period of 1998. The change of imports' trends for Asian countries resulted from the recovery of Asian currencies after 1997 crisis. This recovery made Asian goods relatively expensive at Ukrainian market Imports from African countries, from which Ukraine buys about 1% of the goods produced abroad increased in 1998 (14% comparing to 1997) and remained just 2% bellow 1998 level during the first ten months of 1999.

Imports from Australia and Oceania have decreased in 1998 by 31% and increased during the first ten months of 1999 by 69% comparing to the same period of the previous year. The supply of goods to Ukraine from the latter region, however, remains at insignificant level.

Figure 16. Main suppliers of goods to Ukraine
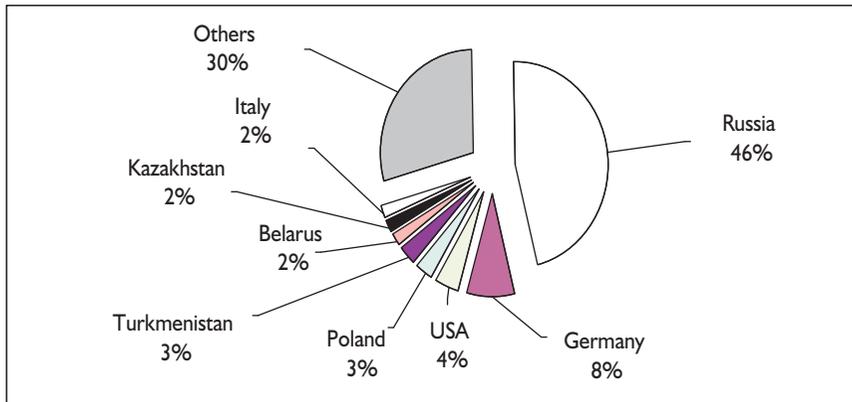
Source: Derzhkomstat, own calculations

Besides Russia, Belarus, Turkmenistan and Kazakhstan, who were already mentioned, the major suppliers of goods to Ukraine are Germany (8% of imports in average for 34 months from January 1997), USA (4%), Italy and Poland (each 3%).

As can be seen from figure 16, Ukraine imports more than 70% of foreign goods from these eight countries.

3.1. Some Notes on the Imports' Structure

As was already noted, 'Mineral products – (C05)' remains the major category of the goods, which Ukraine buys from abroad. During 1997–1999 the goods of this category comprised about half (46%) of Ukrainian merchandise imports.

The category consists of the following groups:

Figure 17. Import of CO5 (46% of Ukrainian Import)
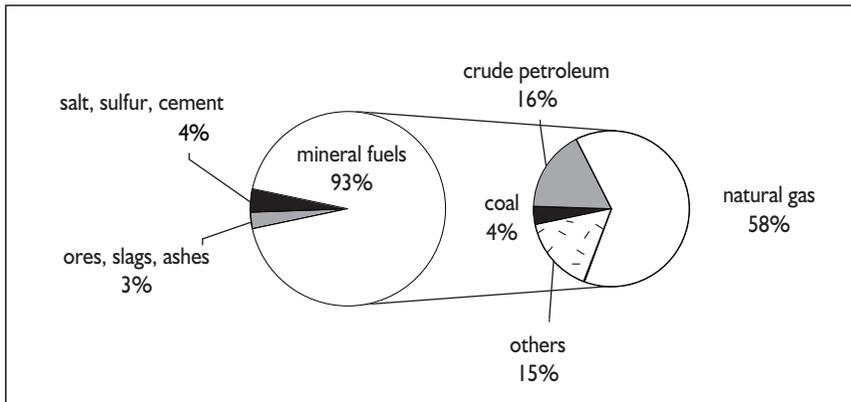
Source: Derzhkomstat, own calculations

– Mineral fuels, petroleum, and petroleum products (95% of CO5);
– Ores, slags, ashes (3%);
– Salts, sulfur, lime, cement (2%).

The biggest group of goods (called 'Mineral fuels, petroleum, and petroleum products – 27'), in turn, consists of (see figure 'Import of C05'):

– Coal (4% of '27' for the ten month of 1999);
– Crude petroleum (17%);
– Natural gas (62%);
– Electricity (0.3%).

As was already noted, most of the enterprises, which Ukraine inherited from the USSR used high energy-consuming technologies. This was caused by huge supply of oil

and natural gas, which were extracted in Russia and, virtually, at no costs provided to the other USSR republics (middle aged Ukrainians still remember the times when gasoline was cheaper than sparkling water). After the collapse of the USSR, Russia remained a major source of energy for Ukraine. However, the price for energy was much higher. Sometimes it was higher than a world price. Thus, Ukraine started to look for other suppliers of mineral fuels. As can be seen from figure 'Regional structure of import of C05', major part of C05 (above 90% in 1998) currently Ukraine imports from four countries: Russia, Kazakhstan, Lithuania and Poland. However, taking into consideration high-energy consumption of Ukrainian industry and limitations for the domestic production, such a low diversification of the most important imported goods makes Ukraine very vulnerable at the trade negotiations and dependent on the economic stability of these countries.

**Figure 18. Regional structure of import of C05, 1998**
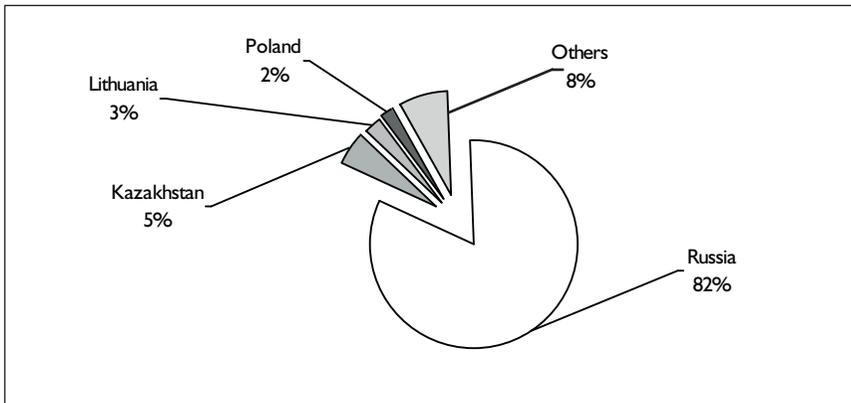
Source: Derzhkomstat, own calculations

MERCHANDISE TRADE BALANCE AND EXCHANGE RATE MOVEMENTS

Starting in 1997 Ukraine's trade balance was continually improving. Negative at about 3.2 bn. US$ at the end of 1996, it decreased by 10% in 1997, by 30% in 1998 and by 104% for the ten months of 1999 comparing to the same period of the previous year (see figure 19). The developments of 1999 show that the trade balance was virtually balancing around zero. It was negative in the first quarter (-426 mn. US$), positive in the second (261 mn. US$), negative again in the third (-14 mn. US$).

**Figure 19. Ukrainian Merchandise Foreign Trade, bn. US$**
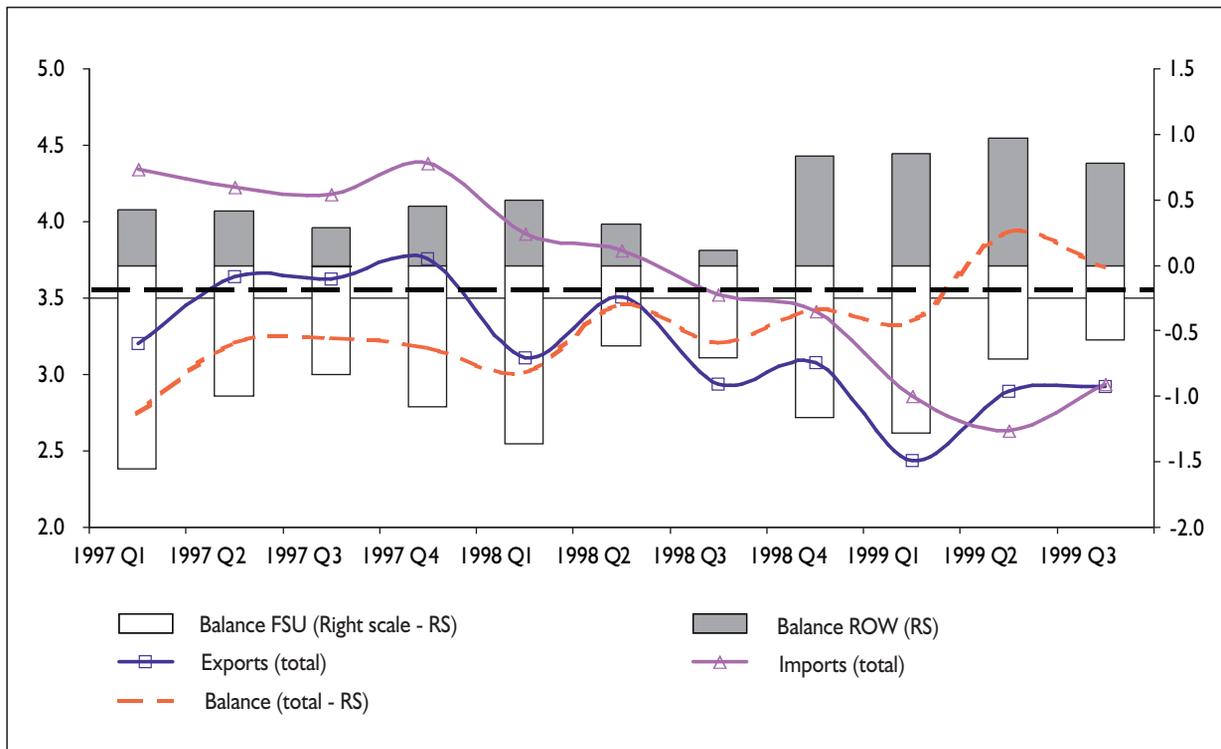
Source: Derzhkomstat, own calculations

For the period of January – October 1999, Ukraine had positive trade balance of 63 mn. US$. The coverage of imports by exports, which is usually presented in the official statistics and somehow reflects the pressure of trade balance on the exchange rate, at 100.68%.

Figure 20A. Trade with FSU, in bn. USD
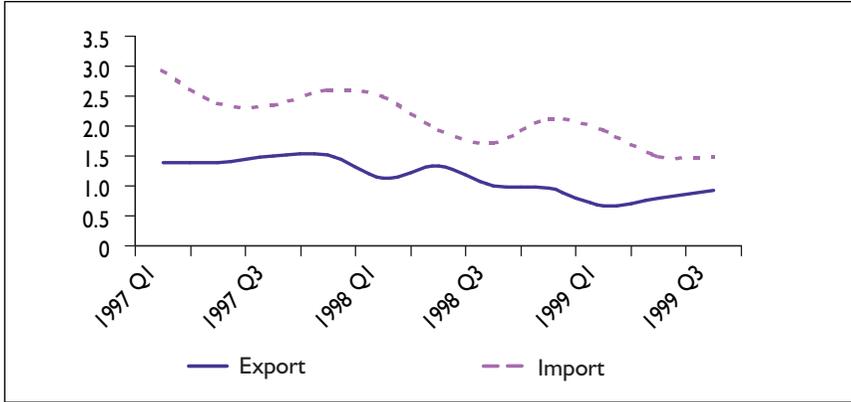
Figure 20B. Trade with ROW, in bn. USD
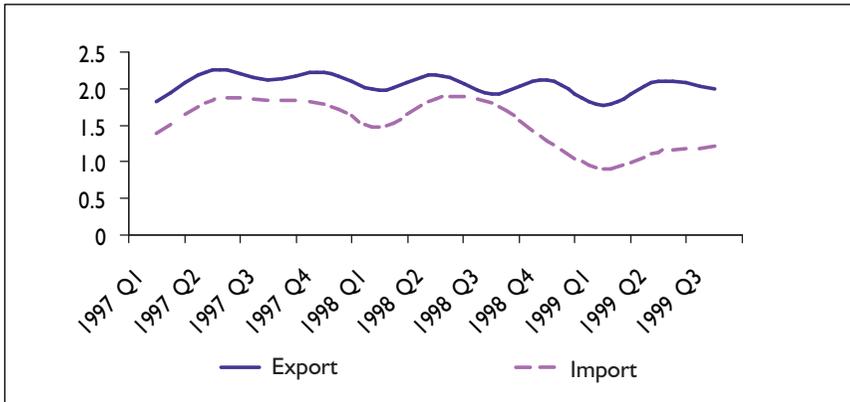
Ukraine has always maintained a negative balance of merchandise trade with FSU countries and a negative one with ROW countries (see figures 20-A and 20-B). Starting

Table 3. Developments of the Exchange Rate, 1997–1999

|	Nominal ER, eop (NC/US$)	Real ER, eop, Jan97=100	Real effective ER, eop (export based)	Nominal ER, eop (NC/US$	Real ER, eop Jan97=100	Real effective ER, eop (export based)	Nominal ER, eop (NC/US$	Real ER, eop Jan97=100	Real effective ER, eop (export based)
Russia	5.94	98.95		20.84	69.35		26.03	86.71	
Italy	####	89.63		1,653.10	125.43		1,844.59	132.54	
Germany	1.79	88.72	96.78	1.67	124.59	92.43	1.83	134.38	105.42
Turkey	205,605	98.26		314,464	132.11		460,211	110.55	
USA*(UAH/US$)	1.90	94.52		3.43	122.02		4.51	149.02	

Source: IMF, JPMorgan, Derzhkomstat, author's calculations

in 1998, a balance with FSU as well as a balance with ROW was constantly improving. Ukraine has decreased its negative balance with FSU by 14% in 1998 and by 2% for the ten months of 1999 and increased its positive balance with ROW by 13% in 1998 and by 132% in 1999. These efforts have resulted in the general positive balance of merchandise trade at October 1999, as was mentioned above.

The success with improving trade balance is related to the real devaluation of the national currency against the currencies of the major trade partners. As it can be seen from the Table 3, at the end of 1997 Ukrainian hryvna appreciated to the currencies of its main trading partners. The next year has drastically changed the situation, as hryvna devalued by 30–40% against all currencies, but the Russian Ruble. Due to the currency crisis in 1998, when the Russian Ruble has nominally devalued by 250% against US$, nominal devaluation of hryvna (80% against US$) resulted in 30% real appreciation of the Ukrainian currency against the Russian Ruble. In the year of 1999, further nominal devaluation of hryvna (31% against US$) along with low domestic inflation resulted in real devaluation of hryvna against the currencies of the main trading partners in the range from 6% comparing to the previous period (against Italian Lira) to 27% (against Russian Ruble). Therefore, at the end of October 1999, Ukrainian currency has been devalued in real terms from 10% to 50% comparing to January 1997 against currencies of Italy, Germany, Turkey and USA and appreciated by 12% against the currency of Russia.

As a result of high share of trade with Russia in the Ukrainian international trade (Russia absorbs 23% of Ukrainian exports and produces 47% of its imports), the weight of Russian Ruble is high. Therefore, the Real Exchange Rate of UAH/US$ (computed based on prices differences) is not a good predictor of Ukrainian foreign trade flows. The changes of Real Effective Exchange Rate (computed as a simple weighted average of Real ER with volumes of trade as weights) reflects the results of the price and ER movements in Ukraine and its major trading partners. This is a primary source of explanations (besides administrative regulations and seasonal effects) to the changes of Ukrainian exports and imports for the period of 1997–1999. Figure 21 confirms that Ukrainian hryvna was appreciated against the currencies of its major partners in 1997. This appreciation made Ukrainian goods abroad more expensive, negatively influenced the competitiveness of Ukrainian producers at the foreign markets and, along with other factors, contributed to the decrease of Ukrainian exports. Crises of Ukrainian currency, which happen in the fall of 1998, resulted in devaluation of hryvna and was regarded as a source of improvements for the competitiveness of Ukrainian exporters. The positive circumstances, however, could not be fully exploited as Russian Ruble devalued more than hryvna. Besides, a currency crisis in Russia and Ukraine were accompanied by banking crisis, which prevented the fast growth of exports to the ROW, but mitigated

Figure 21. Dynamics of Exchange Rates on the graph: curve's uptrend denotes appreciation, downtrend – depreciation (* appreciation favors importers, depreciation – exporters)
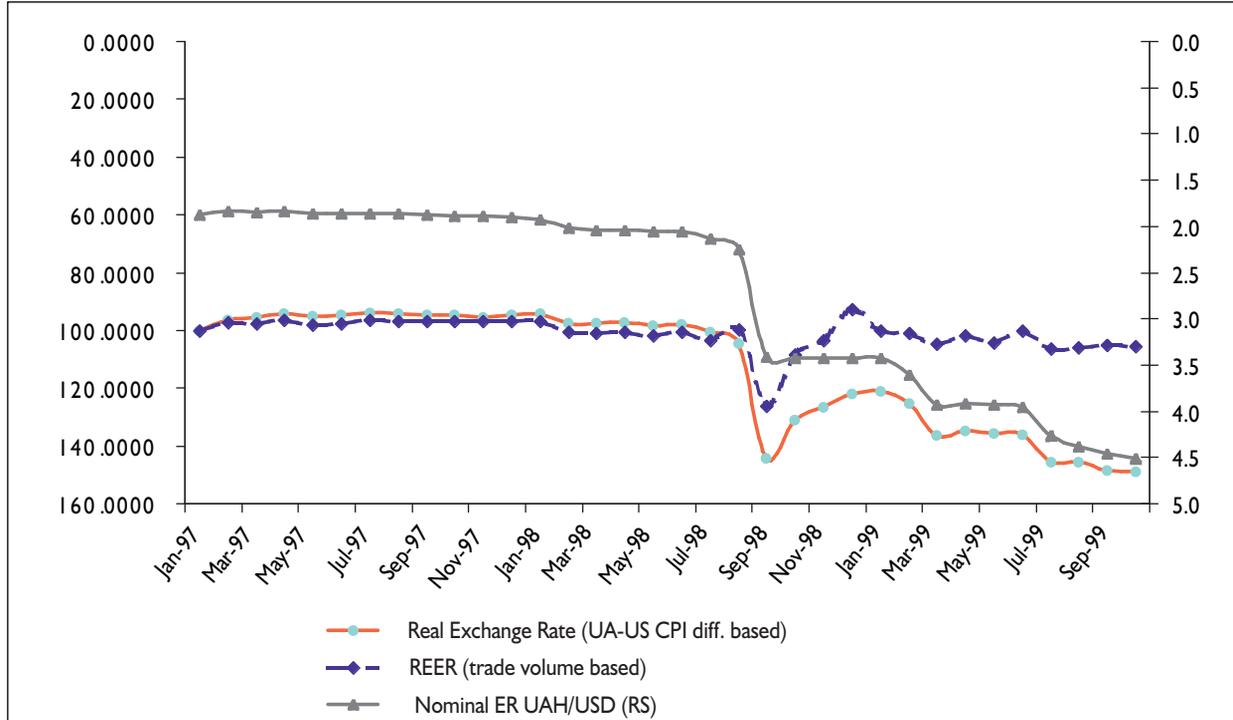
Source: Derzhkomstat, own calculations

growth of imports from Russia. Due to the high devaluation of Russian Ruble, at the end of 1998 hryvna was appreciated against a bulk of the currencies of its major partners, which again negatively influenced Ukrainian exporters. During the course of 1999 Ukrainian hryvna has slightly devalued. As it can be seen from figure 21, at the beginning of 1999 hryvna gained the position it taken two years before. After a summer peak, most probably, caused by the increase of oil prices, real effective exchange rate of Ukrainian currency has devalued favoring Ukrainian exporters and hurting importers. As a result of it, Ukrainian merchandise trade balance has been turned into positive.

4. World Trade Analysis and Forecast

Annual growth of imports (c.i.f.) being at the level of 7.5% on average during 1990–1995, has slowed in the following years. World merchandise imports grew by 5% annually in 1996 and at 3% in 1997. The slowdown of the growth turned into general decrease by 1% in 1998. The annual growth of exports (f.o.b.) dropped from the average of 7.5% during 1990–1995 to 4.5% in 1996 and 3.5% in 1997. Similarly to imports, world exports decreased by 2% in 1998.

The decrease of world demand reflected in the decline of international trade and deceleration of global output growth (from 2% in 1997 to 1% in 1998) contributed to the decrease of Ukrainian exports. As can bee seen from the figure 22, all the main Ukrainian trade partners, but USA and Germany were decreasing their imports during 1997–1998.

Coupled with a strong currency devaluation, the decline of purchasing power in Russia (in 1998 real GDP dropped by 6% comparing to 1997) caused a decrease in imports to Russia (17% annually for the twenty one months starting 1997), to whom Ukraine exports about a quarter of its goods. However, the appreciation of hryvna against the Russian Ruble in real terms becomes less significant with time.

After a long stagflation, Italian imports showed some recovery in 1998 and began to grow in the third quarter of 1999. Movements of Italian imports repeated the trends of German ones, which is not strange for the economies of EU. However, the recovery of imports in 1998 in Italy was weaker than in Germany (since imports of the USA was growing at the higher pace, stronger recovery of German imports might not be clearly seen from the figure 23). The decrease of domestic demand in Turkey (reflected in the low and negative GDP growth in 1998 and the first half of 1999) caused the decrease of Turkish merchandise imports, part of which was Ukrainian exports to this country. USA

Figure 22. World import, bn. US$
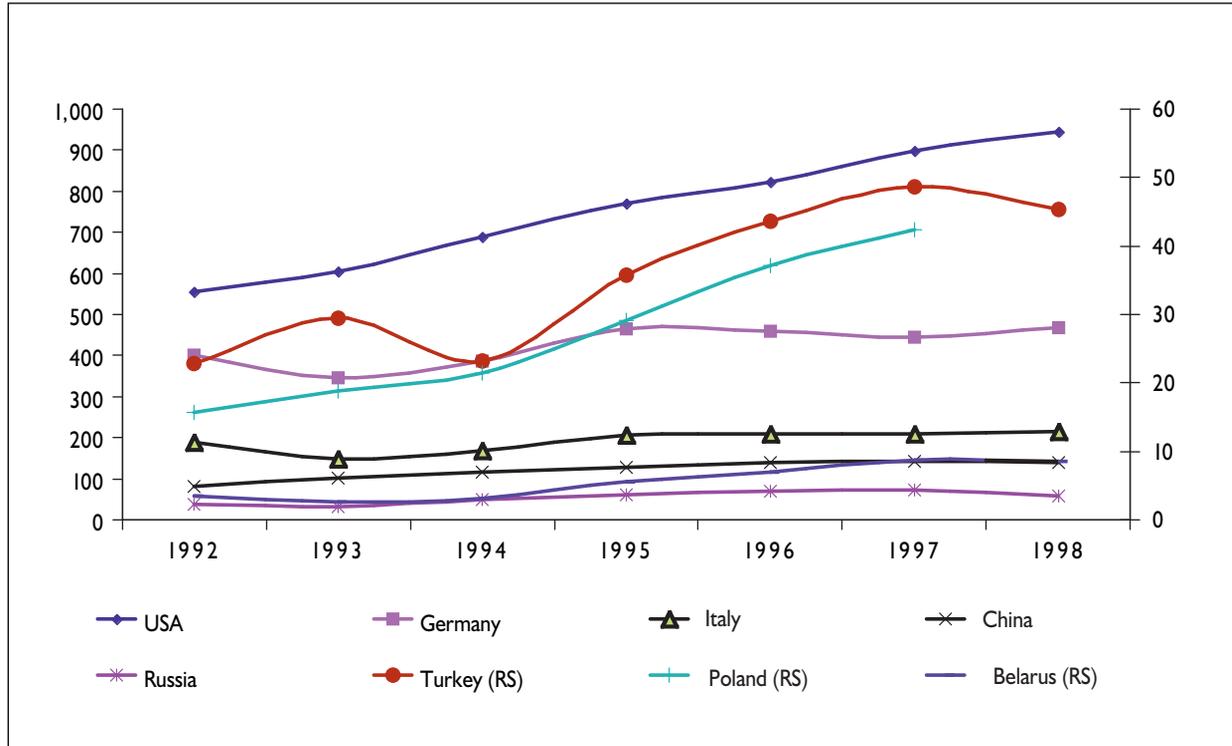
Source: JP Morgan, Consensus Economics, www.economagic.com, own calculations

Figure 23. World import trends, bn. US$
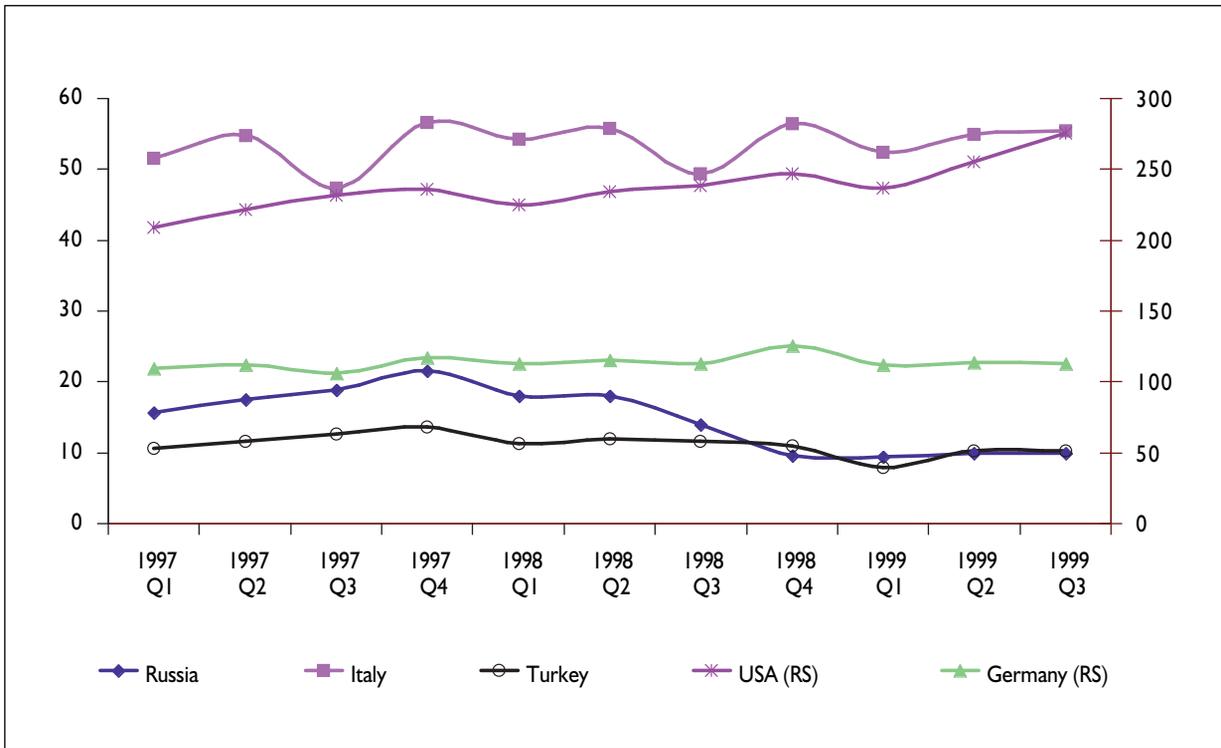
Source: Derzhkomstat, own calculations

Figure 24. RER components

Source: CASE

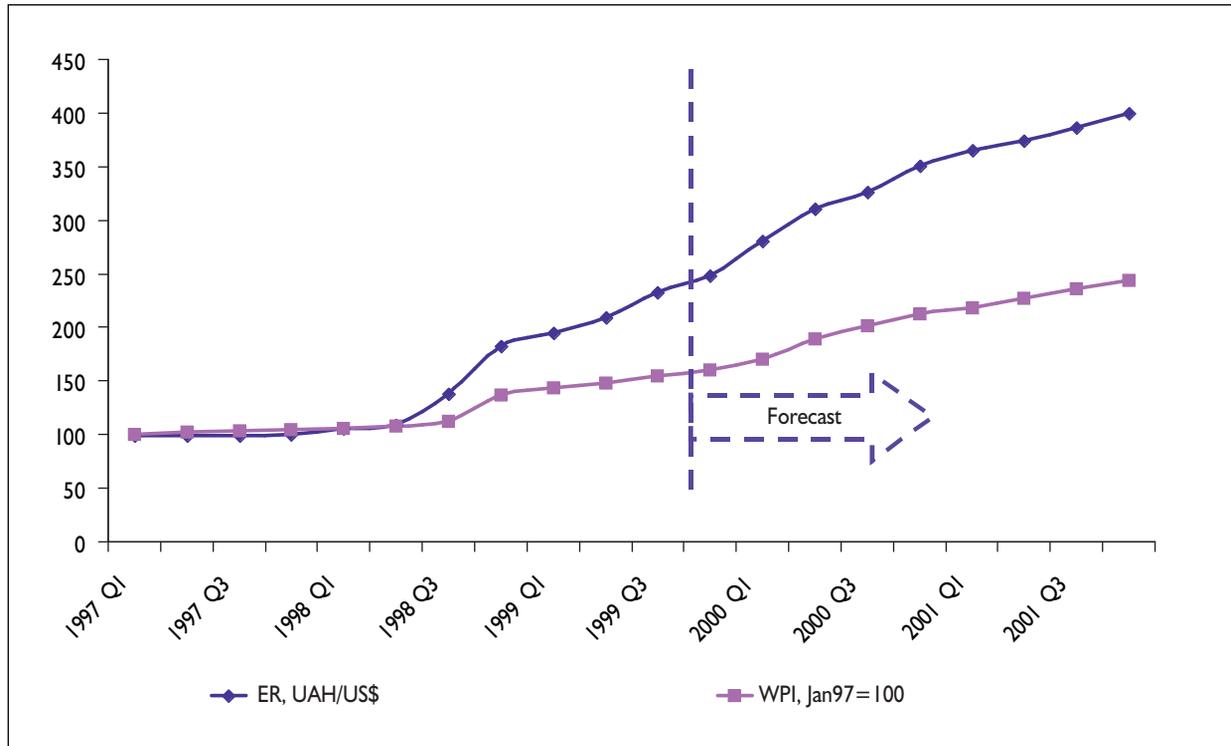was the only one of major Ukrainian trading partners that was increasing its imports during 1998–1999. Strong domestic demand in USA and devaluation of hryvna were the primary causes for the constant increase of Ukrainian exports to this country during the mentioned period.

In view of the CONSENSUS* forecast and the forecast produced by JP Morgan** analysts, we developed the forecast of the future trends in the international trade of main Ukrainian trading partners (see Table 4).

Table 4. Import of major partners (forecast)

Percent change over previous period, SA annual rate (unless stated)	2000				2001			
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Russia (not SA)	89	7	-37	-24	118	8	-37	-24
Italy	4	4	5	5	4	5	4	4
Germany	5	11	8	-3	11	10	8	-3
Turkey (not SA)	-41	58	8	7	-45	58	8	7
USA	4	6	5	5	4	4	5	5

Source: JP Morgan, Concensus Economics, own calculations

During the next two years we expect a recovery in the world economy. The revival of Asian countries, most of which are not major importers of the Ukrainian goods, will boost indirectly the domestic demand in Europe and North America. Russia, where the imports substitution effect of devaluation fades up and increased oil prices brought much revenue from exports is expected to consume more imported goods at the beginning of 2000, but decrease the consumption at its second half.

The forecast of the inflation of the producer prices*** in Ukraine and the assumptions of the exchange rate (UAH/US$) allow us to suggest the trends of the real exchange rate.

As can be seen from figure 'RER components', we expect the hryvna to devalue in real terms against US$. If such a devaluation takes place, it will favor Ukrainian exporters and hurt importers. However, real exchange rate is not a best predictor of trade flows. As was already mentioned, the movement of prices in the countries of trade partners should be considered too.

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* Eastern Europe Consensus Forecasts is published by Consensus Economics Inc.
** World Financial Markets is published by Morgan Guaranty Trust Company.
*** Made by CASE Macroeconomic modeling group.

5. Trends of Trade in Services

Services have always amounted to about 16% of Ukrainian foreign trade. It is noticeable that the balance of services has always been positive and, thus, crucial for the positive balance of the current account.

The average variability of exports for the last eighteen months was about 3% and indicates that exports are much more stable than imports, which variability was about 30%. The geographical structure of exports recipients is also more stable than one of the imports recipients. The exports to FSU countries concludes about 62% and the imports from FSU countries is about 27%. The last component is the most varying part of the trade of services. This variability is due mostly to the seasonal nature of FSU imports and, partly, to the instability at FSU markets, the majority of which still have the transitional status. The constant changes and shortcomings of the tax legislation (at least in the part that concerns services) in FSU countries, which create or abandon the loopholes used by traders, can also explain the changes in this flow.

As can be seen from the figure 25, the volume of exports during 1998 and first half of 1999 was approximately 2.7 times higher than volume of imports and concluded in average 933 mn. US$ per quarter.

5.1. Exports

Since 1996 Ukrainian exports of services were constantly decreasing. They dropped by 0.2% in 1997, by 19.4% in 1998 and by 5.6% in the first half of 1999 compared to the same period of the previous year.

The major part of exported services is "transportation" (84% in average for the last eighteen months). The next large components are "Different business, professional and technical services" (5.1%), "Repair" (3.4%) and "communication" (2.7%).

The transportation services, which Ukraine provides to the other countries, include pipeline (59–63% of the transportation), marine (15%), railway (10–12%), air and "other" transportation (each 6–9%). The volume of transportation services dropped by 4.7% for the first half part of 1999 comparing to the same period of 1998. The main 'contributors' to this decrease were railway transportation (decreased by 19%) and "other transportation" (decreased by 38%). However, the exports of pipeline industry increased for this period by 2.6% and mitigated the drop of transportation compared to the majority of other services exported by Ukraine. Despite the general downtrend,

Figure 25. Trade of Services, regional structure, bn. US$
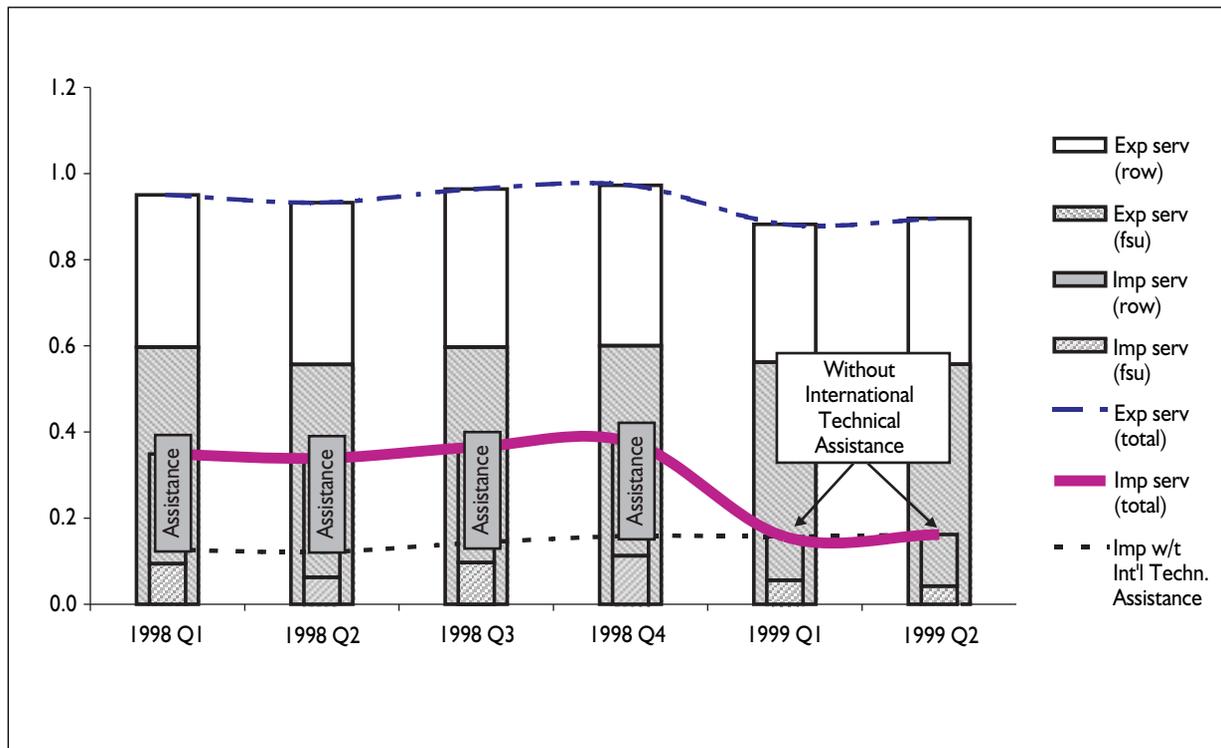

Source: Derzhkomstat, own calculations

Figure 26. Trade of services, bn. US$
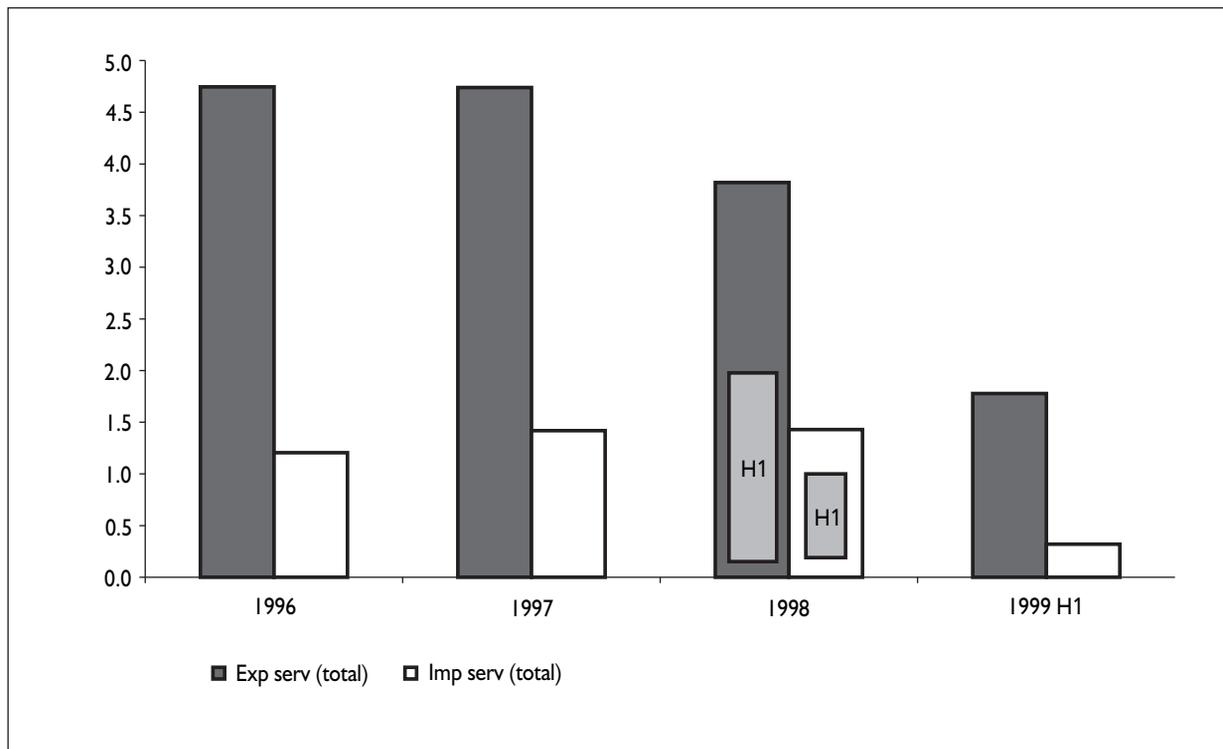
Source: Derzhkomstat, own calculations

some service industries increased their turnover. The most significant growth was of repair services (+33% for the first half of 1999 compared to the first half of 1998). The upturned of other services can be ignored due their low share in the total exports or seasonal effects.

The pipeline services, which Ukraine provides to the other countries, consist of gas transportation (86%), transportation of crude oil and oil products (11%), etc. Russia traditionally has been the main recipient of Ukrainian pipeline services (about 97% of all pipeline transportation). It might be interesting to uncover the other countries, which 'use' Ukrainian pipelines. They are Switzerland (0.85% of total pipeline transportation in average for the period), Great Britain (0.1%) and Hungary (0.92%) in Europe, Cyprus (0.67%) in Asia, Virgin Islands (0.43%) and USA (0.16%). It is noticeable, not only because these countries have very liberal taxation and banking regimes, with Hungary as an exemption, but also because they are the only recipients of Ukrainian pipeline services in their region. In any case, the first half of 1999 has revealed that Switzerland is losing the interest of Ukrainian exporters by a half and no services at all were exported to USA.

Figure 27. Structure of services, (A) Export, (B) Import, 5,5 times smaller than Export
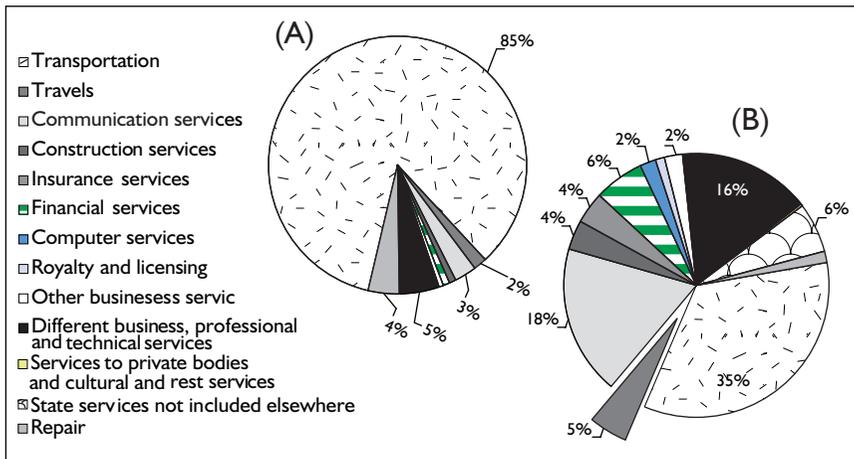
Source: Derzhkomstat

5.2. Imports

Ukrainian imports of services didn't have any stable tendency for the last three years. They increased in 1997 (by 18% compared to the last period) and remained at almost the same level in 1998 (increased only by 0.2%).

The services Ukraine imports from abroad include transportation (29% in average for the last 18 months), communication (13%), "different business, professional and technical services" (13.5%,), "state services not included into other categories" (21%), financial (6.5%) and constructional services (5.1%), etc.

For the first half of 1999, the value of services imported dropped by 27.4% compared to the same period of 1998. The general decline of imports were caused by downsizing of imported transportation (about 33%), financial services (62%) and "different business, professional and technical services" (25.7%). Among transportation services, Ukraine reduced the use of foreign railway transportation (by 38%), including carriage of passengers (by 62%), and marine transportation (by about 40%), mainly due to the reduction of imported freight transport (by 50%).

During the first six months of 1999 Ukraine has increased timports of air transportation (by 19% compared to the same period of 1998), mainly due to the increase of passenger transportation (41%) and freight transportation (by 130%). It is noticeable that increase of imported air transportation has been equal to the decrease of exported one.

The major providers of services, which Ukraine imports are Russia (22%), USA (21%), Great Britain (8%) and Germany (about 5.5%). For the last three years there is a tendency towards a decreasing share of services imported from Russia (by 3 percentage points) and increasing a share of services exported from the other countries with Turkey as an exception. The major increase of imported services was registered with Great Britain (by 5 percentage points) and Germany (by 2 percentage points).

5.3. Some Computational and Reporting Aspects

It should be noted that the Ukrainian statistical office provides only quarterly data on services traded and usually recalculates the figures several periods later. It is known that figures on exports are less exposed to corrections than imports. Data on exports are usually corrected in the next quarter and differ from the previously reported by about 3%. Data on imports can be regarded as final usually one year after the end of reported period. On the one hand, quick correction of the exports' figures can be related to the strictness of Ukrainian currency regime which limits period of exports' payments to 3 months. On the other hand, imports of services is usually a way to underreport tax obligations or to export capital. The other "computational problem" of services imported is the international technical assistance, data on which comes a year behind and is not very precise when they appear for the first time.

6. Modeling of Ukrainian Foreign Trade

6.1. Introduction

Foreign trade forms an essential part of economic activity in Ukraine. Its share is estimated at a level of 40–45% of the official GDP. Therefore, the issue of modeling of this part of economy has been of great necessity for those, who were trying to develop a model of the Ukrainian economy. Besides, one needs a tool that would help to quantify the impact of exchange rate and taxation policies as well as trade regulations on the behavior of foreign trade agents. Also, it was important to check the applicability of the developed theoretical framework and the postulates of mainstream economic thought to specific Ukrainian conditions. From the practical point of view, our work was aimed at building a model that would help to predict the influence of the price (real exchange rate) and income (GDP) changes both domestically and abroad on the Ukrainian Trade Account. The results were planned to use in the monthly and quarterly models of Ukrainian economy developed and operated by CASE and Ukrainian government.

6.2. Theoretical Framework

A model is constructed upon a theory of international trade.

It is generally known that the main factors influencing demand for a good are its price and the consumer's income. This postulate of consumer theory can be written as

$D = f (P, I)$

where: D – denotes demand for good or service (further – good)

P – denotes a price of good

I – denotes an income of a consumer.

A theory assumes that the demand for a good negatively depends on price and positively on income. For a sake of simplicity it ignores influences produced by changes of the consumer tastes and other factors we consider as relevant in a real life. This happens because this theory assumes an existence of only one good. While having pleasure to distinguish among different goods to consume, we believe that mentioned above theory is still valid to describe and forecast our aggregate demand for goods.

This theory is equally applicable to the demand of the foreign consumers for the goods produced in the country (which are country's exports) and the demand of the domestic

consumers for the goods produced abroad (which are coutry's imports). The only difference is that the prices are denominated in different currencies and change over time more or less independently. To overcome this obstacle one uses the concept of the real exchange rate. 'The real exhange rate between two countries' currencies is a broad summary measure of the prices of one coutry' s goods and services relative to the other's.' [Paul R.Krugman, 1994, p.421]. To determine the real exhange rate one needs to know the nominal exchange rate between the currencies (price of home currency in terms of the foreign currency or, for example UAH/RUR) and the prices of the consumers' buskets in each coutry. Unfortunately, it is difficuilt to find out the price and the change of it for each consumer, but one can approximate it by using the price indices like CPI, WPI, etc.

One calculates the price of foreign goods in terms of domestic (the real exchange rate) by using the formula:

$$ER^{real} = ER^{nominal} * P^{foreign} / P^{domestic}$$

were ER^{real} real exchange rate (domestic goods\foreign goods), $ER^{nominal}$ nominal exchange rate (domestic currency\foreign currency), $P^{foreign}$ – foreign price, $P^{domestic}$ – domestic price.

The influence of the change in the real exchange rate on the trade is fairly simple. The growth of the real exchange rate indicates the decline of the purchasing power for domestic goods in terms of foreign, other things beeing equal.

The other influencing variable is the level of disposable income. The increase in domestic income, ceteris paribus, would cause the increase in the demand for the foreing goods from the each country respectively. On the other hand, the change in income (when approached from the production side) reflects the change in the volumes of goods produced and, potentially, ready for consumption by the other country's consumers.

The difference between county's exports and imports is known as net exports (NX). It is a component of aggregate demand equation as shown bellow:

$$Y = C + I + G + EX – IM \text{ or simply } Y = C + I + G + NX$$

where Y – denotes aggregate demand (AD); C, I and G – denote consuption, investment and government spendings, respectively. Each of these components of AD depends on various factors. From now we will turn to the examination of view hold by economists about the factors which determine current account. Since net exports is a major component of current account (CA), we will be using the terms NE and CA interchangably [1].

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[1] Besides Net Export, Current account includes factor income and transfers, but we ignore this issue for now.

The role of the exchange rate in affecting *CA* is controversial [2]. The now dominant intertemporal paradigm stresses the importance of consumption smoothing and investment as an explanation for *CA* dynamics. In models with fully flexible nominal prices and monetary neutrality, devaluation is unlikely to have important effects. Barro (1997, p.631) concludes, "movements in real exchange rate provide little or no information about what the current account is doing". However, in traditional Keynesian analysis, the exchange rate is often seen as a key instrument to influence *CA*. According to this view, real devaluation switches expenditure from foreign to domestic goods, improving trade balance and hence *CA*. Krugman (1988, p.72) points out on two highly desirable features of devaluation as an expenditure-switching policy: it is administratively simple and provides decentralized incentives.

The underlying goal of exchange rate changes is to bring it to a level compatible with sustainable CA. Edwards (1994, p.89) argues that "the autonomous forces that move the real exchange rate back to equilibrium operate fairly slowly, keeping the country out of equilibrium for a long period of time. These results in fact indicate that if a country is indeed in disequilibrium, nominal devaluations can greatly help to speed up the real exchange rate realignment". However, as Williamson (1994, p.2) notices "sometimes a market can develop a very well-defined view that a rate being defended by the authorities is inconsistent with the fundamentals, … but that is very different from claiming that the market always had a well-defined view of what the equilibrium rate is".

Recent exchange rate and CA developments in transition economies generated a variety of explanations. Some authors [Kraynyak and Zettelmejer, 1998, p.309–312] view the recent real appreciation of exchange rates in transition economies as a correction of the "excess" depreciation (overshooting) that occurred in the early stages of the transition process. On the contrary, Roubini and Wachtel (1997, p.25) argue that while some equilibrium real appreciation might have taken place, some of the real exchange movements suggest significant loss of competitiveness that has exacerbated the *CA* imbalances.

6.3. Model

Specification

The model consists of two parts, which deal with Imports and Exports separately. This is done to increase transparency and help in understanding for readers and us, first of all.

It should be noted that trade of goods, but not services is modeled. We believe that trade

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[2] The following description is inspired greatly by Mr. Ruslan Piontkivsky.

of services depends upon different factors, which should be embraced by the different model.

Demands for different goods might not react to the same extent to changes in prices and incomes, despite the similiarity of the manner of the reaction. We suggest that forecast based on equation with the same coefficients /elasticities for all goods/ woud suffer from excessive aggregation and be less presise. Therefore, we attampted to estimate the elasticities for 99 groups of goods traded by Ukraine. On the other hand, the existent data does not allow to make statistically significant conclusions due to the low number of observations. Having seasonally unadjusted data on trade only for 24 observations we applied estimation methods that account for the pooled structure of data. These methods make use not only from information which can be measured from changes of variables over time, but also from one that can be measured comparing variables over sections (groups).

We have attempted to adopt the gravitation model of the trade as a basic model that has shown good results in the ex-post explanation as well as ex-ante predictions. The basic equation represented a relationship mentioned above, namely: $D = f(P, I)$ and takes a form of:

*Trade volume = income domestic ^{A} * income foreign ^{B} * real exchange rate ^{C}*

The modified model suitable for the econometric estimation of imports looks like following:

*log (Imports) = c + B1 * log (Domestic income) + B2 * log (Price index) + e_i*
where e_i denotes an error term;
as a proxy for Domestic income we used Ukrainian GDP expressed in real terms;
as a proxy for Price index we used Real Exchange Rate (RER) UAH/US$, computed as
*RER = Nominal exchange rate (UAH/US$) * Foreign price index / Domestic price index.*

For the price index we used primarily Wholesales price index (WPI) as it contains a high portion of traded goods prices and allows comparing more precisely the competitiveness of the partners. Where WPI was unavailable, we used Consumer price index (CPI).

For the estimation of exports, we used similar model, which in general form can be written as

*log (Exports) = c + B1 * (Price index) + B2 * log (Foreign income) + e_i*
where: e_i denotes an error term.

As a proxy for Price index we used Real Effective Exchange Rate (REER) – a composite index of real exchange rate of hryvna to the bunch of the currencies of major Ukrainian trading partners. Real effective exchange rate is an average of real exchange rates with volumes of trade as weights. The weights could be either bilateral or multilateral. The difference is that the latter can be used for the evaluation of country's competitiveness at the third markets, while the former is bound by their competitiveness at the domestic markets. We used the latter one. From the several methods of averaging we have chosen a geometric one to amplify the variations of the components. Eric Pentacost in his 'Exchange Rate Dynamics' also suggested the similar definition of REER.

As a proxy for foreign income we used foreign merchandise imports (or imports of goods and services, where the earlier was unavailable). The reason to such a substitution was unavailability of monthly GDP data for all trading partners, except Russia.

To escape from the possible problems of indirect causation: Price – Ukrainian exports and Price – Foreign imports – Ukrainian exports, which could spur the results of estimation we combined the influencing components. This combination has taken away the possibility of separate estimation of price and income elasticity. Nevertheless, we continue to call the new index REER, as it possesses the essential features of it. The combined index of price and income was constructed as following:

$$REER = RER_1^{W1} * RER_2^{W2} * \ldots * RER_n^{Wn}$$
where:

1, 2, …n in a subscript denote five major trade partners of Ukraine, which are Russia, Italy, Germany, Turkey, USA. Belorus and China, while being among the top trade partners were excluded due to the unavailability or unreliability of their statistics.

W denotes the values of total imports of a trade partner.

6.4. Data

The models use monthly data series on volumes of trade between Ukraine and other countries. All data are taken from Derzhkomstat (Statistical office of Ukrainian government) publications. Data for the period of 1997–1998 contain information that is regarded as final and not supposed to be refined in the future. Data for 1999 were taken from the monthly bulletin 'Express-information'. These numbers are subjected to possible changes in the future. The procedure of data collection is as follows. Derzhmytkom (Main Customs office) based on custom declarations (receipts) collects the data and forward them to Derzhkomstat. The latter, based on the incoming data, produces

monthly memorandum on Ukrainian foreign trade and publishes them in about fifty days after a period under report. Trade volumes are reported in thousands of US Dollars.

6.5. Output

Model of Imports

As was mentioned above, the original sample included 30 observations from 1997:01 to 1999:06 and used 95 cross sections, which totaled to 2737 panel observations. Some observations were excluded for statistical reasons.

The initial model that used total sample consisted of one equation and did not reflect different income and price elasticity for different goods. The outcome for this model is represented below.

LOG (IMP?) = C + **0.87** * LOG (Y) - **0.58** * LOG (RER_UAH_USD) + [AR (1)=**0.36**]
Where IMP? denotes the respective group of merchandise imports with ? as a counter;

Y denotes real GDP of Ukraine, and
        RER_UAH_USD denotes RER UAH/US$.

The coefficients for constant were varying as we assumed different natural level of trade (translated into different intercepts) for the estimation.

The estimation output has shown that all coefficients have expected signs. The accuracy of fit was at the high level (99.6%).

As it can be seen from the output, the coefficient before Income is greater than coefficient before Exchange rate. This reflects greater dependence of trade upon income changes than exchange rate changes.

Since it is impossible to estimate seasonal effects for series shorter than three years with conventional statistical software, we have used dummy variables to count for seasonal deviations.

Model of exports

An exports model was estimated at a sample from 1997:02 to 1998:12, which included 23 observations and used 96 cross-sections, totaling in 2070 panel (unbalanced) observations.

As in the imports' model, at the beginning we have estimated a model that did not differentiate between elasticities for different goods.

LOG (EXP_99) = C - 0.25*DUMMY_01+0.023*DUMMY_02 - 0.08*DUMMY_03 - 0.5*DUMMY_04 - 0.03*DUMMY_05 + 0.06*DUMMY_07 + 0.24*DUMMY_08 - 0.09*DUMMY_09 - 0.17*DUMMY_10 - 0.08*DUMMY_11 + 0.29*LOG(REER_50_GEOM) - 0.04*LOG (@TREND)

Where *c* denotes the coefficients for constant, it varies for each of ninety-nine groups, and thus, is not presented here;

DUMMY_01…11 denote dummy variables used to estimate seasonal effects;

REER_50_GEOM denotes REER (described above);

@TREND denotes a variable to estimate linear changes in the behavior.

The regression produced a positive sign before REER coefficient, which is conformable to economic theory that claims that exports (supply of Ukrainian goods abroad) is positively related to the foreign price and income.

A negative sign before trend coefficient indicate the decrease of exports during the period. The magnitude of the decrease is not high, however. Thus, there might be misleading in the forecast. We will try to remove trend variable from the model specification later if possible.

As in the imports model, we have conducted detailed estimations for each group of goods and sometimes for each group. As in the previous case, the choice between common and separate elasticity was made as a result tradeoff between number of observations (statistical significance) and level of aggregation.

The estimation outputs are presented in the appendix.

6.6. Forecast Performance

We have used a dynamic method of forecast, one that calculates multi-step forecasts starting from the first period in the forecast sample.

As it was expected the original models (based on one equation and denoted with 'F' at the end of title) performed worse than the detailed models (based on separate equations, denoted with 'FG' at the end of title). The graphs representing the forecasting performance of both models are presented in the appendix.

Imports models

On the historical period the forecast performance of the models has shown the following characteristics.

Root Mean Square error and Mean Absolute Error depend on the scale of the dependent variable. These is used as relative measures to compare forecasts for the same

series across different models; the smaller the error, the better the forecasting ability of that model according to that criterion. Mean Absolute Percentage Error and Theil Inequality Coefficient are scale-invariant. The Theil inequality coefficient always lies between zero and one, where zero indicates a perfect fit.

Table 5. Forecast evaluation

	First model F	Second model FG
Sample 998:01 1999:06		
Include observations: 18		
Root mean Squared Error	159,155.82	70,601.92
Mean Absolute Error	126,825.07	55,136.43
Mean Absolute Percentage Error	0.1135	0.0512
Theil Inequality Coefficient	0.0739	0.0320
Bias Proportion	0.1400	0.0187
Variance Proportion	0.0882	0.1129
Covariance Proportion	0.8224	0.9261

Source: Own calculations

The bias proportion tells us how far the mean of the forecast is from the mean of the actual series. The variance proportion tells us how far the variation of the forecast is from the variation of the actual series. The covariance proportion measures the remaining unsystematic forecasting errors [3].

Figure 28. Forecast performance at the historical period, by quarters Ukrainian import of goods, mn. US$
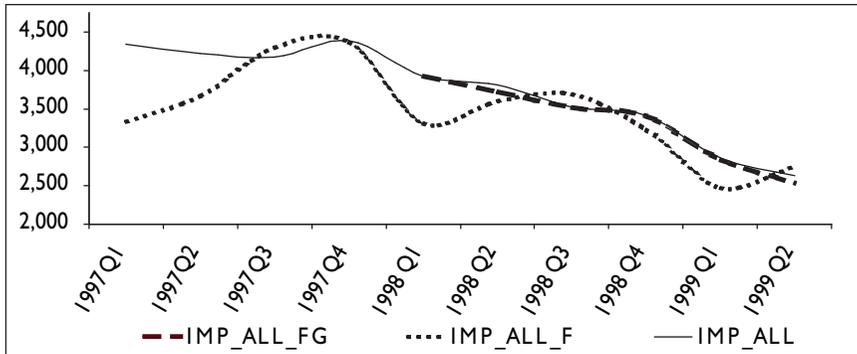
Source: Derzhkomstat, own calculations

[3] Note that the bias, variance, and covariance proportions add up to one. In this particular case the sum is slightly different from zero due to differences in computational techniques used by Excel.

In "good" forecast, the bias and variance proportions should be small so that most of the bias is concentrated on the covariance proportions.

It might be noted from the figure 29, that monthly forecast tabulated by quarters is more precise since it suffers less from seasonal and other deviations.

Exports models

On the historical period the performance of the model has shown the following characteristics.

As it was expected, the *FG* model has shown lower mean squared error and higher covariance proportion. The figure 29 shows that tabulate by quarters monthly forecast of *FG* model is closer to the actual exports than a forecast of *F* model.

Table 6. Forecast evaluation

	First model F	Second model FG
Sample 997:01 1998:12		
Include observations: 19		
Root mean Squared Error	89,025.91	66,733.46
Mean Absolute Error	338,866.48	316,593.14
Mean Absolute Percentage Error	0.3720	0.3503
Theil Inequality Coefficient	0.0499	0.0372
Bias Proportion	0.0005	0.0546
Variance Proportion	0.0232	0.0410
Covariance Proportion	0.8642	1.0912

Source: Own calculations

Figure 29. Forecast performance at the historical period, by quarters Ukrainian export of goods, mn. US$
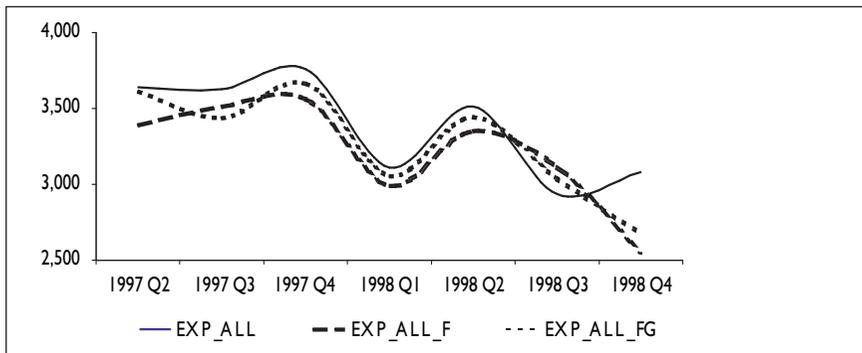
Source: Derzhkomstat, own calculations

6.7. Conclusions

In general, the research has confirmed a possibility to apply the developed theoretical framework to the analysis and modeling of Ukrainian foreign trade.

In principle, our work has confirmed our expectations. We developed a database that allows an analysis of Ukrainian foreign trade. The results of the regressions in most cases were similar to those expected. The developed model produces the forecasts, which can be taken as a basic for the 'expert appraisals'.

During the work we encounter a number of problems, some of which required more close investigation in the related, but different brunches of science. Some of them were related to the taxation and non-tariff forms of trade regulations existing in Ukraine and its trade partners. Others came from the absence of reliable data. The others were caused by lack of the specific knowledge. We made the efforts, considering resource limitations, to overcome these problems in our work. Not all of them, however, were successful.

It should be noted, however, that the obtained results give a measure of optimism and show a need for the further research.

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Appendix

Notations

RER_UAH_USD – Real exchange rate between Ukrainian Hryvnia and US Dollar.

RER_UAH_RUR – Real exchange rate between Ukrainian Hryvnia and Russian Ruble.

Y – real GDP (base year – 1998)

W_IMP_WU – World imports in thousands of US dollars (without Ukrainian imports).

IMP(identifier) – Ukrainian imports in thousands of US dollars

EXP(identifier) – Ukrainian exports in thousands of US dollars

The data are structured according to the official classification of foreign trade.

The series in the pool have the following identifiers:

Classification

ТН ЗЕД – Ukrainian System of Classification of Goods used for Foreign Economic Activity

_ALL, Total volume
_C01, I. Live animals and animal husbandry products
_01, - live animals
_02, - meat and substandard meat products
_03, - fish and fish products
_04, - milk and dairy products eggs
_05, - other animal products
_C02, II. Vegetable products
_06, - seedlings and other trees
_07, - vegetables and roots
_08, - edible fruits, nuts, citrus fruits
_09, - coffee, tea, spices
_10, - grain crops
_11, - flour
_12, - oil seeds and fruits
_13, - lacquers and resins
_14, - materials of vegetable origin
_15, III. Animal and vegetable fats and oils
_C04, IV. Food industry products
_16, - meat and fish products
_17, - sugar

_18, - cocoa and cocoa products
_19, - cereals
_20, - processed fruit and vegetable products
_21, - food mixes
_22, - alcoholic and soft drinks vinegar
_23, - wastes and by-products
_24, - tobacco
_C05, V. Mineral products
_25, - salt, sulfur, lime, cement
_26, - ores, slags, ashes
_27, - mineral fuels, petroleum, and petroleum products, total
_27s01,   - coal
_27s02,   - crude petroleum
_27s03,   - natural gas
_27s04,   - electricity
_C06, VI. Chemical and related industries' products
_28, - non-organic chemicals
_29, - organic chemicals
_30, - pharmaceutical products, including medicaments

_31, - fertilizers
_32, - tanning extracts, dyes
_33, - etheric oils and essences
_34, - soaps and detergents
_35, - protein substances
_36, - explosives
_37, - photo and cinema products
_38, - other chemicals
_C07, VII. Plastics and rubber
_39, - plastics and plastic articles
_40, - rubber and rubber articles
_C08, VIII. Leather, skins, furs (raw materials and articles)
_41, - skin raw materials
_42, - leather goods
_43, - fur raw materials
_C09, IX. Timber and woodwork
_44, - timber and woodwork
_45, - cork and cork articles
_46, - straw articles
_C10, X. Paper and pulp made of timber and other plant fibers
_47, - pulp
_48, - paper and cardboard
_49, - books and newspapers
_C11, XI. Textiles and textile articles
_50, - silk (natural silk fabrics)
_51, - wool
_52, - cotton and cotton fabrics
_53, - other plant fibers
_54, - chemical fiber threads
_55, - chemical fibers
_56, - cotton-wool
_57, - rugs
_58, - special fabrics
_59, - textile fabrics
_60, - knitted fabrics
_61, - knitwear and knitted accessories
_62, - textile clothing and accessories
_63, - other ready-made articles
_C12, XII. Footwear, headgear, umbrellas
_64, - footwear
_65, - headgear
_66, - umbrellas
_67, - processed feathers and down
_C13, XIII. Stone, gypsum, cement, glass, and asbestos articles

_68, - stone, gypsum articles
_69, - ceramic articles
_70, - glass and glass articles
_C15, XV. Nonprecious metals and articles made of them
_72, - ferrous metals
_73, - articles made of ferrous metals
_74, - copper and copper articles
_75, - nickel and nickel articles
_76, - aluminum and aluminum articles
_78, - lead and lead articles
_79, - zinc and zinc articles
_80, - tin and tin articles
_81, - other non-ferrous metals
_82, - tools utensils cutlery
_83, -other articles made of non-ferrous metals
_C16, XVI. Machinery. equipment and mechanical devices. appliances. tape recorders. videos. televisions
_84, - machinery and equipment
_85, - electric machines
_C17, XVII. Road vehicles. aerial and water craft
_86, - locomotives. rolling stocks. tramways. etc.
_87, - road vehicles. except railroad vehicles
_88, - aircraft space. apparatuses. and their craft
_89, - ships. Vessels. boats
_C18, XVIII. Optical. photo. cinema. measuring. medical. and surgical instruments; clocks and watches; musical instruments
_90, - instruments
_91, - clocks. Watches. and their parts
_92, - musical instruments
_93, XIX. Miscellaneous manufactured goods
_94, - furniture
_95, - toys. Games
_96, - other manufactured goods
_97, XX. Work of art
_98, Products brought in ports
_99, Others

The items with bold formatting present groups of items bellow them.

Estimation output

Imports models
The initial model of imports was estimated as a single equation.

Dependent Variable: LOG(IMP?)
Method: GLS (Cross Section Weights)
Date: 09/05/99   Time: 18:57
Sample: 1997:01 1999:06
Included observations: 30
Number of cross-sections used: 95
Total panel (unbalanced) observations: 2737
Convergence achieved after 8 iteration(s)
White Heteroskedasticity-Consistent Standard Errors & Covariance
Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(Y)	0.873114	0.028748	30.37105	0.0000
LOG(RER_UAH_USD)	-0.576298	0.022783	-25.29462	0.0000
AR(1)	0.359840	0.018851	19.08905	0.0000
Fixed Effects				
_01--C	4.142673			
…	…			
_99--C	6.874727			
Weighted Statistics				
R-squared	0.995662	Mean dependent var		13.58515
Adjusted R-squared	0.995502	S.D. dependent var		8.798618
S.E. of regression	0.590074	Sum squared resid		918.8656
F-statistic	302840.8	Durbin-Watson stat		1.988989
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.924360	Mean dependent var		7.568388
Adjusted R-squared	0.921579	S.D. dependent var		2.107165
S.E. of regression	0.590084	Sum squared resid		918.8980
Durbin-Watson stat	2.142952			

The second model used the estimated coefficients from nineteen pools and over 50 equations.
They are not presented here due to length limit.

Exports models

The initial model of exports was estimated as a single equation.

Dependent Variable: LOG(EXP?)
Method: GLS (Cross Section Weights)
Date: 12/31/99   Time: 15:35
Sample: 1997:02 1998:12
Included observations: 23
Number of cross-sections used: 96
Total panel (unbalanced) observations: 2070
Convergence achieved after 11 iteration(s)
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY_01	-0.248655	0.015665	-15.87328	0.0000
DUMMY_02	0.023323	0.012574	1.854841	0.0638
DUMMY_03	-0.076814	0.010956	-7.011374	0.0000
DUMMY_04	-0.049732	0.011161	-4.456042	0.0000
DUMMY_05	-0.034052	0.012204	-2.790178	0.0053
DUMMY_07	0.025037	0.011275	2.220502	0.0265
DUMMY_08	0.236931	0.014557	16.27574	0.0000
DUMMY_09	-0.091560	0.012057	-7.593663	0.0000
DUMMY_10	-0.172299	0.011338	-15.19690	0.0000
DUMMY_11	-0.075494	0.011783	-6.407076	0.0000
LOG(REER_50_GEOM)	0.291239	0.007270	40.06210	0.0000
LOG(@TREND)	-0.041220	0.004109	-10.03229	0.0000
Fixed Effects				
_01--C	3.280580			
…				
99--C	8.535555			
Weighted Statistics				
R-squared	0.997398	Mean dependent var		17.03397
Adjusted R-squared	0.997256	S.D. dependent var		14.64301
S.E. of regression	0.767083	Sum squared resid		1154.473
F-statistic	68361.55	Durbin-Watson stat		1.266775
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.923479	Mean dependent var		7.305590
Adjusted R-squared	0.919305	S.D. dependent var		2.700350
S.E. of regression	0.767083	Sum squared resid		1154.473
Durbin-Watson stat	1.291312			

The second model used the estimated coefficients from nineteen pools and over 50 equations.

They are not presented here due to length limit.

Forecast
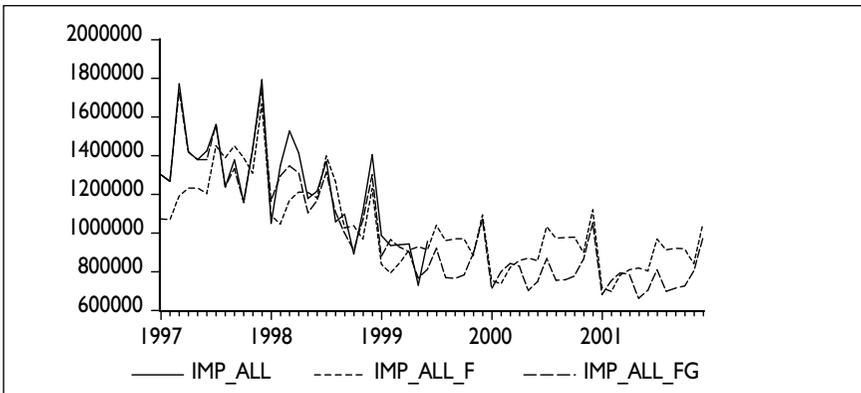
Imports' models

The forecasts produced by imports' models are presented at the graphs bellow.

IMP_ALL – denotes actual values for imports

IMP_ALL_F – denotes a forecast produced by the original model (based on one equation).

IMP_ALL_FG – denotes a forecast produced by the second model (based on separated equations).

Since category of mineral products made about 46% of total Ukrainian imports ranging between 36% to 56% for the period of 1997:01 to 1999:06, bellow we present the separate forecast performance of models for imports of mineral (IMP_MP).
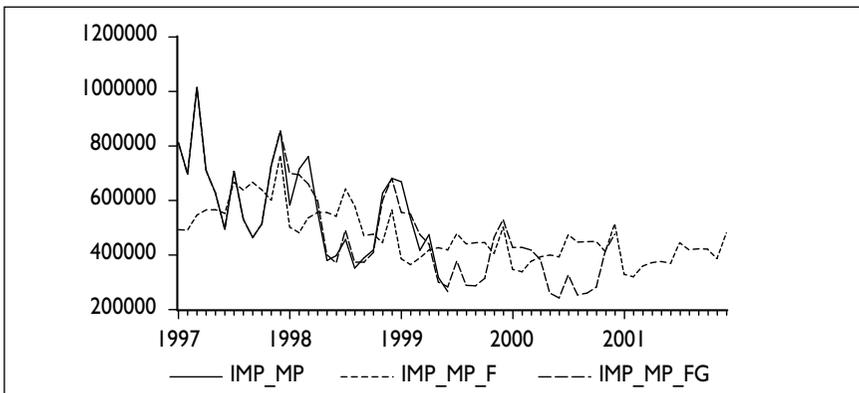

Table below presents a formalized forecast of Ukrainian merchandise imports and its major component – 'Mineral fuels (C15).

Percent change over previous period, SA annual rate	2000	2001	1994 Q4	2000 Q1	Q2	Q3	Q4	2001 Q1	Q2	Q3	Q4
IMP_ALL_F	-2.4	-5.9	-3.0	-62.1	55.9	77.5	2.0	-71.2	50.8	76.0	0.5
IMP_ALL_FG	-7.2	-6.2	56.9	-46.3	-12.0	19.4	63.9	-53.2	-13.3	13.9	60.9
IMP_C15_F	-2.4	-5.9	-3.0	-62.1	55.9	77.5	2.0	-71.2	50.8	76.0	0.5
IMP_C15_FG	-14.3	--	255.0	-10.4	-76.6	-19.1	283.3	--	--	--	--

Exports' models

EXP_ALL – denotes actual values for imports

EXP_ALL_F – denotes a forecast produced by the original model (based on one equation).

EXP_ALL_FG – denotes a forecast produced by the second model (based on separated equations).

Percent change over previous period, SA annual rate	2000	2001	1999 Q4	2000 Q1	Q2	Q3	Q4	2001 Q1	Q2	Q3	Q4
EXP_ALL_F	-2.7	-2.0	-38.0	-22.2	24.7	38.1	-48.8	-10.2	45.7	43.1	-45.2
EXP_ALL_FG	-2.5	-1.8	-8.0	-22.9	13.5	3.7	-22.4	-12.1	31.2	8.4	-18.1
EXP_C15_F	-2.9	-2.4	-37.1	-22.6	24.3	35.8	-48.8	-10.6	46.4	40.6	-45.0
EXP_C15_FG	-2.1	-1.9	-46.4	-8.3	76.5	-2.2	-55.3	3.9	104.8	0.9	-52.4

The figures below present the ex-post (1997:1998) as well as ex-ante (1999:01 2001:12) forecast of all merchandise exports and exports of nonprecious metals (C15) that is a major component of the former.