EXAMINATION OF THE BORDER EFFECT IN UKRAINE: HOW FAR IS THE EAST FROM THE WEST?

by

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Abstract

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The study of price dispersion over 25 main administrative units of Ukraine (24 oblasts and Autonomous Republic of Crimea) over the period of 1997-2004 provides evidence on the border effect in Ukraine, however, somewhat contradictory. Border effect appears to be significant if to rely on one measures of price volatility but not significant according to the other, so the results are not robust. Its distance equivalent is about 560 kilometers, which is negligibly low figure in comparison with findings of the researchers for other countries. Ukrainian markets appear to be more segmented by product and oblast than by a hypothetical East-West border. In line with common trade theory, distance, which approximates well transportation costs, is also proven to have a positive impact on the price dispersion. Besides, differences in linguistic preferences and gross added value per capita appear to matter in Ukraine.

TABLE OF CONTENTS

LIST OF FIGURES

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GLOSSARY

Border Effect – regularity that an administrative border has an increasing effect on price dispersion and a reducing effect on trade flows between locations

Law of One Price (LOP) – all identical goods must have one price across locations in the absence of trade barriers and high transportation costs

Absolute/Relative Purchasing Power Parity (PPP) – in the context of intra-national studies means that absolute/relative price levels must be the same in each time period in all the regions within the country to prevent arbitrage

Absolute/Relative Price Dispersion – deviations of prices from the values implied by absolute/relative PPP

C h a p t e r 1

INTRODUCTION

"Oh, East is East, and West is West, and never the two shall meet…"
The Ballad of East and West by R. Kipling
"East and West together"
Slogan of the Orange Revolution

Numerous empirical studies have shown that theoretical concepts of the law of one price (LOP) and purchasing power parity (PPP) often do not hold in reality (Isard, 1977; Rogoff, 1996). Traditionally this is considered to be mainly due to trade barriers such as tariffs and transportation costs, different consumption preferences, presence of non-traded goods and nominal price stickiness (Engel and Rogers, 2001).

The border effect framework has been developed as a possible explanation of the deviations from the LOP and PPP, where the border effect is a name for a regularity that an administrative border between any two geographical regions is associated with reduced trade and increased price dispersion across these regions (Gorodnichenko and Tesar, 2005). It may incorporate a big range of different factors that prevent complete market integration between countries and regions within a single country.

McCallum (1995), and Engel and Rogers (1996) were the first to provide an explicit investigation of this phenomenon. They both studied the effect of the Canada-U.S. border, but McCallum used a gravity-type model with trade flows for this purpose, whereas Engel and Rogers applied a methodology based on the

relative price volatility and price data. Later studies, as far as I am aware of, adopted either of these two methodologies, sometimes introducing slight modifications.

The concept of border effect has not been thoroughly investigated in Ukrainian context yet, although there has been some research work done on the related topics of regional price convergence and market integration (Vashchuk, 2003; Galushko, 2003; Sagidova, 2004). The obtained results show that there are substantial price variations, and markets are not fully integrated in Ukraine.

After the last Presidential elections 2004 an important political economy issue has been raised which concerns a clear division of Ukraine into the East and the West according to voting patterns. The 'West' here stands for Cherkaska, Chernigivska, Chernivetska, Ivano-Frankivska, Khmelnytska, Kirovogradska, Kyivska, Lvivska, Poltavska, Rivnenska, Sumska, Ternopilska, Vinnytska, Volynska, Zakarpatska and Zhytomyrska oblasts where people voted mostly for Yushchenko, and the 'East' unites Crimea, Dnipropetrovska, Donetska, Zaporizka, Kharkivska, Khersonska, Luganska, Mykolayivska and Odeska oblasts where people supported the other candidate Yanukovych. Recent Parliamentary elections 2006 fully confirm such division (see Appendix A1).

The East-West division is not unexpected, since Ukraine itself is locked between the Eastern and Western worlds, which compete for economic and political influence over our country. In this vain, the West of Ukraine traditionally supports pro-Western ideas and political forces, whereas in the East of Ukraine pro-Russian views dominate. Besides, the East-West dissimilarities of Ukraine are deeply rooted in its history. For a long time our country had been known as the Right-bank Ukraine dominated by Poland and Austro-Hungary, and the Left-bank Ukraine controlled by Russia. The border went exactly along the Dnipro

River[1]. Also, there are significant language differences: Northern, Western and Central Ukraine mostly speak Ukrainian, while Russian predominates in the East and the South. Moreover, the differentiation is often made according to the production structure criteria. Hence, the East of Ukraine is referred to as 'industrial', while the West is considered to be 'agrarian'.

In any case, after the Orange revolution the phenomenon of the East and the West of Ukraine has being heavily exploited and speculated about by many politicians, social leaders and journalists both within the country and abroad. However, the issue has not raised much interest among the researchers.

The goal of my thesis is to test economic significance of the informal border between the Eastern and the Western Ukraine using the border effect framework. After estimating the size of the border effect I compute its distance equivalent in kilometers in order to answer the main question I raise in my paper: how far is the East from the West.

The research work I have conducted is novel in several respects. First, all the earlier studies on the border effect tried to measure the influence of national or regional administrative borders that formally exist, whereas I apply this framework to estimate the role of the hypothetical border. Second, nobody has ever tried to find an answer to a political economy question with the help of the border effect concept. Besides, I suggest several modifications of the basic model, introduce some political and social variables into it[2], and control for the 'river' effect, which has never been done yet. I also find 'true' economic East-West

[1] However, it is not the only possible historical classification. Later in my paper I consider another one suggested by Birch (2000), that distinguishes five Ukrainian regions (see Appendix A2)

[2] Namely, results of voting during Presidential elections of 2004 and percentage of people whose native language is Russian

border from the data. For the purpose of research I make use of a very detailed price data set, which consists of monthly average prices for 85 different goods and services across 25 regions of Ukraine during the period 1997-2004[3]. And finally, I am not aware of any attempts to check for evidence on the border effect in Ukraine, so I am probably the first to apply this framework in the setup of our country.

My investigation was inspired by the last Presidential elections 2004 and current political situation in Ukraine. It is very timely and important for our country now. Elections suggested a political division of Ukraine according to voting preferences. They also raised some fear about potential split of Ukraine. It can be argued that this fear is mainly speculative and has no real foundation behind it but some facts should not be neglected. On December, 1 of 2004 Donetsk local council announced its intention to hold a referendum concerning limited autonomy. This decision was supported by many other local councils of the Eastern Ukraine. And although it did not proceed any further, this issue is worth considering at least for the reason that it is not new in Donetsk. Quite a similar situation took place during the elections of 1994. Besides, coal miners put forward the same demands during the strikes in 1993 and 1996 and found support of Donetsk local authorities. Furthermore, transforming Ukraine into federal state was one of the main points in pre-election program of Party of Regions, which received the majority of votes in the Eastern Ukraine during the Parliamentary elections 2006. So far only Crimea has autonomy status as the only Ukrainian region with ethnic Russian majority. But no one can tell for sure how events might develop in the future.

[3] In all the earlier border effect investigations that I came across data for much smaller number of different products were used. For instance, Engel and Rogers (1996) had only 14 categories of products.

Furthermore, the research centers Fund for Peace and Carnegie Endowment for International Peace placed Ukraine on the 38th place out of 60 in the failed states rating, which they published in November of 2005. In appendix to the rating they claim that Ukraine ranks as highly vulnerable mainly due to disputed election. These facts provide evidence that Ukraine indeed has favorable preconditions for split or, at least, transformation into a federal state.

I look at the issue of the Eastern and Western Ukraine from an economic perspective and test whether there is also an economic East-West division of Ukraine in addition to political. Substantial differences of price volatility across East-West border might reveal this division. Finding strong economic evidence for the split would mean that it is not just a short-term temporary phenomenon and should be treated more seriously. I also estimate the role of different factors, such as relative wage volatility, gross added value per capita, political and linguistic preferences, presence of the Dnipro River in explaining the gap between the East and the West of Ukraine.

Moreover, my research has important regional policy implications. Finding a significant border effect would suggest the presence of substantial differences in tastes and preferences, levels of life, social and business networks, institutions etc. in the East and the West of Ukraine, since there are no formal trade barriers between them. It would be a signal to policy makers that they should take certain economic policy actions for bringing the East and the West together in order to avoid social tension and possible threat of separatism. It would also support a sharp need for Administrative reform in Ukraine and a deeper consideration of pros and cons of transforming Ukraine into a federal state.

On the other hand, if the border effect appeared to be insignificant, it would mean that the gap between the East and the West of Ukraine is not economic by

nature but rather purely political or cultural phenomenon. Consequently, a different type of policy measures is to be taken to stimulate resolution of the East-West conflict.

For the purpose of my research I adopt the baseline regression introduced by Engel and Rogers (1996) as a starting point and then augment it in different ways: use various measures of price dispersion across regions, add other explanatory variables. The initial model is designed to find the significance of the border effect from the relative price volatility after controlling for distance. So, the main data I make use of come from the monthly average prices of 85 different goods and services in the 25 major administrative units of Ukraine (24 oblasts and Autonomous Republic of Crimea) and distances between these locations. I also use some complementary data, such as wages and gross added value per capita[4], percentage of people who voted for Yushchenko, percentage of Russian-speaking population to modify the model.

The rest of the paper is organized as following. In Chapter 2 I provide a comprehensive literature review of the border effect investigations. Chapter 3 presents methodology I rely on in my research. Data description can be found in Chapter 4 and empirical analysis is in Chapter 5. Chapter 6 concludes.

[4] Counterpart of GDP for the regions within a single country

Chapter 2

LITERATURE REVIEW

The issue of border effect is relatively new and started to draw close attention of researchers only about a decade ago. It is being currently elaborated throughout the world. Many influential papers on this topic were written only during the last few years.

Investigations of McCallum (1995) and Engel and Rogers (1996) can be considered as seminal works on the border effect. They have been referred to in most of the later studies of this issue.

As mentioned earlier, both McCallum, and Engel and Rogers examined the effect of the Canada-U.S. border but they adopted different methodological approaches. McCallum applied a gravity-type model with trade flows, GDP and distance as the main inputs for his analysis. Engel and Rogers introduced a different methodology, using relative price volatility as a dependent variable and distance and border dummy as explanatory variables in their model. Both investigations suggested the presence of significant border effect between Canada and U.S. despite the North American Free Trade Agreement signed in 1988, similar language, culture and institutions, and the fact that 90% of the Canadian population lives within 100 miles (161 km) of the U.S. border (Wall, 2000).

McCallum (1995) finds that trade volume across Canada-U.S. border was 20 times smaller than trade flows inside these countries. The distance equivalent of the border computed by Engel and Rogers appeared to be 75000 miles. Later,

Parsley and Wei (2000) found even greater U.S.-Japan border effect (equivalent to 43 000 trillion miles). An unexpectedly great magnitude of the border effect received the name 'border effect puzzle' in the literature (Obstfeld and Rogoff, 2000). It drew attention of other researchers, and many more investigations on the border effect have been conducted during the last decade.

All the later research works can be divided into two big subgroups of those in which quantity data and gravity-type model were used to measure border effect following McCallum (Helliwell, 1998; Wall, 2000; Combes, Lafourcade and Mayer, 2003; Fukao, 2004; etc.), and those in which border effect was found from the price data with the help of methodology introduced by Engel and Rogers (Parsley and Wei, 2000; Beck, 2003; Witte, 2005; etc). My literature review is somewhat tilted to the latter strand of the border effect research, since I follow its methodology in the empirical part.

Recent investigations contributed to development of the border effect framework through introduction of methodological modifications aimed to measure the border effect more precisely (1), suggesting various explanations for this phenomenon (2), trying different scopes of analysis (3) and looking for evidence from many countries (4).

First of all, the authors tried to distinguish between 'nominal' and 'real' components of the border effect (Duvereux and Engel, 1998). 'Real' border effect can be estimated by introducing the nominal exchange rate variability as an explanatory variable into regression. To receive 'nominal' component, one should compute the difference of the border effect estimates before and after inclusion of the nominal exchange rate variability into the model. Witte (2005) estimates 'nominal' portion of the border effect in the study of Engel and Rogers (1996) and comes to a conclusion that it varies substantially across goods: from 7-8% to

90%. Beck (2003) finds that nominal part of the border effect prevails over real, still real component is also highly significant. Actually, 'real' border effect is of a greater interest to study, since it reflects more persistent differences between markets, while 'nominal' border effect is simply due to the short run price stickiness, which makes relative prices in two countries follow the movements in their nominal exchange rates.

Many researchers do not agree with the huge magnitude of the border effect found by Engel and Rogers (1996) and Parsley and Wei (2001), and relate it to some serious drawbacks in the methodological approach they used. Gorodnichenko and Tesar (2005) suggest that in order to receive more precise estimates of the true border effect one should account for volatility and persistence of the nominal exchange rate, as well as the distribution of within-country price differentials.

McCallum's model was also subsequently refined and extended. For instance, Helliwell (1998) includes also remoteness measure in the gravity model in addition to distance. Researchers find that Canada-U.S. border is asymmetric: it has a larger reducing effect for trade flows from U.S. to Canada than from Canada to U.S. (Anderson and Smith, 1999a) and heterogeneous across the provinces (Helliwell, 1996 and 1998; Anderson and Smith, 1999b). Wall (2000) demonstrates that a standard gravity model gives biased estimates of trade volumes due to heterogeneity bias and re-estimates the border effect using the model which allows for heterogeneous equations. Besides, he does not exclude observations with zero trade as many other researchers do. However, using this methodology he receives border effect, which is 40% larger than the one found initially by McCallum (1995). He also finds that home bias for exports from U.S. to Canada is smaller than for exports from Canada to U.S. contrary to findings of Helliwell (1996 and 1998) and Anderson and Smith (1999a) mentioned earlier.

Generally, other researchers receive border effects of smaller size than those estimated by McCallum (1995) and Engel and Rogers (1996). For instance, Helliwell (1998) finds that Canada-U.S. trade volume is 12 times larger than trade flows between U.S. states and Canadian provinces within these countries, whereas in McCallum's investigation it was 20 times bigger. Still, the borders persistently appear to have a substantial reducing effect on the trade flows and increasing effect on the price dispersion.

Existence of the significant border effect is consistent with the literature on the convergence to the law of one price (LOP) and purchasing power parity (PPP). Cross-country studies of PPP deviations estimate 3-5 years of their half life, whereas estimates based on the US price data show about 1 year half life (Parsley and Wei, 2001). It was also proved that distance alone does not fully explain differences between international and intra-national rates of relative price convergence (Frankel and Rose, 1996).

Also, border effect reflects home bias in trade, which Obstfeld and Rogoff (2000) consider one of the 6 major puzzles in international economics and try to explain by empirically reasonable trade costs (transport and tariff costs). Home bias is also proved to exist for capital and labor mobility and knowledge diffusion (Helliwell, 1998).

As stated earlier, border effect incorporates the whole range of factors that impede trade and raise price variation across regions, most common of which are:

- formal and informal trade barriers;
- non-tradability of some goods;
- nominal exchange rate fluctuations;
- differences in consumption behavior (Engel and Rogers, 1996).

Among other less traditional factors that cause market segmentation researchers mention:

- firms' price-to-market behavior (Beck, 2003);
- business networks (Fukao and Okubo, 2004);
- social networks (Combes, Lafourcade and Mayer, 2003);
- heterogeneity of distribution and marketing channels (Parsley and Wei, 1996);
- information costs and imperfect contract enforcement (Anderson, 2000);
- technical barriers (Manchin and Pinna, 2003);
- vertical specialization (Yi, 2005).

It is fairly difficult and sometimes even impossible to disentangle explicitly the role of some factors from the border effect. Still a substantial number of investigations are aimed to do it. In this vain, Combes, Lafourcade and Mayer (2003) introduce the employment composition in terms of birth place (proxy for social networks) and inter-plants connections (proxy for business networks) into traditional model used for the border effect estimation. It appears that these factors explain around 50% of the border effect. Yi (2005) offers vertical specialization (when a country or a region specializes on the certain production stages) as a resolution of the border effect puzzle. He shows that controlling for vertical specialization reduces the border effect by half.

Another interesting issue which many border effect studies touch upon is how to measure distance between locations appropriately. Head and Mayer (2002) argue that border effect is inflated by mismeasured distance, and show that usage of a more appropriate distance measure reduces the size of the border effect, although does not eliminate it completely. Manchin and Pinna (2003) also construct a weighted measure of distance both between and within the countries in their research not to overstate the effect of the border. Parsley and Wei (2001), when

estimating the effect of US-Japan border, applied great circle distance, which they computed from the latitude and longitude of each city in their sample.

Studies on the border effect are done on three different levels:
- intercontinental (estimation of the 'ocean' effect);
- international (finding the effect of geopolitical borders);
- intra-national (measuring the effect of administrative borders within the country).

The vast majority of the research works was done on the international scope of analysis. Usually the effect of the border between two countries was considered, and in most cases these were U.S. and Canada. One possible reason for that could be a lack of access to the relevant datasets in other countries. Also, Canada and U.S. are the largest trade partners of each other, and moreover, their trade volume is greater than between any other two countries in the world (Wall, 2000), so it is indeed very surprising that Canada-U.S. trade flows appear to be many times lower than trade flows within these countries, suggesting a substantial home bias. It also explains why so many researchers decide to investigate this phenomenon.

However, other countries also received some attention of the researchers. Parsley and Wei (2001) estimated intercontinental border effect between Japan and US. Manchin and Pinna (2003) investigated effect of the borders between EU member countries. Beck (2003) does a very comprehensive investigation for Asian, North American and European countries considering all three types of the border effects. He finds that all of them are significant but international price dispersion is 4 times greater than intra-national, and inter-continental – 3 times bigger than international. Also, he demonstrates that the 'ocean' effect is persistent even in the long run, which is in accordance to findings of Parsley and

Wei (2001). Another interesting observation is that introduction of the European Monetary Union decreased the border effect between the European countries by 80-90%, which means that it used to be mostly 'nominal' by nature.

The most relevant to my research are the studies of intra-national border effect. First of all, it is important to note that the border effect within a country is purely 'real'. It simplifies the analysis by eliminating some of the problems that usually arise with estimating the border effect between the countries, such as short run price stickiness and nominal exchange rate fluctuations. Besides, some other problems that often appear in studies of international border effect are irrelevant for intra-national scope of analysis. For instance, classification of goods and services for which price data are collected can differ across the countries, so it is not an easy task to find comparable price data sets. This problem is completely eliminated when region within a single country are considered.

Although a set of papers on the within-country border effect is substantially smaller than the one for national borders, there is enough evidence that administrative borders inside the country also matter, suggesting the relevance of research on intra-national borders. Wolf (2000) and Ceglowski (2003) investigate the effects of state borders in the U.S. and provincial borders in Canada respectively, and find significant border effects. Combes, Lafourcade and Meyer (2003) do a similar research for France and find effect of the same order of magnitude as Wolf (2000) for the U.S.

I am not aware of any attempts to measure the border effect in Ukraine but there are some related studies. Vashchuk (2003) investigates the issue of regional price convergence in Ukraine and comes to a conclusion that the law of one price generally holds in Ukraine but only after taking into account transaction costs. Galushko (2003) examines the evidence on market integration from Ukrainian

food markets. According to the results she receives, bread, sugar and sunflower oil markets in Ukraine can be considered integrated 'only to a limited extent' due to the slowness of adjustment to the price shocks. Sagidova (2004) conducts a study on price transmission in Ukrainian grain market, which concerned mostly the relationship between Ukrainian and world grain prices, and suggests that there is a long-run equilibrium relationship but adjustment is rather slow. Overall, according to findings of Vashchuk (2003), Galushko (2003) and Sagidova (2004), there are substantial price discrepancies in Ukraine, and Ukrainian markets are not fully integrated, which allows me to expect finding a significant border effect in Ukraine.

Chapter 3

METHODOLOGY

Theoretical framework

I rely on the methodology introduced by Engel and Rogers (1996) in my research and not the one that McCallum used, because data on the trade flows between Ukrainian administrative units are not readily available.

In their influential paper Engel and Rogers first present a simple theoretical framework that shows the effects of distance and the border on price variation across territories, and then suggest an econometric model based on it.

Basic assumptions behind their theoretical model are:

- all the goods have a tradable and non-tradable components, where non-tradable component might reflect, for instance, distribution and marketing costs (1);
- the price of tradable component of each good is determined in competitive market (2);
- the price of non-tradable component is set by profit-maximizing monopolist (3);
- Cobb-Douglas production technology with constant returns to scale (4).

Not all of these assumptions are very realistic, especially in the context of transition country like Ukraine. For instance, while assumption (1) seems to be equally valid both for developed and transition countries, assumption (2) is rather disputable. Even the price of a tradable component of each good does not necessarily have to be determined in competitive market. While it can be generally

true for food products, this assumption is likely to be violated for nonfood products, which are usually highly differentiated, so oligopoly seems to be more appropriate for them. Besides, in the case of high capital and labor mobility arbitrage is not possible for both tradable and non-tradable components, and their prices are determined in a similar way, so assumption (3) would not generally hold either. Another problem, especially relevant for transition countries, is the state regulation of prices and state interventions in the market. In Ukraine, for instance, high level of state regulation is observed in many market of food products like sugar, bread and cereals markets. Assumption (4) is also rather restrictive: production technologies vary over industries, and there are industries with increasing returns to scale (IRS) like natural monopolies.

Despite many of its assumptions do not exactly correspond to reality, the model offered by Engel and Rogers (1996) provides some very useful insights on the factors that influence prices variation of different products across locations.

The price of good *i* in location *j* is determined according to the following formula:

$$p_j^i = \beta_j^i \alpha_j^i (w_j^i)^{\gamma i} (q_j^i)^{1-\gamma i} \quad (1),$$

where γ_i stands for the share of non-tradable component of good *i* and w_j^i – for its price in location *j*. The share of tradable component is respectively (1- γ_i) and its price in location *j* is q_j^i. The productivity is measured by a_j^i and the markup over costs by β_j^i inversely related to the elasticity of demand, ε: $\beta = \frac{\varepsilon}{\varepsilon - 1}$.

Several predictions can be derived from this model (Engel and Rogers, 1996):

- If transportation costs are d_i, then the relative price of good i in location j and k could be in the range $\frac{1}{d_i} \le \frac{q_j^i}{q_k^i} \le d_i$ and there still would be no opportunity for arbitrage. If to assume that transportation costs are positively correlated with distance, which is quite reasonable, then an increase in distance between the locations should lead to a rise in their relative price variation;

- More distant locations and those separated by the border might have more different cost structures, levels of labor market integration and productivity shocks, so $\frac{\alpha_j^i}{\alpha_k^i}$ and $\frac{w_j^i}{w_k^i}$ would vary more for them;

- Under pricing-to-market behavior of the firms, markup β_j^i may also be different across the locations and its variation would probably be higher for more distant and separated by the border territories.

Empirical method

On the basis of theoretical predictions mentioned earlier, Engel and Rogers offer the following econometric model:

$$V(P_{jkt}^i) = \beta_1^i \ln dist_{jk} + \beta_2^i Border_{jk} + \sum_{m=1}^{N} \gamma_m^i D_m + u_{jk} \qquad (2),$$

where $V(P_{jkt}^i)$ stands for price volatility measured as a standard deviation across time-series of P_{jkt}^i and $P_{jkt}^i = \log(\frac{P_{j,t}^i}{P_{k,t}^i}) - \log(\frac{P_{j,t-1}^i}{P_{k,t-1}^i})$, which can be rewritten as

$\log\left(\frac{P^i_{j,t} / P^i_{k,t}}{P^i_{j,t-1} / P^i_{k,t-1}}\right)$ and shows percentage difference of relative prices of product *i* in locations *j* and *k* at time *t* and *t-1*[5]. $\ln dist_{jk}$ is the log of distance between locations *j* and *k*, $Border_{jk}$ is a dummy variable, which equals 1 when locations *j* and *k* are in different regions and 0 when they are in the same region, D_m is a dummy variable for each of N locations[6], u_{jk} – regression error.

It is necessary to mention that in my research 'location' would stand for 25 major administrative units of Ukraine (24 oblasts and Autonomous Republic of Crimea). Ideally I would like to consider different cities as locations instead but it is impossible due to the data availability constraint. Two 'regions' would be differentiated according to political division: the East and the West, and 5 for historical: the West, the North-Center, the North-East, the South and the East (see Appendix A).

Basic hypothesis implied by this model is that, controlling for distance, price discrepancy should be higher for locations separated by the border. Also, distance is supposed to have a positive impact on the price volatility ($\beta_1^i > 0$). Coefficient β_2^i in this specification shows the difference between the mean price volatility of two jurisdictions located across the border and within one region after controlling for distance.

[5] If relative price parity were to hold P^i_{jkt} would equal 0.

[6] When a pair of locations (j,k) is considered, dummies for location *j* and location *k* are equal to 1 and the rest location dummies are 0.

Engel and Rogers (1996) justify inclusion of dummy variables for each location in several ways. First of all, they claim that there can be individual measurement errors or seasonality present in some locations, which influence price volatility. Also, integration of goods or labor markets can differ across locations. Finally, some differences in the way the price data are collected may also occur.

Regression (2) represents a simple OLS cross-section regression, which is run for each product separately. However, a pooled regression for all the products can be also considered because it has more observations and gives more precise estimates. Then it is appropriate to include dummies for all the products and all but one locations into regression. Pooled regression would give the average of the logged distance and border coefficients across all the goods – β_1 and β_2 :

$$V(P_{jkt}) = \beta_1 \ln dist_{jk} + \beta_2 Border_{jk} + \sum_{i=1}^{K} \lambda_i G_i + \sum_{m=1}^{N-1} \gamma_m D_m + u_{jk} \qquad (3).$$

Here G_i is a dummy variable for each of K products and D_m is a dummy variable for each but one of N locations. The rest of variables are the same as in specification (2).

Natural log specification of distance is rather strong assumption, which implies a concave relationship between distance and relative price volatility. Another drawback of this specification is that this measure of distance is unitless. So, an alternative quadratic distance specification can be introduced, which would allow to test whether the assumption of concave relationship is realistic:

$$V(P^i_{jkt}) = \beta^i_1 dist_{jk} + \beta^i_2 sqrdist_{jk} + \beta^i_3 Border_{jk} + \sum_{m=1}^{N} \gamma^i_m D_m + u_{jk} \qquad (4).$$

A convex specification of distance can be tried as well. In this case it is assumed that after some critical level additional distance does not influence at all relative price volatility (Engel and Rogers, 1996).

An important issue is an economic significance of the border relative to distance in explaining price variation across locations. There are several ways to find distance equivalent of the border effect. For instance, it can be found from the model specification with natural log of distance according to the formula: $\exp(\beta_2 / \beta_1)$, where β_1 and β_2 are average coefficients of logged distance and border dummy respectively. However, this measure would be very sensitive to small changes in β_1 and β_2 because distance enters the regression in logs. Besides, under this specification interpretation of the distance equivalent would change if we change the units in which distance is measured (Parsley and Wei, 2001).

Parsley and Wei (2001) offer an alternative way to compute distance equivalent by finding how much more distant must be the countries (regions) in order to have the observed price dispersion:

$$\beta_1 \ln(\overline{dist} + Z) = \beta_2 + \beta_1 \ln(\overline{dist}) \qquad (5)$$

In the equation above $\overline{dist}$ is an average distance between city-pairs across regions, and Z is actually a distance equivalent of the border effect. One can easily rearrange terms in equation (5) to solve it for Z:

$$Z = \overline{dist} * (\exp(\beta_2 / \beta_1) - 1) \qquad (6)$$

Different measures of price volatility (dependent variable) can be used in the model. For instance, P^i_{jkt} can be defined as $\log(\frac{P^i_{j,t}}{P^i_{k,t}})$ (and not first difference of logs as suggested previously), which would reflect percentage difference between

the average prices (not the relative) of product *i* in jurisdictions *j* and *k* at time *t*[7]. Besides, Engel and Rogers (1996) also try a filtered measure of P^i_{jkt}, which they obtain by regressing log of the relative price on 12 seasonal dummies and six monthly lags and then taking month ahead forecast error.

Standard deviation is not the best measure of volatility because it gives too much weight to outliers, so it might be a good idea to consider a spread between the 10th and 90th percentile in the time series of P^i_{jkt} or inter-quartile range (75th – 25th percentile) instead. For the sake of comparison, average P^i_{jkt} over time series can be also used as a dependent variable in regressions, although it is necessary to keep in mind that then outliers would be given even higher weight than in case of standard deviation.

There is usually a problem with heteroscedasticity of error terms in such models. To account for it one should use White's heteroscedasticity consistent standard errors when estimating test statistics (Beck, 2003). An alternative model specification where all the variables are divided by log of distance can be also introduced, since it is generally believed that the variance of the error terms is greater for more distant locations:

$$V(P^i_{jkt}) / \ln dist_{jk} = \beta^i_1 + \beta^i_2 (Border_{jk} / \ln dist_{jk}) + \sum_{m=1}^{N} \gamma^i_m (D_m / \ln dist_{jk}) + v_{jk} \quad (7)$$

In order to have some intuition about the dynamics of the border effect, one can either split the sample into 2 or more subperiods[8], consider 2 separate years or just use P^i_{jkt} and not its volatility across time series $V(P^i_{j,k})$ as a dependent

[7] It would equal 0 if average price parity were to hold.

[8] Price dispersion can be computed for each year, in order to examine the evolution of the border effect

variable in the basic regression following Parsley and Wei (2001). Regressions for two periods should be run and then the size of border dummies received from these two regressions must be compared.

Robustness of the results can be insured through a split of the sample or exclusion of several periods or goods from it. Where to split the sample and which periods and goods to exclude depends on the individual characteristics of the data set under consideration. For instance, 3 separate pooled regressions can be run for food products, nonfood products and services. Then obtained estimates should be compared with the results for full sample, and if there are no substantial differences one can conclude about the robustness of the results.

I suggest a number of modifications to the standard methodology. First of all, I try to augment the model with several additional explanatory variables in order to find the influence of different factors on the relative price volatility and disentangle various determinants of the border effect. For example, I introduce wage volatility[9] into the regression to test a hypothesis that labor market segmentation explains a part of the border effect. To control for possible pricing-to-market behavior of the firms I include variability of gross added value per capita in regression because it can be a proxy for the differences of people's wealth across oblasts, which in turn influence consumers' willingness to spend certain amount of money on a particular product.

Apart from that, I add some social and political explanatory variables in the regression. For example, introduction of the relative percentage of people who voted for Yushchenko in 2004 (or for pro-Yushchenko parties in 2006) into the model may reveal whether political preferences play a direct role in explaining

[9]

price dispersion across the East and the West of Ukraine. Use of relative percentage of Russian-speaking people as another explanatory variable would allow to control for the impact of language differences on the price discrepancy between the Eastern and the Western Ukraine.

Besides, I try using the common administrative border dummy, which takes the value of 1 whenever two locations have a common administrative (oblast) border and 0 otherwise as explicative variable because neighboring oblasts are likely to have less variation of prices. Finally, a large Dnipro river flows through Ukraine dividing it in half, so it seems reasonable to control for possible 'river' effect through introduction of respective dummy into the regression.

Within the border effect framework I also examine 205 different possible East-West divisions, which I generated myself from the map of Ukraine, in order to find 'true' economic border from the data. I simply run 205 pooled regressions for each of these borders with correspondent border dummy, and find which border has the largest effect on relative price variation[10].

[10] I look at coefficients of significant border dummies in different pooled regressions and find which of them has the largest size relatively to distance

Chapter 4

DATA DESCRIPTION

The main data I use for the purpose of my research are monthly average retail prices of different consumer products across the oblasts, which allow me to compute relative price volatility. They come from official sources, namely statistical collections 'Average Prices and Tariffs for Consumer Goods and Services' published by the State Committee of Statistics. I have these collections available for the period from 1997 to 2004. They provide monthly average prices of 29 food products, 35 nonfood products and 21 services across 24 oblasts of Ukraine and Autonomous Republic of Crimea. These are actual prices including indirect taxes such as tax on added value (VAT) and excise tax. Price information is collected in oblast and rayon centers, which are chosen taking into account quantity of urban population and satiation of consumer markets with goods and services. In order to compute average prices, price data are weighted on the share of the urban population.

Goods and services for which price data are collected are chosen directly by the representatives of the regional offices of the State Committee of Statistics according to demand for them, representation on the consumer market and regularity of availability for sale during a long period of time. Prices are registered in the trading network excluding markets and enterprises in the sphere of services. These prices are also used to compute indices of consumer prices.

Classification of products in my price data set is given in Table 1. The number in brackets indicates the number of products in each category. (See also Appendix B for a detailed description of the price data)

Table 1. Classification of products

Food products (29)	
Farinaceous foods (3)	Wheat bread, rye bread, bun
Cereals (4)	Rice, semolina, buckwheat, oats
Meet (7)	Beef, pork, poultry, lard, smoked sausage, boiled sausage, herring
Dairy products (4)	Butter, milk, sour cream, hard cheese
Vegetables (5)	Potatoes, cabbage, onions, beets, carrots
Drinks (2)	Vodka, mineral water
Other (4)	Flour, sugar, sunflower oil, eggs
Nonfood products (35)	
Clothes (13)	Man's suit, man's shirt, man's trousers, woman's skirt, children's tracksuit, children's jacket, children's dress, children's t-shirt, rompers, sweater, man's socks, woman's stockings, children's stockings
Footwear (3)	Man's boots, woman's boots, children's boots
Hygiene products (3)	Household soap, toilet-soap, toothpaste
Drugs (3)	Vessel widening medicine, aspirin, antibiotics
Household appliances (2)	TV set, refrigerator
Furniture (3)	Sofa, writing-table, kitchen table
Building materials (3)	Bricks, cement, wallpapers
Fuel (2)	Petrol, diesel fuel
Other (3)	Wool cloth, sheet, exercise-book
Services (21)	
Hairdresser's (3)	Man's haircut, woman's haircut, hair curling
Cleaning (2)	Dry-cleaning, laundry
Sewing (2)	Trousers sewing, dress sewing
Repair services (3)	Man's trousers repair service, shoes repair service, watch repair service
Transportation (2)	Freight transportation, parking fee
Institutions (5)	Theatres, preschool institutions, higher education institutions, hotels, bath-house
Photo services (2)	Photos for documents, art photos
Other (2)	Dental services, video-tape hire

The data set of prices I utilize for the purpose of research has several advantages. First of all, it comes from official sources. Also, it provides average retail prices of consumer goods, and not price indexes. So, there is no aggregation bias there, which is usually present in price index data (Ceglowski, 2003). In addition, most of products are narrowly defined, which also reduces the possibility of bias. Another advantage of my data is coverage of the wide range of different products (85 overall). All the investigations that I came across are based on the price data for much smaller number of products: Engel and Rogers (1996) has 14 different groups of products, Parsley and Wei (2001) – 27, Beck (2003) – 8, Ceglowski (2003) – 45, etc. Having average price data for 25 oblasts I can obtain 300 relative prices for each product. When pooling the data over 85 products I receive cross-section data set with 25 500 observations.

A weak point of my price dataset is that prices not for all 85 goods and services are available for the whole period from 1997 till 2004. Due to periodical changes in classification of the State Committee of Statistics products, for which the prices are reported, vary slightly from year to year during the considered period. Some products were added later than 1997, others discontinued to be reported at some point. For instance, in 2003 the Committee stopped reporting prices of services at all and reduced the number of reported nonfood goods to only two (petrol and diesel fuel). Besides, these price data were collected to be used in computing oblast consumer price indices, and not for inter-oblast comparisons of the price levels. But despite these more or less minor drawbacks, I make use of these data for the purpose of my research because this is the only reliable price data set available in Ukraine.

On the basis of available price data I compute relative prices for each product over 300 oblast pairs, their logs and first difference of logs (see Appendix C). Table 2 provides short summary statistics for 3 main categories of products.

Table 2. Summary statistics for 3 main product categories

Products	Relative prices			Log of relative prices			Difference of logs of relative prices		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Food products	1.041	5.67	0.15	0.0212	1.73	-1.90	-0.00005	1.63	-1.85
Nonfood products	1.074	9.63	0.13	0.0320	2.26	-2.04	0.00113	2.26	-2.04
Services	1.130	6.00	0.14	0.0430	1.79	-1.97	0.00170	1.54	-1.74

According to Table 1, relative prices of food products on average are most close to 1, of services – least close and of nonfood products – somewhere in the middle. Most of services are non-tradable, which explains why on average their relative prices diverge the most from 1. However, from the perspective of tradability one would expect absolute PPP to hold the best for nonfood products and, consequently, their prices to be the closest to 1, since food products are perishable goods, which puts some restriction on their tradability. But, on the other hand, nonfood products are much more heterogeneous than food, which can ration higher variability of their prices. It is probably also due to differentiation of nonfood products that the range between their maximum and minimum relative prices is the highest among product categories.

If to look at the first difference of logged relative prices, one can see that its average value for food products negligibly deviates from zero, whereas for nonfood products and services the correspondent values are more than an order of magnitude higher. This suggests that relative PPP also holds best for food products. At the same time, the range between maximum and minimum values is the smallest for services, which might results from lower responsiveness to different short-term shocks.

Then, I consider separately percentage differences of the products' absolute and relative prices[11] for oblast pairs in which both oblasts are located in the East (East-East), in the West (West-West) and for those pairs in which one oblast is in the East and the other is in the West (East-West). Summary of results is presented in the table below (for results for all 85 products see Appendix D).

Table 3. Average standard deviation of percentage differences of absolute and relative prices

	Average prices			**Relative prices**		
	East-West	East-East	West-West	East-West	East-East	West-West
Food products	0.12702	0.11185	0.12071	0.08484	0.07592	0.08678
Nonfood products	0.11999	0.11836	0.12021	0.08227	0.07712	0.08789
Services	0.08655	0.07993	0.08964	0.09085	0.07796	0.08037
All the products	**0.11413**	**0.10664**	**0.11283**	**0.08527**	**0.07692**	**0.08565**

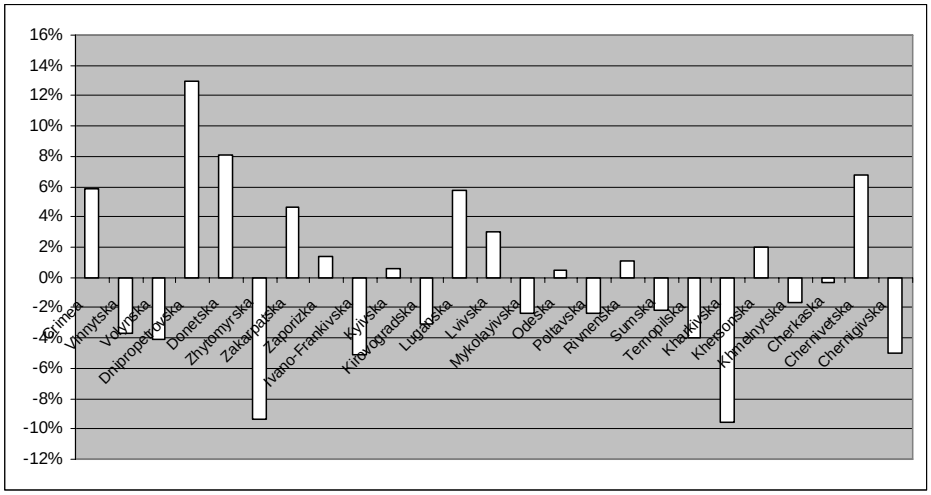
If the East-West border did not matter, then average percentage differences of average and relative prices would be the same for the East-West, East-East and West-West pairs of oblasts. In our case, average percentage differences both for absolute and relative prices are the highest for oblast pairs located in the West, and the lowest for oblast pairs located in the East. Cross-border pairs are in the middle. One would expect price volatility to be higher in the West because Eastern and Western regions according to our classification are not symmetric: the West comprises of almost twice as many oblasts as the East (16 and 9 respectively). Therefore, there are 120 oblast pairs in the West and only 36 in the East. It is more difficult to explain why price volatility for the Western oblast pairs is a little higher than for cross-border pairs. In the paper of Engel and Rogers (1996) intra-national price volatility between the US states for some categories of products was also higher than US-Canada cross-border volatility.

[11] Logs of relative prices and first differences of logs of relative prices respectively

They explained it by high product differentiation of some products and the fact that there are products, which both Canada and the US mostly import from some third countries.

I also constructed 4 hypothetical baskets of consumer products: first basket comprising 29 food products, second – 35 nonfood products, third – 21 services and forth – all 85 products. To do this I first found the average price of each good in each oblast during the period for which price data of this particular product is available[12]. Then, I used rather primitive construction procedure simply giving all the products in each basket equal weights. It obviously does not have to correspond to reality. Still it allows to make a rough judgment about deviations of price levels across the oblasts. Figure 1 illustrates the results for the basket of all 85 products (see Appendix E for all 4 baskets).

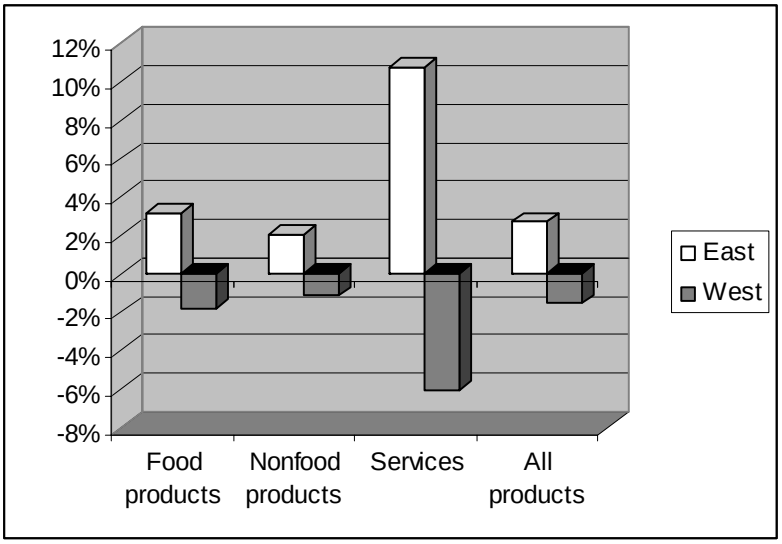
Figure 1. Deviations from the average price of the basket of 85 products across the oblasts of Ukraine



[12] The periods for which data are available vary over products. For more detail see Appendix B.

The average price of basket consisting 85 products during 1997-2004 was the highest in Crimea, Dnipropetrovska, Donetska, Luganska and Chernivetska oblasts, all but 1 of which are in the East. It was the lowest in Vinnytska, Volynska, Zhytomyrska, Ivano-Frankivska, Kirovogradska, Ternopilska, Kharkivska and Chernigivska oblasts, all but 1 of which are in the West. So, price level is generally higher in the Eastern Ukraine and lower in the Western, which is also shown in Figure 2.

Figure 2. Deviations from the average price of 4 baskets of products in the East and the West of Ukraine



For all 4 baskets of products prices in the East were higher and in the West lower than on average in Ukraine. The biggest difference in price levels between the East and the West is observed for services in line with their non-tradability. In Figure 2 price discrepancy for nonfood products is a little lower than for food, somewhat contrary to figures reported in Table 2 but in accordance with higher tradability of nonfood products, which are non-perishable goods.

Apart from the price data, I also make use of some complementary data for my analysis, which are:

- 300 distances between the oblast capital cities;
- monthly data of average wages across oblasts during 1999-2004;
- average gross added value during 1997-2004 across oblasts;
- percentage of people who voted for Yushchenko and Yanukovych during Presidential elections 2004 across oblasts;
- percentage of people who voted for pro-Yushchenko and pro-Yanukovych parties during Parliamentary elections 2006 across oblasts;
- share of Russian-speaking people across oblasts according to All-Ukrainian Census 2001.

These data also come from official sources, namely:

- different statistical collections of the State Committee of Statistics;
- report of All-Ukrainian Census in 2001;
- reports of the Central Election Committee.

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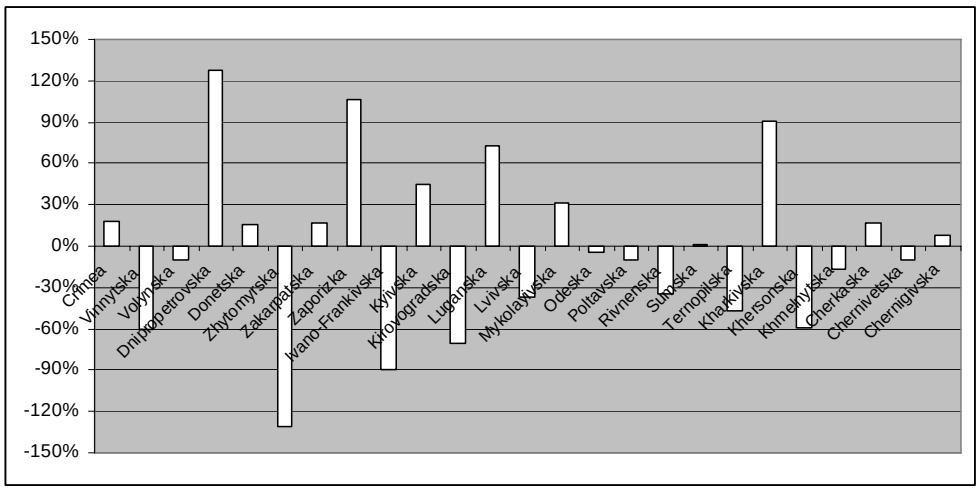
On average, distance between the oblast capital cities is around 594 km. It is almost equal for oblast pairs in the East and in the West: 410 and 449 km respectively. For cross-border oblast pairs this figure is 762 km.

It is also worth to compare average wages across Ukrainian oblasts, since they reflect price of the labor, which is an important factor of production of goods and services. Figure 3 is a counterpart to Figure 1 for wages. It demonstrates deviations from the average level of wages across Ukrainian oblasts (see also Appendix F for summary statistics of the wage data).

Figure 3. Deviations from the average level of wages across the oblasts of Ukraine



Deviations of wages are an order of magnitude higher than of prices, which is expected because labor is not as mobile as products. Wage deviations range from about -130% to +130%, whereas the spread of price discrepancy is (-10%; +13%). 15 out of 25 oblasts have the same sign of deviations for prices and wages, and among those that have different signs most oblast have deviations rather close to zero. Overall, the highest wages during 1999-2004 were observed in Dnipropetrovska, Zaporizka, Kyivska, Luganska, Mykolayivska and Sumska oblasts, all of which but Kyivska are located in the Eastern Ukraine. The lowest wages had Volynska, Zhytomyrska, Ivano-Frankivska and Lvivska oblasts, all of which are in the Western Ukraine. So, both wages and prices were generally higher in the East than in the West over the period of 1999-2004. To be precise, wages in the East were about 44% higher and in the West 27% lower than on average in Ukraine.

I would like to conclude the data description section by a correlation matrix that presents degrees of correlation between average price level[13], wage, gross added value per capita, percentage of Russian-speaking people and those who voted for Yanukovych at the Presidential elections 2004 and East dummy[14] for the oblasts of Ukraine.

Table 4. Correlation matrix of some indicators across the oblasts of Ukraine

	Price level	Wage	Gross added value per capita	Russian-speaking	Yanukovych	East dummy
Price level	1					
Wage	0.48	1				
Gross added value per capita	0.28	0.89	1			
Russian-speaking	0.43	0.72	0.51	1		
Yanukovych	0.40	0.74	0.55	0.94	1	
East dummy	0.39	0.72	0.54	0.87	0.91	1

The main message of this matrix is that there is a substantial positive correlation between all these indicators. They have higher values in the East than in the West, which was earlier shown explicitly for prices and wages. This suggests that if in the empirical part I find a significant border effect between the East and the West it may reflect either economic (wage, gross added value per capita), or political, or linguistic differences, or possibly, some other factors. To check the role of each of these indicators, they will have to be introduced one way or another into the model.

[13] I proxy it to the price of the basket of 85 products that I constructed earlier

[14] Takes on value 1 whenever oblast is in the East according to the political division, and 0 otherwise

Chapter 5

EMPIRICAL EVIDENCE

I start empirical part with analysis of the regression pooled over all 85 products. This gives me 25500[15] observations and, therefore, a lot of degrees of freedom, which insures high precision of the estimates.

I first run a pooled regression (3) from the methodology section, which has exactly the same form as the baseline model offered initially by Engel and Rogers (1996): $V(P_{jkt}) = \beta_1 \ln dist_{jk} + \beta_2 Border_{jk} + \sum_{i=1}^{K} \lambda_i G_i + \sum_{m=1}^{N-1} \gamma_m D_m + u_{jk}$, with first difference of logs of relative prices as a dependent variable and log of distance, border dummy[16], 85 product dummies and 24 oblast dummies[17] as explicative variables. I use White's heteroscedasticity-consistent standard errors, since variance of the error terms is likely to have positive correlation with distance between the locations. Short summary of the results is presented in the table below.

Table 5. Summary of Stata output for regression (3)

Variable	Coefficient	Robust Std. Error	t	P>|t|	95% Confidence Interval	
Lndist	.0017601	.0006812	2.58	0.010	.0004249	.0030953
Border	.0030536	.0007297	4.18	0.000	.0016233	.0044839

[15] 85*300(number of oblast pairs)=25500

[16] For East-West political border

[17] One oblast dummy has to be excluded to avoid perfect collinearity. I excluded dummy for Chernigiv oblast

For this particular regression coefficients of both natural log of distance and border dummy are highly significant. Both of them are greater than zero, which corresponds to theoretical predictions, since one would expect price dispersion to be higher for more distant oblasts and those separated by a border. According to the results of regression, increase of distance between oblasts by 1% raises price dispersion by 1.76%.

Economic significance of the border can be computed according to the formula proposed by Parsley and Wei (2001):

$Z = \overline{dist} * (\exp(\beta_2 / \beta_1) - 1)$ =762*exp(0.0030536/.0017601)-1)=560 km, which is negligibly small value in comparison with findings of Engel and Rogers (1996), who estimated the effect of Canada-US border to be equivalent to 75000 miles.

R-squared for this regression equals to 0.7724, so the model has rather high explanatory power. Coefficients of all 85 product dummies are highly significant (p-value = 0.000), suggesting that price volatility has some important product-specific features. 21 out of 24 oblast dummies[18] are significant at 5% level of significance, which means that oblast-specific characteristics also have substantial impact on price dispersion. For instance, some oblasts might have more integrated markets with the rest of Ukraine than the other. Then, price volatility for oblast pairs containing these oblasts would be lower on average, and vice versa. In a given regression oblast pairs that include either Kirovogradska, or Ternopilska, or Cherkaska oblasts appeared to have price dispersion above mean.

[18] To save space, I do not provide Stata output for 85 product dummies and 24 product dummies. Henceforth only results for the variables of special interest are provided.

If to run regression (3) but exclude border dummy from it, R-squared will remain essentially the same but the coefficient of logged distance will be twice as high as in the original regression. This will happen because now the coefficient will show not only the effect of distance but also, implicitly, effect of the border – omitted variable in this specification. Even in the original regression (3) there could be a misspecification bias because historical borders and/or Dnipro River might also matter for the magnitude of price dispersion between the oblasts in Ukraine. Besides, oblasts that share common border might have lower relative price volatility. So, next I will run regression (3) augmented by historical and common border dummies and the Dnipro River dummy.

I constructed the Dnipro River dummy the way that it takes on value 1 any time oblast pair contains oblasts located on different sides of the Dnipro River, and 0 if they are located on the same side. However, there are some oblasts (Dnipropetrovska, Kyivska, Khersonska and Cherkaska), which are crossed by the Dnipro river in the middle. I assume that in these oblasts the river effect is already incorporated in the intra-oblast price dispersion, so for pairs containing these oblasts the Dnipro River dummy always equals to zero.

From a theoretical standpoint, I would expect coefficients of the historical border and Dnipro dummies to be positive, and of common border dummy – negative. These predictions hold for coefficients of Dnipro and common border dummies but not of historical border. But, actually, it is not very important, since all of them are insignificant anyway. So, no evidence that the regression (3) has misspecification bias is found so far.

Running regression (4) with quadratic specification of distance proves concave relationship of distance: coefficient of distance is positive and statistically significant at 5% level of significance, and coefficient of squared distance –

negative and significant at 10% level. Border dummy coefficient remains positive and highly significant in this specification.

Table 6. Summary of Stata output for regression (4)

Variable	Coefficient	Robust Std. Error	t	P>|t|	95% Confidence Interval
Distance	9.57e-06	4.06e-06	2.36	0.018	1.62e-06 .0000175
Dist-sqr	-5.11e-09	3.06e-09	-1.67	0.095	-1.11e-08 8.97e-10
Border	.0031926	.0007576	4.21	0.000	.0017078 .0046775

Controlling explicitly for heteroscedasticity (running regression (7):

$$V(P_{jkt}^i)/\ln dist_{jk} = \beta_1^i + \beta_2^i(Border_{jk}/\ln dist_{jk}) + \sum_{m=1}^{N}\gamma_m^i(D_m/\ln dist_{jk}) + v_{jk})$$

does not alter general results. Coefficient of the border dummy remains significant and approximately of the same size (0.003412).

Since most of 24 oblast dummies are statistically significant in all the mentioned specifications, I find it reasonable to try to include in the model 299 dummies for all but one oblast pairs. The rationale is that if oblast-specific features influence substantially price dispersion, then, possibly, oblast pair-specific features also do. Inclusion of 299 more explicative variables is not going to hurt degrees of freedom too badly because I have very large number of observations – 25500. But after all I find out that coefficients of only about a dozen out of 299 oblast pair dummies are significant at 5% level of significance, and just one – at 1% significance level.

Up till now I was conducting my analysis using just one measure of price volatility, namely standard deviation of the first difference of logs of relative prices. But it is worthwhile to consider also 7 other price volatility measures mentioned in the section on methodology, namely:

- standard deviation of $\log(\frac{P^i_{j,t}}{P^i_{k,t}})$ (volatility2);
- spread between 10th and 90th percentile of P^i_{jkt}, where $P^i_{jkt} = \log(\frac{P^i_{j,t}}{P^i_{k,t}}) - \log(\frac{P^i_{j,t-1}}{P^i_{k,t-1}})$ (volatility 3) or $\log(\frac{P^i_{j,t}}{P^i_{k,t}})$ (volatility 4);
- inter-quartile range of P^i_{jkt} (volatility 5 and 6);
- mean P^i_{jkt} (volatility 7 and 8).

I duplicated main points of my analysis for these volatility measures. Short summary of results can be found in the table below.

Table 7. Main Stata output for specification (3) with volatility 2 to 8 as a dependent variable

Variable	Coefficient	Robust Std. Error	t	P>|t|	95% Confidence Interval	
Volatility 2 (R-sqr = 0.8259)						
Lndist	.0053094	.0007702	6.89	0.000	.0037998	.0068191
Border	.0010746	.0008894	1.21	0.227	-.0006686	.0028178
Volatility 3 (R-sqr = 0.8938)						
Lndist	.003103	.0006455	4.81	0.000	.0018377	.0043682
Border	.0003144	.0007991	0.39	0.694	-.0012519	.0018807
Volatility 4 (R-sqr = 0.8315)						
Lndist	.0150636	.0018978	7.94	0.000	.0113438	.0187834
Border	.001789	.0022003	0.81	0.416	-.0025238	.0061018
Volatility 5 (R-sqr = 0.9074)						
Lndist	.0014993	.0002471	6.07	0.000	.0010151	.0019835
Border	.0000591	.000304	0.19	0.846	-.0005366	.0006549
Volatility 6 (R-sqr = 0.7646)						
Lndist	.008711	.0012356	7.05	0.000	.0062892	.0111327
Border	.0013757	.0015331	0.9	0.370	-.0016294	.0043807
Volatility 7 (R-sqr = 0.0485)						
Lndist	.0000294	.0001804	0.16	0.871	-.0003242	.0003829
Border	.0005355	.0002217	2.41	0.016	.0001008	.0009701
Volatility 8 (R-sqr = 0.0821)						
Lndist	-.0032037	.0031969	-1	0.316	-.0094698	.0030624
Border	.0208572	.0039093	5.34	0.000	.0131948	.0285196

As noted in section on methodology, measures of volatility 3-6 ignore outliers, whereas volatilities 7-8 give them rather high weigh. According to Table 7, for all the volatilities ignoring outliers R-squared is rather high, log of distance has big explanatory power, whereas political border appears to be insignificant. For volatilities which take outliers into account the situation is the opposite. Quite logically, R-squared is very small for them because outliers usually reflect some shocks. However, it is a bit surprising that logged distance has no substantial impact on them, whereas border is important.

For regressions with volatilities 2-6 as dependent variables the Dnipro River, historical and common border dummies were insignificant. However, for volatilities 7-8 common border dummy becomes highly significant (p-value = 0.001 and 0.000 respectively) and has negative sign as expected, since oblasts that have a common border are supposed to have more integrated markets and, therefore, lower price dispersion. Roughly 95% of all product dummies and 75% of oblast dummies are significant for all these volatility measures, so product-specific and oblast-specific effects repeatedly prove to be important.

The analysis of different volatilities has already shown that the results obtained from regression (3) are not robust, so there is not much sense to present any other check on robustness like split of the sample or exclusion of some products. I proceed further by testing the importance of wage volatility, differences in the average gross added value per capita, percentage of people who voted for Yushchenko in 2004 and share of Russian-speaking population in explaining price dispersion across oblasts.

For the analysis of the impact of wage volatility on price dispersion I use two different ways to compute wage volatility, which are essentially counterparts to

the first and second measures of price volatility: standard deviation of w^i_{jkt}, with

$w^i_{jkt} = \log(\frac{w^i_{j,t}}{w^i_{k,t}}) - \log(\frac{w^i_{j,t-1}}{w^i_{k,t-1}})$ (wage volatility 1) or $\log(\frac{w^i_{j,t}}{w^i_{k,t}})$ (wage volatility 2).

Since there are differences in periods for which price data for various products are available, as stated in 'Data description' section, I compute separately measures of wage volatility correspondent to each product and then pool them over all the products. However, some disparities can not be eliminated because price data for 30 out of 85 products are available starting from 1997, whereas wage data are available only from 1999.

After computing wage volatilities I run two pooled regression of the general form:

$$V(P_{jkt}) = \beta_1 \ln dist_{jk} + \beta_2 Border_{jk} + \beta_3 V(w_{jkt}) + \sum_{i=1}^{K} \lambda_i G_i + \sum_{m=1}^{N-1} \gamma_m D_m + u_{jk}$$

In pooled regression 1 with $P^i_{jkt} = \log(\frac{P^i_{j,t}}{P^i_{k,t}}) - \log(\frac{P^i_{j,t-1}}{P^i_{k,t-1}})$ and $w^i_{jkt} = \log(\frac{w^i_{j,t}}{w^i_{k,t}}) - \log(\frac{w^i_{j,t-1}}{w^i_{k,t-1}})$ coefficient of wage volatility is statistically significant at 5% level of significance but surprisingly has a negative sign. In pooled regression 2 it is insignificant. These unexpected results could be partly due to lack of correspondence between the periods for which price volatility and wage volatility are computed as mentioned above.

To test the significance of differences in political and linguistic preferences, I use data on percentage of people who voted for Yushchenko at Presidential elections 2004 and percentage of people who consider Russian their native language to

compute differences for all oblast pairs. This allows me to receive two explicative variables – proxies of political and linguistic preferences. I add them to model (3) and run 8 pooled regressions with different measures of price volatility.

Differences in political preferences appear to have no direct impact on the price dispersion, since coefficient of this variable is insignificant in all 8 specifications. A possible explanation can be that political preferences in reality are important but have to enter regression in a different functional form.

There is some evidence, however, about positive influence of differences in linguistic preferences on price dispersion. Its coefficient is positive and statistically significant for specifications with volatilities 6, 7 and 8. This corresponds to theoretical predictions and means that the more different are two oblasts according to language preferences, the higher price dispersion one might expect for them. Besides, native language might reflect person's origin and, therefore, some cultural differences, including preferences what products to consume.

Table 7. Testing for significance of linguistic differences

Variable	Coefficient	Robust Std. Error	t	P>|t|
Language (volatility 6)	.0170623	.0013244	2.05	0.040
Language (volatility 7)	.0033063	.0012093	2.73	0.006
Language (volatility 8)	.0796957	.021798	3.66	0.000

Analysis of variation in gross added value per capita across oblasts, which can be used as a proxy for income and wealth, also produces some interesting results. This variable appeared to be significant in 4 out of 8 pooled regressions and always higher than zero. This means the more different are two oblasts in terms of wealth the higher price dispersion can be expected for the them. It can also potentially mean pricing-to-market behavior of the firms.

Variable	Coefficient	Robust Std. Error	t	P>|t|
Relative GAV per capita (volatility 1)	.002171	.0012135	1.79	0.074
Relative GAV per capita (volatility 3)	.0023648	.0010939	2.16	0.031
Relative GAV per capita (volatility 7)	.0056722	.0003312	17.13	17.13
Relative GAV per capita (volatility 8)	.1711945	.0058568	29.23	0.000

I also run simple OLS regressions for each of 85 products separately with volatility 1 and volatility 2 as dependent variables. This brings the following results (see Appendix H2 for more detail):

I. For volatility 1:

- logged distance is positive and significant[19] for 14 food products, 2 nonfood products and 4 services;
- political border is positive and significant for 6 food products, 3 nonfood products and 9 services;
- historical border is positive and significant for 3 food products, 5 nonfood products and 1 service;
- common border is negative and significant for 4 food products, 1 nonfood product and 2 services;
- Dnipro River is positive and significant for food products, 3 nonfood products and no services.

II. For volatility 2:

- Logged distance is positive and significant for 18 food products, 6 nonfood products and 1 service;

[19]Significant stands for significant at 10% level of significance in the analysis of separate OLS regressions for each product

- political border is positive and significant for 12 food products, 3 nonfood products and 3 services;
- historical border is positive and significant for 3 food products, 5 nonfood products and 2 services;
- common border is negative and significant for 1 food product, no nonfood products and no services;
- Dnipro River is positive and significant for 4 food products, 2 nonfood products and 2 services.

So, separate OLS regressions for 85 products do not give strong evidence on the border effect.

Running pooled regressions with standard deviation of P^i_{jkt} as a dependent variable ($P^i_{jkt} = \log(\frac{P^i_{j,t}}{P^i_{k,t}}) - \log(\frac{P^i_{j,t-1}}{P^i_{k,t-1}})$ in specification 1 and $P^i_{jkt} = \log(\frac{P^i_{j,t}}{P^i_{k,t}})$ in specification 2 allows drawing the following conclusions (see Appendix C1 for Stata output of selected pooled regressions): distance is highly significant in both specifications;

- political border is highly significant in specification 1 but not in specification 2;
- historical border is statistically insignificant in both specifications[20];
- common border dummies are statistically insignificant in both specifications;
- around 95% of oblast dummies are highly significant in both specifications;

[20] Inclusion both political and historical border dummies into regression simultaneously does not change the results

- around 80% of product dummies are highly significant in both specifications;
- river dummies are statistically insignificant in both specifications.

Adjusted R^2 equals about 0.7723 in specification1 and about 0.8259 in specification2. Introduction of the border dummy into regression does not increase adjusted R^2 substantially but reduces the size of the distance coefficient.

I also tried running pooled regressions with quadratic specification of distance. It did not influence the results.
Running simple OLS regressions for each of 85 products separately brought the following results (see Appendix C2):
III. Specification 1:

- distance is positive and significant for 20 food products, 4 nonfood products and 16 services;
- political border is positive and significant for 5 food products, 3 nonfood products and 8 services;
- historical border is positive and significant for 3 food products, 1 nonfood product and 4 services;

IV. Specification 2:

- distance is positive and significant for 19 food products, 4 nonfood products and 1 service;
- political border is positive and significant for 9 food products, 2 nonfood products and 2 services;
- historical border is positive and significant for 2 food products, 3 nonfood products and 1 service.

This does not provide strong evidence for the border effect in Ukraine, since coefficient of the East-West border is insignificant in most of separate OLS regressions for 85 products. However, it demonstrates that the effect of this

border on the price dispersion is larger than of historical border, common borders and Dnipro River.

I also tried finding the 'true' East-West border suggested by data. In order to do this, I generated 205 potentially possible East-West divisions from the map of Ukraine. Then, I created correspondent border dummies, and ran regression (3) for 8 different measures of price volatility and 205 different East-West border dummies (1640 regressions in total). I found borders, which were significant and had the highest values for most of these 8 price volatilities. According to this analysis, the political border was among the best candidates for the 'true' East-West border.

Chapter 6

CONCLUSIONS

There is some evidence that political border has a positive impact on the price dispersion across the oblasts of Ukraine but its economic significance is not very high. When converted into distance units this border is equivalent to about 560 kilometers, which is rather low figure in comparison with findings of other researchers for other countries.

Not all of the measures of price volatility reveal positive and significant border effect, so the results are not robust. Still, the political border appears to have much higher explanatory power of the price dispersion than historical border, common borders between oblasts, the Dnipro River and wage volatility. Moreover, political border is a good candidate for the 'true' East-West border of Ukraine according to actual data. So, its role definitely should not be ignored.

However, some fixed product-specific and oblast-specific features explain much larger part of the price volatility, which suggests that Ukrainian markets are more segmented by product and oblast than by hypothetical 'East-West' border.

Distances between locations, which approximate well shipping costs, are also consistently proven to have a positive effect on the price dispersion.

Also, differences in the linguistic preferences and gross added value per capita appear to matter for price volatility across the oblasts of Ukraine. The impact of the former could reflect people's heterogeneity by origin, which influences their consumption preferences. Both are likely to be connected to the pricing-to-

market behavior of the firms, which implies that Ukrainian markets are not very competitive.

These findings can have some important policy implications for Ukrainian government:

- language issues should be given more attention, since they matter not only from the social and political perspectives but also have some economic meaning;

- economic competition policies must be reviewed and improved to insure the competitive environment and lack of opportunities for pricing-to-market behavior of the firms.

However, the evidence of economic nature of the East-West political border does not seem strong enough to support the need of transforming Ukraine into the federal state.

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APPENDIX A. DIFFERENT DIVISIONS OF UKRAINE

A1. Political division

WEST	% voted for Yushchenko in 2004	% voted for pro-Yushchenko parties* in 2006	**EAST**	% voted for Yanukovych in 2004	% voted for pro-Yanukovych party** in 2006
Vinnytska	84.07%	70.84%	Crimea	81.26%	57.92%
Volynska	90.71%	76.99%	Dnipropetrovska	61.13%	44.95%
Zhytomyrska	66.86%	54.02%	Donetska	93.54%	73.63%
Zakarpatska	67.45%	53.74%	Zaporizka	70.14%	51.23%
Ivano-Frankivska	95.72%	86.36%	Luganska	91.24%	74.27%
Kyivska	82.70%	70.37%	Mykolayivska	67.13%	50.35%
Kirovogradska	63.40%	50.51%	Odeska	66.56%	47.48%
Lvivska	93.74%	82.12%	Kharkivska	68.12%	51.66%
Poltavska	66.00%	55.40%	Khersonska	51.32%	39.14%
Rivnenska	84.52%	73.39%			
Sumska	79.45%	66.06%			
Ternopilska	96.03%	85.55%			
Khmelnytska	80.47%	67.22%			
Cherkaska	79.10%	67.66%			
Chernivetska	79.75%	65.78%			
Chernigivska	71.15%	60.31%			

* Block of Yuliya Tymoshenko, block 'Nasha Ukrayina', Socialistic party of Ukraine, block of Kostenko and Plyushch, block 'Pora-PRP'
** Party of regions

A2. Historical division

WEST	Ivano-Frankivska, Lvivska, Ternopilska, Volynska, Rivnenska, Zakarpatska, Chernivetska	Lands in the Western Ukraine that were joined to Soviet Union in 1944
NORTH-CENTER	Kyivska, Vinnytska, Zhytomyrska, Kirovogradska, Khmelnytska, Cherkaska	The rest of the Right Bank territory of Ukraine that was under Polish control from the time of the Polish-Lithuanian Commonwealth to the Second Partition of Poland in 1793
NORTH-EAST	Chernigivska, Poltavska, Sumska	The Left Bank Ukraine that was under Russia during the same period
SOUTH	Dnipropetrovska, Zaporizka, Mykolayivska, Odeska, Khersonska, Crimea	The Southern Ukraine which unites historical region of Zaporizhya, former Ottoman Black Sea littoral and the Crimean peninsula
EAST	Donetska, Luganska, Kharkivska	Eastern regions with heavy industrialization and in-migration from Russia

APPENDIX B. DESCRIPTION OF THE PRICE DATA

B1. Food price data

Product	Units	Period	Product	Units	Period
Wheat bread	1 kg	2003:1-2004:12	Butter	1 kg	1997:1-2004:12
Rye bread	1 kg	1999:1-2004:12	Sunflower oil	1 liter	1997:1-2004:12
Bun	500 g	1999:1-2004:12	Milk	1 liter	1997:1-2004:12
Flour	1 kg	1997:1-2004:12	Sour cream	1 kg	1997:1-2004:12
Rice	1 kg	1997:1-2004:12	Hard cheese	1 kg	1997:1-2004:12
Semolina	1 kg	1997:1-2004:12	Eggs	10-pack	1997:1-2004:12
Buckwheat	1 kg	1999:1-2004:12	Sugar	1 kg	1997:1-2004:12
Oats	1 kg	1999:1-2004:12	Potatoes	1 kg	1997:1-2004:12
Beef	1 kg	1997:1-2004:12	Cabbage	1 kg	1997:1-2004:12
Pork	1 kg	1997:1-2004:12	Onions	1 kg	1997:1-2004:12
Poultry	1 kg	1997:1-2004:12	Beets	1 kg	1997:1-2004:12
Lard	1 kg	1997:1-2004:12	Carrots	1 kg	1997:1-2004:12
Smoked sausage	1 kg	2001:7-2002:12	Vodka (alcohol)	1 liter	1997:1-2004:12
Boiled sausage	1 kg	1999:1-2001:6	Mineral water	1 liter	1997:1-2002:12
Herring	1 kg	1997:1-2004:12			

B2. Nonfood price data

Product	Units	Period	Product	Units	Period
Man's suit	1 item	2001:7-2003:12	Household soap	200 g	1997:1-2002:12
Man's shirt	1 item	2000:1-2003:12	Toilet-soap	100 g	2001:7-2002:12
Man's trousers	1 item	1999:1-2001:6	Toothpaste	1 item	2000:1-2001:6
Woman's skirt	1 item	1997:1-2003:12	Exercise-book	1 item	2000:1-2001:6
Children's tracksuit	1 item	2001:7-2002:12	Vessel widening medicine	10 pills	2001:7-2002:12
Children's jacket	1 item	1997:1-2003:12	Aspirin, analgin	10 pills	1999:1-2001:6
Children's dress	1 item	2001:7-2003:12	Antibiotics	10 pills	2000:1-2001:6
Children's T-shirt	1 item	2000:1-2001:6	TV set	1 item	2000:1-2003:12
Rompers	1 item	1999:1-2001:6	Refrigerator	1 item	1997:1-2003:12
Sweater, jumper	1 item	2000:1-2002:12	Sofa, bed	1 item	1997:1-2002:12
Man's socks	1 pair	2000:1-2002:12	Writing-table	1 item	2001:7-2002:12
Woman's stockings	1 pair	1997:1-2002:12	Kitchen table	1 item	2000:1-2001:6
Children's stockings	1 pair	1997:1-2002:12	Bricks	1000 items	2000:1-2001:6
Man's boots	1 pair	1997:1-2003:12	Cement	50 kg	2001:7-2002:12
Woman's boots	1 pair	1997:1-2003:12	Wallpapers	10 m	2001:7-2003:12
Children's boots	1 pair	2000:1-2002:12	Petrol	1 liter	1999:1-2004:12
Wool cloth	1 m	2000:1-2001:6	Diesel fuel	1 liter	2002:1-2004:12
Sheet	1 item	2000:1-2001:6			

B3. Services price data

Product	Units	Period	Product	Units	Period
Dry-cleaning	1 item	2000:1-2002:12	Watch repair service	1 item	2000:1-2001:12
Laundry and ironing	1 kg	1997:1-2002:12	Parking fee	24 hours	2000:1-2001:12
Bath-house service	1 hour	2000:1-2002:12	Freight transportation	1 service	2002:1-2002:12
Man's haircut	1 service	1997:1-2002:12	Staying at the hotels	24 hours	2002:1-2002:12
Woman's haircut	1 service	2000:1-2001:12	Services of preschool institutions	1 day	2002:1-2002:12
Chemical hair curling	1 service	1999:1-1999:12	Services of higher education institutions	1 month	2002:1-2002:12
Dental services	1 item	2002:1-2002:12	Theatres	1 ticket	2002:1-2002:12
Trousers sewing	1 item	1999-2000:12	Video tapes hire	24 hours	2000:1-2001:12
Dress sewing	1 item	1999-2000:12	Photo for documents service	6 photos	1997:1-2002:12
Man's trousers repair service	1 pair	2000:1-2001:12	Art color photo service	3 photos	2001:1-2001:12
Shoes repair service	1 pair	1997:1-2002:12			

APPENDIX C. SUMMARY STATISTICS OF THE PRICE DATA

C1. Food price data

Product	Prices, UAH			Relative prices			Log of relative prices			Difference of logs of relative prices		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Wheat bread	1.75	2.74	0.96	0.987	1.57	0.65	-0.0222	0.45	-0.44	-0.00182	0.42	-0.46
Rye bread	1.39	2.33	0.68	1.010	1.73	0.57	-0.0012	0.55	-0.56	0.00004	0.39	-0.34
Bun	1.48	2.60	0.63	1.064	2.48	0.39	0.0400	0.91	-0.95	0.00068	0.85	-0.95
Flour	1.43	2.51	0.67	1.025	1.47	0.69	0.0200	0.39	-0.37	-0.00019	0.27	-0.30
Rice	2.53	3.94	1.37	1.003	1.53	0.63	0.0004	0.43	-0.47	-0.00010	0.34	-0.41
Semolina	1.83	3.07	0.86	1.021	1.66	0.66	0.0158	0.51	-0.42	-0.00035	0.33	-0.32
Buckwheat	2.82	5.48	1.22	1.022	1.64	0.61	0.0168	0.49	-0.49	0.00038	0.63	-0.63
Oats	2.29	3.99	0.70	1.092	2.92	0.34	0.0472	1.07	-1.09	-0.00016	0.84	-0.75
Beef	8.66	22.48	2.13	1.034	1.94	0.53	0.0168	0.66	-0.63	-0.00010	0.59	-0.61
Pork	10.87	27.39	2.97	1.051	2.17	0.53	0.0347	0.77	-0.64	-0.00020	0.54	-0.55
Poultry	8.42	14.13	2.87	1.014	1.79	0.50	0.0063	0.58	-0.69	-0.00024	0.48	-0.51
Lard	7.86	20.14	2.40	1.041	2.63	0.39	0.0227	0.97	-0.94	0.00025	0.68	-0.70
Smoked sausage	20.85	26.30	14.85	1.041	1.70	0.63	0.0276	0.53	-0.45	0.00295	0.45	-0.42
Boiled sausage	10.47	18.04	6.83	1.026	1.64	0.60	0.0160	0.50	-0.51	0.00033	0.32	-0.26
Herring	5.79	11.38	2.73	1.013	1.71	0.60	0.0082	0.53	-0.51	-0.00019	0.52	-0.55
Butter	10.44	16.29	5.19	1.017	1.67	0.65	0.0109	0.51	-0.43	0.00010	0.29	-0.25
Sunflower oil	4.52	7.07	1.37	1.030	1.99	0.53	0.0215	0.69	-0.64	-0.00004	0.57	-0.49
Milk	1.33	2.73	0.40	1.110	3.30	0.39	0.0653	1.19	-0.94	-0.00078	0.43	-0.44
Sour cream	5.42	10.23	1.97	1.069	2.80	0.43	0.0449	1.03	-0.85	-0.00082	0.37	-0.39
Hard cheese	13.53	22.02	5.79	1.016	2.00	0.47	0.0093	0.69	-0.75	-0.00022	0.50	-0.53
Eggs	2.71	5.27	0.80	1.011	2.26	0.46	0.0057	0.82	-0.77	-0.00013	0.62	-0.59
Sugar	2.31	3.74	0.75	1.015	1.48	0.68	0.0128	0.39	-0.38	0.00015	0.31	-0.30
Potatoes	0.96	2.82	0.20	1.087	3.79	0.26	0.0403	1.33	-1.34	0.00014	1.48	-1.03
Cabbage	1.00	4.18	0.11	1.061	3.79	0.25	0.0095	1.33	-1.39	-0.00053	1.63	-1.85
Onions	1.60	4.31	0.33	1.026	3.70	0.25	0.0021	1.31	-1.38	-0.00045	1.33	-1.75
Beets	0.93	4.83	0.15	1.098	5.67	0.15	0.0404	1.73	-1.90	-0.00040	1.52	-1.66
Carrots	1.32	5.80	0.29	1.105	5.56	0.22	0.0458	1.71	-1.50	0.00085	1.47	-1.85
Vodka (alcohol)	12.19	19.44	5.59	1.009	1.94	0.54	0.0027	0.66	-0.61	0.00022	0.49	-0.46
Mineral water	1.09	3.00	0.46	1.083	2.83	0.34	0.0558	1.04	-1.07	-0.00067	0.93	-0.94
Food products	**5.10**	**27.39**	**0.11**	**1.041**	**5.67**	**0.15**	**0.0212**	**1.73**	**-1.90**	**-0.00005**	**1.63**	**-1.85**

C2. Nonfood price data

Product	Prices, UAH			Relative prices			Log of relative prices			Difference of logs of relative prices		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Man's suit	314.07	475.00	200.59	1.028	2.37	0.50	-0.0039	0.86	-0.70	-0.00002	0.86	-0.68
Man's shirt	35.17	63.53	15.00	0.991	2.25	0.45	-0.0360	0.81	-0.80	-0.00077	0.65	-0.70
Man's trousers	59.09	91.72	29.73	1.058	2.73	0.42	0.0217	1.01	-0.86	-0.00046	0.82	-0.57
Woman's skirt	47.85	91.21	13.39	1.068	3.70	0.36	0.0291	1.31	-1.03	-0.00053	0.60	-0.74
Children's tracksuit	53.66	87.88	29.17	1.081	2.86	0.42	0.0247	1.05	-0.87	0.00256	1.06	-0.79
Children's jacket	70.27	136.53	24.02	1.090	3.22	0.41	0.0449	1.17	-0.89	-0.00045	1.13	-0.99
Children's dress	50.63	94.65	10.05	1.247	6.70	0.14	0.1049	1.90	-2.00	0.00301	2.19	-1.95
Children's T-shirt	6.25	9.63	4.08	1.124	2.35	0.52	0.0879	0.85	-0.66	0.00293	0.66	-0.48
Rompers	4.85	7.69	3.17	1.091	2.14	0.55	0.0669	0.76	-0.60	0.00197	0.54	-0.52
Sweater, jumper	54.77	103.09	21.28	1.048	3.89	0.32	-0.0028	1.36	-1.14	0.00077	1.18	-1.28
Man's socks	3.31	4.41	2.02	1.005	1.55	0.63	-0.0097	0.44	-0.46	0.00002	0.46	-0.39
Woman's stockings	4.09	8.44	1.35	1.113	2.91	0.35	0.0618	1.07	-1.04	0.00100	0.76	-0.69
Children's stockings	4.82	8.92	2.67	1.031	1.70	0.54	0.0207	0.53	-0.62	-0.00033	0.71	-0.48
Man's boots	134.39	247.49	51.86	1.032	2.60	0.47	0.0098	0.96	-0.76	-0.00030	0.68	-0.63
Woman's boots	177.92	430.00	58.93	1.040	3.54	0.36	0.0105	1.26	-1.02	0.00031	1.14	-1.09
Children's boots	86.74	141.30	29.01	1.025	3.12	0.38	-0.0123	1.14	-0.97	-0.00110	0.98	-1.24
Wool cloth	28.49	46.07	19.60	1.046	2.21	0.46	0.0175	0.79	-0.77	0.00071	0.66	-0.77
Sheet	13.95	17.53	11.14	1.002	1.48	0.72	-0.0055	0.39	-0.33	0.00012	0.29	-0.28
Household soap	0.85	1.36	0.55	1.048	1.80	0.55	0.0369	0.59	-0.59	0.00053	0.55	-0.38
Toilet-soap	1.35	2.19	0.97	1.057	2.26	0.51	0.0282	0.81	-0.67	0.00121	0.73	-0.61
Toothpaste	3.05	5.05	1.85	1.135	2.73	0.43	0.0681	1.00	-0.84	0.00538	0.93	-0.77
Exercise-book	0.32	0.44	0.19	1.066	1.71	0.61	0.0510	0.54	-0.49	0.00234	0.46	-0.39
Vessel widening medicine	1.84	5.97	0.62	1.120	9.63	0.13	0.0177	2.26	-2.04	-0.00141	2.26	-2.04
Aspirin, analgin	0.76	1.73	0.40	1.267	4.22	0.29	0.0890	1.44	-1.24	0.00404	1.21	-1.23
Antibiotics	3.18	8.31	1.84	1.189	3.87	0.32	0.1124	1.35	-1.13	0.00371	1.25	-1.13
TV set	1266.10	1760.02	1021.33	1.009	1.64	0.63	-0.0019	0.50	-0.46	0.00030	0.50	-0.47
Refrigerator	1070.34	1721.19	473.77	1.003	2.05	0.38	-0.0154	0.72	-0.96	0.00052	0.51	-0.51
Sofa, bed	644.93	1349.34	278.31	1.061	2.54	0.35	0.0304	0.93	-1.04	-0.00022	0.71	-0.90
Writing-table	331.15	735.33	208.07	1.133	3.30	0.42	0.1017	1.19	-0.88	0.00619	0.55	-0.46
Kitchen table	186.65	254.84	105.71	1.024	2.17	0.42	-0.0028	0.77	-0.86	-0.00097	0.65	-0.67
Bricks	274.98	613.00	131.49	1.208	3.96	0.30	0.0923	1.38	-1.21	0.00612	1.13	-1.10
Cement	14.68	29.89	11.67	1.049	2.55	0.49	0.0322	0.94	-0.72	0.00170	0.97	-0.97
Wallpapers	14.73	25.09	7.42	1.070	3.23	0.34	0.0258	1.17	-1.09	0.00036	1.15	-1.09
Petrol	1.76	3.20	0.68	1.015	2.77	0.38	0.0102	1.02	-0.98	0.00007	0.95	-0.98
Diesel fuel	1.70	2.83	0.96	1.016	1.28	0.81	0.0143	0.24	-0.21	0.00007	0.28	-0.22
Nonfood products	**141.96**	**1760.02**	**0.19**	**1.074**	**9.63**	**0.13**	**0.0320**	**2.26**	**-2.04**	**0.00113**	**2.26**	**-2.04**

C3. Services price data

Product	Prices, UAH			Relative prices			Log of relative prices			Difference of logs of relative prices		
	Avg	Max	Min	Avg		Avg	Max	Min	Avg		Avg	Max
Dry-cleaning	25.70	57.89	6.93	1.107	4.64	0.17	0.0120	1.54	-1.75	-0.00004	1.54	-1.74
Laundry and ironing	1.80	3.35	0.55	1.197	3.75	0.39	0.1220	1.32	-0.94	-0.00188	0.54	-0.64
Bath-house service	3.47	7.15	1.00	1.295	6.00	0.14	0.1190	1.79	-1.97	0.00328	1.28	-1.24
Man's haircut	5.50	12.35	1.80	1.231	4.49	0.29	0.0829	1.50	-1.22	-0.00058	0.32	-0.45
Woman's haircut	10.85	16.48	5.10	1.128	2.71	0.44	0.0582	1.00	-0.82	0.00198	1.00	-0.79
Chemical hair curling	17.86	28.27	10.61	1.104	2.59	0.38	0.0435	0.95	-0.96	0.00374	0.93	-0.89
Dental services	24.54	38.46	9.11	1.224	4.22	0.24	0.0937	1.44	-1.42	0.00706	1.31	-1.29
Trousers sewing	23.22	37.85	11.08	1.158	2.90	0.43	0.0789	1.06	-0.85	0.00296	0.98	-0.85
Dress sewing	35.13	52.96	15.19	1.148	2.91	0.41	0.0569	1.07	-0.90	0.00155	1.07	-0.90
Man's trousers repair service	4.33	7.33	2.00	1.050	2.79	0.33	-0.0124	1.03	-1.10	0.00096	0.95	-1.06
Shoes repair service	4.57	8.61	2.15	1.055	2.33	0.42	0.0219	0.85	-0.86	-0.00009	0.33	-0.32
Watch repair service	7.06	12.94	3.60	1.173	3.40	0.41	0.0980	1.22	-0.88	0.00402	1.19	-0.84
Parking fee	2.10	3.09	1.11	1.038	2.62	0.36	-0.0168	0.96	-1.02	-0.00078	0.96	-0.93
Freight transportation	33.95	63.88	13.17	1.131	4.85	0.21	-0.0481	1.58	-1.55	-0.00395	1.46	-1.42
Staying at the hotels	47.36	83.19	18.72	1.238	4.06	0.36	0.1251	1.40	-1.02	0.01019	1.40	-1.01
Services of preschool institutions	4.03	8.72	1.02	1.104	3.84	0.24	0.0448	1.35	-1.41	0.00646	1.28	-1.04
Services of higher education institutions	212.10	301.26	97.43	1.052	2.77	0.32	-0.0182	1.02	-1.13	-0.00217	1.02	-1.13
Theatres	5.79	8.06	2.00	1.115	3.67	0.25	0.0111	1.30	-1.39	0.00228	1.19	-1.39
Video tapes hire	1.45	2.69	0.66	1.057	3.77	0.31	-0.0273	1.33	-1.18	-0.00131	0.99	-0.99
Photo for documents service	5.63	9.12	1.86	1.067	3.29	0.33	0.0285	1.19	-1.11	-0.00044	0.52	-0.50
Art color photo service	11.67	14.62	6.96	1.062	2.06	0.51	0.0291	0.72	-0.67	0.00238	0.65	-0.65
Services	**23.24**	**301.26**	**0.55**	**1.130**	**6.00**	**0.14**	**0.0430**	**1.79**	**-1.97**	**0.00170**	**1.54**	**-1.74**

APPENDIX D. AVERAGE PERCENTAGE DIFFFERENCES OF ABSOLUTE AND RELATIVE PRICES

D1. Food price data

	Absolute prices			Relative prices		
Name of product	**East-West**	**East-East**	**West-West**	**East-West**	**East-East**	**West-West**
Wheat bread	0.09102	0.09452	0.09189	0.06954	0.06721	0.06849
Rye bread	0.08634	0.08110	0.09575	0.04729	0.04873	0.04661
Bun	0.13134	0.15936	0.11022	0.06794	0.08113	0.05444
Flour	0.07694	0.07211	0.07809	0.04548	0.04338	0.04505
Rice	0.07015	0.07477	0.05657	0.03932	0.03635	0.03523
Semolina	0.07451	0.07462	0.07114	0.04023	0.03905	0.04169
Buckwheat	0.08825	0.07696	0.08484	0.06491	0.06018	0.06760
Oats	0.18139	0.16219	0.18603	0.09047	0.08732	0.09453
Beef	0.13289	0.09257	0.15141	0.06602	0.04689	0.07900
Pork	0.12152	0.10010	0.12894	0.06918	0.06075	0.07084
Poultry	0.10258	0.08460	0.11167	0.05863	0.04875	0.06764
Lard	0.14360	0.12324	0.13511	0.07917	0.07926	0.07746
Smoked sausage	0.04132	0.03137	0.04558	0.04858	0.04667	0.04376
Boiled sausage	0.10135	0.05435	0.14439	0.10986	0.03071	0.17094
Herring	0.06768	0.06734	0.06650	0.03935	0.03506	0.04256
Butter	0.07539	0.08211	0.06506	0.03857	0.03945	0.03721
Sunflower oil	0.11178	0.11306	0.08837	0.05818	0.06160	0.05461
Milk	0.15280	0.14709	0.11204	0.05832	0.05439	0.05955
Sour cream	0.13077	0.09438	0.10605	0.05070	0.04843	0.05267
Hard cheese	0.08009	0.07007	0.08173	0.04686	0.04479	0.04832
Eggs	0.09981	0.08036	0.09318	0.09004	0.07999	0.08699
Sugar	0.06618	0.05270	0.05844	0.04927	0.04242	0.04328
Potatoes	0.18600	0.15157	0.18212	0.16272	0.14534	0.16476
Cabbage	0.29413	0.21202	0.28233	0.23657	0.19339	0.24806
Onions	0.20561	0.18851	0.17874	0.18806	0.18708	0.17197
Beets	0.27330	0.20954	0.25505	0.21430	0.17278	0.22397
Carrots	0.26855	0.22339	0.25726	0.22608	0.20575	0.22187
Vodka (alcohol)	0.09288	0.11358	0.06859	0.04350	0.04232	0.04542
Mineral water	0.13550	0.15609	0.11348	0.06124	0.07264	0.05203
Food products	**0.12702**	**0.11185**	**0.12071**	**0.08484**	**0.07592**	**0.08678**

D2. Nonfood price data

	Absolute prices			Relative prices		
Name of product	**East-West**	**East-East**	**West-West**	**East-West**	**East-East**	**West-West**
Man's suit	0.08874	0.10724	0.06873	0.05960	0.06126	0.05935
Man's shirt	0.13668	0.14984	0.11590	0.06363	0.05749	0.06978
Man's trousers	0.11482	0.12258	0.11463	0.07279	0.06561	0.07719
Woman's skirt	0.17878	0.16697	0.17899	0.06759	0.06124	0.07485
Sweater, jumper	0.19093	0.20190	0.18219	0.10682	0.09545	0.11216
Children's jacket	0.21203	0.19195	0.23257	0.10074	0.07528	0.12195
Children's dress	0.21855	0.16089	0.27461	0.16723	0.13769	0.19838
Children's sport suit	0.15491	0.18614	0.12926	0.10693	0.11415	0.10637
Children's T-shirt	0.08806	0.09033	0.08744	0.07104	0.07130	0.07452
Rompers	0.09053	0.10244	0.08184	0.06120	0.06078	0.06463
Man's socks	0.06012	0.05357	0.06939	0.04832	0.04314	0.05652
Woman's stockings	0.18375	0.17807	0.15903	0.08064	0.08437	0.07712
Children's stockings	0.10523	0.09139	0.11018	0.04214	0.04269	0.04429
Man's boots	0.15400	0.14684	0.16919	0.07079	0.06056	0.08197
Woman's boots	0.18461	0.20064	0.17749	0.08127	0.06788	0.09686
Children's boots	0.17422	0.17611	0.17692	0.10981	0.10928	0.11236
Wool cloth	0.06213	0.06031	0.06893	0.06817	0.07311	0.06633
Sheet	0.05139	0.04831	0.04682	0.04497	0.04391	0.04473
Household soap	0.09565	0.08935	0.09817	0.04593	0.04390	0.04894
Toilet-soap	0.09750	0.11480	0.07561	0.08196	0.09113	0.07895
Toothpaste	0.08223	0.07911	0.08763	0.09515	0.09753	0.09778
Exercise-book	0.06198	0.06430	0.06215	0.06010	0.06043	0.05731
Vessel widening medicine	0.21338	0.20757	0.23142	0.18574	0.16365	0.22243
Aspirin, analgin	0.11222	0.13180	0.09111	0.09556	0.10042	0.09726
Antibiotics	0.10343	0.09392	0.11657	0.10258	0.10050	0.11674
TV set	0.07717	0.08964	0.06896	0.04252	0.04077	0.04645
Refrigerator	0.12989	0.13787	0.12165	0.06553	0.06154	0.07157
Sofa, bed	0.15195	0.13204	0.15230	0.07686	0.06845	0.08585
Writing-table	0.07408	0.05845	0.09276	0.06819	0.06232	0.07610
Kitchen table	0.09403	0.06184	0.11324	0.09132	0.06436	0.09689
Wallpapers	0.11771	0.11263	0.11144	0.09005	0.08036	0.09262
Bricks	0.11908	0.12195	0.12089	0.12405	0.11528	0.11257
Cement	0.08874	0.07713	0.10480	0.09435	0.08748	0.10500
Petrol	0.08379	0.08856	0.07856	0.09312	0.09528	0.09229
Diesel fuel	0.04750	0.04623	0.03600	0.04281	0.04061	0.03803
Nonfood products	**0.11999**	**0.11836**	**0.12021**	**0.08227**	**0.07712**	**0.08789**

D3. Services

	Absolute prices			Relative prices		
Name of product	**East-West**	**East-East**	**West-West**	**East-West**	**East-East**	**West-West**
Dry-cleaning	0.12409	0.07466	0.13441	0.12907	0.08106	0.11796
Laundry and ironing	0.17940	0.14297	0.21899	0.05812	0.05015	0.06689
Bath-house service	0.12504	0.12386	0.13341	0.11028	0.10972	0.11272
Man's haircut	0.10997	0.10530	0.11697	0.04136	0.04481	0.03629
Woman's haircut	0.05361	0.05732	0.04948	0.08324	0.06863	0.04673
Chemical hair curling	0.02117	0.02059	0.02171	0.10147	0.06802	0.04237
Dental services	0.05160	0.05333	0.05170	0.11744	0.09213	0.11525
Trousers sewing	0.06517	0.05872	0.07160	0.09890	0.05744	0.05727
Dress sewing	0.05923	0.06019	0.05956	0.09286	0.05897	0.06706
Man's trousers repair service	0.10083	0.08258	0.12178	0.08957	0.08557	0.07804
Shoes repair service	0.10272	0.10207	0.09385	0.03550	0.04312	0.02782
Watch repair service	0.06171	0.04151	0.07806	0.07447	0.06557	0.05796
Parking fee	0.06426	0.05326	0.07689	0.06254	0.04949	0.07226
Freight transportation	0.04155	0.02727	0.05390	0.13202	0.12701	0.14176
Staying at the hotels	0.07688	0.07971	0.07518	0.12717	0.12350	0.11155
Services of preschool institutions	0.17298	0.18006	0.16505	0.11573	0.11617	0.11694
Services of higher education institutions	0.06666	0.10425	0.01913	0.10123	0.10812	0.09847
Theatres	0.05166	0.04886	0.05007	0.12552	0.09903	0.11937
Video tapes hire	0.10345	0.11593	0.09268	0.09760	0.08162	0.08565
Photo for documents service	0.14974	0.11039	0.16308	0.04462	0.03902	0.05118
Art color photo service	0.03596	0.03560	0.03511	0.06914	0.06805	0.06413
Services	**0.08655**	**0.07993**	**0.08964**	**0.09085**	**0.07796**	**0.08037**

APPENDIX E. DEVIATIONS FROM THE AVERAGE PRICE OF 4 BASKETS OF PRODUCTS ACROSS THE OBLASTS OF UKRAINE

Oblasts	Basket of 29 food products	Basket of 35 nonfood products	Basket of 21 services	Basket of all 85 products
Crimea	3.56%	6.23%	5.79%	5.82%
Vinnytska	-3.51%	-3.71%	-3.66%	-3.63%
Volynska	-3.83%	-2.46%	-4.14%	-4.12%
Dnipropetrovska	6.95%	10.80%	12.88%	12.91%
Donetska	8.47%	6.72%	8.08%	8.12%
Zhytomyrska	-2.23%	-8.61%	-9.41%	-9.39%
Zakarpatska	-0.62%	5.25%	4.64%	4.68%
Zaporizka	6.80%	0.08%	1.37%	1.40%
Ivano-Frankivska	-1.20%	-4.55%	-5.13%	-5.10%
Kyivska	4.95%	0.17%	0.59%	0.62%
Kirovogradska	-1.46%	-0.81%	-3.08%	-3.05%
Luganska	0.45%	6.38%	5.69%	5.72%
Lvivska	-1.63%	1.56%	3.00%	3.03%
Mykolayivska	0.16%	-2.93%	-2.40%	-2.37%
Odeska	3.05%	-0.43%	0.45%	0.48%
Poltavska	1.32%	-2.98%	-2.44%	-2.41%
Rivnenska	-5.29%	1.80%	1.10%	1.14%
Sumska	2.09%	-0.21%	-2.16%	-2.13%
Ternopilska	-8.98%	-3.85%	-4.01%	-3.98%
Kharkivska	-2.89%	-10.84%	-9.56%	-9.54%
Khersonska	1.78%	2.16%	1.97%	2.00%
Khmelnytska	-5.96%	-1.20%	-1.67%	-1.64%
Cherkaska	0.96%	-3.24%	-0.32%	-0.29%
Chernivetska	-3.53%	7.79%	7.44%	6.72%
Chernigivska	0.59%	-3.12%	-5.01%	-4.98%

APPENDIX E. CROSS-OBLAST COMPARISON OF THE WAGES DURING 1999-2004

	Mean, UAH	**Max, UAH**	**Min, UAH**	**Deviation from the average in Ukraine**
Crimea	331.714	612.05	137.47	18.34%
Vinnytska	253.973	531.56	105.2	-60.18%
Volynska	240.322	498.89	98.08	-10.57%
Dnipropetrovska	405.688	745.25	181.55	128.01%
Donetska	425.724	816.27	188.18	15.51%
Zhytomyrska	256.839	517.92	111.81	-130.73%
Zakarpatska	277.997	553.82	104.81	16.38%
Zaporizka	415.513	737.75	177.4	106.45%
Ivano-Frankivska	300.1	598.32	111.78	-89.34%
Kyivska	357.694	663.74	151.02	44.58%
Kirovogradska	266.038	528.67	111.08	-70.95%
Luganska	359.712	678.1	160.17	72.51%
Lvivska	312.307	606.7	120.59	-36.70%
Mykolayivska	353.336	633.01	142.84	31.76%
Odeska	347.27	628.99	150.37	-4.70%
Poltavska	334.187	641.78	139.68	-10.13%
Rivnenska	288.705	614.57	113.28	-35.21%
Sumska	289.835	543.67	123.01	0.87%
Ternopilska	229.453	490.45	91.52	-46.74%
Kharkivska	346.22	641.81	154.38	90.39%
Khersonska	268.937	520.12	115.07	-59.82%
Khmelnytska	247.442	500.8	108.03	-16.64%
Cherkaska	268.68	546.98	119.6	16.44%
Chernivetska	256.315	520.59	97.99	-9.57%
Chernigivska	266.577	524.94	114.69	7.94%

APPENDIX G. LINGUISTIC DIFFERENCES ACROSS THE OBLASTS OF UKRAINE

	Ukrainian-speaking	**Russian-Speaking**	**Russian by origin**
Crimea	10.0%	76.6%	58.3%
Vinnytska	94.8%	4.7%	3.8%
Volynska	97.3%	2.5%	2.4%
Dnipropetrovska	67.0%	31.9%	17.6%
Donetska	24.1%	74.9%	38.2%
Zhytomyrska	93.0%	6.6%	5.0%
Zakarpatska	81.0%	2.9%	2.5%
Zaporizka	50.2%	48.2%	24.7%
Ivano-Frankivska	97.8%	1.8%	1.8%
Kyivska	92.3%	7.2%	13.1%
Kirovogradska	88.9%	10.0%	7.5%
Luganska	30.0%	68.8%	39.0%
Lvivska	95.3%	3.8%	3.6%
Mykolayivska	69.2%	29.3%	14.1%
Odeska	46.3%	41.9%	20.7%
Poltavska	90.0%	9.5%	7.2%
Rivnenska	97.0%	2.7%	2.6%
Sumska	83.3%	15.5%	9.4%
Ternopilska	98.3%	1.2%	1.2%
Kharkivska	53.8%	44.3%	25.6%
Khersonska	73.2%	24.9%	14.1%
Khmelnytska	95.2%	4.1%	3.6%
Cherkaska	92.5%	6.7%	5.4%
Chernivetska	75.6%	5.3%	4.1%
Chernigivska	89.0%	10.3%	6.0%

APPENDIX H. STATA OUTPUT FOR SEPARATE OLS REGRESSIONS FOR EACH PRODUCT

H1. Standard deviation of $\log(\frac{P^i_{j,t}}{P^i_{k,t}}) - \log(\frac{P^i_{j,t-1}}{P^i_{k,t-1}})$ used as a dependent variable

i) Food products

	lndist	**border_polit**	**border_hist**	**common_border**	**Dnipro**	**R-sqr**
Wheaten bread						0.9793
Rye bread		-.0013684*	.0018874**			0.9888
Bun				-.0035927*		0.9865
Flour	.0012801*			-.0020624**		0.9935
Rice	.0014665**	.0029199***				0.9938
Semolina						0.9945
Buckwheat						0.9783
Oats					.0045567*	0.9808
Beef	.0016934*	.0024042***				0.9966
Pork		.0034325***				0.9956
Poultry		.001796**			.0015497*	0.9936
Lard			.0025072**			0.9961
Smoked sausage	.0119756***	-.0037665*	-.0060477**		.001634***	0.9406
Boiled sausage						0.9629
Herring						0.9951
Butter	.0012451**	-.0007703*				0.9946
Sunflower oil				-.0022232*		0.9935
Milk	.0020843***					0.9965
Sour cream, cream	.0018376***					0.9966
Hard cheese					.0012593**	0.9928
Eggs	.0077078***				.0029187***	0.9942
Sugar	.0037753***	.0038604***				0.9922
Potato	.016649***				.006699*	0.9878
Cabbage	.0217931***			-.0085771*		0.9926
Onion	.0100376**		.0076904**			0.9920
Beet	.0113234**	.0075082**				0.9907
Carrot	.0234727***			.0084863*	-.0085106**	0.9898
Vodka (alcohol)						0.9610
Mineral water						0.9958

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance

ii) Nonfood products

	lndist	border_polit	border_hist	common_border	Dnipro	R-sqr
Man's suit			.0060574*			0.9516
Man's shirt						0.9826
Man's trousers						0.9755
Woman's skirt						0.9959
Sweater, jumper						0.9742
Children's jacket		.0032069***				0.9951
Children's dress					.0136164*	0.9234
Children's sport suit						0.9596
Children's T-shirt						0.9507
Rompers						0.9809
Man's socks						0.9385
Woman's stockings			-.0034168**	-.002739*		0.9940
Children's stockings		-.0016312*				0.9769
Man's boots						0.9935
Woman's boots						0.9945
Children's boots	.0062409*			.006685*		0.9843
Wool cloth			.0053712*			0.9633
Sheet				.0033669*	.0023059*	0.9670
Household soap					.0016851**	0.9914
Toilet-soap						0.9462
Toothpaste			.0123284**			0.9235
Exercise-book			.0045838*			0.9593
Vessel widening medicine						0.9124
Aspirin, analgin						0.9003
Antibiotics		-.0062018*				0.9500
TV set						0.9753
Refrigerator						0.9930
Sofa, bed						0.9928
Writing-table						0.9518
Kitchen table		.0117448***				0.9764
Wallpapers						0.9254
Bricks		.0104764*		.0165307*		0.9250
Cement						0.9388
Petrol						0.9176
Diesel fuel	.0032206***		.0046494***			0.9809

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance

iii) Services

	lndist	border_polit	border_hist	common_border	Dnipro	R-sqr
Dry-cleaning	-.0165536**	.0319492***		-.0210024**		0.9326
Laundry and ironing						0.9949
Bath-house service						0.9450
Man's haircut		.0013326**				0.9918
Woman's haircut	-.0063394*	.0286513***				0.9368
Chemical hair curling		.0458037***	.0103751*			0.9207
Dental services	.0178327*					0.8658
Trousers sewing	.0122874***	.0355301***		.0112684*	-.0071591*	0.9258
Dress sewing		.0320362***				0.8972
Shoes repair service						0.9922
Men's trousers repair service	.0102677**				-.0075205**	0.9474
Watch repair service	.009685***	.0082786***	-.0078075**			0.9472
Parking fee						0.9055
Freight transportation						0.8496
Staying at the hotels			-.0175705*	-.0244894**	-.0156352*	0.8994
Services of preschool institutions						0.9213
Services of higher education institutions						0.8801
Theatres		.0189477***				0.9198
Video tapes hire		.0157478***				0.8916
Photo for documents service						0.9781
Art color photo service						0.8748

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance

H2. Standard deviation of $\log(\frac{P^i_{j,t}}{P^i_{k,t}})$ used as a dependent variable

i) Food products

	lndist	border_polit	border_hist	common_border	Dnipro	R-sqr
Wheaten bread		-.005208*	.0065461*			0.9636
Rye bread		-.0052367**				0.9627
Bun						0.9504
Flour						0.9775
Rice	.0079797***					0.9847
Semolina	.0040885*					0.9794
Buckwheat		.0052504***				0.9799
Oats						0.9218
Beef	.0163592***	.008625**	-.0106664**	.0101736*		0.9658
Pork	.0078423**	.0041066*				0.9786
Poultry		.0062611**			.0048325*	0.9752
Lard	.0223701***	-.004916*	.0200872***			0.9826
Smoked sausage			.0071018**			0.9434
Boiled sausage						0.9647
Herring	.0047894**	-.0027363*				0.9762
Butter	.0064833***				.00585**	0.9653
Sunflower oil		.0099176***	-.0067408*		.0064314*	0.9753
Milk	.0166679***	.0155948***		.0159622**		0.9579
Sour cream, cream	.0106991**	.0252961***				0.9613
Hard cheese	.006855**		.0043769*	.006211*		0.9771
Eggs	.0133696***	.0047046***			.0060764***	0.9865
Sugar	.0108351***	.0044671***			-.0032857**	0.9862
Potato	.0290099***					0.9906
Cabbage	.0602457***	.0104023**				0.9887
Onion	.0226496***	.006586**				0.9908
Beet	.0479771***	.0155027***			-.0130768**	0.9879
Carrot	.0512824***				-.0138619***	0.9906
Vodka (alcohol)	.004396*				-.0049936*	0.9692
Mineral water	-.0108153*			-.027032***		0.9536

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance

ii) Nonfood products

	lndist	border_polit	border_hist	common_border	Dnipro	R-sqr
Man's suit						0.9393
Man's shirt						0.9428
Man's trousers			.0111221*			0.9451
Woman's skirt			.0317428***		-.0132472**	0.9654
Sweater, jumper			-.0225651*			0.9361
Children's jacket						0.9652
Children's dress					.018747*	0.9167
Children's sport suit			-.0156253*			0.9305
Children's T-shirt	.0084829*					0.9482
Rompers						0.9640
Man's socks						0.9057
Woman's stockings	.0241809***					0.9714
Children's stockings			.0095138*			0.9615
Man's boots						0.9638
Woman's boots		-.0093174*	.0181867***			0.9712
Children's boots						0.9594
Wool cloth						0.9608
Sheet						0.9322
Household soap	.0082831*					0.9583
Toilet-soap						0.9437
Toothpaste						0.9588
Exercise-book				.0077465*		0.9371
Vessel widening medicine						0.8722
Aspirin, analgin						0.9447
Antibiotics					.0095883**	0.9537
TV set						0.9588
Refrigerator					-.0102293**	0.9695
Sofa, bed	.0118753**		.0143359**			0.9597
Writing-table						0.9480
Kitchen table		.0071971***				0.9643
Wallpapers	.0214254**	.0071971	-.0140528*			0.9101
Bricks						0.9447
Cement						0.9561
Petrol						0.9496
Diesel fuel	.0049615***	.0036706***				0.9727

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance

iii) Services

	lndist	border_polit	border_hist	common_border	Dnipro	R-sqr
Dry-cleaning		.0218339***				0.9528
Laundry and ironing						0.9476
Bath-house service						0.9463
Man's haircut		-.0085655**	.0233132***			0.9455
Woman's haircut						0.9592
Chemical hair curling						0.9491
Dental services						0.9766
Trousers sewing			.0076373***			0.9672
Dress sewing						0.9482
Shoes repair service	.0086579					0.9560
Men's trousers repair service						0.9339
Watch repair service	-.0095477**	.0053597*	-.015657**			0.9571
Parking fee						0.9337
Freight transportation						0.9736
Staying at the hotels						0.9468
Services of preschool institutions						0.8780
Services of higher education institutions		.0063128**				0.9734
Theatres						0.9694
Video tapes hire					.0154973*	0.9217
Photo for documents service					.0268522***	0.9439
Art color photo service						0.8909

* significant at 10% level of significance
** significant at 5% level of significance
*** significant at 1% level of significance