

***Macroeconomics***

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**THE ORIENTATION  
OF UKRAINE'S TRADE****Abstract**

This article analyzes the geographical structure of Ukraine's trade. A modified version of the Gravity Equation is used to measure the impact of the selected groups of countries. Ukraine's trade appears to be very strongly connected with former Soviet Republics, while the OECD members seem to be underrepresented. Over the last years, the orientation towards former Soviet Republics has got stronger. However, the orientation at the OECD members has improved since 2003 as well. Institutional convergence towards the West, e.g. Ukraine's accession to the WTO, could double the potential trade with the OECD countries. The potential trade with the former Soviet republics, in contrast, could decrease down to one tenth of the present value.

**Key words:**

Gravity equation, international trade, transformation economy, Ukraine.

**JEL:** F14, F15.

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## 1. Introduction

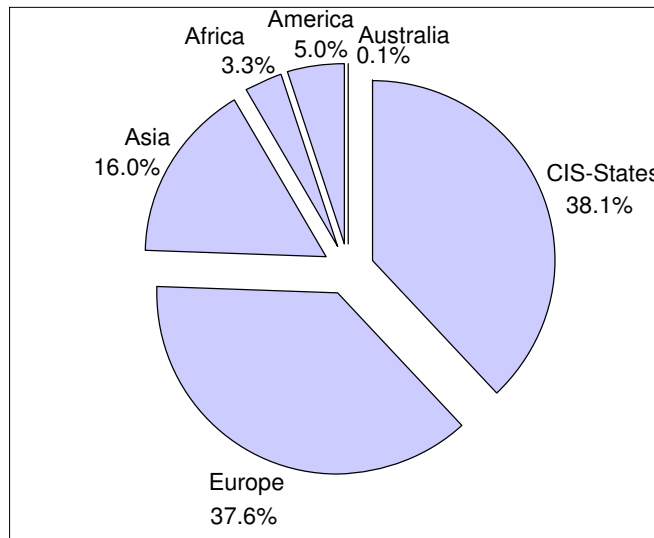
This article analyzes the structure of Ukraine's international trade relations. There are three questions to be answered within the scope of this work:

1. Are Ukraine's trade relations more orientated towards the West or the East?
2. Have there been any particular developments since Orange Revolution?
3. Which consequences will arise from Ukraine's institutional convergence to western countries, for example from the WTO-convergence?

Figure 1 shows how the volume of Ukrainian trade (exports plus imports) was distributed over each country group trading with Ukraine. The member states of the Commonwealth of Independent States (CIS) had the largest share with 38.1 percent, marginally behind the states of the continental Europe with 37.6 percent. The American continent played a very weak role with 5.0 percent, just a little bit more than Africa with 3.3 percent.

Figure 1

### Distribution of Ukraine's trade volume (exports plus imports) by country group (2003)

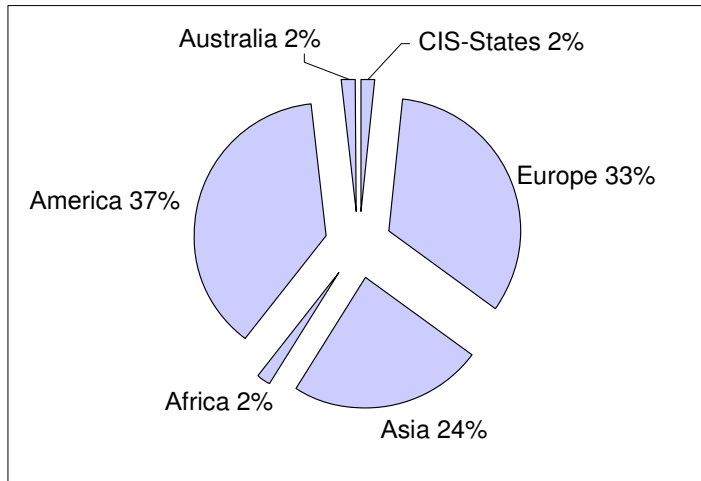


Source: State Statistics Committee of Ukraine (2007).

These trade shares can be compared with the economic strength of separate country groups. Figure 2 shows the shares of the country groups in the world GDP. The relatively weak in terms of economic development CIS states seem to play a very intensive role in Ukraine's trade, whereas the economically strong American continent has a relatively unspectacular trade share.

Figure 2

**The distribution of the world GDP by country group (2003)**



Source: World Development Indicators (2005).

This makes an impression that Ukraine's trade is very strongly connected with the East. A possible explanation for this phenomenon is the history of Ukraine as a part of the Soviet Union, which implies institutional and socio-cultural features, as well as geographical localization.

### The Gravity Equation

One approach to finding an answer to this question is the gravity equation, first mentioned by Tinbergen (1962). In its basic form, it claims that the trade volume of two countries depends on their economic power (measured by their GDP) and the transport costs between them (measured by the geographic dis-

tance between the economic centers of the two countries). A preliminary introduction to this methodology is given, for example, by Krugman and Obstfeld (2006, Chapter 2). The gravity equation is consistent with the fundamental theorems of international trade theory (Anderson, 1979, Bergstrand, 1985 and Dear-dorff, 1995) and is often used to estimate the effects on a country's trade volume produced by its belonging to specific country groups like currency unions, trade unions, etc.

In this analysis, a modified version of the gravity equation is used:

$$\ln T_i = b_0 + b_1 \ln PCI_i + b_2 \ln POP_i + b_3 \ln DIS_i + \sum_1^K b_{k+3} DUMMY_k + u_i.$$

Thus, the (log) trade volume of Ukraine with country  $i$  is described by this country's (log) per-capita income PCI, its (log) population POP and its economic center's (log) distance DIS from Kyiv. Per-capita income and population are expected to have a positive effect on trade, whilst the distance should have a negative effect. Thus, the estimates of the parameters  $b_1$  and  $b_2$  should have a positive sign,  $b_3$  on the contrary a negative one. These parameters can be interpreted as elasticities. This means, for example, for the parameter  $b_1$  that a one percent increase in per-capita income raises the trade volume by  $b_1\%$ , ceteris paribus.

To measure the effects on country groups, dummy variables were added. They are set to equal 1 if country  $i$  belongs to a certain country group, otherwise their value is 0. Altogether three models were run:

- Model 0 with two dummies: Former Soviet Union and OECD. This is the Basic Model.
- Model 1 with two dummies: Former Soviet Union except Russia and OECD. Here, it will be analyzed how the results of the Basic Model 0 change if the Russian Federation, as the by far the largest country in the group of the former Soviet Republics, is excluded.
- Model 2 with eight dummies: Former Soviet Union (with Russian Federation), OECD, members of the Council of Mutual Economic Assistance (COMECON), the first 15 members of the European Union (EU15), the members of the North American Free Trade Agreement (NAFTA), the members of the Association of Southeast Asian Nations (ASEAN), and the states of Sub-Sahara Africa and South America.

The dummy-parameters  $b_{k+3}$  cannot be interpreted as elasticities. They must be exponentiated to become interpretable. The value of  $\exp(b_{k+3})$  shows by which factor the trade volume of a country with Ukraine increases or falls when this country switches from state 0 (country does not belong to a certain country group) to state 1 (country belongs to a certain country group), ceteris paribus.

The data on the trade volume were taken from the Ukrainian State Statistics Committee's official data for exports and imports of goods from all countries

of the set for the years 2003 to 2006. The data on per-capita income and population were applied from the World Bank's «World Development Indicators 2005» for the year 2003. The distances between Kyiv and the economic centers of Ukraine's trade partners were calculated by the author. Because the data on the right-hand-side-variables are constant over time, the panel data analysis did not appear to be a suitable method. Therefore, in each of the three models, four cross-section estimations were done for the years 2003 to 2006.

## Results

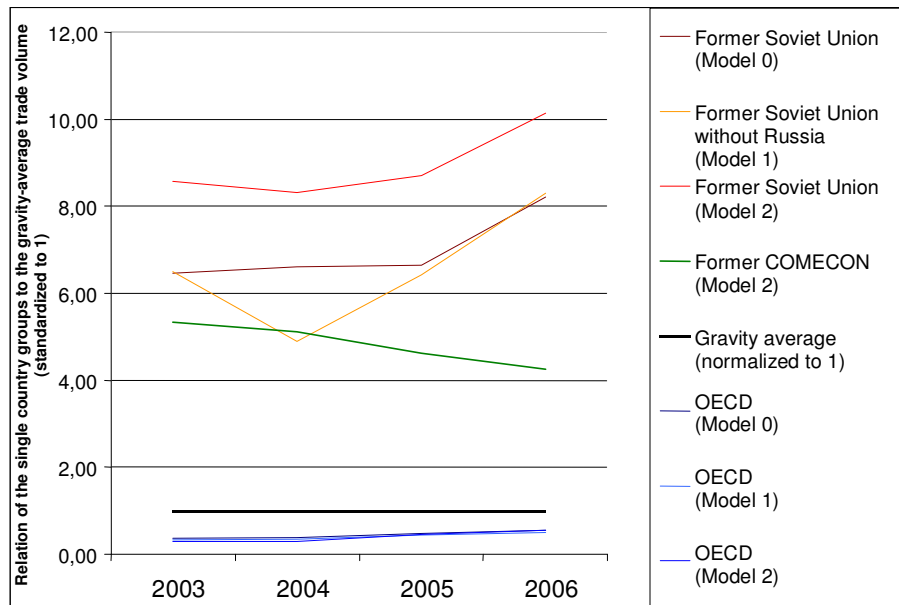
In the Basic Model 0 all effects are significant and have the expected signs. The effect of per-capita income lies between 0.82 and 0.91 and is a bit smaller than the effect of population, which lies between 0.91 and 1.01. The distance effect has the expected negative sign and lies between  $-1.12$  and  $-1.20$ . The dummy variable for the former Soviet Republics is highly significant and has risen from 1.87 to 2.10 over the years 2003 to 2006. The dummy for the OECD countries has risen from  $-1.02$  to  $-0.59$ . Its significance level, however, has decreased over this period of time. In 2003 it is highly significant (significance level 1%), while it is no longer statistically significant for the year 2006 (significance level 10%).

This means that the trade volume of the former Soviet Republics trading with Ukraine is 6.5 to 8.2 times higher than that of an average country:  $\exp(1.87)$  to  $\exp(2.10)$ . Suppose, for example, two countries have the same economic size (per-capita income and population) and the same geographical distance from Kyiv: then the fact that one country was a Soviet Republic rises its trade volume with Ukraine by the factor 6.5 to 8.2 compared to the other (average) country. In contrast, the OECD states tend to trade with Ukraine below its average. It climbs from 36 percent of the average trade volume to (insignificant) 56 percent over the period of 2003 to 2006. This interpretation is shown in Figure 3 «The trade of several country groups compared with the average trade potential (normalized to one)» together with the interpretations of Model 1 and Model 2.

In Model 1 the Russian Federation was excluded from the group of former Soviet Republics compared to the Basic Model. The overall results of Model 1 differ only marginally from those of Basic Model 0. The elasticities of per-capita income, population and distance are all highly significant and little higher than those of the Basic Model. The trade with former Soviet Republics except Russia rises similar to the Basic Model from 6.5 to 8.3-fold trade volume compared to the gravity average. The trade with OECD countries appears even weaker than in the Basic Model. It goes from 33 percent up to 50 percent of the average gravity trade volume.

Figure 3

The trade of several country groups compared with the average trade potential (normalized to one)



Source: own calculations.

In Model 2, the Basic Model 0 was augmented by additional dummy variables for several groups of countries. The elasticities of per-capita income, population and distance are highly significant again and their values are about 1. The effect of former Soviet Republics (here including the Russian Federation again) is, as in the Basic Model, also highly significant in this control model. Remarkably, this effect is clearly higher than in the other regressions. It lies circa 25 to 30 percent above the results of the Basic Model and thus has climbed from the 8.6-fold trade above average in 2003 to a 10.1-fold trade in 2006. The effect of OECD member states is throughout significant in this model and lies below the results of the Basic Model. It rises from 29 percent of average trade volume to 55 percent. Among the additional dummy variables, another group of countries appears as significantly different from the average: the group of the former COMECON member states. The trade with the former COMECON members was 5.3 times higher than the gravity average in 2003 and declined to 4.3 in 2006. For the other country groups like EU15 or NAFTA there was no significant deviation from the average.

## Conclusions

The results of the presented estimation make it possible to find an answer to the three questions outlined in the introduction of this article. Firstly, Ukrainian trade is still oriented towards the East. The former Soviet Republics and the former COMECON members play a role highly above the average in the Ukraine's trade structure. One could say that the former East Bloc has survived in Ukraine's international trade relations. Secondly, it has been shown that since the Orange Revolution, the trade with the OECD countries has caught up, whereas the role of the former COMECON has decreased in the same time. However, the weight of the former Soviet Republics has also increased over this time. Thirdly, the possible consequences of Ukraine's institutional convergence towards western countries can be figured out. They result from the interpretation of trade compared with the average trade potential (see Babetskaia-Kukharchuk and Maurel, 2004). The economic orientation of Ukraine towards western countries could double the trade with the OECD members. The trade with the former Soviet Republics, on the contrary, could shrink to one tenth of the present level.

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## Appendix

Table 1.

### Description of the data

Variable	Observations	Mean	Standard derivation	Minimum	Maximum	Unit	Source
Exports 2003	162	$1.41 \times 10^8$	$3.99 \times 10^8$	300	$4.31 \times 10^9$	US-Dollar	State Statistics Committee of Ukraine (2007)
Imports 2003	161	$1.28 \times 10^8$	$7.02 \times 10^8$	40	$8.65 \times 10^9$	US-Dollar	
Exports 2004	167	$1.94 \times 10^8$	$5.43 \times 10^8$	1320	$5.89 \times 10^9$	US-Dollar	
Imports 2004	156	$1.68 \times 10^8$	$9.66 \times 10^8$	30	$1.18 \times 10^{10}$	US-Dollar	
Exports 2005	163	$2.08 \times 10^8$	$6.53 \times 10^8$	1210	$7.50 \times 10^9$	US-Dollar	
Imports 2005	168	$1.94 \times 10^8$	$1.03 \times 10^9$	20	$1.28 \times 10^{10}$	US-Dollar	
Exports 2006	165	$2.14 \times 10^8$	$7.32 \times 10^8$	100	$8.65 \times 10^9$	US-Dollar	
Imports 2006	166	$2.31 \times 10^8$	$1.13 \times 10^9$	100	$1.38 \times 10^{10}$	US-Dollar	
Per capita income	154	7.400.169	11.670.86	83	59.143	US-Dollar	WDI (2005)
Population	175	$3.53 \times 10^7$	$1.30 \times 10^8$	28.000	$1.29 \times 10^9$	Individuals	Own calculations
Distance	175	5.679.32	3.812.757	382	17.068	Kilometers	



Table 2.

**Basic model 0**

Trade Volume	2003	2004	2005	2006
Per capita income	0.892 ***	0.907 ***	0.820 ***	0.819 ***
Population	0.955 ***	0.898 ***	0.907 ***	1.006 ***
Distance	-1.199 ***	-1.148 ***	-1.120 ***	-1.161 ***
Former Soviet Union	1.866 ***	1.887 ***	1.894 ***	2.106 ***
OECD	-1.015 ***	-0.969 ***	-0.728 **	-0.587
Constant ( $b_0$ )	4.930 ***	5.548 **	5.981 ***	4.785 **
Observations	133	134	142	140
$R^2$	0.735	0.644	0.731	0.740
$P$ -Value	0.000	0.000	0.000	0.000

\*) significance level 10%,

\*\*) significance level 5%,

\*\*\*) significance level 1%.

Table 3.

**Model 1 (Former Soviet Union excluding Russia)**

Trade Volume	2003	2004	2005	2006
Per capita income	0.908 ***	0.922 ***	0.834 ***	0.835 ***
Population	0.974 ***	0.915 ***	0.924 ***	1.027 ***
Distance	-1.234 ***	-1.189 ***	-1.162 ***	-1.199 ***
Former Soviet Union except Russia	1.872 ***	1.855 ***	1.860 ***	2.116 ***
OECD	-1.108 ***	-1.068 ***	-0.822 **	-0.685 *
Constant ( $b_0$ )	4.822 ***	5.540 **	5.975 ***	4.668 **
Observations	133	134	142	140
$R^2$	0.734	0.642	0.728	0.740
$P$ -Value	0.000	0.000	0.000	0.000

\*) significance level 10%,

\*\*) significance level 5%,

\*\*\*) significance level 1%.

Table 4.

**Model 2 (Base Model expanded by 6 additional country dummies)**

Trade Volume	2003	2004	2005	2006
Per capita income	0.929	0.943	0.857	0.843
Population	0.982	0.923	0.907	1.020
Distance	-0.882 ***	-0.814 ***	-0.947 ***	-0.940 ***
Former Soviet Union	2.148 ***	2.119 ***	2.163 ***	2.316 ***
OECD	-1.247 ***	-1.216 **	-0.768 ***	-0.591 ***
COMECON	1.676 ***	1.633 ***	1.531 ***	1.448 ***
EU15	0.087	-0.068	-0.135	-0.285
NAFTA	-0.596 *	-0.158	-0.345	-0.562
ASEAN	-0.243	-0.124	0.625	-0.296
SUBSAHARA	-0.414	-0.537	-0.090	-0.285
SOUTHAMERIKA	-1.050	-1.373 *	-0.270	-0.496
Constant ( $b_0$ )	1.669	2.226	4.205 *	2.571
Observations	133	134	142	140
$R^2$	0.764	0.675	0.751	0.758
P-Value	0.000	0.000	0.000	0.000

\*) significance level 10%,  
 \*\*) significance level 5%,  
 \*\*\*) significance level 1%.

Table 5.

**The ratio of separate country groups' trade volume to the gravity-average trade volume (standardized to 1)**

Model	2003	2004	2005	2006
Former Soviet Union (Model 0)	6.46	6.60	6.65	8.22
Former Soviet Union excluding Russia (Model 1)	6.50	4.89	6.42	8.30
Former Soviet Union (Model 2)	8.57	8.32	8.70	10.14
Former COMECON (Model 2)	5.34	5.12	4.62	4.25
OECD (Model 0)	0.36	0.38	0.48	0.56
OECD (Model 1)	0.33	0.34	0.44	0.50
OECD (Model 2)	0.29	0.30	0.46	0.55

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