HAS SPATIAL MARKET INTEGRATION INCREASED OVER TIME: THE EVIDENCE FROM UKRAINIAN FOOD MARKETS?

by

Viktoriya Galushko

A thesis submitted in partial fulfilment of
the requirements for the degree of

Master of Arts in Economics

National University of "Kyiv-Mohyla Academy"
Economics Education and Research Consortium
Master's Program in Economics

2003

Approved by _____
Ms.Svitlana Budagovska (Head of the State Examination Committee)

_____

_____

_____

Program Authorized
to Offer Degree Master's Program in Economics, NaUKMA

Date _____

National University of "Kyiv-Mohyla Academy"

Abstract

HAS SPATIAL MARKET INTEGRATION INCREASED OVER TIME: THE EVIDENCE FROM UKRAINIAN FOOD MARKETS?

by Viktoriya Galushko

Head of the State Examination Committee: Ms.Svitlana Budagovska,
Economist, World Bank of Ukraine

The question of how a specific market performs has long interested economists. One way to assess the performance of the market is to look at how it interacts with other markets. Competitive conditions in the market and, consequently, arbitrage activities imply that prices for a homogeneous product in two different locations will not drift apart and differ by transaction costs. This paper addresses the question of integration of regional Ukrainian Food markets and its improvement over time. In my work I analyse the performance of only three major markets: bread, sugar and sunflower oil. These markets present three interesting cases and the analysis can be used to infer about the performance of (i)markets that are under local authorities control, (ii) markets that are under temporal centralized control, and (iii) markets with imperfect competition. In this paper I estimate long-run equilibrium parameters as well as an immediate response and adjustment parameters employing the two-step Engle and Granger procedure. The hypotheses of full price transmission and short-run integration are tested The overall conclusion is that Ukrainian Food markets are integrated only to a limited extent and there is no overwhelming evidence of improvements in these markets over 2000-2002 period compared to 1997-1999. Even though there exists a long-run stable relationship between markets, that is arbitrage does work, the adjustment process to price shocks is rather slow and for about 70% of markets it takes more than 6 months to completely absorb the price shock.

TABLE OF CONTENTS

LIST OF FIGURES & TABLES

ACKNOWLEDGMENTS

The author wishes to thank Professor James Gaisford for his helpful comments and ideas. The author would also like to express gratitude to the Professor of University of Goettingen (Germany) Stephan von Cramon-Taubadel for his assistance with and suggestions about the empirical part of the paper and to thank Mike Bowe for editorial comments.

Chapter 1

INTRODUCTION

Continuing debate concerning the appropriate role of the government in the marketplace and the necessity to somehow estimate the effects of agricultural policies on agricultural markets have forced researchers to develop various methods which would enable them to analyse market efficiency. Government intervention in setting prices, incomes and markets is always controversial. For economists government intervention may be justified if it does not enhance distortions into the market and, moreover, remedies the existing market imperfections. But how can one observe whether the policy proves to improve market functioning or results in even more inefficiency? One way to throw some light on this long-standing issue is to analyse market performance by studying market integration.

In the context of developing and transition countries agriculture plays an important role in the economy and contributes a significant share of GDP and employment. Because the rural and food economies are considered to be very important, some form of government involvement in farm and food markets is found in most societies. To improve the performance of the markets governments have employed different adjustment programs. From the outset of transition in Ukraine, price liberalization and price stabilization policies as well as farm restructuring have been an integral part of the reform. Successful farm restructuring, in its turn, requires that the price system works as a mechanism for communicating information to both producers and consumers. For producers, prices must direct the allocation of resources, meanwhile for consumers prices must reflect society's costs of production in a world of scarce resources. Thus,

the success of agricultural reforms depends on the strength of transmission of price signals among regional markets and the ability of prices to fulfil an allocative function.

Ukrainian staple food markets have been under government regulation and control for a long time. As a rule, Ukrainian government has relied on price stabilization policy and the necessity for interventionist policies has primarily been substantiated by the inability of markets alone to quickly respond to different kinds of shocks. Nevertheless, almost any efforts by the government to set prices at a certain level either for the purpose of supporting producers or, as in most cases, keeping food prices from increasing and thus, supporting consumers, fail to produce the desired results. Setting price ceilings to put a downward pressure on retail food prices always ended up in shortages, black markets and rationing in "regulated" regions (von Cramon-Taubadel, Striewe and Zorya, 2001, p. 123). In this setting free markets might have worked better, and any price increase in a region might have been avoided due to arbitrage activities rather than government intervention. Thus, it is not ensured that government intervention per se will inevitably bring about an improved market performance, and the success of government policies in food markets is highly dependent on the strength of transmission of price signals among regional markets.

A study of market integration is essential for several reasons. First and foremost, the degree of market integration is an indicator of how a specific market works and has, therefore, important implications for market efficiency. Market efficiency implies that due to arbitrage activities the price of a homogeneous product in different locations will not drift apart by more than transfer costs. If this is not the case the markets may convey inaccurate information to producers and consumers, thus leading to misallocation of resources in the economy.

Second, Ukraine has been trying to enter the WTO. WTO membership opens a window of opportunity for Ukraine; however, the benefits Ukraine will be able to reap from this membership greatly depend on the conditions prevailing on the domestic markets. Integration of markets is a prerequisite for WTO membership having a large positive effect on the Ukrainian economy. Therefore, the results of this study are of interest both for Ukrainian policy-makers and for authorities considering Ukraine's membership in the WTO.

Third, the investigation of market integration has important policy implications. When implementing stabilization policies in food markets, a policy-maker should be well cognizant of the fact that it takes some time for a price policy to be transmitted across regional markets and also take into consideration the adjustment period, which might make the policy more successful. Moreover, since a well-integrated market system is essential to household food security, the analysis of Ukrainian food markets and their performance over time will enable one to determine the possible further directions for government agricultural policies aimed at improving market functioning and promoting food security in Ukraine.

The motivation to analyze spatial integration of food markets comes, first of all, from the fact that there have been few if any empirical studies written in this area with a direct application to Ukrainian Food markets. Furthermore, as food expenditures account for approximately 65% of total expenditures the food market and the behavior of food prices should receive special attention.

The paper is organized as follows. Chapter 2 highlights the theoretical aspects of market integration. It provides an overview of what constitutes market integration as it is described in the existing literature. Chapter 3 concentrates on a review of relevant literature. In this chapter I briefly cover various approaches to

testing for market integration with special attention being paid to their shortcomings and strengths. Findings of the previous empirical studies conducted for Russia are also reported in this chapter. The methodological framework is described in Chapter 4. Chapter 5 is a representation of the empirical work undertaken. It contains a data description section and a section covering estimation procedures and empirical results. Finally, in Chapter 6 I summarize the findings, and based on the obtained results I provide possible recommendations for further agricultural policy.

C h a p t e r 2

MARKET INTEGRATION: THEORETICAL CONSIDERATIONS

Under competitive conditions arbitrage activities ensure that prices of a homogenous product will be linked in two different markets and will not drift apart by more than transaction costs. Alternative statements of this same arbitrage concept are that (i) markets are integrated and (ii) that the Law of One Price holds between these two markets (Sexton, Kling and Carman, 1991). Of course, prices fluctuate over time and their margins are subject to different kinds of shocks, arising from which short-run deviations from a long-term commonly shared trend may occur. However, economic forces should prohibit *persistent long-run* deviations from equilibrium conditions, although significant *short-run* deviations may be observed (Goodwin 1991).

In the context of market analysis, there are three types of markets: (1) geographic (place utility) markets, (2) product (form utility) markets, and (3) seasonal (time utility) markets (Kohls and Uhl, 1990). Market boundaries are then defined by the degree of interdependence of buyers and sellers over time, form and space and this interdependence is measured by price sensitivity. Thus, it makes sense to also consider market integration along the three dimensions of time (temporal market integration), product form (vertical integration) and location (spatial market integration). Each of these forms is briefly discussed below with a special emphasis put on spatial market integration, since it is the focus of this paper.

Spatial market integration reflects the effects of a price change in one market on the price of the same commodity in another market. In the extreme case two markets are said to be *completely separated* if there is no linkage between prices. If a

shock in one market is fully transmitted to another one then markets are said to be *perfectly spatially integrated*.

Ravallion (1986) defined markets as spatially integrated "if, when trade takes place between them, price in the importing market equals price in the exporting market plus the transportation and other transfer costs involved in moving food between them".

Let us consider two markets denoted market 1 and market 2. If the areas where market 1 is located happen to have a bad harvest, prices will increase because of decreased supply. If markets are spatially integrated then prices in market 2 will also increase. This results from the profit-seeking behavior of food marketing firms and traders who in order to earn more profits take the commodity from market 2 and sell it on market 1 where prices are higher. As a result, supply of the commodity in market 2 declines and the price increases. The faster the adjustment takes place, the greater the extent to which spatial markets are integrated. Therefore, theoretically, spatial integration of markets implies that if two regions trade the price in the importing region will equal the price in the exporting region plus transfer costs.

However, in many settings it will be implausible that trade adjusts instantaneously to equate spatial price differentials. This necessitates that a clear distinction between long-run and short-run integration be made. Short-run integration implies that a price increase in one market is immediately (in the course of one time period) passed onto another market. Long-run integration refers to the cases in which there exists a long-run and stable price relationship between two markets.

Temporal market integration reflects the effects of present price change on future prices. When prices meet the condition of "future price = present price + storage cost" it is called temporal market integration.

Vertical integration reflects a passthrough of a price change across steps in the marketing chain. Sometimes product form does not change at all as the product moves across marketing stages. A movement of a product from the wholesale to the retail level and, accordingly, integration of wholesale and retail prices is one example of this kind of integration. In some cases the movement of a product across marketing stages is combined with some form of processing, due to which product form changes. An example of this kind of integration might be the price relationship between markets of raw products and markets of processed products. If markets are integrated across product form then a price increase in a primary product will inevitably result in a proportional increase in the price of a processed product.

The failure of spatial markets to exhibit a linkage between prices can be explained by some factors. A primary factor is an agent's cost and risk associated with trade between markets (Bucolla 1989). If transportation costs are sufficiently high, which may arise because of the limitations of transportation capacity, then no arbitrage takes place. Risk and agent's costs are, in their turn, dependent on the distance between trading regions. The greater the distance the greater the transportation costs and the greater the risk associated with quality losses (this risk is especially high for perishable products). Thus, the distance contributes to disintegration of spatial markets.

The second factor is the spread of market information. If traders possess perfect information on the situation in the market, they can perfectly foresee a change in prices and instantaneously respond to price differentials. Lack of market information negatively effects spatial market integration.

The third point why markets may be separated is that one or more markets exhibit imperfect competition.

Finally, the last, but not necessarily the least important factor is government intervention. Tariffs and other barriers to trade act like transportation costs and prohibit arbitrage activities to happen. It is claimed that government intervention tends to isolate markets and cuts off price linkages completely. However, one should keep in mind that government intervention can force the same price changes in regional markets, in which case the degree of spatial market integration seems higher. In fact, this is "planned" integration rather than real "market integration" in an economic sense.

In practice, however, conventional approaches for testing market integration do not allow one to disentangle the contributions of each of these factors to market imperfections. The conclusions drawn are whether markets are integrated or not, with the possibility of measuring the degree of integration.

Chapter 3

LITERATURE REVIEW

The issue of how to test for market integration occupies a voluminous literature. The availability of time-series data on commodities' prices and a need to assess market performance induced analysts to develop various approaches to studying market integration. The first attempts to analyze spatial, temporal and vertical price linkages were made by Jones and Lele (1972, 1974). In their work they studied integration of agricultural markets in low-income countries and relied in their analysis on static price correlations. Bivariate models had widely been used until the early 1980s when economists recognized the serious dangers of this approach. The major shortcoming of bivariate modelling is that it can easily accept the hypothesis of integration in cases where markets are actually segmented but share a dynamic seasonal structure in production, or if prices are influenced by the third commodity traded in a common market (Ravallion, 1986). Many studies that employed bivariate models in the analysis showed a low degree of market integration even when markets behaved competitively. Nevertheless, the static price correlation approach remains one of the most common approaches used to measure market integration mainly because needed for more sophisticated tests complementary data on transportation costs are very often difficult or prohibitively costly to obtain.

The Law of One Price (LOP) remains the basic theoretical framework for testing market integration. Developed by Granger (1981), Engle and Granger (1987) and Engle and Yoo (1987) cointegration analysis has become important in studies of the LOP, since it helps avoid the spurious regression trap when working with nonstationary price series and because it provides more powerful inference and

parameterisations of price transmission that are intuitively appealing. Thus, cointegration analysis is a useful statistical tool that helps in attempts to study and work with the LOP but it has no real theoretical content as regards price transmission. A benchmark in cointegration analysis is that in integrated markets prices for homogeneous products are linked and, thus, can be used to form a cointegration regression. An equilibrium relationship can then be modelled in the following way:

$$\varepsilon_t = p_i - \alpha - \beta \cdot p_j \tag{3.1}$$

where ε_t – the residuals from the regression of p_i on p_j; p_i – price in market i; p_j – price in market j.

Using (3.1) one can say that (nonstationary) price series are cointegrated if their linear combination yields stationary series. Furthermore, regional markets are said to be perfectly spatially integrated if a cointegrating parameter β is not statistically different from 1.

There exists an extensive literature on how to test the (LOP). Most of the tests utilize a model similar to Richardson's (Richardson, 1987):

$$P_{it} = \alpha_0 P_{jt}^{\alpha_1} \pi^{\alpha_2} T_{it}^{\alpha_3} R_{it}^{\alpha_4} \tag{3.2}$$

where α's are parameters to be estimated, P_{it} – price in i-th market, P_{jt} – price in the j-th market, π - exchange rate, T_{it} – transportation or transfer costs, R_{it} – is the residual reasons for price differences between countries.

An important shortcoming of the studies based on the Law of One Price is the assumption that parity should hold contemporaneously (Goodwin, Grennes and Wohlgenant, 1990). Another shortcoming of this approach is that transfer costs

are typically assumed to be constant over time or proportional to commodities' prices. As a result, transfer costs are omitted from the model (3.2) as a regressor and are included as an intercept term. Jabara (1987) and Schwarz and Ardeni (1989) in their work implicitly assume that transportation costs are constant. This assumption seems to be unrealistic and, as a rule, transfer costs vary over time and market integration is likely to be stronger the shorter the distance between markets and the lower the transaction costs. The omission of a relevant variable such as transfer costs biases the results and makes the model less powerful. The Law of One Price approach also assumes that prices are given exogenenously, meanwhile in reality the prices are likely to be simultaneously determined. In the presence of endogeneity of prices, OLS yields inconsistent results and the model may fail to serve as a good test for detecting market integration.

The Law of One Price has been of a limited use in studying the behavior of prices in agricultural markets, since as most analysts indicate it fails as a long-run relationship in several important agricultural markets, and the deviations from the Law of One Price are permanent (Goodwin, Grennes, Wohlgenant, 1990).

Later on, the Law of One Price model was re-considered by Goodwin and Grennes (1990) who incorporated into the model expectations of market agents.

The recognition of the fact that traders possess no perfect foresight of the situation in the markets and, consequently, cannot respond to price changes instantaneously led to an elaboration of more sophisticated models incorporating lagged effects and seasonal fluctuations. The most prominent innovation to the existing approaches came from Ravallion (1986). The main advantage of his approach is that the price-series for each market is permitted to have its own autoregressive structure. Ravallion realized that in many cases price shocks occurring in one market would not be instantaneously transmitted onto another

market. The use of a dynamic model enables the researcher to distinguish between the short-run and long-run dynamic adjustment, which allows extraction of more information on the nature of spatial price differentials from the same data. Ravallion assumes that there is a central (urban) market and a number of local (rural) markets. In general setting the Ravallion model can be represented as follows (Ravallion, 1986):

$$P_{1t} = \sum_{j=1}^{n} a_{1j} P_{1t-j} + \sum_{k=2}^{N} \sum_{j=0}^{n} b_{1j}^{k} P_{kt-j} + \varepsilon_t$$

$$P_{it} = \sum_{j=1}^{n} a_{ij} P_{i1t-j} + \sum_{j=0}^{n} b_{ij} P_{1t-j} + \eta_e \qquad (3.\ 3)$$

where P_{1t} – prices in the central market, P_{it} – prices in the local markets, ε and η are stochastic error terms, a's and b's – parameters to be estimated.

Prices in the urban market are assumed to be weakly exogenous. However, developing previous approaches, Ravallion realizes that since supply shocks are likely to have rural roots, the endogeneity of urban market prices is also acceptable. To deal with the endogeneity problem, an instrumental variable estimation is used: first, one estimates the dynamic model for the urban price and then the fitted values are used as a regressor in the dynamic models for each rural market. Various tests concerning the nature of market integration can then be tested using model (3.3) as parameter restrictions. A detailed description of these tests is beyond the scope of literature review part but rather is left for the next chapter of the paper.

A thorough assessment of the conventional approaches briefly described above has been made by Bob Baulch (1997). In his work the author uses Monte Carlo

experiments in which artificial data for highly integrated (extensively engaged in trade) markets and independent (where trade does not take place) markets are created. He considers the statistical performance of the four commonly used approaches for testing market integration: the Law of one price, the Ravallion model, cointegration and Granger Causality. Baulch concludes that the Law of one price and the Ravallion model are too strong to detect market integration, but cointegration and Granger causality are too weak, that is, they are unable to distinguish between integrated and independent markets (Baulch, 1997). The weaknesses of these tests lie in that none of them approaches the issue of market integration directly, and that they are all based on the analysis of the co-movement of prices. Baulch indicates that the main explanation for why the conventional tests fail to detect market integration is that they do not allow for transfer costs and the resulting discontinuity of trade flows.

Incorporation of information on transfer costs and discontinuous trade into the models brought a substantial improvement into the field of market integration testing. First such a model was developed by Baulch (1997) and is referred as Parity Bounds Model (PBM). As a benchmark he used the spatial arbitrage conditions, which are represented in the literature as follows:

whenever $$P_{it} + T_{it} = P_{jt} \tag{3.4}$$

trade occurs. *But if*

$$P_{it} + T_{it} \rangle P_{jt} \tag{3.5}$$

then there is no incentive to trade. Here, P_{it} stands for the price in market i in period t, T_{it} – transfer costs between market i and j, P_{jt} – price in the j-th market.

In his model Baulch distinguishes between three possible trade regimes: at the parity bounds (when (3.4) holds), inside the parity bounds (when (3.5) holds) and outside the parity bounds (when price differentials are greater than transfer costs). The first two regimes (at and inside the parity bounds) are consistent with spatial market integration. The likelihood function for the PBM is then constructed and MLE estimates of the probabilities for each regime can be estimated. A high value of the probability of being in regime 1 testifies to high degree of market integration.

The limitation of Baulch's approach in empirical applications lies in unavailability of data on transportation costs. In most cases, even if the data are available they are either imprecise or are not reported in full (that is, for some periods data are missing), which necessitates the use of extrapolation to generate the missing data. A high degree of imprecision in the data aggravates the results and reduces any advantages over conventional approaches.

So far, the literature review has primarily focused on the revision of major approaches developed in literature work with an emphasis on the contributions of certain authors to improving the testing techniques being adopted. All of these approaches are widely applied in empirical analysis.

Markets of transition economies have recently gained considerable attention in empirical work. Nevertheless, the literature that attempts to measure the evolution of market integration during the periods of liberalization in transition economies is not vast. A general conclusion reached in most of the studies is that integration of food markets in transition economies is only limited.

Space neither allows, nor it is necessary to make an overview of all studies conducted for food markets in transition economies. Only studies applied to Russian market will be considered. Furthermore, empirical findings for Ukraine may be productively compared to those for Russia, since Ukraine like Russia inherited trade regimes from the Soviet Union and has been employing similar tools for regulating regional trade (price setting policies, bans to transport food from one region to another, etc.).

One of the earliest studies on spatial market integration in Russia was conducted by Gardner and Brooks (1994). In their work the authors estimate the log transformation of Richardson's model (3.2) and find no evidence in favor of food market integration. They also analyze price differences between pairs of cities. The results reveal no consistent relationship between distance, which is assumed to serve as a proxy for transportation costs, and the city price differentials. Moreover, for two cities in the same oblast price differences are found to be insignificant, meanwhile for two cities equally distant from one another but located in different oblasts price differences are found to be significant. The strongest and the most consistent explanation offered by the authors is government "regulation", which in the model simply measures the effect of being in the same oblast. The overall conclusion of the paper is that there exists a significant geographical price dispersion primarily due to the fact that in the course of food price liberalization national regulation was replaced by local one, and geographical price differences are big enough to impose large welfare losses (Gardner and Brooks, 1994, p. 645).

An important contribution to empirical work came from Berkowitz and DeJong (1998). In their study they employed the method developed by Engel and Roger (1996). The authors find that after food price liberalization reform had been implemented market integration progressed rapidly. However, different regions

within Russia had different preferences for economic reforms, which led to a division of Russia into two distinct zones: the Red Belt and the rest. While the latter adopted the reforms quickly, the former was resistant to price liberalization reforms. Empirical findings of the paper reveal that there emerged an internal border within Russia as much of a barrier to trade as US – Canadian cross-border, which separated the Red Belt regions and the rest of Russia (Engel and Roger (1996), Berkowitz and DeJong (1998)). Furthermore, the Red belt regions showed higher price dispersion and lower degree of spatial market integration as well as poorer economic performance compared to the rest of Russia.

A further study was carried out by Kopsidis and Peter (2001). Their contribution to this subject is that when measuring spatial market integration in the Russian wheat flour market they also analyze different patterns concerning the relationships between deficit and surplus regions depending on the economic performance of a demand area. Their findings support the view that Russian wheat flour market is integrated to a very limited extent. The authors explain this result by (i) poorly developed infrastructure, due to which it is less costly for deficit regions to import flour from abroad rather than from other Russian supply regions; and (ii) the regionalization of food policy, which has seriously aggravated the emergence of a highly integrated domestic Russian market for grain (Kopsidis and Peter, 2001, p.39).

Hence, one may infer that most of the studies done for Russia support very weak spatial food market integration and witness the fact that there are large price dispersions both within and across cities that cannot easily be explained by transportation costs, but to a great extent can be explained by government food policy.

Chapter 4

METHODOLOGY

Integration analysis begins with the premise that for a long-run equilibrium relationship to exist between two variables it is necessary that they belong to the same family of time series processes. Thus, the first step is to test each price series for the order of integration. Testing can be performed using Augmented Dickey-Fuller (ADF) test, which is applied to the model:

$$\Delta P_{it} = \delta \cdot P_{it} + \sum_{n=1}^{N} \alpha_n \cdot \Delta P_{it-n} + \varepsilon_t \qquad \textbf{(4.1)}$$

where P_{it} is a price in market i at time t. The number of augmented terms N is chosen such that the disturbance term ε_t is white noise. Under the null $\delta=0$ and series are integrated of order 1 (I(1)). If the null is not rejected, but first-differenced series are stationary one can proceed with co-integration analysis.

Spatial market integration necessarily implies a unique long-run equilibrium relationship in which deviations from regional price parity are forced to 0 (Goodwin, 1991). Such an equilibrium relationship can be modelled as follows:

$$P_{it} = \alpha + \beta^* \cdot P_{jt} + u_t \qquad \textbf{(4.2)}$$

where P_{it} and P_{jt} are prices in market i and j respectively and β^* is a long-run equilibrium parameter to be estimated. As it was briefly mentioned in the previous chapter when estimating (4.2) using OLS a problem arises because variables are non-stationary. Even though β^* is "superconsistent" in case of variables being co-integrated, in small samples it is biased. This bias may be sufficiently large and lead to making

wrong conclusions concerning long-run relationship. Furthermore, the hypothesis of perfect spatial integration can be tested by testing whether the long-run parameter β^* is unity. But given the properties of the standard errors of the estimators in (4.2) conventional hypothesis testing cannot be applied. One way of calculating long-run equilibrium parameter, and this is the approach employed in this paper, is to construct an autoregressive distributed lags (ADL) model, which can be represented as follows:

$$P_{it} = \alpha_0 + \sum_{n=1}^{N} \alpha_n P_{it-n} + \sum_{m=0}^{M} \beta_m P_{jt-m} + \varepsilon_t \qquad \textbf{(4.3)}$$

where all variables are as defined above. The number of lags N and M is chosen such that the error term ε_t exhibits no autocorrelation and heteroskedasticity. Furthermore, the number of lags is chosen on the basis of Akaike or Schwartz criteria.

If markets i and j are in equilibrium then $E\{P_t\} = E\{P_{t-1}\} = E\{P_{t-2}\}$, that is, the present price and all lagged prices are just equal ($P_{it}=P_{it-1}=P_{it-2}=\ldots=P_{it-N}$). Allowing for this fact equation (4.3) can be re-arranged as follows:

$$(1 - \sum_{n=1}^{N} \alpha_n) \cdot P_{it} = \alpha_0 + P_{jt} \cdot \sum_{m=0}^{M} \beta_m + \varepsilon_t,$$

or, equivalently as

$$P_{it} = \frac{\alpha_0}{1 - \sum_{n=1}^{N} \alpha_n} + P_{jt} \cdot \frac{\sum_{m=0}^{M} \beta_m}{1 - \sum_{n=1}^{N} \alpha_n} + \eta_t \qquad \textbf{(4.4)}$$

where $\eta_t = \dfrac{\varepsilon_t}{1 - \sum_{n=1}^{N} \alpha_n}$.

Long-run coefficient β* can be calculated from equation (4.4) as:

$$\beta^* = \frac{\sum_{m=0}^{M} \beta_m}{1 - \sum_{n=1}^{N} \alpha_n} \qquad \textbf{(4.5)}$$

Substituting β* into (4.2) a co-integration test can be performed. If a linear combination of P_{it} and P_{jt} yields stationary series u_t then prices are co-integrated with the cointegrating vector (1, -β*).

Equation (4.3) can be re-parameterised to yield Error correction model (ECM). To derive unrestricted ECM let us subtract from each side of equation (4.3) P_{it} and make the following substitutions:

$$P_{jt} = P_{jt} - P_{jt-1} + P_{jt-1} = \Delta P_{jt} + P_{jt-1}$$

$$P_{jt-m} = P_{jt-m} - P_{jt-m+1} + P_{jt-m+1} = -(P_{jt-m+1} - P_{jt-m}) + P_{jt-m+1} = -\Delta P_{jt-m+1} + P_{jt-m+1} =$$
$$= -\Delta P_{jt-m+1} - \Delta P_{jt-m+2} - \Delta P_{jt-m+3} - \ldots - \Delta P_{jt-1} + P_{jt-1}, \qquad m = 2,\ldots, M$$

$$P_{it-n} = P_{it-n} - P_{it-n+1} + P_{it-n+1} = -(P_{it-n+1} - P_{it-n}) + P_{it-n+1} = -\Delta P_{it-n+1} + P_{it-n+1} =$$

$$= -\Delta P_{it-n+1} - \Delta P_{it-n+2} - \ldots - \Delta P_{it-1} + P_{it-1}, \qquad n = 2,\ldots, N$$

Model (4.3) can then be represented as follows:

$$\Delta P_{it} = -\sum_{n=2}^{N} \alpha_n \Delta P_{it-1} - \sum_{n=3}^{N} \alpha_n \Delta P_{it-2} - \ldots - \sum_{n=N}^{N} \alpha_n \Delta P_{it-N+1} + \beta_o \Delta P_{jt} - \sum_{m=2}^{M} \beta_m \Delta P_{jt-1} -$$

$$- \sum_{m=3}^{M} \beta_m \Delta P_{it-2} - \ldots - \sum_{m=M}^{M} \beta_m \Delta P_{jt-M+1} + (\alpha_o + (\sum_{m=1}^{M} \beta_m) P_{jt-1} - (1 - \sum_{n=1}^{N} \alpha_n) P_{it-1}) + \varepsilon_t$$

(4.6)

From the last expression in equation (4.6) one can factor out the term $(1 - \Sigma\alpha_n)$, which yields:

$$\Delta P_{it} = \beta_0 \Delta P_{jt} + \gamma_1^* \Delta P_{jt-1} + \ldots + \gamma_{M-1}^* \Delta P_{jt-M+1} + \delta_1^* \Delta P_{it-1} + \ldots + \delta_{N-1}^* \Delta P_{it-N+1} -$$

$$- (1 - \sum_{n=1}^{N} \alpha_n) \left[P_{it-1} - \frac{\alpha_o}{1 - \sum_{n=1}^{N} \alpha_n} - \left(\frac{\sum_{m=1}^{M} \beta_m}{1 - \sum_{n=1}^{N} \alpha_n} \right) \cdot P_{jt-1} \right] + \varepsilon_t =$$

$$= \beta_o \Delta P_{jt} + \sum_{m=1}^{M-1} \gamma_m^* \Delta P_{jt-m} + \sum_{n=1}^{N-1} \delta_n^* \Delta P_{it-n} - z(P_{it-1} - \alpha - \beta * P_{jt-1}) + \varepsilon_t =$$

$$= \beta_o \Delta P_{jt} + \sum_{m=1}^{M-1} \gamma_m^* \Delta P_{jt-m} + \sum_{n=1}^{N-1} \delta_n^* \Delta P_{it-n} - z \cdot ECT_{t-1} + \varepsilon_t$$

(4.7)

where $\gamma_1^* = \sum_{m=2}^{M} \beta_m, \ldots, \gamma_{M-1}^* = \sum_{m=M}^{M} \beta_m, \delta_1^* = \sum_{n=1}^{N} \alpha_n, \ldots, \delta_{N-1}^* = \sum_{n=N}^{N} \beta_n$, $z = (1 - \sum_{n=1}^{N} \alpha_n$

ECT_{t-1} are lagged residuals from the estimated long-run relationship (4.2).

The point estimate of β_0 has important economic content. It reflects an immediate change in P_{it} or short-run effect due to a shock in P_{jt}. Furthermore, the point estimate of z measures the speed of adjustment to the long run equilibrium.

The speed with which the system approaches its equilibrium depends on the magnitude of the estimate of z – the closer it is to –1 the faster the system approaches its equilibrium.

A word of caution should be added here. When estimating (4.7) a very strong assumption is made. It is assumed that price series P_{jt} is weakly exogenous to P_{it}. In practice, however, prices are, as a rule, determined simultaneously. Endogeneity of P_{jt} implies that a response of P_{it} to a shock in P_{jt} also effects P_{jt}, which biases the estimate of an immediate change in (4.7). Some authors attempt to solve this problem by testing for Granger causality. However, Granger non-causality from P_i to P_j is neither a necessary nor a sufficient condition for the weak exogeneity of P_j (Ericsson, 1992, p. 260). In this paper I adopt a test for weak exogeneity of P_j with respect to the short-run parameter proposed by Boswijk and Urbain (1997). In the first step a dynamic model for P_j is estimated as:

$$\Delta P_{jt} = \gamma_0 + \sum_{n=1}^{N1} \gamma_n \Delta P_{it-n} + \sum_{m=1}^{M1} \mu_m \Delta P_{jt-m} + \nu_t \qquad \textbf{(4.8)}$$

The second step is to plug the fitted residuals from (4.8) into the ECM represented by (4.7), which yields:

$$\Delta P_{it} = \beta_o \Delta P_{jt} + \sum_{m=1}^{M-1} \gamma^*_m \Delta P_{jt-m} + \sum_{n=1}^{N-1} \delta^*_n \Delta P_{it-n} - z \cdot ECT_{t-1} + \lambda_1 \cdot \nu_t + \varepsilon_t \qquad \textbf{(4.9)}$$

Weak exogeneity can be tested by applying a t-test to the coefficient on the fitted residuals. Under the null of prices in market j being weakly exogenous to prices in market i $\lambda_1 = 0$. If, however, λ_1 is statistically different from zero then P_{jt} is endogenous and instrumental variable estimation rather than OLS should be employed.

To adjust the theoretical framework to the purpose of the current paper let us first briefly discuss the policy environment on Ukrainian Food markets. Even though the description of the prevailing situation in the market is not the part of the methodology chapter and it will be covered in much greater details further on, this will help formulate the model applicable to our particular case.

Ukrainian Food markets have been suffering from government regulation for a long time. At the end of 1999, Ukraine started a major reform drive under the new Prime Minister Viktor Yushchenko. There was a strong concentration of reforms in 2000 and they were quite radical, comprehensive and profound (Aslund A., 2002, p.6). The reform package also provided for further liberalization of food markets and agricultural trade. The state orders were eliminated, reducing the authorities' leverage for interfering in agricultural and food markets. Government intervention on some staple food markets, however, (for example, bread and cereals markets) was decentralized starting from the second half of 1999 in a sense that now local authorities were given power to regulate bread, cereals and milk prices. Thus, the hypothesis to be tested in this paper may be formulated as follows: *For products rather than bread market integration has improved over time, perhaps with a noticeable "break" in the trend at the end of 1999. But no real* ***positive*** *change is apparent for bread market, since it experienced decentralized regulation rather than price liberalization.* To incorporate into the model the idea of this change in policy environment at the end of 1999 let us define two dummy variables: D_{1997} is a dummy variable equalling 1 for 1997-1999 period and 0 otherwise; D_{2000} – equalling 1 for 2000-2002 period and 0 otherwise.

The long-run relationship given in equation (4.2) can now be represented as follows:

$$P_{it} = \alpha_1 D_{1997} + \alpha_2 D_{2000} + \beta_1^* \cdot D_{1997} \cdot P_{jt} + \beta_2^* D_{2000} \cdot P_{jt} + u_t \qquad \textbf{(4.10)}$$

where β_1^* is a long-run equilibrium parameter calculated according to formula (4.5) from the ADL model defined in (4.3) using observations only for 1997-1999 period; β_2^* is an equilibrium parameter calculated from the ADL model constructed only for 2000-2002 period; a_1 and a_2 are intercepts for the first and the second sub-period respectively.

The splitting of the whole period into two sub-periods can be modelled into the ECM in the following way:

$$\Delta P_{it} = \beta_{1o}\Delta P_{jt} \cdot D_{1997} + \beta_{2o}\Delta P_{jt} \cdot D_{2000} + \sum_{n=1}^{N-1} \delta_n^* \Delta P_{it-n} + \sum_{m=1}^{M-1} \gamma_{1m}^* \cdot D_{1997}\Delta P_{jt-m} +$$

$$+ \sum_{m=1}^{M-1} \gamma_{2m}^* \cdot D_{2000}\Delta P_{jt-m} + z_1 ECT_{t-1} \cdot D_{1997} + z_2 ECT_{t-1} \cdot D_{2000} + \varepsilon_t \qquad \textbf{(4.11)}$$

where ECT_{t-1} are lagged residuals from model (4.10) and all variables as defined above.

Using equation (4.11) tests on long run and short-run spatial market integration can be performed. Independence of the two price series suggests that price movements are distributed randomly with each other. This can be tested as $\beta^*_1=0$ and $\beta_2^*=0$ for the first and the second sub-period respectively. To test the hypothesis of full price transmission or perfect spatial integration requires that long-run parameters β_1^* and β_2^* be equal to unity.

The distinction between a strong form and a weak form of short-run integration should be made. Strong short-run hypothesis asserts that following a price shock on market j market i reaches equilibrium in the second period, that is, an initial response to a shock is a unit increase in prices, and the residual effect of the shock is completely absorbed in the second period. Thus, in this case the system returns back to its equilibrium within one period (in our case within one month). A weak form of short-run market integration requires an immediate effect be equal to unity. In this case, an initial response to the price shock is a unit increase in market i prices, however, in the subsequent periods prices may increase or

decrease. Thus, in this case the system approaches its equilibrium gradually. If, for example, an equilibrium parameter is significantly less than one, but weak short-run integration hypothesis holds, then we first have price overshooting but gradually in the course of a few periods prices decline and adjustment takes place until the equilibrium is reached. The strong short-run hypothesis implies that the following restrictions in model (4.11) hold:

for the first sub-period: $\delta^*_n = 0, \quad n = 1,\ldots, N-1$

$\gamma^*_{1m} = 0, \quad m = 1,\ldots, M-1$

$\beta_{10} = -z_1 = \beta^*_1 = 1$

for the second sub-period: $\delta^*_n = 0, \quad n = 1,\ldots, N-1$

$\gamma^*_{2m} = 0, \quad m = 1,\ldots, M-1$

$\beta_{20} = - z_2 = \beta^*_2 = 1$

Weaker short-run hypothesis can be tested as $\beta_{10} = 1$ and $\beta_{20} = 1$ for the first and the second sub-period respectively.

Chapter 5

EMPIRICAL EVIDENCE

Data description

The research covers the period from January 1997 to December 2002. The data used in the study are monthly retail prices for bread, sugar and sunflower oil. All data are deflated by Consumer Price Index (CPI). It may be argued that deflating prices is inappropriate in the current setting, since the traders face nominal prices rather than real ones. The problem in using nominal prices is mainly econometric: using nominal prices might bias the results and favor the acceptance of the hypothesis of the existence of integration across spatial markets (Dercon S. (1995), Goodwin et. Al (1996), Kopsidis M. & Guenter P. (2001)). This is explained by prices sharing the common inflationary trend. Of course, there is no easy way to model the inflationary process, yet to control for common inflationary effects it is preferable to deflate the prices. Furthermore, since the data on monthly regional CPI are not available I deflate all prices by overall Ukrainian CPI. In this case the results may not be substantially different from those I would obtain using nominal prices unless deflating turns I(0) series into an I(1) series. This normalization, however, helps avoid some econometric problems connected with stationarity of the data. Further measuring prices in real terms (i.e. relative to a broad bundle of consumer goods) rather than monetary terms (i.e. relative to a currency unit potentially subject to inflation) may be desirable on theoretical grounds, since arbitrage opportunities are measured in real terms. Of course, the assumption that price indices behave similarly in different regions is rather restrictive. Using one deflator for different regional

prices smoothes the time series only since it does not change the relative price movements and this also might eliminate the common inflationary trends.

Domestic consumer prices are gathered by Derzhkomstat and published biannually. Prices are the averages for the retail stores in each of the 25 Ukrainian regions. For bread prices the observations for the first half of 2001 are missing for two oblasts: Luhansk and Kyiv oblast. Thus, for the bread market we omit these two oblasts from the analysis.

The choice of the products is not arbitrary. First and foremost, these are the products that have an important weight in the food basket. Furthermore, such a choice is stipulated by the fact that each of these markets exhibits some type of market imperfections: bread market has long been under government regulation; sugar market experienced government interference only until 2000 and this interference was temporary rather than permanent; sunflower oil market has been free from government regulation, however, it is an illustrious example of a market with imperfect competition. These [government intervention and imperfect competition] are common features of food markets in Ukraine and the analysis of these three markets may be used to generate the true and complete picture of overall Ukrainian Food Market. Another criterion on which the choice of the products is based is the degree of homogeneity of products. In a competitive market arbitrage activities ensure that in different locations prices for *homogeneous* products are equal. If products are heterogeneous this should be somehow modeled, since price differential may arise due to product heterogeneity. In our case sugar and sunflower oil seem to be highly homogeneous products; meanwhile for bread some degree of heterogeneity is present. Another characteristic of the products is a different period of shelf life. Shelf life might play an important role in determining the degree of market integration. It is reasonable to assume that markets for perishable products (like that for bread,

since bread must be consumed within a few days) will be less integrated. Thus, bread market may seem less integrated just because the shelf life of bakery products is so short that it makes no sense to transport them from one region to another.

Starting from the second half of 1999 radical reforms in agricultural and food markets were implemented. New Prime Minister Yushchenko's reform package provided for further trade liberalization on agricultural and food markets. These measures reduced local authorities' power to control over price setting process as well as were intended to make regional trade more transparent and freer. The policy environment on the markets under consideration will be described below for each market separately. For the purpose of assessing whether price integration has increased over time the whole period is divided into two sub-periods: the first – from January 1997 until December 1999, and the second one – starts in January 2000 up until December 2002.

Figure 1 represents the development of bread, sugar and sunflower oil prices over 1997-2002 (averages for Ukraine). According to the Derzhkomstat data in 2000 the bread price increased by 46-50% in retail stores. As can be seen up until the end of 1999 the retail price was officially kept almost at a constant level despite fluctuations (declines) in wholesale flour price. At the beginning of 2000 wheat supplies significantly shrank; according to the rumors, this was due to unofficial exports of milling wheat. This as well as poor grains harvest in 2000 contributed to a noticeable price increase. Thus, at least visually one can see a possible break in the trend starting from the beginning of 2000. Over the whole period sugar and sunflower oil prices were trending upward with no noticeable break. A similar picture is observed for each region. The regional data are not provided in the figure, however, a closer look at the regional data reveals that bread prices seem to be more co-integrated, that is, bread prices move almost

identically in each region, than sugar and sunflower oil ones do. Sugar and sunflower oil prices are much more volatile and this volatility differs from region to region. Whether bread market is more co-integrated as is suggested by the visual inspection of the data is left for empirical analysis.

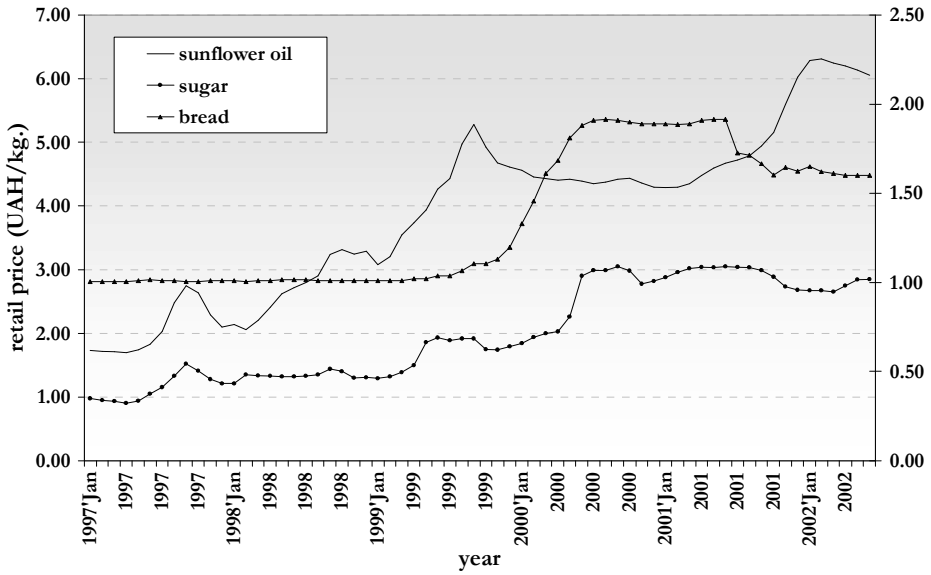

Figure 1. Bread, sugar and sunflower oil retail prices

Source: Derzhkomstat

Bread market

5.1.1. Policy environment

After a jump in prices for most food products in May, 1999 the Cabinet of Ministers entitled the local governments to intervene into price formation process. In most oblasts bread price increases were met by the local authorities' resolutions aimed at a temporary regulation of bread prices. Price Regulation policy included direct setting of prices or setting of trade margins for urban and rural retail stores. As a rule, the margin was not to exceed 15% of the release bread price for urban retail stores and 24-25% - for rural retail stores. Trade margins were examined on the initiative of regional Offices of Public Prosecutor.

Starting from 2000 bread prices started climbing rapidly. Specialists and market operators stated that the main reasons for an increase in prices in 2000 were increased prices for raw materials (wheat and flour) as well as weakened control of local governments over bread prices (AGROPerspektiva Issue 1, 2001). Market operators also stressed that bread prices could have risen even higher but local governments continued to put a downward pressure on large bread-producing plants. In certain regions in order to keep bread prices from fluctuating local authorities continued subsidizing bread-producing plants. Price policy differed from region to region. Meanwhile some regions liberalized bread prices in 2000 and on and left the bread market to itself, the others heavily relied on price regulation policies. For example, the chief of the state price inspection in Kharkiv – Mr. Chaplyi - reported that bread prices were under government control until mid-2001 and it is only in May 2001 that the department of economy of Ukraine passed a resolution on elimination of regulation of bread prices ("Status Quo", 10.07.2001).

A summary of regulatory measures is presented in Table 1.

Table 1. Bread price regulations

Donetska oblast. Order #145 as of 20.01.2000 "On government regulation of baked products prices"	Bread prices were set at 0.96 UAH (as compared to a market price of 1.00 UAH). The order provided for government regulation of marketing margin. Marketing margin was not supposed to exceed 15% of the release price. The local authorities controlled price formation process across bread producer – ultimate seller chain.
Kiev City: Resolution of the Kiev City Soviet #91/812 as of 27.04.2000 "On temporary government regulation of baked products prices in Kiev City"	This resolution *increased* retail bead prices.
Crimea: 19.10.2001 Order " On temporary regulation of prices for certain food products"	The order provided for regulation of prices for wheat flour, bread, cereals and milk. It also envisaged regulation of marketing margin, which was not to exceed 15% for retail stores located in the cities and 25% for stores located in rural areas.

5.1.2. Empirical findings

Long-run equilibrium parameters are calculated from ADL model. Deciding on the number of lags to be included it would be logically to conclude that given monthly data an inclusion of 12 lags is reasonable. However, since the number of observations in each sub-period is not large (36 observations for each region) 12 lags cannot be included because then many degrees of freedom are lost. Initially I included 6 lags. With 6 lags the residuals from the ADL models exhibited no autocorrelation up to the 12-th lag (the twelfth lag is important because we have monthly data) and heteroskedasticity, which are crucial assumptions as far as hypothesis testing is concerned. Further, certain lagged variables were excluded from the model based on the significance of the coefficients and AIC and Schwarz criteria. An ultimate model was chosen such that the errors were homoskedastic and free of autocorrelation. Since the space is limited the ultimate [253] specifications are not presented in the paper but are available on request. The calculated long-run coefficients are reported in Table A3 of the Appendix A. As can be seen out of 253 market pairs under consideration only for 93 of them (37%) do we fail to reject the null hypothesis of full price transmission (or perfect spatial market integration) in both sub-periods. In only 6 out of 25 regional markets did the number of markets which were perfectly spatially integrated increase in the second sub-period. For the rest of the markets it either remained the same or declined.

At the next stage the ADF test for the stationarity of the residuals from the cointegrating equation was performed. To avoid overloading the Appendix with the tables the table containing the p-values of the test has not been included. The general finding is that for all market combinations prices are cointegrated, which suggests that there exists a long-run stable relationship between prices. Thus, even though prices may diverge for some months implying smaller or larger margins, ultimately they converge and long-run margins are re-gained.

Before constructing the error correction model and analyzing the adjustment process the test for weak exogeneity of price series with respect to the short-run parameter was carried out. The p-values of the variable addition test are presented in Table A2. Under the null hypothesis of exogeneity λ_1 from equation (4.9) is not statistically different from zero. Those market pairs for which we can reject the hypothesis of weak exogeneity are marked in gray in the table. As can be seen for many market pairs we fail to accept the hypothesis that price series are weakly exogenous. For cases where prices are endogenous I employ an instrumental variable approach when estimating ECM. The core of this approach is the following. *First*, P_j from model (4.7) is estimated using the lagged values of all other market prices and lagged values of itself. Lagged values are appropriate instruments, since given interrelated prices data generating process for each of the price series can adequately be described using all other prices. Furthermore, lagged values are assumed to be predetermined and uncorrelated with the error term. To estimate P_j initially one lag of all 25 price-series was included. Then the model containing 25 variables was reduced to a more parsimonious model based on coefficient significance and AIC criterion, with the errors being homoskedastic and exhibiting no autocorrelation. For some price series in order to get rid of autocorrelation problem the inclusion of the second and the third lag of the dependent variable was necessary. *Second*, the fitted values instead of the actual values of P_j (j= 2…25) are used in estimating ECM.

When estimating the ECM initially 6 lags of the dependent variable and 4 lags of the independent variable are included. As before, insignificant variables were excluded. However, when deciding whether to leave a variable in the equation or to exclude it I chose 20% (rather than 5%) significance level. The ultimate model was chosen such that the disturbance term was white noise (with no autocorrelation and heteroskedasticity) and the hypothesis of appropriate specification of the model, which was tested employing the Ramsey Reset test,

could not be rejected. A diagnostic test for the presence of ARCH effects in the errors was also conducted: for all of the models we cannot reject the null that errors exhibit no ARCH effects, that is, an assumption that the variance of the errors is constant over time is not violated for any of the models. For some models, however, the normality assumption does not hold. But this is a small-sample problem [72 observations is rather a small sample] but even having non-normality of errors we can proceed with a hypothesis testing.[1]

Table A4 reports point estimates of the immediate effect. Here one should keep in mind that in our case "immediate" means one month, which should suffice for traders to carry out the transactions. The weak form of short-run hypothesis cannot be rejected at 5% significance level only for 75 market pairs (about 30%) in the first sub-period and for 43 (about 17%) in the second one. Only for 27 out of 253 market pairs this effect significantly increased in the second period meanwhile for 45 market pairs it significantly declined. This information is contained in Table A4 where the shaded cells indicate those market pairs for which an immediate effect increased significantly and the dashed cells indicate those market pairs for which this effect significantly decreased. Thus, in the second sub-period the immediate response of the markets to price shocks on the other market actually weakened. The strong form of short-run market integration can be accepted at 5% significance level only for 7 market pairs: Vinnytsa – Transkarpathian, Vinnytsa – Zaporizzya, Vinnytsa – Khmelnytskiy; Transkarpathian – Lviv; Zaporizzya – Kharkiv; Poltava – Cherkasy, Poltava – Chernigiv. For all but the last market pairs the hypothesis can be accepted for the

[1] "If the errors are not distributed normally the exact distribution is approximated with asymptotic distribution of betas, which is found from limiting distribution. Applying Central Limit Theorem one can show that the limiting distribution is normal with mean zero. Hence, the assumption that the sample size is large enough for asymptotic distribution to be a good approximation, hypothesis testing proceeds in the usual fashion, in spite of the error not being normally distributed". (P. Kennedy "Econometrics", fourth edition, p.325)

first sub-period, and only for the last [Poltava – Chernigiv] pair – can it be accepted for the second sub-period. To help the reader to visualize the situation a map of Ukraine is placed in the Appendix A (Figure 1).

Table A5 contains the estimated coefficients of the adjustment parameters. For 43 market pairs the absolute value of the coefficient significantly increases in the second sub-period compared to the first one. In many cases a decline in the magnitude of the immediate effect was accompanied by an increase in the adjustment parameter. This means that in the second period prices adjusted faster over time but, at the same time, responded less immediately. An interesting case is the case of **Vinnytsa** region. In the first sub-period for this region we can accept the null hypothesis of weak short-run integration at 5% significance level for 17 out of 21 considered market-pair combinations, but all of the adjustment parameters are insignificantly different from zero. Thus, this region's prices immediate reaction to a unit shock on any regional market was a unit increase, and then prices very slowly adjusted to their long-run equilibrium values. **Dnipropetrovsk** region in the first period appears to have been somewhat isolated from the rest of the regions, which can be supported by the fact that the magnitude of the immediate effect for almost all market-pairs is rather small and statistically different from unity; at the same time the values of adjustment coefficients are rather small and insignificantly different from zero. Dnipropetrovsk was integrated only with the adjacent Poltava region, in which case we can accept at 10% that the immediate effect is unity and the adjustment coefficient is significant and close to -1 (-0.93). In the second sub-period the situation in this region improved and, even though immediate effects are still significantly less than 1, adjustment coefficients are significantly different from zero for most of the market-pairs.

For the rest of the markets it is rather difficult to trace out a specific trend in market integration process. Market integration among regions seems not to be primarily explained by the distance (and transportation costs), as it would usually be under competitive conditions, which is not surprising given the presence of price regulation policies. To assess the importance of distance between regional markets in determining the strength of market connection a simple correlation coefficient between price dispersion and distance is calculated. Price dispersion is measured using absolute mean dispersion (Q_{ij}) between regions i and j at date t calculated as $Q_{ij} = \frac{\left|\ln(P_{it} / P_{jt})\right|}{T}$, where T = 71. The calculated correlation coefficient is extremely low and equals 0.01. So, only 1% of regional price differentials is associated with distance or, roughly speaking, transportation costs. Such a low correlation between price differential and transportation costs comes as no surprise given (i) regionalization of government price and trade policies, and (ii) short shelf life of the product, due to which transportation may not be a reasonable strategy for traders.

Table A6 reports the estimated speed of adjustment. It shows the percentage of a shock that was transmitted within the first half of a year after the shock occurred. It is said that 100% of a shock has been absorbed if the market returns to its equilibrium and long-run margin between the prices is re-gained. The value of over a hundred percent means that initially (immediately and over one or two months depending on the lags included in the ECM) in response to a price shock prices overshoot their equilibrium values. Thus, in this case in the following months prices adjust downward rather than upward (as is the case when the percentage of a shock transmitted is less than 100%). The adjustment does not seem to be speedy. In each sub-period about 86% of market pairs do not reach equilibrium after 6 months had passed. In competitive and integrated markets a half of a year is more than enough for traders to make transactions.

Summarizing, there is no overwhelming evidence of either improvement or deterioration of the market functioning. Meanwhile some markets have become more integrated and some have become more isolated, the situation on the majority of the markets has not changed. Even though an initial response for the majority of the markets is statistically different from zero it is not large in magnitude. Market integration is only limited. This can be inferred from both the magnitude and statistical significance of the adjustment coefficients. In the first sub-period for 57% (145) of market pairs under consideration the adjustment coefficient is not statistically significant at 5% significance level, that is, prices in market i do not "error correct" or, equivalently, do not react to deviations from the long-run cointegrating relationship. In the second sub-period, however, markets appear to have become more interlinked and the percentage of market pairs for which the adjustment coefficient is not statistically significant declined by more than a half to 21% (54 market pairs).

Sugar market

5.2.1. Policy environment

Government intervention in the sugar market consists in determining and re-allocating production quotas and setting the minimum wholesale price for sugar. The minimum or "floor" price should not have any direct effect on market integration as long as the market price is higher than this floor price, since in this case in a competitive market the price will be determined by the forces of supply and demand. The sugar market was subject to temporary government regulation in the second quarter of 1999 when, in response to a sharp increase in retail sugar prices the government felt compelled to set a price ceiling for sugar in some regions that was below the market price. The consequences of this policy were as those predicted by the theory: sugar gradually disappeared from the shop counters and when it re-appeared again its price grew even further. After the start

of 2000 no cases of government control over retail sugar prices are known, at least officially. But local authorities seem to unofficially create trade barriers. As the traders assert, local governments prohibit free movement of raw materials for sugar production to processing enterprises (sugar beet) by setting barriers at a regional level (Agricultural Policy for Human Development Project: 1999-2002, 2002, p. 19). Furthermore, in spring when prices start rising large parcels of sugar are smuggled primarily from Poland into the Western regions of Ukraine. Smuggled sugar is sold at much cheaper prices, which drives the domestic price down and enhances competition. Since the goal of government policy concerning sugar market is to keep prices high in order to support sugar producers, illegal imports are not welcomed and one would expect the Western regions to fight with them more fiercely by strengthening controls over trade.

5.2.2. Empirical evidence

The estimation procedure for sugar market is similar to that for the bread market. First, I calculate the long-run equilibrium parameter based on the estimates from the ADL model. As before, an inclusion of 6 lags of both dependent and independent variables ensures that the residuals from the model exhibit no autocorrelation at all lags up to the twelfth one and are homoskedastic. Then, the model is reduced to a more parsimonious one (based on the coefficient significance and AIC criterion) including 6 or 7 parameters to be estimated. Again, the ultimate specifications are not reported in the paper for any of the market combinations but all estimation output is available on the request of the reader. Table B2 contains the estimates of the long-run equilibrium parameters. The results seem to be more "promising" than those obtained for the bread market. For the sugar market the percentage of market pairs for which we cannot reject the hypothesis of perfect price integration in either of the periods (a unit shock in market j is transmitted into a unit shock in market i) is 55% (or 164 out of 300 market pairs). At the same time, for 107 (36%) and 43 (14%) market pairs

we can reject at 5% significance level the hypothesis of perfect price transmission in the first and the second sub-period respectively.

Regarding the cointegration of prices the results of the ADF test reveal that prices for all market pairs are cointegrated, which is the first sign of the existence of spatial market integration.

The results of the test for the weak exogeneity are reported in Table B1. In gray color there are marked those market pairs for which the null cannot be accepted at 10% significance level and to which an instrumental variable estimation (IV) outlined in the previous section is applied. Here I am not repeating the steps of IV estimation, since the procedure is actually the same.

The number of lags in the ECM was chosen on the basis of AIC criterion and diagnostic tests. The errors were tested for autocorrelation of up to the 12th order, heteroskedasticity and the presence of ARCH effects. The ultimate model was chosen such that the residuals are white noise and the Ramsey Test does not reject the right specification of the model. In most of the cases the ultimate specification includes 2 lags of the dependent variable and the second and the third lag of the explanatory variable. Of course, the deviations from this specification occur, as getting rid of autocorrelation in the models for some market pairs requires an inclusion of the fourth or the sixth lag of the dependent variable. The whole set of specifications is readily available upon the request.

Table B3 reports the estimates of the short-run parameter. For 58% (174) of market pairs under research the *hypothesis of weak short-run integration* can be rejected at 5% level of significance in the first sub-period. In the second sub-period the number of market pairs for which weak form of short-run integration does not hold is 192 (64%), which suggests that in the second sub-period an immediate response became smaller in magnitude. An immediate response to price changes

significantly increased over time for 34 out of 300 market pairs or 11%, meanwhile it significantly decreased for three times as many market pairs – for 93 or 31% of analyzed market combinations. Noticeable improvements occurred in two Western markets, and, in particular, in the **Transkarpathian** and the **Ivano-Frankivsk** regions and in one central region – **Vinnytsa** region. However, even though for these regions the immediate effect to a price shock on other markets significantly increased in the second sub-period it is still less than unity at 5% level of significance. An interesting finding arises in this respect. The value of the immediate response appears to be the smallest (about two times less) for Volyn, Transkarpathian, Lviv, Rivne and Vinnytsa regions. The first three regions border with Poland, where large parcels of smuggled sugar come from. Thus, one possible explanation of a small immediate response may be that it is less costly for these regions to trade with and to (illegally) import sugar from Poland rather than trade with the regions within Ukraine.

Meanwhile the hypothesis of strong short-run spatial market integration for the bread market is not rejected only in 7 cases, for the sugar market this hypothesis can be accepted at 5% level of significance in 33 out of 300 cases in the first period and in 18 cases in the second one, which is an indication of sugar market performing somewhat better than the bread one. The market pairs for which the hypothesis of strong short-run market integration is not rejected are reported in Table B5.

Concerning the adjustment parameters they are contained in Table B4. Their magnitudes in general declined over time rather than increased. For 65 (22%) market pairs the adjustment parameter significantly declined in the second period compared to 1997-1999 period and only for 10 (3%) cases did it significantly increase. **Vinnytsa** region appears to be the only one where the response to a deviation from the long-run equilibrium actually sped up.

Some findings indicate on the sugar market performing better than the bread one. *First*, the speed of adjustment is much higher: in the first sub-period for 56% of market pairs the shock is completely absorbed within 6 months. However, in the second sub-period the complete adjustment takes place only in 26% (or 77 out of 300 market pairs) of cases, which suggests that the second period response and adjustment process did become slower. *Second*, regarding the sugar market there seems to be a stronger relation between regional price differentials and distance as a proxy for transportation costs. The calculated correlation coefficient between price dispersion and distance is 0.36, which is much higher than that of 0.01 for the bread market.

Sunflower oil market

5.3.1. Policy environment

Sunflower oil market has been free from government regulation over the whole period. However, there are also other factors that can contribute to market separation. One is imperfect competition. Sunflower oil market is an illustrious example of an olygopolistic market. 75-80% of the market is captured by the association "UkrOliyaProm" that unites the largest 19 oil-extracting plants in different regions and only 20% of oil is supplied by small enterprises. In total there are only 6 oil-extracting companies operating in the market. The implications of market imperfections may be even more disastrous for market efficiency than government intervention, as now enterprises may have power to set different prices in different locations or may collude to set market boundaries. Here the question of whether imperfect competition is detrimental to integration of regional markets is left for empirical analysis.

5.3.2. Empirical evidence

The estimation proceeds as described in the previous sections. First ADL is constructed and long-run equilibrium parameters are calculated. The specifications of ADL models are almost (with some exceptions) the same for all 300 models. The ultimate specification that ensures no autocorrelation and homoskedastic residuals includes 3 lags of the dependent variable and 3 lags of the explanatory variable. The estimated long-run equilibrium parameters are given in Table C2 Appendix C. For 47% (141 out of 300) of market combinations we can accept that perfect (complete) price transmission is not violated in both sub-periods. In the first sub-period a unit price shock on market j is transmitted into a unit shock on market i for 76% (229) of market pairs, meanwhile in the second period this share is somewhat lower and accounts for 66% or 128 out of 300 analyzed market pairs. Thus, the percentage of markets that are perfectly spatially integrated declines a little bit in the second sub-period. However, this per se does not indicate that spatial market integration decreased but rather is an indicative of the existence of transaction costs that work to create wedges between prices.

The p-value of a variable addition test for weak exogeneity of price series with respect to the short-run parameter are given in Table C1. In the estimation of error correction model I employ IV approach only in 9 cases.

The ECM is estimated as outlined above. The ultimate models are chosen such that all assumptions, except, perhaps, normality assumption for some models, hold. The most common specification, which occurs in 90% of all models, includes the first and the second lag of both dependent and explanatory variables. However, for the majority of models the LM test for ARCH effects in the residuals show the presence of autoregressive heteroskedasticity in residuals. This necessitates the modification of the variance of the errors from being constant to being time-varying. To model this I have estimated ARCH(p) or, in some cases,

GARCH(1,1). An inclusion of 2 or 3 lags of the squared residuals into the conditional variance equation ensures minimization of AIC and BIC criteria as well as no autocorrelation in the error terms. To allow for heteroskedastic errors in estimation I use Bollerslev-Wooldridge robust standard errors and covariance matrix. Thus, ARCH(p) as it has been specified for most of the models can be represented as follows:

$$\Delta P_{it} = \beta_{1o}\Delta P_{jt} \cdot D_{1997} + \beta_{2o}\Delta P_{jt} \cdot D_{2000} + \delta_1^*\Delta P_{it-1} + \delta_2^*\Delta P_{it-2} + \gamma_{11}^* D_{1997}\Delta P_{jt-1} + \gamma_{12}^* D_{1997}\Delta P_{jt-2} +$$

$$+ \gamma_{21}^* D_{2000}\Delta P_{jt-1} + \gamma_{22}^* D_{2000}\Delta P_{jt-2} + z_1 ECT_{t-1} \cdot D_{1997} + z_2 ECT_{t-1} \cdot D_{2000} + \varepsilon_t \quad \textbf{(5.1)}$$

This [Eq. 5.1] is simply the ECM that has been estimated. However, to model in the presence of autoregressive heteroskedastic errors the conditional variance (h_t) must be defined. For ARCH(2) it is given by:

$$h_t = \alpha_0 + \alpha_1\varepsilon_{t-1}^2 + \alpha_2\varepsilon_{t-2}^2 \quad \textbf{(5.2)}$$

where ε_t are the residuals from equation (5.1).

So, (5.1) and (5.2) together represent ARCH(2) process. Again, just a remark that the ultimate specifications of the ECMs and ARCH(p) models are not reported but are readily available.

The estimated short-run parameters are presented in Table C3. An immediate effect significantly increased in the second period only for 10 market pairs, meanwhile significantly declined for 85 market pairs. For 26 market pairs both immediate effect and adjustment parameter significantly declined. In this respect, the performance of **Vinnytsa** and **Kyiv** markets was the poorest. An interesting finding is that for Vinnytsa oblast the short-run response to price changes in four

adjacent regions significantly weakened. This might suggest, that there exist some barriers to trade, which prevent traders from responding to price deviations immediately. Another explanation might be that the difference in prices in the adjacent regions is so small that it makes no sense to transport oil from one region to another. To reveal the possible reason one should have a careful look at the data. As it appears the average difference in the second sub-period between prices in Vinnytsa region and in Khmelnytskiy (adjacent) region comprises 0.26 UAH with the maximum value of 42 kopecks and the minimum one of 8 kopecks. Thus, the additional revenue the trader could have earned by selling a ton of oil in Khmelnytskiy region (rather than in Vinnytsa) would have been on average 260 UAH with a maximum of 420 UAH and a minimum of 80 UAH. These figures seem to be higher than transportation costs (about 50 UAH if one goes by a truck) and if traders are rational, markets are competitive and there are no bars to trade the transporting should have taken place. The same is true for Vinnytsa and Odessa (adjacent) region. Concerning the other two bordering regions price differences seem to be small enough (about 2 kopecks) for arbitrage to happen, which explains why in the second sub-period the immediate response was of small magnitude.

Table C4 reports the estimated adjustment coefficients. Again, the evidence suggests that market performance in the second period got worse rather than better. The linkage between markets, which can be described with a help of the magnitude of the adjustment parameter, significantly weakened for 48 out of 300 market pairs under consideration, and at the same time it significantly strengthened only for 17 market pairs. For the majority of the markets there occurred no significant changes over the whole period. However, an interesting finding arises. Meanwhile in the first sub-period adjustment parameters, albeit of small magnitude, are statistically significant for the majority of the market pairs, in the second sub-period for 58% of the market pairs they are insignificant. The

mean value of the adjustment parameter (calculated as an arithmetic average of statistically significant parameters only) is 0.49 in the first sub-period and 0.54 in the second one. The adjustment process is rather sluggish and within a half of a year only 28% and 23% of market pairs return to equilibrium, or, in other words, absorb a price shock completely, in the first and the second sub-period respectively. Thus, the general conclusion to be drawn is that in the sunflower oil market the situation worsened over time and in the second period more than a half of markets appear to be somewhat isolated.

Continuing with the analysis of the strength of market connection a few words should also be added regarding the explanatory power of distance. Distance appears not to be helpful in explaining the differences between regional sunflower oil prices, since the correlation coefficient between price dispersion and distance is only 0.07, that is, only 7% of price differential is associated with distance (transportation costs).

To summarize the findings for all three markets a table is presented below. The information contained in the table suggests that sugar market is the most efficient one, since regional markets' immediate response to price deviations as well as the adjustment parameter is statistically higher than that for bread and sunflower oil markets. In the first sub-period sunflower oil market seems to be the least integrated in terms of both short-run and long run integration. Regarding the improvement in integration of Ukrainian Food markets the evidence supports just the opposite: the short-run response and the adjustment parameter became significantly smaller in magnitude for about one third and one fifth of market pairs respectively in case of sugar and sunflower oil markets.

Table 2. Summarized findings

Bread market (253)[2]		**Sugar market (300)[2]**		**Sunflower oil market (300)[2]**	
I period	II period	I period	II period	I period	II period
Immediate (short-run) effect					
Insignificant at 5% sign. level for … market pairs (% of market pairs)					
113 (45%)	74 (29%)	0	8 (3%)	19 (6%)	158 (53%)
Significantly (at10%) increased for … market pairs (% of market pairs)					
27 (11%)		34 (11%)		10 (3%)	
Significantly (at 10%) declined for … market pairs (% of market pairs)					
45 (18%)		93 (31%)		85 (28%)	
Average value for significant parameters					
0.60 (0.02)[3]	0.54 (0.01)	0.77 (0.01)	0.67 (0.01)	0.59 (0.01)	0.59 (0.02)
Adjustment coefficient					
Insignificant at 5% sign. level for … market pairs (% of market pairs)					
144 (57%)	56 (22%)	25 (8%)	66 (22%)	27 (9%)	173 (58%)
Significantly (at10%) increased for … market pairs (% of market pairs)					
43 (17%)		10 (3%)		17 (6%)	
Significantly (at 10%) declined for … market pairs (% of market pairs)					
14 (6%)		65 (22%)		48 (16%)	
Average value for significant parameters					
0.50 (0.02)[3]	0.48 (0.01)	0.66 (0.01)	0.53 (0.01)	0.49 (0.01)	0.54 (0.02)

Further Research

This study leaves much room for further research. The findings suggest that future research should address the following issues. First, when performing estimation procedure the effect of price deviations was studied only in one direction, that is, only the effect of the change in P_j on market i prices was studied. To verify the flavor of the results one would possibly like to analyze the effect of the change in P_i on market j prices, since information is likely to flow in both directions. Second, the research could be extended by analyzing the symmetry of the response. As empirical findings support markets are more rapid

[2] in parenthesis there is given the number of market pairs under consideration

[3] standard errors are given in parenthesis

to react to price increases, meanwhile after a negative price shock the adjustment is likely to be sluggish. The asymmetry of response may be particularly relevant for olygopolistic markets when firms make price commitments. Last, the research should be extended to analyze the factors contributing to market separation.

Chapter 6

CONCLUSIONS AND POLICY IMPLICATIONS

Before drawing the conclusions a few remarks on the analysis itself should be added. The first concerns the quality and reliability of the data set. The data employed are retail food prices (markets at retail stores) at a regional level. However, what might give more valuable insights is the behavior of *market* prices, since food products are mostly traded in marketplaces. Unfortunately, market prices are available only for the most recent years and, thus, there is scope for future research employing information on market prices. The second point concerns the time span under consideration. The conclusions about long-run relationships and integration drawn from an analysis covering just a few years (or, to be precise, 3 years in each sub-period) may present an incomplete picture. The results would describe the situation more accurately if the research covered a larger time span. Nevertheless, any efforts to expand the period under analysis are constrained by the availability of data. With these caveats in mind, the reader should consider the empirical analysis of this paper as a significant first attempt to measure the extent to which Ukrainian Food markets are spatially integrated.

The overall picture emerging from the analysis is the following. First of all, all regional markets exhibit long-run equilibrium relationships. This conclusion is supported by the fact that the null of cointegration cannot be rejected for any of the market pairs. However, even though prices do not drift apart the price differentials cannot be primarily explained by transportation costs as would usually be the case under competitive conditions. The calculated coefficient of correlation between price dispersion and distance as a proxy for transportation costs is 0.01, 0.36 and 0.07 for the bread, sugar and sunflower oil markets

respectively. The degree of (strong) short-run integration is rather low and it is the lowest for the bread market. This suggests that markets do react to price shocks on the other markets, however, the response is not speedy. For 70-80% of markets it takes more than a half of a year for a price shock to be completely transmitted. The general conclusion, thus, is that markets are integrated only to a limited extent. Moreover, there is no overwhelming evidence of improvement in market performance, but, on the contrary, over 2000-2002 period markets appear to have become more isolated and more sluggish. This, in particular, concerns sunflower oil market for which the second period adjustment coefficients are insignificantly different from zero for 58% of market pairs.

Having obtained the evidence of poor integration of regional markets in Ukraine one should identify what are the contributing factors. In practice, it is hard to disentangle the effects of different factors and for this purpose a more careful look at the patterns of regional trade is required. Nevertheless, a number of interim policy recommendations may be warranted.

First and foremost, a local political reform should be undertaken that would at least weaken if not eliminate completely local authorities' intervention into interregional trade and reduce their opportunities for the maintenance of independent price policies. This reform should also provide for making government policies more transparent. Meanwhile some food markets (e.g. bread and cereals markets) are formally regulated in the majority of regions, prices and trade may also be under informal administration constraints, which prevents arbitrage from taking place. Furthermore, the belief in gradual improvements of market integration over time is not supported by the empirical results and this challenges the government to undertake new actions directed to sustaining progress and growth. Obviously, such policy instruments as price ceilings push the market to disequilibrium and should be removed. And if temporary

government interference in food markets is really important in promoting food security in Ukraine in a time of crisis then (i) it should rely on more market-based policies such as subsidies, and (ii) it should be at the national rather than regional level.

Second, imperfect competition on food markets (sunflower oil market is a nice example) seems to have more destructive effects on interregional trade. It appears to separate the markets and block arbitrage activities. Thus, creating competitive environment should be the goal of government policies. This implies the following measures to be undertaken on the part of the government. First, the government could implement competition policy that would effectively deal with firms that enjoy a dominant position in markets.. Second, the government could indirectly influence the conditions on the sunflower oil market via its policy regarding export tax for sunflower seeds. In 1999 the implementation of 23% duty on seeds exports was an initiative of the association "UkrOliyaProm" that had enough political power to persuade legislative bodies of the necessity of this export duty, although it has since been reduced to 17%. Opening up the markets to foreign competition may be beneficial. Third, no cartels should be allowed. In the present context it is noteworthy that firms may collude in cartels to set market boundaries instead of prices, which will lead directly to market separation.

However, market liberalization, elimination of regional barriers to trade and creation of more competitive environment will not by themselves result in structural change in spatial market integration. Investments in marketing infrastructure (transportation, communication) are required. More attention should be paid to the development of railway transportation and road network. Currently, in Ukraine there is only one company (a monopolist "Ukrzaliznytsya") that provides railway transportation services, which makes them very costly. Further, high transaction costs eliminate possibilities for arbitrage activities. To

lower transaction costs some degree of government involvement is necessary. This, in particular, concerns communication services that have features of public goods and, thus call for the government role. What is also important is the provision of informational services. For traders to quickly respond to price deviations they should possess a perfect foresight of the situation in the market. For this purpose information on the current situation in the market should be readily available. However, high transaction costs are not only a matter of poor infrastructure or unavailability of information but rather a matter of high costs of documentation procedures. Sometimes traders in order to transport products from one region to another are required to collect a whole bunch of documents. Collecting the necessary documents is very often accompanied by official payments as well as by briberies to officials. This makes transactions costly and eliminates arbitrage. Thus, the government should work out a more transparent system of documentation and minimize the number of documents and licenses required to make the transaction.

Hence, there is a call for the government actions. However, the government should re-consider its policy and move away from the policies that distort markets (e.g. price ceilings, regionalization of trade policy) towards the policies that promote markets (e.g. investments into infrastructure, communications etc.).

BIBLIOGRAPHY

Ardeni, P. G. *"Does the Law of One Price Really Hold for Commodity Prices?"* American Journal of Agricultural Economics 71 (1989): 661-669

Aslund, A. *"Why Has Ukraine returned to Economic Growth?"* Institute for Economic Research and Policy Consulting, Working Paper No. 15, July 2002

Baffes, J. *"Some Further Evidence on the Law of One Price: the Law of One price still holds."* American Journal of Agricultural Economics, 73 (1991): 1264-1273

Barrett, C. B. *"Market Analysis Methods: Are Our Enriched Toolkits Well Suited to Enlivened Markets?"* American Journal of Agricultural Economics, 78 (1996): 825-829

Baulch, B. *"Transfer Costs, Spatial Arbitrage and Testing for Food Market Integration."* American Journal of Agricultural Economics, 79 (1997): 477-487

Baulch, B. *"Testing for Food Market Integration Revisited."* Journal of Development Studies, Vol. 33, No.4 (1997): 512-534

Berkowitz, D. *"Quantifying Price Liberalization in Russia",* June 1996

Berkowitz, D. & DeJong, D.N. "*Internal Borders", June 1998*

Boswijk, H.P. and Urbain, J.-P. *"Lagrange-Multiplier Tests for Wek Exogeneity: A Synthesis"*. Econometric Reviews, Vol. 16 (1997): 21-38

Bucolla, S.T (1989) *"Pricing Efficiency in Agricultural Markets: Issues, Methods and Results."* Western Journal of Agricultural Economics, 14: 111-121

Chang, H-S. And Griffith, G. *"Examining long-run Relationships between Australian Beef Prices."* Australian Journal of Agricultural Economics and Resource economics, 42 (1998): 369-387

Delgado, C. L. *"A Variance Components Approach to Food Grain Integration in Northern Nigeria."* American Journal of Agricultural Economics, 68 (1986): 970-979

Dercon, S. *"On Market integration and Liberalization: Method and Application to Ethiopia."* Journal of Development Studies, Vol. 32, No. 1 (1995): 112-133

Diakosavvas, D. *"How integrated are world Beef Markets?"* Agricultural Economics, 12 (1995): 37-53

Dries, M. A. and Unnevehr, L. J. *"Influence of Trade Policies on price Integration in the World Beef Markets."* Agricultural economics, 4 (1990): 73-89

Engel, C. and Rogers, J.H. *"How wide is the Border?"* American Economic Review, Vol. 86, No. 5 (1996): 1112-1125

Engel, C. and Rogers, J.H. *"Regional Patterns in the Law of One Price: the Roles of Geography vs. Currencies."* NBER Working Paper 5395, December 1995

Engle, R. and Granger, C.W.J. *"Cointegration and Error Correction: Representation, Estimation and Testing"*. Econometrica, 55 (1987): 251-276

Engle, R. and Yoo, B.S. *"Forecasting and Testing in Co-integrated Systems."* Journal of Econometrics, 35 (1987): 143-159

Ericsson, N.R. *"Cointegration, Exogeneity and Policy Analysis: An Overview"*. Journal of Policy Modelling, Vol. 14 (1992): 251-280

Faminow, M. D. and Benson, B. L. *"Integration of Spatial markets."* Agricultural Journal of Agricultural economics, 72 (1990): 49-61

Gardner, B. L. and Brooks, K. M. *"Food Prices and market Integration in Russia: 1992-1993."* American Journal of Agricultural Economics, 76 (1994): 641-646

Goletti, F. and Babu, S. *"Market Liberalization and Integration of Maize Markets in Malawi."* Agricultural Economics 11(1994): 311-324

Goodwin, B. K. and Schroeder, T. C. *"Cointegration Tests and Spatial Price Linkages in Regional Cattle Markets."* American Journal of Agricultural Economics, 73 (1991): 452-463

Goodwin, B.K., Grennes, T.J. & McCurdy, C. *"Spatial Price Dynamics & Integration in Russian Food Markets"*. Discussion Paper, August 17, 1996. Duke University, North Carolina

Goodwin, B. K., Grennes, T. J. and Wohlgenant, M. K. *"A Revised Test of the Law of One Price Using Rational Price Expectations."* American Journal of Agricultural Economics (1990): 682-693

Granger, C.W.J and Newbold, P. *"Spurious Regression in Econometrics."* Journal of Econometrics, 26 (1974): 1045-1066

Granger, C.W.J. *"Some Properties of Time-Series data and their Use in Econometric Model Specification."* Journal of Econometrics, 16 (1981): 121-130

Hassan, Daniel and Simioni, Michel *"Price Linkage and Transnission between shippers and retailers in the French vegetable channel",* 2001

Jabara, C.L. and Schwartz, N.E. *"Flexible Exchange Rates and Commodity Prices Changes: the Case of Japan."* American Journal of Agricultural Economics, 69 (1987): 580-590

Kennedy, P. *"A Guide to Econometrics"*. Fourth Edition. Cambridge: The MIT Press, 1998

Kopsidis, M. and Peter, G. *"Spatial Integration during Transition? The Russian wheat flour Market 1994-1996."* Quarterly Journal of International Agriculture, 40 (2001): 29-43

Ravallion, M. *"Testing Market Integration."* American Journal of Agricultural economics, 68 (1986): 103-109

Richardson, D.J. *"Some Empirical Evidence on Commodity Arbitrage and the Law of One price."* Journal of International Economics, 8 (1987): 341-351

Sexton, R. J., Kling, C. L. and Garman, H. F. *"Market Integration, Efficiency of Arbitrage, and Imperfect Competition: Methodology and Application to U.S. Cellery."* American Journal of Agricultural Economics, 73 (1991): 568-580

Thompson, S.R., Sul, D. and Bohl, M.T. *"Spatial Market Efficiency and Policy Regime Change: Seemingly Unrelated Error Correction Model Estimation."* American Journal of Agricultural Economics, 84 (2002): 1042-1063

von Bailey, D. and Brorsen, B. W. *"Price Asymmetry in Spatial Fed cattle markets."* Western Journal of Agricultural economics, 14 (1989): 246-252

von Cramon-Taubadel, S. and Loy, J. P. *"Asymmetrische Preistransmission bei Integrierten Variablen."* Schriften der gesellschaft fur Wirtschafts und Sozialwisswnschaften des landbaues, Bd. 35, (1999): 621-626

von Cramon-Taubadel, S., Zorya, S. and Striewe, L. *"Policies and Agricultural Development in Ukraine"*. Aachen: Shaker, 2001

APPENDIX A. *Bread market*

Table A1. Statistics summary

Region	Index	Bread						Sugar						Sunflower oil					
		Min.	Max.	Mean	Std. Dev.	ADF test[1]	ADF test[2]	Min.	Max.	Mean	Std. Dev.	ADF test[1]	ADF test[2]	Min.	Max.	Mean	Std. Dev.	ADF test[1]	ADF test[2]
AR Krim*	***1***	0.79	1.15	0.95	0.11	-2.10	-4.82	0.91	1.75	1.38	0.20	-2.90	-4.83	1.73	3.96	2.69	0.52	-1.85	-3.84
Vynnytza-reg.	***2***	0.70	1.21	0.87	0.13	-1.68	-3.66	0.94	1.59	1.27	0.17	-2.95	-4.91	2.15	3.98	2.73	0.47	-2.09	-3.66
Volyn-reg.	***3***	0.71	1.13	0.87	0.16	-2.04	-4.21	0.86	1.70	1.29	0.21	-2.21	-4.70	1.59	3.54	2.45	0.48	-1.36	-4.33
Dnipropetrovsk-reg.	***4***	0.69	1.06	0.86	0.11	-2.15	-3.32	0.90	1.78	1.33	0.21	-2.96	-4.19	1.45	3.89	2.59	0.60	-1.71	-4.09
Donetzk-reg.	***5***	0.68	0.94	0.83	0.07	-2.54	-3.20	0.84	1.62	1.28	0.20	-2.73	-4.27	1.43	3.65	2.31	0.53	-2.07	-4.54
Shytomyr-reg.	***6***	0.65	0.96	0.79	0.08	-1.97	-3.65	0.90	1.62	1.27	0.20	-2.79	-4.60	1.70	3.01	2.24	0.37	-1.85	-4.49
Zakarpattia-reg.	***7***	0.78	1.17	0.95	0.10	-2.48	-3.59	0.93	1.75	1.32	0.18	-2.60	-5.85	2.18	3.87	2.77	0.63	-1.77	-3.45
Zaporishia-reg.	***8***	0.76	1.14	0.93	0.11	-2.40	-3.06	0.80	1.73	1.36	0.23	-2.88	-4.66	1.54	3.70	2.64	0.45	-1.78	-3.80
Ivano-Frankivsk-reg.	***9***	0.81	1.16	0.96	0.09	-1.93	-3.82	0.87	1.71	1.26	0.20	-2.96	-5.08	1.76	3.69	2.55	0.48	-2.08	-3.48
Kyjiv-reg.	***10***	-	-	-	-	-	-	0.90	1.69	1.28	0.21	-2.84	-5.54	1.73	3.82	2.46	0.49	-2.26	-4.04
Kirovograd-reg.	***11***	0.62	1.17	0.87	0.14	-1.74	-3.19	0.99	1.66	1.28	0.16	-279	-4.96	1.69	4.10	2.72	0.54	-2.19	-4.17
Luhansk-reg.	***12***	-	-	-	-	-	-	0.88	1.57	1.25	0.18	-2.84	-4.79	1.40	3.76	2.46	0.56	-1.83	-4.95
L'viv-reg.	***13***	0.63	1.03	0.84	0.10	-2.47	-3.02	0.79	1.66	1.22	0.21	-2.70	-4.98	2.01	3.47	2.56	0.42	-1.80	-4.25
Mykolajiv-reg.	***14***	0.67	1.09	0.88	0.13	-1.81	-3.81	0.93	1.69	1.33	0.19	-3.13	-4.64	1.36	4.27	2.65	0.70	-2.01	-4.29
Odesa-reg.	***15***	0.73	1.04	0.89	0.09	-2.21	-3.70	0.95	1.75	1.35	0.20	-2.91	-4.86	1.64	3.92	2.51	0.48	-2.08	-4.04
Poltava-reg.	***16***	0.72	1.05	0.90	0.11	-2.18	-3.02	0.97	1.78	1.29	0.19	-2.68	-4.89	1.46	3.82	2.52	0.54	-2.34	-4.35
Rivne-reg.	***17***	0.74	1.01	0.89	0.07	-1.24	-3.46	0.87	1.67	1.30	0.19	-2.35	-5.16	1.57	3.75	2.43	0.50	-1.99	-4.61
Sumy-reg.	***18***	0.72	1.10	0.90	0.10	-2.20	-3.72	0.88	1.67	1.28	0.19	-3.04	-4.67	1.59	4.09	2.64	0.53	-1.98	-4.59
Ternopil-reg.	***19***	0.73	1.15	0.94	0.11	-2.04	-3.52	0.73	1.63	1.20	0.22	-2.41	-5.15	1.66	3.72	2.42	0.50	-2.02	-3.99
Charkiv-reg.	***20***	0.71	1.20	0.92	0.14	-2.57	-3.07	0.86	1.62	1.25	0.21	-2.50	-4.97	1.35	3.21	2.23	0.48	-1.97	-4.58
Chersson-reg.	***21***	0.65	1.06	0.87	0.11	-2.37	-3.00	0.92	1.86	1.31	0.20	-2.28	-4.45	1.50	3.89	2.28	0.49	-2.04	-5.64
Chmelnytskyj-reg.	***22***	0.67	1.16	0.89	0.13	-2.10	-3.67	0.81	1.56	1.24	0.21	-2.22	-4.69	1.63	3.79	2.52	0.51	-1.93	-3.91
Tshercassy-reg.	***23***	0.66	1.07	0.84	0.11	-2.07	-3.23	0.89	1.71	1.28	0.19	-2.75	-4.94	1.74	3.98	2.74	0.49	-1.66	-3.92
Tshernivtsi-reg.	***24***	0.69	1.13	0.90	0.13	-2.19	-3.48	0.85	1.73	1.27	0.21	-2.45	-5.00	1.71	3.71	2.36	0.49	-2.17	-4.42
Tshernihiv-reg.	***25***	0.80	1.18	1.03	0.11	-2.33	-3.53	0.85	1.69	1.29	0.22	-2.75	-4.55	1.71	3.55	2.42	0.44	-2.34	-4.61

[1] - ADF test for the levels. Critical values at 1% - -4.11, 5% - -3.48, 10%- -3.17

[2] - ADF test for first differences. Critical values at 1% - -3.53, 5%- -2.91, 10%- -2.59

Table A2. P-values of the test for endogeneity

i/j	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
1	-	0.020	0.050	0.030	0.070	0.040	0.005	0.795	0.103	0.010	0.078	0.390	0.122	0.032	0.240	0.190	0.051	0.035	0.078	0.008	0.153	0.030	0.108
2		-	0.000	0.170	0.061	0.005	0.623	0.259	0.143	0.051	0.973	0.630	0.713	0.830	0.707	0.027	0.903	0.154	0.685	0.794	0.120	0.217	0.726
3			-	0.740	0.872	0.551	0.782	0.000	0.168	0.096	0.819	0.042	0.115	0.071	0.045	0.146	0.038	0.208	0.474	0.292	0.166	0.884	0.025
4				-	0.245	0.396	0.688	0.619	0.271	0.712	0.121	0.340	0.004	0.722	0.598	0.828	0.077	0.155	0.045	0.171	0.098	0.211	0.000
5					-	0.837	0.486	0.325	0.120	0.754	0.442	0.990	0.287	0.038	0.050	0.195	0.196	0.085	0.011	0.310	0.971	0.026	0.917
6						-	0.581	0.517	0.002	0.007	0.006	0.041	0.001	0.051	0.001	0.001	0.905	0.025	0.353	0.301	0.000	0.008	0.019
7							-	0.574	0.522	0.903	0.005	0.339	0.001	0.061	0.018	0.065	0.001	0.639	0.216	0.362	0.102	0.086	0.364
8								-	0.988	0.669	0.008	0.976	0.597	0.030	0.943	0.034	0.949	0.154	0.081	0.000	0.912	0.792	0.198
9									-	0.112	0.519	0.404	0.000	0.457	0.000	0.409	0.397	0.686	0.076	0.038	0.295	0.048	0.612
11										-	0.067	0.096	0.062	0.567	0.127	0.036	0.017	0.615	0.014	0.332	0.067	0.607	0.861
13											-	0.046	0.526	0.057	0.010	0.090	0.093	0.177	0.034	0.664	0.887	0.112	0.001
14												-	0.306	0.759	0.002	0.031	0.004	0.004	0.325	0.000	0.049	0.287	0.765
15													-	0.355	0.553	0.233	0.076	0.336	0.767	0.069	0.776	0.066	0.059
16														-	0.377	0.427	0.000	0.826	0.875	0.242	0.381	0.077	0.895
17															-	0.742	0.622	0.023	0.971	0.171	0.768	0.458	0.930
18																-	0.863	0.116	0.759	0.676	0.133	0.926	0.060
19																	-	0.838	0.015	0.190	0.165	0.978	0.816
20																		-	0.427	0.017	0.028	0.510	0.071
21																			-	0.275	0.689	0.063	0.691
22																				-	0.458	0.049	0.014
23																					-	0.002	0.729
24																						-	0.022

Note: 1…25 is a region index as it appears in Table A1

Note: The cells in grey indicate that the null of weak exogeneity can be rejected at 10% significance level

Table A3. Long-run equilibrium parameters

	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	--	0.83	1.09	1.10*	1.05	0.97	1.13	0.95	1.07	1.12	1.24	1.09**	1.09***	1.02	1.03	1.17	0.77**	0.95	1.17*	1.24*	1.07	1.19	0.84**
2000		0.25***	0.95	0.89	2.21	1.00	0.63**	0.84	0.75**	0.52*	1.10***	0.56**	1.03	0.73***	0.99	0.88**	0.37***	0.49	0.83	0.39	0.71	0.53**	0.53
2 1999		--	0.70***	0.71*	0.56***	0.44***	0.88***	0.44***	0.93	0.12***	0.73***	0.94	0.94	0.40*	1.00	-.31***	0.25***	0.93***	0.70**	0.99**	1.02	0.59**	0.42***
2000			0.99	1.02	3.68**	1.41	1.06	1.23	1.09	0.53***	1.80	0.73*	1.68***	1.07	1.00	1.09	0.93	0.72*	0.86***	0.73**	0.97	0.88	0.83***
3 1999			--	0.81***	0.93	0.51**	1.00	0.85*	0.95***	0.43***	0.90**	0.83***	1.00	0.22***	0.96	0.32***	0.95	1.05	0.21***	0.98*	0.58	0.85**	0.60***
2000				0.98	1.28***	1.04**	0.59**	0.89***	0.77***	0.25***	1.07	0.53*	0.95	0.33***	0.70**	0.59***	0.36	0.46	0.39***	0.39**	0.68	0.56	0.50
4 1999				--	1.09***	0.80	0.90	0.87	0.91	1.01	1.08	0.95***	0.96	0.95**	0.94	0.51***	0.64	0.97***	0.35***	1.06***	0.87	1.15	0.31***
2000					0.94	1.04	0.71***	0.87***	0.81**	0.38	0.89***	0.53***	0.93**	0.60*	0.44**	0.51***	0.68	0.52**	0.33***	0.44**	0.93*	0.58***	0.34***
5 1999					--	0.84	1.28	0.70	0.90	0.96	1.05	0.89	0.81**	0.66***	0.55***	0.76**	0.66***	0.57**	0.87	0.97	0.78**	0.93	0.64
2000						0.36***	0.26***	0.30***	0.26***	0.11***	0.49***	0.20**	0.46**	0.31***	-.06***	0.17***	0.08***	0.19***	0.46*	0.13**	0.21	0.21***	0.27***
6 1999						--	0.83	0.87	0.85	0.91	0.89	0.83	0.87	0.72**	0.87**	0.95**	0.51	0.75*	0.99	0.90	0.78**	0.85**	0.62**
2000							0.60***	0.81**	0.70	0.37***	0.88	0.48***	0.90**	0.70***	0.93	0.78	0.57	0.50**	0.82	0.42**	0.74	0.49**	0.68*
7 1999							--	0.94***	1.00	1.07	0.86***	0.72**	0.55	1.00	1.04	0.04	0.37***	1.10	0.74*	1.04	1.11	1.02	0.73**
2000								1.03	0.95	0.55	1.23	0.76*	1.10	1.07*	1.08	0.89	0.61***	0.79***	0.94	0.63	1.11	0.83***	0.92***
8 1999								--	0.80	0.99	1.13	1.18***	1.02	1.02	0.84	1.08	0.81	1.06	1.14	1.26**	1.11	1.28	0.89***
2000									0.93	0.48*	1.00	0.62***	1.15	0.87**	0.97	0.89	0.89*	0.6*	0.91	0.51	1.23	0.62***	0.78**
9 1999									--	0.33	0.50**	0.46**	0.48**	0.39	0.74**	0.02***	0.22***	0.42*	0.66	0.66*	0.45***	0.55	0.33***
2000										0.55*	1.10*	0.71**	1.12	0.97	1.09**	0.90	0.71***	0.70	0.89	0.62	0.96	0.70**	0.87
11 1999										--	0.02***	0.61	0.70	0.62***	0.13***	0.23**	0.19***	0.69	0.63**	0.97***	0.75	0.78	0.51***
2000											1.61***	1.32	0.96	0.90	1.61***	1.77	1.23**	1.25	0.77**	1.06	2.01	1.29***	1.31
13 1999											--	0.87***	0.86**	0.85	0.86**	0.96	0.81	1.44	0.97**	0.98	1.01	0.85*	0.53***
2000												0.38***	0.74*	0.48*	0.88	0.85	0.87	0.39**	0.75	0.20***	1.13	0.38***	0.47***
14 1999												--	0.99	0.88	1.22**	0.80	0.49***	0.79**	1.14**	1.09***	0.89	1.07	0.71***
2000													0.93	1.37***	0.95	1.29	0.89	0.87***	0.65	0.89***	1.84	0.98	0.74
15 1999													--	0.85	1.15***	0.98	0.27	0.88	0.45***	0.70	0.94	0.98*	0.57
2000														0.63***	0.94	0.86**	0.83**	0.40	0.58***	0.39***	0.32	0.51***	0.65**
16 1999														--	1.07	1.09*	0.65***	0.98	1.13*	1.04	1.02	1.10	0.73**
2000															1.02	0.80	0.51***	0.66	0.89	0.53	0.88	0.73***	0.86*
17 1999															--	-0.18**	0.21***	0.75	0.56	0.72*	0.24	0.28	0.19***
2000																0.57	0.60***	0.56	0.90	0.54	0.94	0.72	0.59***
18 1999																--	0.46	0.69	0.22***	0.49***	0.92	0.92**0	0.50
2000																	0.95	0.48	0.69***	0.32***	1.08	.42	0.58**
19 1999																	--	0.47	0.67	0.97	0.62*	0.99	0.53
2000																		0.62	1.02	0.56	0.86	0.70	0.88
201999																		--	1.05	0.83	1.05	1.07*	0.27
2000																			0.92	0.78***	1.58***	1.01	1.22

	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
21 1999 2000																			--	0.71* 0.31***	0.97 0.56	1.02 0.37***	0.57** 0.43***
22 1999 2000																				--	0.53 1.74**	0.98 1.20**	0.76 0.87
23 1999 2000																					--	1.11 0.61***	0.46*** 0.50***
24 1999 2000																						--	0.68*** 0.52

* - denotes a rejection of the null of perfect spatial integration ($\beta^*=1$) at 10% significance level

**- denotes a rejection of the null of perfect spatial integration at 5% significance level

***- denotes a rejection of the null of perfect spatial integration at 1% significance level

Note: the cells in grey indicate those market pairs for which the hypothesis of perfect spatial market integration cannot be rejected at 5% significance level in both sub-periods; 1999 – denotes the first period 1997-1999; 2000 – stands for the second period 2000-2002

Table A4. A point-estimate of an immediate effect (short-run) to a unit change in P_j

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-1999	-0.01 (0.18)	**0.36 (0.19)**	-0.09 (0.20)	0.75*** (0.21)	0.34* (0.26)	0.25 (0.21)	0.67 (0.11)	0.39 (0.15)	0.71*** (0.20)	0.62*** (0.27)	**0.68 (0.08)**	0.34 (0.25)	0.30 (0.19)	0.16 (0.23)	0.43 (0.18)	0.44 (0.20)	0.91*** (0.14)	**0.31 (0.21)**	0.51** (0.27)	**0.59* (0.16)**	0.56** (0.26)	0.46 (0.08)
2000-2002	0.06 (0.09)	**0.00 (0.04)**	0.06 (0.12)	0.60* (0.20)	0.50 (0.08)	-0.01 (0.17)	0.52 (0.16)	0.21 (0.15)	0.50 (0.11)	0.47 (0.13)	**0.34 (0.07)**	0.47 (0.07)	0.61 (0.13)	0.32 (0.11)	0.40 (0.11)	0.16 (0.12)	0.24 (0.05)	**0.54 (0.11)**	0.03 (0.16)	**0.28 (0.07)**	0.36 (0.10)	0.27 (0.15)
2 1997-1999		**0.78*** (0.35)**	0.14 (0.16)	0.54*** (0.40)	1.29*** (0.48)	1.00*** (0.30)	0.87*** (0.34)	0.94*** (0.24)	0.43* (0.26)	0.82*** (0.17)	0.47** (0.30)	0.43* (0.25)	1.03*** (0.28)	0.90*** (0.18)	0.71*** (0.44)	0.09 (0.20)	0.49*** (0.56)	1.04*** (0.19)	**1.21*** (0.45)**	**0.69*** (0.29)**	1.18*** (0.38)	0.53** (0.27)
2000-2002		**0.17 (0.11)**	0.29 (0.18)	1.07*** (0.33)	0.72*** (0.28)	0.56 (0.16)	0.58** (0.20)	0.55* (0.21)	0.56 (0.15)	1.10*** (0.26)	0.63 (0.15)	0.92*** (0.23)	0.51 (0.17)	0.54 (0.13)	0.55*** (0.30)	0.52 (0.13)	0.43 (0.12)	0.69* (0.14)	**0.36 (0.13)**	**0.13 (0.15)**	0.37 (0.15)	0.96*** (0.26)
3 1997-1999			0.14 (0.24	0.42 (0.18)	0.46 (0.13)	0.44 (0.11)	**0.60*** (0.20)**	0.42 (0.13)	0.42 (0.18)	0.61*** (0.28)	0.28 (0.17)	0.23 (0.15)	0.35 (0.19)	-0.02 (0.24)	0.49 (0.14)	0.33* (0.26)	**0.62*** (0.28)**	0.39 (0.11)	**0.72* (0.14)**	0.11 (0.19)	**0.57 (0.16)**	0.54 (0.13)
2000-2002			0.95*** (0.12)	0.81*** (0.17)	1.05*** (0.12)	0.28 (0.08)	**-0.03 (0.16)**	0.52 (0.12)	0.65 (0.12)	0.49* (0.22)	-0.04 (0.14)	1.43 (0.11)	0.46 (0.14)	0.44 (0.21)	0.50 (0.11)	0.38 (0.12)	**0.14 (0.12)**	0.52 (0.14)	**0.34 (0.06)**	0.42 (0.12)	**0.10 (0.50)**	1.71 (0.24)
4 1997-1999				0.28 (0.20)	0.47 (0.17)	0.24 (0.12)	0.31 (0.14)	0.49 (0.15)	0.18 (0.15)	0.27 (0.21)	0.24 (0.10)	0.52** (0.26)	**0.87*** (0.17)**	0.20 (0.12)	0.39 (0.15)	0.09 (0.13)	**0.46 (0.15)**	0.10 (0.21)	**0.39 (0.15)**	0.12 (0.24)	**0.47 (0.14)**	-0.09 (0.38)
2000-2002				0.20 (0.22)	0.62 (0.13)	0.34 (0.07)	0.45 (0.10)	0.40 (0.08)	0.30 (0.09)	0.45 (0.15)	0.43 (0.09)	0.81*** (0.21)	**0.26 (0.05)**	0.16 (0.10)	0.19 (0.09)	0.27 (0.12)	**0.04 (0.06)**	0.18 (0.12)	**0.12 (0.06)**	-0.22 (0.18)	**0.17 (0.07)**	0.79*** (0.42)
5 1997-1999					**0.33 (0.16)**	0.30 (0.13)	0.35 (0.20)	**0.32 (0.18)**	0.21 (0.20)	0.61* (0.19)	0.33 (0.15)	0.43 (0.16)	0.15 (0.12)	**0.14 (0.24)**	**0.53* (0.22)**	**0.24 (0.09)**	0.27 (0.21)	0.08 (0.27)	**0.63** (0.25)**	0.32 (0.12)	0.31 (0.27)	0.51 (0.10)
2000-2002					**-0.09 (0.12)**	0.18 (0.08)	0.22 (0.13)	**-0.09 (0.14)**	0.24 (0.11)	0.41 (0.11)	0.16 (0.11)	0.72*** (0.19)	0.41 (0.08)	**-0.34 (0.13)**	**0.09 (0.12)**	**-0.08 (0.06)**	0.17 (0.06)	0.44 (0.09)	**0.14 (0.06)**	0.14 (0.07)	0.34 (0.13)	0.35 (0.20)
6 1997-1999						0.40 (0.18)	0.37 (0.14)	**1.04*** (0.23)**	0.52* (0.22)	0.19 (0.18)	0.21 (0.16)	0.44 (0.17)	**0.85*** (0.13)**	0.17 (0.28)	0.81*** (0.42)	0.10 (0.09)	0.27* (0.30)	**0.71* (0.14)**	0.55 (0.14)	0.70*** (0.30)	**0.64*** (0.26)**	0.49* (0.23)
2000-2002						0.35 (0.07)	0.31 (0.09)	**0.52 (0.12)**	0.39 (0.16)	0.12 (0.21)	0.27 (0.13)	0.36 (0.18)	**0.41 (0.12)**	0.83*** (0.15)	0.95*** (0.14)	0.20 (0.12)	0.18 (0.09)	**0.26 (0.16)**	0.34 (0.05)	0.41* (0.26)	**0.19 (0.11)**	1.17*** (0.20)
7 1997-1999							**1.00*** (0.21)**	0.57* (0.21)	0.14 (0.23)	0.74*** (0.42)	0.48** (0.30)	0.56* (0.20)	0.76*** (0.27)	0.52*** (0.37)	0.46*** (0.35)	0.24* (0.34)	0.59*** (0.39)	0.70*** (0.22)	**1.15*** (0.20)**	0.56* (0.21)	**1.11*** (0.24)**	0.46 (0.16)
2000-2002							**0.17 (0.21)**	0.79*** (0.14)	0.65* (0.15)	0.65*** (0.32)	0.83*** (0.25)	1.15*** (0.14)	0.97*** (0.21)	0.08 (0.33)	0.74*** (0.25)	0.18 (0.18)	0.33 (0.11)	0.27 (0.19)	**0.61 (0.07)**	0.17 (0.31)	**0.60 (0.15)**	1.11*** (0.15)
8 1997-1999								0.60 (0.12)	0.29 (0.19)	0.60*** (0.28)	0.73** (0.14)	0.47 (0.16)	0.58 (0.16)	0.47 (0.15)	0.49*** (0.33)	0.05 (0.15)	**0.73*** (0.24)**	0.62*** (0.25)	0.56* (0.19)	**0.81* (0.21)**	**0.81*** (0.14)**	0.39 (0.12)
2000-2002								0.71 (0.08)	0.28 (0.09)	-0.08 (0.32)	0.41 (0.18)	0.54 (0.18)	0.69 (0.12)	0.44 (0.11)	0.52* (0.21)	0.17 (0.10)	**0.13 (0.07)**	0.99*** (0.17)	0.51 (0.07)	**0.07 (0.13)**	**-0.02 (0.07)**	0.60*** (0.27)
9 1997-1999									0.30 (0.15)	0.30 (0.14)	0.41 (0.13)	**0.66** (0.19)**	**0.65 (0.12)**	0.56*** (0.31)	0.51 (0.19)	0.14 (0.09)	0.38* (0.30)	0.53* (0.22)	0.25 (0.22)	0.26 (0.13)	**0.82*** (0.23)**	0.51 (0.14)
2000-2002									0.40 (0.11)	0.15 (0.19)	0.45 (0.10)	**0.05 (0.21)**	**0.32 (0.08)**	1.14*** (0.17)	0.56 (0.13)	0.11 (0.09)	0.09 (0.09)	0.42 (0.19)	0.55 (0.09)	0.07 (0.19)	**-0.08 (0.20)**	0.39 (0.15)

continued

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
11 1997-1999										0.12	0.27	0.38	0.19	-0.11	0.10	-0.11	0.28*	0.38*	0.22	0.08	0.10	0.08
										(0.31)	(0.20)	(0.22)	(0.20)	(0.22)	(0.29)	(0.21)	(0.29)	(0.28)	(0.27)	(0.27)	(0.19)	(0.18)
2000-2002										1.06***	0.99***	0.79***	0.33	0.60*	1.06***	0.60	0.32	0.73**	0.34	0.67*	0.32	0.73***
										(0.18	(0.11)	(0.15)	(0.12)	(0.16)	(0.18)	(0.13)	(0.08)	(0.16)	(0.09)	(0.15)	(0.11)	(0.18)
13 1997-1999											0.31	0.26	0.42*	0.18	-0.08	0.45*	0.70***	0.38*	**0.72*** **	0.39	0.43	0.36
											(0.18)	(0.16)	(0.24)	(0.27)	(0.25)	(0.21)	(0.22)	(0.25)	**(0.18)**	(0.17)	(0.13)	(0.22)
2000-2002											0.41	0.69*	0.27	0.10	0.39	0.32	0.46	0.55*	**0.05**	0.29	0.40	0.85***
											(0.11)	(0.14)	(0.17)	(0.16)	(0.16)	(0.12)	(0.07)	(0.18)	**(0.06)**	(0.11)	(0.06)	(0.15)
14 1997-1999												0.30	0.26	0.14	0.38*	0.32	0.58***	0.43	0.47**	0.55**	0.53	0.64
												(0.17)	(0.16)	(0.27)	(0.26)	(0.22)	(0.31)	(0.18)	(0.27)	(0.27)	(0.16)	(0.13)
2000-2002												0.67*	0.33	0.88***	1.01***	0.60	0.20	0.47	0.47	0.31	0.27	0.46
												(0.16)	(0.10)	(0.16)	(0.18)	(0.12)	(0.08)	(0.18)	(0.10)	(0.15)	(0.08)	(0.14)
15 1997-1999													0.22	**0.55**	0.44	0.16	**0.66*** **	0.14	0.09	**0.49**	0.18	0.85***
													(0.15)	**(0.14)**	(0.20)	(0.16)	**(0.24)**	(0.14)	(0.22)	**(0.17)**	(0.21)	(0.25)
2000-2002													0.30	**0.07**	0.63	0.36	**0.26**	0.36	0.29	**0.13**	0.31	1.34**
													(0.10)	**(0.13)**	(0.12)	(0.12)	**(0.05)**	(0.14)	(0.08)	**(0.09)**	(0.13)	(0.09)
16 1997-1999														0.41*	**0.63*** **	0.07	0.30*	0.77***	**0.64*** **	**0.53*** **	**0.63*** **	0.82***
														(0.23)	**(0.28)**	(0.22)	(0.32)	(0.19)	**(0.31)**	**(0.24)**	**(0.32)**	(0.34)
2000-2002														0.23	**0.09**	0.01	-0.03	0.55	**0.03**	**-0.05**	**0.01**	0.61**
														(0.17)	**(0.15)**	(0.15)	(0.12)	(0.15)	**(0.13)**	**(0.17)**	**(0.21)**	(0.22)
17 1997-1999															0.59*	0.11	0.06	0.47	0.63***	**0.54**	**0.40**	0.14
															(0.18)	(0.11)	(0.32)	(0.15)	(0.25)	**(0.15)**	**(0.23)**	(0.17)
2000-2002															0.46	0.33	0.01	0.58	0.23	**0.01**	**-0.13**	0.15
															(0.11)	(0.09)	(0.08)	(0.15)	(0.08)	**(0.21)**	**(0.19)**	(0.16)
18 1997-1999																0.07	0.39*	0.26	0.22	0.42	**0.60**	0.17
																(0.09)	(0.30)	(0.17)	(0.20)	(0.09)	**(0.09)**	(0.24)
2000-2002																0.60	0.32	0.48	0.01	0.46	**0.25**	1.36*
																(0.07)	(0.07)	(0.17)	(0.09)	(0.16)	**(0.10)**	(0.15)
19 1997-1999																	0.52***	0.18*	0.29*	0.25	0.42*	0.22
																	(0.45)	(0.36)	(0.32)	(0.25)	(0.29)	(0.22)
2000-2002																	0.24	0.14	0.11	0.25	0.41	0.54**
																	(0.11)	(0.29)	(0.11)	(0.15)	(0.15)	(0.25)

Continued

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
20 1997-1999																		0.23	0.17*	0.11	0.41	0.25
																		(0.19)	(0.41)	(0.31)	(0.17)	(0.18)
2000-2002																		0.36	0.39	0.88***	0.65**	2.12***
																		(0.19)	(0.19)	(0.41)	(0.21)	(0.74)
21 1997-1999																			**0.82*** (0.15)**	**0.41 (0.16)**	**1.09*** (0.18)**	**0.56 (0.12)**
2000-2002																			**-0.01 (0.05)**	**0.05 (0.10)**	**-0.28 (0.12)**	**0.07 (0.13)**
22 1997-1999																				0.45**	0.77***	0.67***
																				(0.29)	(0.28)	(0.29)
2000-2002																				0.46	0.49	0.47***
																				(0.20)	(0.17)	(0.54)
23 1997-1999																					0.66***	0.77***
																					(0.33)	(0.28)
2000-2002																					0.73***	0.49
																					(0.26)	(0.17)
24 1997-1999																						0.47**
																						(0.31)
2000-2002																						0.41
																						(0.23)

* - indicates that the hypothesis of weak short-run (β_{10} =1 or β_{20} =1) integration can be accepted at 1%, but rejected at 5%

** - indicates that the hypothesis of weak short-run integration can be accepted at 5%, but rejected at 10%

***- indicates that the hypothesis of weak short-run integration can be accepted at 10%

Note: the cells in grey indicate those market pairs for which an immediate effect has significantly ***increased*** in the second period compared to the first one: the hypothesis that $\beta_{10} < \beta_{20}$ can be accepted at 10% significance level;

the cells indicate those market pairs for which an immediate effect has significantly ***decreased*** in the second period compared to the first one: the hypothesis that $\beta_{10} > \beta_{20}$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table A5. Adjustment coefficient

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-1999	-0.44* (0.09)	-0.52 (0.28)	-0.19 (0.12)	-0.52 (0.33)	-0.40* (0.10)	-0.30 (0.15)	-0.49* (0.16)	-0.38* (0.10)	-0.29* (0.08)	-0.06 (0.18)	-0.40* (0.09)	-0.28 (0.15)	-0.32* (0.10)	-0.31** (0.12)	-0.10 (0.10)	-0.16 (0.15)	-0.29 (0.15)	-0.36 (0.20)	-0.31 (0.19)	-0.59* (0.17)	-0.39** (0.19)	-0.37** (0.17)
2000-2002	-0.38* (0.11)	-0.30* (0.09)	-0.41* (0.07)	-0.40 (0.23)	-0.38* (0.14)	-0.34* (0.07)	-0.69* (0.17)	-0.77* (0.06)	-0.34* (0.13)	-0.42* (0.12)	-0.42* (0.09)	-0.79* (0.10)	-0.51* (0.09)	-0.49* (0.11)	-0.45* (0.13)	-0.30* (0.11)	-0.46* (0.08)	-0.41** (0.17)	-0.40* (0.09)	-0.27 (0.15)	-0.38* (0.13)	-0.47* (0.10)
2 1997-1999		-0.48 (0.30)	-0.16 (0.09)	-0.35 (0.37)	-0.45 (0.31)	-0.57 (0.35)	-0.29 (0.35)	-0.13 (0.13)	-0.21 (0.15)	-0.71 (0.46)	-0.07 (0.22)	-0.02 (0.18)	-0.10 (0.25)	-0.16 (0.19)	-0.13 (0.19)	-0.23 (0.23)	0.14 (0.34)	-0.38 (0.22)	-0.48 (0.36)	-0.21 (0.20)	-0.37 (0.27)	-0.21 (0.33)
2000-2002		-0.08 (0.09)	-0.12 (0.09)	-0.50* (0.16)	-0.40* (0.12)	-0.36* (0.10)	-0.30* (0.10)	-0.40* (0.18)	-0.37* (0.14)	-0.46** (0.18)	-0.08 (0.03)	-0.33* (0.09)	-0.26* (0.10)	-0.10 (0.07)	0.30 (0.12)	-0.29* (0.10)	-0.49* (0.12)	-0.06 (0.09)	-0.26** (0.10)	-0.24** (0.12)	-0.33 (0.19)	-0.33* (0.09)
3 1997-1999			-0.09 (0.16)	-0.63 (0.32)	-0.28** (0.11)	**-0.41** (0.19)**	-0.10 (0.28)	-0.11 (0.11)	-0.27** (0.11)	-0.79 (0.55)	-0.35 (0.24)	-0.18 (0.12)	-0.33** (0.13)	-0.34** (0.10)	-0.16 (0.08)	-0.17 (0.16)	-0.18 (0.27)	-0.13 (0.08)	**-0.92* (0.28)**	-0.44** (0.18)	-0.31** (0.12)	-0.56 (0.28)
2000-2002			-0.89* (0.20)	-1.17* (0.09)	-0.66* (0.11)	**0.02 (0.12)**	-0.03 (0.09)	-0.09 (0.12)	-1.18* (0.09)	-0.39* (0.14)	-0.05 (0.14)	-0.82* (0.11)	-1.15* (0.09)	-0.44* (0.16)	-0.64* (0.14)	-1.26* (0.11)	-0.25 (0.14)	-0.56 (0.15)	**0.02 (0.14)**	-1.33* (0.15)	-0.13 (0.15)	-0.97* (0.15)
4 1997-1999				-0.05 (0.11)	-0.23 (0.17)	-0.13 (0.11)	-0.11 (0.15)	-0.16 (0.11)	-0.09 (0.13)	0.00 (0.05)	-0.02 (0.07)	-0.34 (0.21)	-0.93* (0.18)	-0.12 (0.08)	-0.12 (0.11)	-0.10 (0.12)	-0.07 (0.14)	-0.22 (0.12)	-0.19 (0.13)	-0.23 (0.17)	-0.07 (0.12)	-0.44 (0.41)
2000-2002				-0.53* (0.14)	-0.39* (0.13)	-0.40* (0.09)	-0.07 (0.09)	-0.15** (0.08)	-0.43* (0.09)	-0.33* (0.09)	-0.49* (0.09)	-0.63* (0.16)	-0.24* (0.05)	-0.26* (0.08)	-0.36* (0.09)	-0.28* (0.10)	-0.27* (0.08)	-0.39* (0.09)	-0.30* (0.09)	-0.16 (0.14)	-0.43* (0.11)	-0.70* (0.13)
5 1997-1999					-0.25 (0.13)	-0.45* (0.17)	-0.65* (0.21)	-0.41* (0.14)	-0.07 (0.14)	-0.28 (0.20)	-0.27 (0.23)	-0.21 (0.14)	-0.19** (0.09)	-0.23* (0.08)	-0.21 (0.12)	-0.37* (0.14)	-0.26** (0.12)	-0.41** (0.18)	-0.09 (0.18)	-0.33** (0.13)	-0.24 (0.13)	-0.19 (0.15)
2000-2002					-0.66* (0.25)	-0.82* (0.12)	-0.74* (0.28)	-0.91* (0.25)	-0.19 (0.22)	-1.02* (0.22)	-0.19 (0.22)	-0.73** (0.28)	-0.37* (0.14)	-0.41* (0.12)	-0.20 (0.26)	-0.50* (0.15)	-0.68* (0.18)	-0.58* (0.16)	-0.52* (0.15)	-0.65* (0.15)	-0.63* (0.19)	-0.24 (0.15)
6 1997-1999						-0.25** (0.11)	-0.46* (0.13)	-0.15 (0.13)	-0.29 (0.18)	-0.33** (0.13)	-0.35* (0.10)	-0.35** (0.14)	-0.18 (0.14)	-0.24** (0.09)	-0.16 (0.15)	-0.42* (0.12)	-0.43** (0.16)	-0.25 (0.14)	**-0.32* (0.11)**	-0.45* (0.17)	-0.20 (0.12)	-0.39** (0.18)
2000-2002						-0.07 (0.12)	-0.35* (0.13)	-0.81* (0.16)	-0.40** (0.17)	-0.56* (0.15)	-0.86* (0.20)	-0.41** (0.18)	-0.47* (0.10)	-0.39** (0.16)	-0.54* (0.16)	-0.45* (0.15)	-0.43** (0.18)	-0.20 (0.13)	**0.02 (0.12)**	-0.45* (0.15)	-0.45* (0.13)	-0.37* (0.12)
7 1997-1999							-0.45 (0.26)	-0.10 (0.18)	-0.07 (0.13)	-0.79 (0.52)	-0.22 (0.32)	-0.49* (0.16)	-0.29 (0.18)	-0.40** (0.19)	-0.21 (0.17)	-0.36 (0.31)	0.03 (0.23)	-0.52** (0.24)	-0.72* (0.22)	-0.26 (0.14)	-0.40** (0.19)	-0.24 (0.19)
2000-2002							-0.10 (0.14)	-0.19 (0.19)	-0.46** (0.17)	-0.39** (0.16)	-0.48** (0.21)	-0.71* (0.13)	-0.61* (0.18)	-0.10 (0.15)	-0.39** (0.16)	-0.24 (0.13)	-0.26 (0.21)	-0.29** (0.12)	-0.66* (0.15)	-0.37** (0.18)	-0.73* (0.27)	-0.38** (0.15)
8 1997-1999								-0.23 (0.13)	-0.10 (0.14)	0.09 (0.29)	-0.21 (0.11)	-0.23 (0.18)	-0.21 (0.17)	-0.25 (0.15)	-0.08 (0.15)	-0.05 (0.19)	-0.49 (0.27)	-0.46 (0.32)	-0.16 (0.15)	-0.28 (0.21)	-0.34 (0.20)	-0.20 (0.11)
2000-2002								-0.37* (0.11)	-0.54* (0.13)	-0.27 (0.20)	-0.55** (0.26)	-0.28** (0.13)	-0.77* (0.16)	-0.33* (0.10)	-0.44* (0.15)	-0.26** (0.13)	-0.59* (0.17)	-0.57* (0.16)	-0.27* (0.08)	0.11 (0.15)	-0.24** (0.10)	-0.93* (0.30)
9 1997-1999									-0.85* (0.21)	-0.89* (0.25)	-0.83** (0.32)	**-1.26* (0.26)**	**-0.87* (0.22)**	-0.68* (0.18)	-0.56* (0.19)	**-0.99* (0.19)**	**-1.03* (0.32)**	**-0.98* (0.26)**	**-0.80* (0.24)**	**-1.07* (0.25)**	-0.73* (0.22)	-0.66* (0.21)
2000-2002									-0.54* (0.18)	-0.51** (0.15)	-0.54* (0.17)	**-0.57* (0.18)**	**-0.41* (0.10)**	-0.63* (0.13)	-0.51* (0.13)	**-0.30* (0.10)**	**-0.35 (0.25)**	**-0.41** (0.17)**	**-0.35* (0.13)**	**-0.36** (0.15)**	-0.46** (0.18)	-0.39* (0.11)

continued

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
11 1997-1999										-0.29	-0.21	-0.29	-0.60**	-0.29	-0.39**	-0.47**	-0.48**	-0.37**	-0.33**	**-0.54****	-0.38**	-0.43**
2000-2002										(0.17) -0.19** (0.08)	(0.12) -0.48* (0.16)	(0.18) -0.21* (0.07)	(0.26) -0.43* (0.09)	(0.17) -0.23 (0.12)	(0.18) -0.19** (0.08)	(0.20) -0.27* (0.08)	(0.21) -0.19** (0.09)	(0.17) -0.30** (0.08)	(0.14) -0.53* (0.13)	**(0.22) -0.04 (0.10)**	(0.16) -0.31* (0.09)	(0.18) -0.41* (0.11)
13 1997-1999											-0.20	-0.06	-0.39**	-0.15	0.11	-0.21	-0.03	-0.28	-0.36	-0.04	-0.05	-0.16
2000-2002											(0.18) 0.01 (0.11)	(0.13) -0.16 (0.16)	(0.16) -0.52* (0.13)	(0.12) -0.11 (0.11)	(0.10) -0.002 (0.13)	(0.16) -0.09 (0.11)	(0.15) -0.54* (0.11)	(0.20) -0.51* (0.17)	(0.39) -0.27* (0.09)	(0.13) 0.01 (0.11)	(0.11) -0.18** (0.07)	(0.18) 0.09 (0.13)
14 1997-1999												-0.36*	-0.26**	-0.48*	-0.16	-0.27	-0.39*	-0.50**	-0.34	-0.28	-0.45*	-0.48*
2000-2002												(0.13) -0.23** (0.11)	(0.12) -0.20** (0.08)	(0.11) -0.42* (0.09)	(0.10) -0.28 (0.16)	(0.15) -0.32* (0.11)	(0.14) -0.32** (0.12)	(0.20) -0.36* (0.10)	(0.32) -0.11 (0.12)	(0.15) -0.05 (0.11)	(0.13) -0.33* (0.12)	(0.15) -0.43* (0.11)
15 1997-1999													-0.61*	-0.43*	-0.23	**-0.54***	-0.69*	-0.97*	-0.63*	-0.38*	-0.44*	-0.52*
2000-2002													(0.17) -0.40* (0.14)	(0.13) -0.19 (0.12)	(0.13) -0.22 (0.17)	**(0.17) -0.15 (0.12)**	(0.15) -0.68* (0.14)	(0.20) -0.67* (0.18)	(0.17) -0.40* (0.10)	(0.14) -0.52* (0.11)	(0.16) -0.33* (0.11)	(0.16) -0.25** (0.11)
16 1997-1999														-0.21	-0.09	-0.28	-1.00*	-0.31	-0.53**	-0.66*	-0.23	-0.51**
2000-2002														(0.14) -0.47* (0.13)	(0.26) -0.33* (0.11)	(0.15) -0.40* (0.09)	(0.36) -0.90* (0.17)	(0.22) -0.49* (0.13)	(0.20) -0.40* (0.12)	(0.24) -0.30* (0.10)	(0.28) -0.51* (0.16)	(0.20) -0.86* (0.21)
17 1997-1999															-0.27**	-0.20	-0.14	-0.49*	-0.27	-0.36**	-0.30	-0.22
2000-2002															(0.12) -0.54* (0.14)	(0.14) -0.66* (0.18)	(0.14) -0.22 (0.14)	(0.18) -0.51* (0.15)	(0.18) -0.14 (0.14)	(0.15) -0.47* (0.10)	(0.18) -0.11 (0.13)	(0.18) -0.55* (0.16)
18 1997-1999																-0.33*	-0.42*	-0.25	-0.30**	-0.27*	-0.18	-0.35**
2000-2002																(0.12) -0.31** (0.15)	(0.15) -0.57* (0.12)	(0.14) -0.63* (0.15)	(0.11) -0.55* (0.08)	(0.08) -0.53* (0.14)	(0.09) -0.34* (0.11)	(0.14) -0.38* (0.09)
19 1997-1999																	-0.35**	-0.39*	-0.45*	-0.43*	-0.44*	-0.40*
2000-2002																	(0.14) -0.24 (0.14)	(0.14) -0.30** (0.15)	(0.14) -0.18 (0.13)	(0.14) -0.37** (0.17)	(0.13) -0.21 (0.14)	(0.14) -0.22 (0.12)

continued

	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
20 1997-1999																			-0.14	-0.04	0.01	-0.11	-0.15
2000-2002																			(0.27)	(0.45)	(0.25)	(0.25)	(0.16)
																			-0.32*	-0.39**	-0.25**	-0.47*	-0.56**
																			(0.10)	(0.15)	(0.12)	(0.12)	(0.25)
21 1997-1999																				**-0.98***	-0.34**	**-0.56***	-0.56**
2000-2002																				**(0.18)**	(0.14)	**(0.16)**	(0.21)
																				-0.28*	-0.28*	**-0.22***	-0.32*
																				(0.05)	(0.08)	**(0.06)**	(0.08)
22 1997-1999																					-0.10	-0.08	-0.22
2000-2002																					(0.24)	(0.26)	(0.28)
																					-0.33*	-0.87*	-0.44**
																					(0.12)	(0.13)	(0.18)
23 1997-1999																						-0.33	-0.08
2000-2002																						(0.18)	(0.26)
																						-0.52**	-0.87*
																						(0.21)	(0.13)
24 1997-1999																							-0.38**
2000-2002																							(0.16)
																							-0.27
																							(0.14)

*-significantly different from zero at 1% level of significance

** - significantly different from zero at 5% level of significance

Note: the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***increased*** significantly: the hypothesis that $|z_1| < |z_2|$ can be accepted at 10% significance level;

the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***decreased*** significantly: the hypothesis that $|z_1| > |z_2|$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table A6. The speed of adjustment (a percent of a shock transmitted within 6 month)

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	96%	98%	88%	99%	97%	84%	100%	93%	100%	50%	94%	91%	99%	90%	78%	85%	100%	100%	93%	100%	97%	100%
2000	94%	91%	96%	97%	94%	93%	100%	100%	100%	95%	93%	100%	100%	100%	98%	100%	100%	97%	96%	98%	98%	99%
2 1999		100%	83%	99%	105%	100%	115%	98%	285%	100%	37%	49%	76%	93%	-116%	139%	53%	110%	98%	94%	105%	98%
2000		93%	82%	100%	97%	96%	109%	100%	105%	99%	107%	99%	99%	124%	99%	97%	102%	84%	106%	100%	107%	105%
3 1999			83%	99%	118%	100%	125%	85%	99%	100%	98%	69%	44%	81%	86%	83%	73%	193%	100%	108%	94%	101%
2000			100%	98%	99%	80%	63%	76%	98%	102%	91%	100%	97%	93%	98%	98%	77%	100%	66%	94%	81%	99%
4 1999				22%	96%	72%	92%	101%	59%	13%	34%	96%	100%	49%	89%	54%	56%	92%	67%	76%	69%	94%
2000				97%	94%	98%	54%	60%	107%	89%	99%	99%	70%	77%	90%	85%	76%	85%	90%	46%	104%	98%
5 1999					94%	92%	101%	103%	55%	98%	102%	87%	120%	80%	111%	97%	88%	90%	89%	87%	88%	108%
2000					100%	102%	100%	100%	107%	100%	122%	100%	108%	89%	125%	96%	100%	98%	103%	101%	99%	11%
6 1999						103%	102%	72%	80%	105%	98%	99%	61%	68%	106%	95%	96%	90%	110%	94%	92%	103%
2000						34%	84%	99%	85%	96%	101%	94%	95%	94%	100%	98%	98%	79%	97%	93%	110%	100%
7 1999							99%	102%	54%	100%	92%	91%	88%	94%	420%	105%	56%	100%	100%	88%	98%	95%
2000							33%	93%	99%	99%	100%	98%	99%	71%	92%	78%	107%	89%	100%	88%	100%	105%
8 1999								106%	42%	123%	87%	96%	91%	106%	88%	58%	103%	97%	91%	135%	98%	92%
2000								96%	98%	112%	99%	110%	100%	80%	96%	82%	100%	92%	100%	59%	91%	100%
9 1999									99%	100%	100%	100%	100%	99%	103%	99%	100%	100%	100%	100%	100%	99%
2000									99%	97%	99%	98%	97%	100%	97%	90%	98%	95%	95%	81%	98%	97%
11 1999										219%	93%	114%	103%	73%	108%	95%	105%	90%	84%	100%	100%	94%
2000										92%	105%	108%	95%	87%	93%	94%	101%	87%	99%	78%	99%	96%
13 1999											77%	64%	95%	58%	2%	97%	62%	82%	97%	83%	75%	116%
2000											70%	117%	96%	57%	74%	67%	104%	95%	88%	40%	138%	164%
14 1999												89%	98%	94%	91%	95%	100%	99%	79%	84%	93%	90%
2000												77%	76%	102%	94%	97%	94%	91%	60%	33%	83%	87%
15 1999													100%	78%	97%	104%	99%	99%	96%	96%	100%	101%
2000													101%	90%	99%	89%	99%	100%	93%	101%	100%	121%
16 1999														81%	82%	94%	100%	92%	95%	100%	91%	97%
2000														98%	95%	98%	100%	97%	93%	90%	99%	100%
17 1999															15%	82%	51%	94%	98%	96%	116%	56%
2000															99%	99%	73%	91%	77%	90%	89%	97%
18 1999																90%	95%	75%	70%	70%	61%	74%
2000																97%	100%	99%	99%	94%	90%	95%

continued

	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1999																		118%	95%	98%	100%	97%	98%
2000																		83%	89%	82%	95%	85%	82%
20 1999																			80%	97%	41%	83%	171%
2000																			94%	101%	94%	98%	101%
21 1999																				99%	97%	99%	99%
2000																				81%	87%	71%	92%
22 1999																					98%	81%	90%
2000																					94%	100%	106%
23 1999																						93%	81%
2000																						99%	100%
24 1999																							98%
2000																							98%

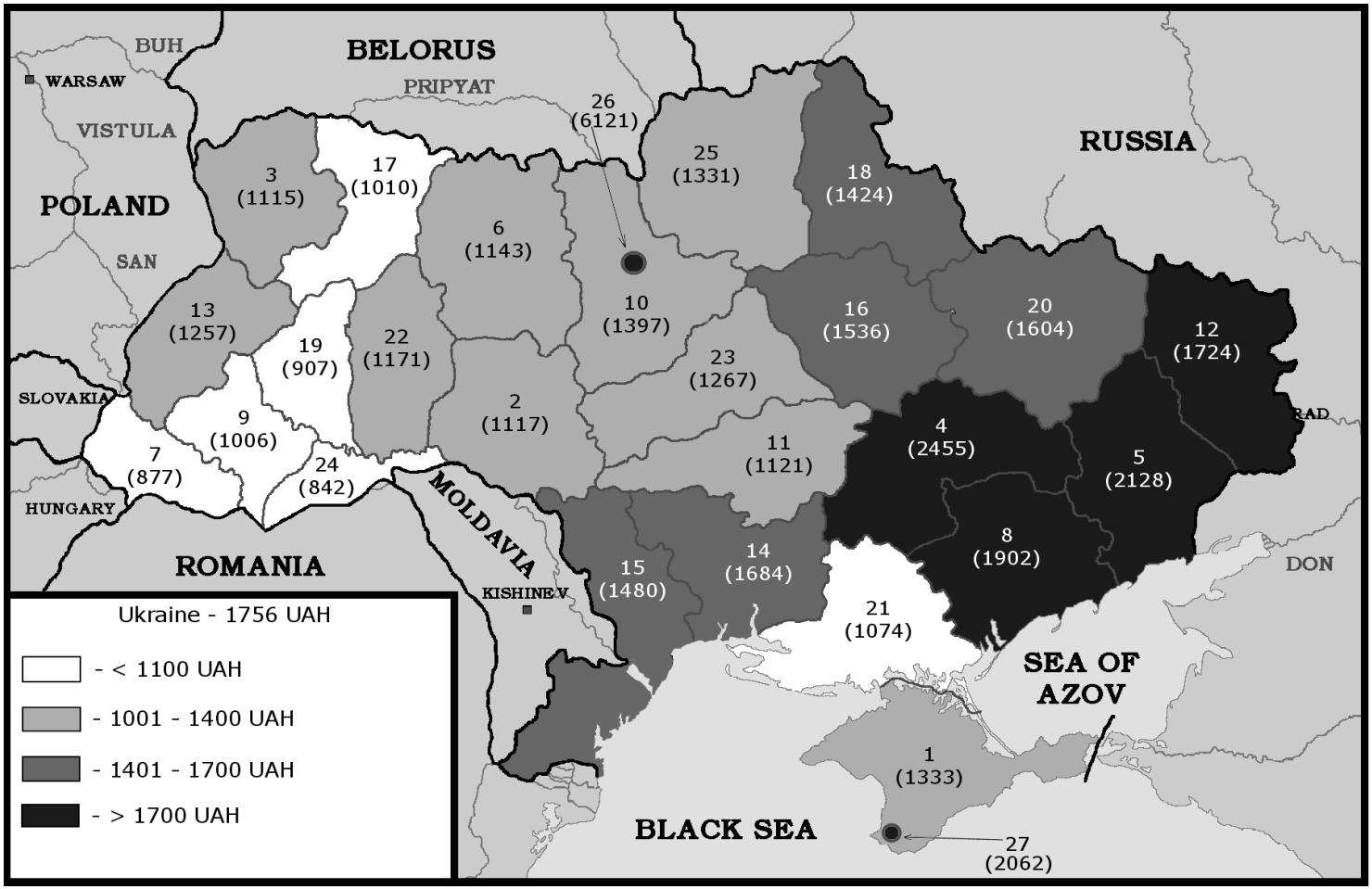

Figure 1. Map of Ukraine

1–Crimea autonomy; oblasts: 2–Vinnytsya, 3–Volyn, 4–Dnipropetrovsk, 5–Donetsk, 6–Zhytomyr, 7–Transkarpatian, 8–Zaporizzya, 9–Ivano-Frankivsk, 10–Kyiv, 11–Kirovograd, 12–Lugansk, 13–Lviv, 14–Mykolaiv, 15–Odesa, 16–Poltava, 17–Rivne, 18–Sumy, 19–Ternopil, 20–Kharkiv, 21–Kherson, 22–Khmelnytskiy, 23–Cherkasy, 24–Chernivtsi, 25–Chernigiv; 26–Kyiv city, 27–Sevastopol city.

APPENDIX B. *Sugar market*

Table B1. P-values of the test for endogeneity

i/j	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	--	0.76	0.26	0.18	0.32	0.88	0.18	0.79	0.53	0.85	0.36	0.20	0.33	0.27	0.25	0.64	0.27	0.83	0.35	0.10	0.69	0.19	0.19	0.25	0.99
2		--	0.39	0.95	0.25	0.54	0.04	0.20	0.04	0.03	0.00	0.18	0.92	0.26	0.53	0.16	0.10	0.47	0.96	0.43	0.16	0.28	0.37	0.30	0.99
3			--	0.20	0.64	0.73	0.63	0.18	0.87	0.08	0.81	0.31	0.92	0.24	0.98	0.85	0.24	0.79	0.82	0.19	0.25	0.90	0.77	0.76	0.37
4				--	0.73	0.66	0.02	0.88	0.69	0.12	0.57	0.96	0.09	0.25	0.67	0.29	0.72	0.41	0.58	0.41	0.74	0.66	0.88	0.38	0.88
5					--	0.66	0.20	0.05	0.00	0.00	0.01	0.08	0.00	0.05	0.59	0.05	0.00	0.01	0.00	0.66	0.00	0.17	0.17	0.57	0.08
6						--	0.00	0.42	0.21	0.18	0.65	0.69	0.83	0.31	0.02	0.17	0.00	0.26	0.92	0.81	0.51	0.29	0.64	0.15	0.89
7							--	0.74	0.25	0.74	0.63	0.50	0.94	0.54	0.25	0.76	0.90	0.98	0.84	0.99	0.32	0.85	0.67	0.98	0.85
8								--	0.82	0.17	0.22	0.10	0.44	0.66	0.59	0.80	0.90	0.43	0.54	0.48	0.30	0.72	0.55	0.85	0.17
9									--	0.69	0.08	0.22	0.45	0.10	0.46	0.75	0.56	0.02	0.68	0.30	0.42	0.29	0.69	0.74	0.22
10										--	0.64	0.66	0.71	0.10	0.21	0.77	0.95	0.97	0.21	0.17	0.02	0.17	0.89	0.55	0.60
11											--	0.52	0.93	0.20	0.53	0.61	0.01	0.71	0.52	0.53	0.79	0.14	0.49	0.60	0.77
12												--	0.50	0.60	0.03	0.44	0.03	0.26	0.65	0.67	0.45	0.49	0.74	0.18	0.11
13													--	0.93	0.39	0.00	0.57	0.24	0.30	0.28	0.66	0.30	0.04	0.79	0.65
14														--	0.44	0.02	0.01	0.65	0.46	0.31	0.75	0.71	0.88	0.74	0.37
15															--	0.13	0.37	0.42	0.29	0.89	0.63	0.90	0.79	0.78	0.43
16																--	0.65	0.21	0.13	0.19	0.33	0.51	0.03	0.12	0.41
17																	--	0.33	0.94	0.54	0.76	0.06	0.09	0.44	0.21
18																		--	0.05	0.34	0.92	0.53	0.31	0.73	0.69
19																			--	0.59	0.23	0.97	0.65	0.85	0.97
20																				--	0.24	0.90	0.40	0.58	0.71
21																					--	0.76	0.87	0.30	0.25
22																						--	0.91	0.53	0.93
23																							--	0.87	0.59
24																								--	0.12

Note: the cells in grey indicate that the hypothesis of weak exogeneity can be rejected at 10% level of significance

Table B2. Long-run equilibrium parameters

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	1.11*	1.10	1.05***	1.08*	1.31***	1.06*	0.95	1.13**	1.12***	1.08***	1.12**	1.20*	1.05	1.03	1.11***	1.08***	1.09***	0.99	1.41	1.25*	1.16***	1.24**	1.11*	1.09***
2000	1.04	0.94	0.98	0.74	1.02	1.01	0.82	0.65	1.02	1.09*	1.08	1.05	1.27**	1.01	0.80	1.03*	0.98	0.86	0.59	0.79	1.02	1.00	1.04	0.78
2 1999	--	0.82	0.78	0.64	1.02	0.95**	0.46***	1.01	0.97	0.79***	0.67	0.88	0.73	0.85	0.71***	0.98	0.98	0.78	0.52***	0.78	0.90	1.00	0.88	0.57***
2000		0.95	0.62	1.01	0.97**	0.98	0.75***	0.90	0.50***	0.65***	0.96	0.51	1.00	0.97	0.66***	0.76	0.95	0.68	0.64	0.95	0.99	1.00	0.96	0.67*
3 1999		--	0.94	0.75	1.10*	0.97**	0.60**	1.06	1.04	1.01	0.26	1.10**	0.65	0.94*	1.02	0.99	1.02	0.74	0.66	0.63**	0.96	1.01	1.02	0.65
2000			1.00	1.03	0.82	1.00	0.95	0.89	0.86	0.56**	1.06	1.05	1.01	0.98	0.68	1.01	1.02	0.94	0.61	0.69	1.08	1.02	0.94	1.01
4 1999			--	0.93	1.10*	1.08	0.79**	1.06***	0.97	1.03	1.06	1.09	1.00	0.91*	1.07**	1.02	1.04	0.79	1.11**	1.01	1.10***	1.05**	1.07*	0.80
2000				1.03	1.01	0.97	0.96**	0.94	0.91**	0.72*	1.05	1.02	1.01	0.94	1.02	1.00	0.94	0.99	1.03	1.01	0.99	1.03	1.00	0.93
5 1999				--	1.07	0.97***	0.96	1.04***	1.03*	1.00	1.05	1.10	0.96**	0.80**	1.02	1.00	1.01	1.10	1.07	1.07	1.08**	1.02	1.03	0.79
2000					0.98	0.97	0.93**	1.01	0.97	1.03	1.02	1.02	0.98	0.96	1.00	0.99	0.98	1.02	0.76**	0.79	1.01	1.00	0.99	0.82
6 1999					--	0.93	0.60*	0.98	0.93	0.94	0.64	1.03	0.82*	0.68**	0.82	0.77	0.84*	0.95	0.71**	0.89	0.98	1.03	1.11*	0.75
2000						0.99	0.95	1.01	0.99	0.90	1.05***	1.04	0.97	0.97	0.75*	1.01	1.02	0.62***	0.76	0.40**	1.02	0.99	1.00	0.97
7 1999						--	0.55**	0.83*	0.77	0.77***	0.93	0.90	0.57	0.71**	1.06	0.91	0.52	0.67*	0.62***	0.68	0.79**	0.77	1.05	0.58***
2000							0.96	0.89	1.01	0.83*	1.06**	1.05	1.01	0.98**	1.04	1.02	1.03	1.06	0.79***	1.03***	1.03	1.03	0.89	0.87*
8 1999								1.17	1.09**	1.05*	1.09	1.15**	1.01	0.99	1.08**	1.04**	1.05**	1.15***	1.13***	1.02*	1.12***	1.14	1.08***	1.07**
2000								1.09	0.99	0.79	1.27	1.04	1.06***	1.03	1.12	1.06	0.95	1.03	1.12	1.06***	1.03	1.06	1.05	1.05**
9 1999									1.00	0.96	0.73	1.06	0.75	0.76***	0.98	0.95*	0.97**	1.06*	0.76	0.75***	1.07	0.98	0.96	0.69**
2000									0.97***	1.01	1.01	1.01***	0.98	0.95***	1.00	0.98	0.99	1.02	0.98	1.01	0.99	0.99	0.97	0.97
10 1999										0.97	0.95	0.98	0.65**	0.79**	0.98	0.96	0.97*	0.79	0.70*	0.67***	0.86	0.86**	0.99	0.84
2000										1.00	1.05***	1.04***	1.13	0.99	0.82**	1.01	1.02***	1.04	0.85*	0.84**	1.01	1.02**	1.00	1.01
11 1999										--	1.04***	0.93	0.79**	0.69**	0.94	0.69*	0.74*	0.65**	0.97**	0.85	1.00	1.01	0.96	0.69**
2000											0.99	0.98	0.96	0.93*	0.97	0.96	0.97	0.99	0.97**	0.96	0.96	0.97**	0.96	0.95*
12 1999											--	1.05	0.94*	0.92*	0.99	0.97	0.98	0.84	1.04***	0.95	1.04	0.99	1.01	0.99
2000												0.99	0.96	0.93	0.98	0.96	0.97*	0.77***	1.00	0.96	0.98	0.97	0.96*	0.96
13 1999												--	0.90	0.87	0.93	0.92	0.55	0.56	0.78**	0.88**	0.97	0.96**	0.93*	0.65***
2000													0.97	0.94	0.98	0.97	0.98**	0.98	0.76***	0.99	0.96***	0.98	0.99	0.82
14 1999													--	0.98	1.06**	1.03*	1.05***	1.14	1.11***	1.01	1.11	1.06	1.05	0.79***
2000														0.97	1.02	1.00	0.70	0.91	0.47**	0.84	0.84	0.78*	0.51*	0.63***
15 1999														--	1.07***	1.05***	1.06***	1.16***	1.12***	1.03***	1.13***	1.08***	1.08*	0.87
2000															0.61***	0.91	1.02	0.94	1.02	0.50	1.04	1.04*	1.02	1.00
16 1999															--	0.97	0.98	1.09	1.05**	0.91	1.03	0.99	0.95	0.89
2000																0.99	0.99	1.02	1.00	0.98	0.98	0.99	0.99	0.98
17 1999																--	1.02	1.12	0.61***	0.98**	1.09**	1.03***	1.03	0.67**
2000																	1.01	0.96	0.62	0.63	0.99	1.01	0.99	0.91
18 1999																	--	0.97	0.85	0.88	1.06**	1.01	1.00	0.81**
2000																		0.83***	0.90	1.00	1.00	1.00	0.98	1.01
19 1999																		--	0.97	0.89***	0.83	0.93***	0.94*	0.72
2000																			0.97	1.00	0.98	0.97	0.97	0.97

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
20 1999 2000																			--	0.75 0.80	1.00 1.00	0.96 1.00	0.96 0.99	0.57*** 0.98*
21 1999 2000																				--	1.10 0.99	1.05** 1.01	1.05 1.00	0.76* 0.99
22 1999 2000																					--	0.95*** 1.00	0.96* 1.06	0.74*** 0.67***
23 1999 2000																						--	1.00 0.99	0.78 0.70***
24 1999 2000																							--	0.92 0.99

* - reject the null of perfect spatial integration ($\beta^*=1$) at 10% significance level

**- reject the null of perfect spatial integration at 5% significance level

***- reject the null of perfect spatial integration at 1% significance level

Note: the cells in grey indicate those market pairs for which the hypothesis of perfect spatial market integration cannot be rejected at 5% significance level in both sub-periods

Table B3. A point-estimate of an immediate effect (short-run) to a unit change in P_j

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-1999	1.95 (0.21)	1.43*** (0.43)	0.72 (0.09)	0.78* (0.09)	1.32** (0.19)	1.09*** (0.27)	0.94*** (0.06)	1.57 (0.14)	1.15*** (0.16)	1.16*** (0.12)	0.87*** (0.11)	1.02*** (0.19)	0.80 (0.08)	1.17*** (0.12)	1.03*** (0.15)	1.39** (0.23)	1.70 (0.19)	1.11*** (0.11)	0.92*** (0.11)	0.86** (0.08)	1.10*** (0.14)	1.08*** (0.18)	1.16*** (0.22)	0.96*** (0.09)
2000-2002	0.92*** (0.23)	0.87*** (0.31)	0.83*** (0.13)	1.02*** (0.18)	0.75*** (0.16)	1.10*** (0.20)	0.88*** (0.14)	0.66 (0.13)	0.86*** (0.13)	0.77 (0.09)	0.90*** (0.17)	0.60* (0.18)	0.80** (0.11)	0.57 (0.14)	0.43 (0.15)	0.48* (0.22)	0.99*** (0.19)	0.82*** (0.14)	0.40 (0.13)	0.54 (0.10)	0.68*** (0.26)	0.53* (0.22)	0.61** (0.21)	0.57 (0.15)
2 1997-1999		0.64 (0.11)	0.22 (0.04)	0.19 (0.06)	0.59 (0.08)	0.71** (0.15)	0.21 (0.04)	0.66* (0.15)	0.51 (0.13)	0.36 (0.11)	0.16 (0.06)	0.28 (0.09)	0.19 (0.06)	0.67** (0.19)	0.52 (0.11)	0.71 (0.10)	0.71 (0.09)	0.49 (0.05)	0.20 (0.06)	0.28 (0.06)	0.39 (0.08)	0.51 (0.06)	0.40 (0.10)	0.23 (0.06)
2000-2002		0.56 (0.15)	0.28 (0.06)	0.53 (0.10)	0.60 (0.09)	0.75*** (0.21)	0.58 (0.07)	0.56 (0.12)	0.35 (0.12)	0.28 (0.11)	0.48 (0.10)	0.30 (0.06)	0.50 (0.08)	0.54 (0.06)	0.65 (0.07)	0.60 (0.10)	0.87*** (0.14)	0.50 (0.06)	0.39 (0.07)	0.32 (0.07)	0.90*** (0.15)	0.52 (0.07)	0.51 (0.11)	0.44 (0.08)
3 1997-1999			0.29 (0.06)	0.34 (0.07)	0.67 (0.11)	0.81*** (0.12)	0.20 (0.05)	0.50 (0.10)	0.69* (0.13)	0.53 (0.08)	0.18 (0.08)	0.41 (0.10)	0.24 (0.06)	0.51 (0.07)	0.41 (0.10)	0.75** (0.13)	0.71* (0.35)	0.31 (0.08)	0.18 (0.07)	0.24 (0.07)	0.53 (0.07)	0.49 (0.08)	0.65 (0.08)	0.36 (0.06)
2000-2002			0.17 (0.10)	0.46 (0.15)	0.25 (0.10)	0.39 (0.12)	0.43 (0.13)	0.20 (0.08)	0.20 (0.12)	0.23 (0.08)	0.43 (0.11)	0.29 (0.08)	0.33 (0.10)	0.22 (0.08)	0.19 (0.10)	0.47 (0.10)	0.54 (0.12)	0.32 (0.09)	0.27 (0.08)	0.14 (0.08)	0.55 (0.13)	0.20 (0.08)	0.61 (0.09)	0.52 (0.07)
4 1997-1999				0.93*** (0.09)	1.34* (0.16)	1.43* (0.19)	0.83 (0.06)	1.60 (0.10)	1.35 (0.10)	1.35* (0.15)	0.92*** (0.10)	1.18*** (0.22)	0.92*** (0.08)	1.17*** (0.13)	1.12*** (0.15)	1.40*** (0.25)	1.81 (0.26)	0.93*** (0.12)	0.83*** (0.11)	0.96*** (0.07)	1.35 (0.12)	1.21* (0.10)	0.96*** (0.23)	1.09*** (0.09)
2000-2002				1.36*** (0.23)	0.72** (0.15)	1.15*** (0.20)	1.18*** (0.14)	0.93*** (0.11)	0.84*** (0.11)	0.44 (0.12)	0.95*** (0.17)	0.66* (0.16)	0.83*** (0.11)	0.71* (0.14)	0.83*** (0.17)	0.72*** (0.21)	1.21*** (0.22)	0.75*** (0.16)	0.71* (0.14)	0.65 (0.09)	1.04*** (0.23)	0.78** (0.12)	0.53*** (0.43)	0.66* (0.14)
5 1997-1999					1.21*** (0.27)	1.23*** (0.18)	0.96*** (0.09)	1.66* (0.27)	1.03*** (0.12)	1.13*** (0.13)	0.82 (0.05)	1.34** (0.25)	0.89*** (0.07)	0.92*** (0.10)	1.24*** (0.17)	1.30*** (0.23)	1.51 (0.15)	0.96*** (0.16)	0.94*** (0.12)	1.12*** (0.11)	1.10*** (0.12)	0.87*** (0.10)	0.84*** (0.21)	0.94*** (0.08)
2000-2002					0.59 (0.04)	0.62 (0.10)	0.54 (0.15)	0.54* (0.19)	0.53 (0.12)	0.45 (0.07)	0.69 (0.07)	0.58 (0.14)	0.38 (0.10)	0.51 (0.10)	0.60 (0.14)	0.60* (0.17)	0.84*** (0.14)	0.52 (0.12)	0.53 (0.05)	0.33 (0.08)	0.81*** (0.16)	0.41 (0.10)	0.47* (0.22)	0.56 (0.09)
6 1997-1999						0.82*** (0.16)	0.38 (0.04)	0.87*** (0.09)	0.78** (0.11)	0.84** (0.09)	0.44 (0.07)	0.66 (0.12)	0.50 (0.09)	0.56 (0.07)	0.65 (0.07)	0.85*** (0.14)	1.12*** (0.10)	0.63 (0.09)	0.48 (0.07)	0.48 (0.05)	0.78 (0.06)	0.69 (0.10)	0.90*** (0.16)	0.58 (0.06)
2000-2002						0.96*** (0.14)	0.44 (0.10)	0.89*** (0.08)	0.82*** (0.12)	0.22 (0.07)	0.52 (0.14)	0.73 (0.08)	0.44 (0.16)	0.78 (0.08)	0.37 (0.10)	1.06*** (0.10)	1.14*** (0.09)	0.72 (0.10)	0.35 (0.11)	0.14 (0.11)	0.68* (0.13)	0.60 (0.16)	0.99*** (0.19)	0.22 (0.10)
7 1997-1999							0.25 (0.04)	0.62 (0.07)	0.51 (0.07)	0.33 (0.09)	0.32 (0.07)	0.49 (0.08)	0.15 (0.06)	0.41 (0.06)	0.44 (0.10)	0.85*** (0.12)	0.60 (0.12)	0.45 (0.06)	0.25 (0.07)	0.25 (0.05)	0.41 (0.08)	0.37 (0.07)	0.70 (0.09)	0.37 (0.07)
2000-2002							0.65 (0.10)	0.65 (0.06)	0.68 (0.07)	0.35 (0.08)	0.72 (0.10)	0.68 (0.06)	0.42 (0.08)	0.58 (0.07)	0.60 (0.09)	0.80* (0.10)	0.90*** (0.11)	0.67 (0.08)	0.42 (0.11)	0.48 (0.06)	0.78*** (0.15)	0.55 (0.07)	0.89*** (0.11)	0.47 (0.12)
8 1997-1999								1.56 (0.12)	1.27* (0.12)	1.15*** (0.10)	0.70 (0.09)	1.09*** (0.16)	0.79 (0.07)	1.05*** (0.11)	0.95*** (0.11)	1.30*** (0.21)	1.48 (0.17)	1.28 (0.11)	0.84** (0.09)	0.69 (0.08)	1.03*** (0.13)	0.90*** (0.21)	0.94*** (0.26)	0.92*** (0.10)
2000-2002								0.79*** (0.13)	0.69 (0.11)	0.47 (0.08)	0.72** (0.16)	0.57 (0.12)	0.72 (0.10)	0.65 (0.09)	0.61 (0.13)	0.72** (0.16)	0.97*** (0.17)	0.76** (0.14)	0.60 (0.12)	0.45 (0.09)	1.07*** (0.25)	0.60 (0.12)	0.48* (0.26)	0.67* (0.15)
9 1997-1999									0.69 (0.07)	0.58 (0.08)	0.36 (0.05)	0.76** (0.13)	0.36 (0.04)	0.48 (0.06)	0.48 (0.07)	0.78*** (0.14)	0.95*** (0.10)	0.56 (0.08)	0.34 (0.06)	0.30 (0.05)	0.66 (0.07)	0.50 (0.06)	0.97*** (0.09)	0.43 (0.06)
2000-2002									0.73 (0.07)	0.45 (0.07)	0.70 (0.08)	1.08*** (0.15)	0.43 (0.05)	0.60 (0.08)	0.84 (0.06)	1.07*** (0.10)	0.98*** (0.11)	0.78* (0.09)	0.57 (0.08)	0.66 (0.05)	1.02*** (0.13)	0.55 (0.06)	0.59 (0.14)	0.53 (0.09)

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
10 1997-1999										0.63	0.48	0.73	0.48	0.67	0.64	0.91***	0.93***	0.63	0.34	0.35	0.69	0.57	0.99***	0.64
										(0.10)	(0.07)	(0.10)	(0.08)	(0.08)	(0.12)	(0.17)	(0.16)	(0.07)	(0.08)	(0.11)	(0.09)	(0.07)	(0.10)	(0.07)
2000-2002										0.51	1.10***	1.04***	0.64	0.89***	0.59	0.78***	1.09***	0.73**	0.66	0.59	1.03***	0.64	0.53	0.69
										(0.08)	(0.10)	(0.18)	(0.14)	(0.08)	(0.06)	(0.17)	(0.12)	(0.14)	(0.11)	(0.09)	(0.15)	(0.07)	(0.16)	(0.11)
11 1997-1999											0.48	0.69*	0.49	0.56	0.79*	0.54**	0.90***	0.52	0.53	0.45	0.86***	0.67	0.73**	0.55
											(0.08)	(0.15)	(0.08)	(0.10)	(0.09)	(0.25)	(0.16)	(0.10)	(0.09)	(0.07)	(0.09)	(0.08)	(0.14)	(0.08)
2000-2002											1.17***	1.39***	0.81***	0.84***	0.98***	1.04***	1.27**	1.06***	1.04***	0.95**	1.21***	0.81***	0.10	1.13***
											(0.13)	(0.24)	(0.12)	(0.12)	(0.10)	(0.27)	(0.16)	(0.15)	(0.11)	(0.13)	(0.31)	(0.12)	(0.21)	(0.12)
12 1997-1999												1.10***	0.89***	0.97***	0.93***	1.40**	1.36*	0.60	0.92***	0.79	1.06***	0.78***	0.65**	0.98***
												(0.15)	(0.08)	(0.13)	(0.14)	(0.21)	(0.18)	(0.12)	(0.07)	(0.07)	(0.15)	(0.14)	(0.20)	(0.11)
2000-2002												0.66	0.54	0.66	0.73*	0.76**	1.05***	0.69	0.82	0.54	0.93***	0.58	0.50*	0.79**
												(0.04)	(0.15)	(0.06)	(0.11)	(0.14)	(0.14)	(0.13)	(0.07)	(0.07)	(0.18)	(0.10)	(0.20)	(0.12)
13 1997-1999													0.56	0.57	0.62	1.18***	0.90***	0.57	0.52	0.49	0.83***	0.58*	0.80***	0.59
													(0.07)	(0.10)	(0.10)	(0.14)	(0.12)	(0.07)	(0.07)	(0.07)	(0.12)	(0.21)	(0.12)	(0.09)
2000-2002													0.34	0.39	0.55	0.69**	0.84***	0.61	0.47	0.47	0.46*	0.23	0.34	0.44
													(0.10)	(0.18)	(0.17)	(0.18)	(0.17)	(0.13)	(0.11)	(0.12)	(0.21)	(0.18)	(0.17)	(0.12)
14 1997-1999														1.19***	1.14***	1.49***	1.82	0.89***	0.94***	0.80	1.17***	0.99***	0.92***	0.90***
														(0.13)	(0.13)	(0.31)	(0.17)	(0.13)	(0.08)	(0.08)	(0.15)	(0.12)	(0.25)	(0.12)
2000-2002														0.83***	0.63	0.79***	1.18***	0.79***	0.68	0.56	1.27***	0.70**	0.61**	0.87***
														(0.16)	(0.16)	(0.39)	(0.20)	(0.19)	(0.10)	(0.10)	(0.27)	(0.18)	(0.22)	(0.19)
15 1997-1999															0.93***	1.05***	1.17***	0.79	0.62	0.51	0.72**	0.65	0.85***	0.76
															(0.17)	(0.26)	(0.13)	(0.09)	(0.14)	(0.06)	(0.14)	(0.11)	(0.17)	(0.10)
2000-2002															0.72	1.09***	1.02***	0.97***	0.87***	0.40	1.07***	0.64	0.60***	0.50
															(0.07)	(0.12)	(0.14)	(0.11)	(0.15)	(0.07)	(0.16)	(0.11)	(0.25)	(0.17)
16 1997-1999																0.91***	1.03***	0.55	0.57	0.48	0.79	0.66	0.69	0.74
																(0.19)	(0.12)	(0.09)	(0.07)	(0.05)	(0.08)	(0.07)	(0.12)	(0.06)
2000-2002																1.11***	1.05***	0.62*	0.65	0.60	0.79***	0.55	0.54	0.69
																(0.14)	(0.18)	(0.15)	(0.12)	(0.10)	(0.16)	(0.10)	(0.17)	(0.11)
17 1997-1999																	0.92***	0.48	0.25	0.34	0.76	0.50	0.62	0.44
																	(0.09)	(0.06)	(0.05)	(0.05)	(0.10)	(0.09)	(0.08)	(0.07)
2000-2002																	0.41	0.35	0.07	0.10	0.25	0.37	0.39	0.18
																	(0.14)	(0.11)	(0.09)	(0.10)	(0.17)	(0.11)	(0.13)	(0.11)
18 1997-1999																		0.55	0.34	0.33	0.72	0.54	0.70	0.54
																		(0.08)	(0.05)	(0.05)	(0.04)	(0.06)	(0.10)	(0.05)
2000-2002																		0.58	0.44	0.50	0.66	0.48	0.56	0.52
																		(0.12)	(0.08)	(0.06)	(0.09)	(0.06)	(0.12)	(0.07)

Continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1997-1999																			0.35 (0.08)	0.50 (0.17)	0.69 (0.11)	0.41 (0.11)	0.89*** (0.16)	0.62 (0.11)
2000-2002																			0.84** (0.09)	0.60 (0.03)	1.43 (0.15)	0.72 (0.08)	0.91*** (0.17)	0.94*** (0.14)
20 1997-1999																				0.64 (0.08)	1.16*** (0.13)	0.93*** (0.13)	0.88*** (0.26)	0.70** (0.16)
2000-2002																				0.66 (0.08)	1.31*** (0.19)	0.64 (0.12)	0.54*** (0.34)	0.93*** (0.15)
21 1997-1999																					1.10*** (0.15)	1.22 (0.09)	0.90*** (0.25)	1.00*** (0.10)
2000-2002																					1.27*** (0.31)	0.52 (0.18)	0.50** (0.29)	0.91*** (0.14)
22 1997-1999																						0.73 (0.06)	0.87*** (0.10)	0.72 (0.06)
2000-2002																						0.44 (0.06)	0.51 (0.12)	0.60 (0.07)
23 1997-1999																							0.77*** (0.19)	0.75 (0.10)
2000-2002																							0.80*** (0.22)	0.55 (0.12)
24 1997-1999																								0.58 (0.09)
2000-2002																								0.53 (0.12)

* - indicates that the hypothesis of weak short-run (β_{10} =1 or β_{20} =1) integration can be accepted at 1%, but rejected at 5%

** - indicates that the hypothesis of weak short-run integration can be accepted at 5%, but rejected at 10%

***- indicates that the hypothesis of weak short-run integration can be accepted at 10%

Note: the cells in grey indicate those market pairs for which an immediate effect has significantly ***increased*** in the second period compared to the first one: the hypothesis that $\beta_{10} < \beta_{20}$ can be accepted at 10% significance level;

the cells indicate those market pairs for which an immediate effect has significantly ***decreased*** in the second period compared to the first one: the hypothesis that $\beta_{10} > \beta_{20}$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table B4. Adjustment coefficient

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-	-0.86*	-1.05*	-0.74*	-0.60*	-0.89*	-0.73*	-0.60**	-0.84*	-0.77*	-0.76*	-0.66*	-0.65*	-0.59*	-1.01*	-0.68*	-0.87*	-1.25*	-0.78*	-0.35**	-0.79*	-0.87*	-0.99*	-1.04*	-0.88*
1999	(0.19)	(0.32)	(0.23)	(0.18)	(0.25)	(0.20)	(0.24)	(0.25)	(0.20)	(0.19)	(0.20)	(0.20)	(0.19)	(0.28)	(0.19)	(0.24)	(0.25)	(0.17)	(0.16)	(0.16)	(0.19)	(0.20)	(0.25)	(0.15)
2000-	-0.92*	-0.77**	-0.73*	-0.68*	-0.67*	-0.75*	-0.77*	-0.65*	-0.91*	-0.66*	-0.68*	-0.64*	-0.85*	-0.87*	-0.94*	-0.62*	-1.10*	-0.97*	-0.76*	-0.55*	-0.77*	-0.85*	-0.58*	-1.30*
2002	(0.19)	(0.33)	(0.21)	(0.14)	(0.19)	(0.22)	(0.18)	(0.17)	(0.21)	(0.20)	(0.20)	(0.21)	(0.17)	(0.19)	(0.21)	(0.21)	(0.23)	(0.22)	(0.17)	(0.15)	(0.17)	(0.24)	(0.21)	(0.21)
2 1997-		-0.35**	-0.22*	-0.12	-0.33**	-0.31**	-0.20**	-0.11	-0.37**	-0.36**	-0.12	-0.20	-0.16	-0.29	0.06	-0.39*	-0.33**	-0.37*	-0.13	-0.30*	-0.20**	-0.43*	-0.38*	-0.22**
1999		(0.17)	(0.07)	(0.10)	(0.13)	(0.14)	(0.08)	(0.18)	(0.18)	(0.16)	(0.09)	(0.10)	(0.10)	(0.23)	(0.11)	(0.12)	(0.14)	(0.09)	(0.08)	(0.10)	(0.09)	(0.12)	(0.14)	(0.11)
2000-		-0.04	-0.83*	-0.17	-0.29**	-0.15	-0.75*	-0.38	-0.63*	-0.66*	-0.28	-0.49*	-0.73*	-0.21	-0.68*	-0.39*	-0.54**	-0.53*	-0.53*	-0.32*	-0.31**	-0.52*	-0.16	-0.85*
2002		(0.21)	(0.13)	(0.13)	(0.14)	(0.28)	(0.16)	(0.28)	(0.19)	(0.14)	(0.14)	(0.12)	(0.17)	(0.14)	(0.02)	(0.12)	(0.22)	(0.13)	(0.14)	(0.11)	(0.13)	(0.12)	(0.16)	(0.16)
3 1997-			-0.63*	-0.54*	-0.73*	-0.43*	-0.58*	-0.55**	-0.63*	-0.57*	-0.35*	-0.84*	-0.50*	-0.60*	-0.66*	-0.48*	-0.35**	-0.75*	-0.50*	-0.62*	-0.82*	-0.64*	-0.78*	-0.67*
1999			(0.09)	(0.12)	(0.14)	(0.14)	(0.16)	(0.23)	(0.16)	(0.09)	(0.09)	(0.13)	(0.10)	(0.13)	(0.13)	(0.17)	(0.16)	(0.12)	(0.09)	(0.12)	(0.19)	(0.23)	(0.21)	(0.13)
2000-			-0.62*	-0.67*	-0.85*	-0.61*	-0.49*	-0.26	-0.54*	-0.28**	-0.28**	-0.67*	-0.36*	-0.75*	-0.61*	-0.58*	-0.40	-0.68*	-0.41*	-0.55*	-0.34**	-0.23	-0.58*	-0.25**
2002			(0.11)	(0.15)	(0.13)	(0.14)	(0.15)	(0.17)	(0.14)	(0.11)	(0.11)	(0.10)	(0.10)	(0.09)	(0.13)	(0.19)	(0.24)	(0.13)	(0.10)	(0.10)	(0.15)	(0.21)	(0.20)	(0.11)
4 1997-				-1.02*	-0.97*	-1.08*	0.70*	-0.98*	-1.03*	-1.39*	-0.80*	-1.00*	-0.46**	-1.25*	-0.28	-0.99*	-1.05*	-0.84*	-0.40**	-0.85*	-1.02*	-0.91*	-0.95*	-0.93*
1999				(0.21)	(0.23)	(0.19)	(0.16)	(0.17)	(0.18)	(0.27)	(0.17)	(0.18)	(0.19)	(0.24)	(0.20)	(0.22)	(0.25)	(0.17)	(0.17)	(0.18)	(0.21)	(0.20)	(0.29)	(0.21)
2000-				-0.52**	-0.37	-0.69**	-0.65**	-0.66*	-0.93*	-0.22	-0.40	-0.47**	-0.47*	-0.49**	-0.21	-0.35	-0.82*	-0.57**	-0.04	-0.23	-0.38*	-0.76*	-0.56	-0.57**
2002				(0.23)	(0.20)	(0.28)	(0.31)	(0.18)	(0.25)	(0.12)	(0.21)	(0.18)	(0.18)	(0.21)	(0.37)	(0.22)	(0.28)	(0.24)	(0.19)	(0.17)	(0.13)	(0.25)	(0.31)	(0.22)
5 1997-					-0.67*	-0.91*	-0.59*	-0.84*	-0.62*	-0.79*	-1.10*	-0.69*	-1.09*	-0.82*	-0.44**	-0.92*	-0.76*	-0.66*	-0.62*	-0.95*	-0.73*	-0.60*	-0.90*	-0.72*
1999					(0.18)	(0.19)	(0.13)	(0.25)	(0.14)	(0.27)	(0.21)	(0.20)	(0.20)	(0.15)	(0.18)	(0.17)	(0.17)	(0.22)	(0.20)	(0.21)	(0.16)	(0.13)	(0.25)	(0.15)
2000-					-0.26**	-0.32*	-0.50**	-0.24**	-0.34	-0.32*	-0.55*	-0.20	-0.40*	-0.24	-0.22	-0.11	-0.41	-0.34**	-0.36**	-0.24*	-0.21	-0.40*	-0.31	-0.56*
2002					(0.10)	(0.10)	(0.23)	(0.10)	(0.23)	(0.10)	(0.20)	(0.16)	(0.14)	(0.15)	(0.21)	(0.17)	(0.26)	(0.13)	(0.14)	(0.13)	(0.16)	(0.14)	(0.16)	(0.20)
6 1997-						-0.52*	-0.57*	-0.81*	-0.55**	-0.62*	-0.45*	-0.49*	-0.54*	-0.71*	-0.36*	-0.71*	-0.75*	-0.71*	-0.38*	-0.60*	-0.46*	-0.47*	-0.81*	-0.66*
1999						(0.16)	(0.17)	(0.18)	(0.22)	(0.16)	(0.12)	(0.15)	(0.13)	(0.19)	(0.13)	(0.16)	(0.20)	(0.16)	(0.12)	(0.14)	(0.13)	(0.13)	(0.26)	(0.17)
2000-						-0.43**	-0.30**	-0.22	-0.22**	-0.21	-0.24**	-0.29	-0.66**	-0.34**	-0.26**	-1.03*	-0.30**	-0.25	-0.33**	-0.18**	-0.21**	-0.33**	-1.02*	-0.06
2002						(0.17)	(0.12)	(0.12)	(0.11)	(0.13)	(0.11)	(0.17)	(0.13)	(0.15)	(0.11)	(0.25)	(0.12)	(0.14)	(0.14)	(0.09)	(0.10)	(0.16)	(0.28)	(0.10)
7 1997-							-0.54*	-0.74*	-0.64*	-0.76*	-0.57*	-0.64*	-0.59*	-0.85*	-0.42*	-0.34**	-0.57*	-0.40*	-0.64*	-0.76*	-0.73*	-0.60*	-0.35	-0.66*
1999							(0.12)	(0.17)	(0.14)	(0.15)	(0.14)	(0.14)	(0.11)	(0.18)	(0.13)	(0.15)	(0.17)	(0.12)	(0.13)	(0.15)	(0.14)	(0.12)	(0.19)	(0.18)
2000-							-0.38*	-0.75*	-0.51*	-0.34*	-0.23**	-0.78*	-0.40*	-0.48*	-0.24	-0.32**	-0.38**	-0.32**	-0.27**	-0.33**	-0.22**	-0.49*	-0.56*	-0.41**
2002							(0.14)	(0.19)	(0.19)	(0.10)	(0.12)	(0.14)	(0.13)	(0.16)	(0.21)	(0.15)	(0.19)	(0.13)	(0.11)	(0.14)	(0.10)	(0.13)	(0.20)	(0.16)
8 1997-								-0.62*	-0.68*	-0.71*	-0.42*	-0.45*	-0.74*	-0.77*	-0.50*	-0.80*	-1.01*	-1.00*	-0.35*	-0.64*	-0.78*	-0.68*	-0.97*	-0.93*
1999								(0.17)	(0.14)	(0.14)	(0.12)	(0.13)	(0.11)	(0.21)	(0.14)	(0.18)	(0.22)	(0.16)	(0.12)	(0.13)	(0.19)	(0.20)	(0.20)	(0.17)
2000-								-0.42**	-0.47	-0.37**	-0.14	-0.27	-0.32**	-0.31	-0.25	-0.31	-0.60**	-0.36	-0.08	-0.22	-0.30**	-0.32	-0.35	-0.38
2002								(0.20)	(0.26)	(0.15)	(0.20)	(0.21)	(0.15)	(0.20)	(0.22)	(0.20)	(0.23)	(0.19)	(0.18)	(0.12)	(0.12)	(0.18)	(0.30)	(0.26)
9 1997-									-0.52*	-0.66*	-0.35*	-0.67*	-0.37*	-0.81*	-0.35*	-0.44**	-0.34**	-0.28**	-0.27**	-0.44*	-0.63*	-0.48*	-0.96*	-0.47*
1999									(0.13)	(0.15)	(0.08)	(0.19)	(0.11)	(0.19)	(0.12)	(0.21)	(0.17)	(0.12)	(0.11)	(0.14)	(0.18)	(0.12)	(0.22)	(0.16)
2000-									-0.67*	-0.30*	-0.30*	-1.02*	-0.55*	-0.60*	-0.52*	-0.40*	-0.47*	-0.38**	-0.20**	-0.37*	-0.24*	-0.54*	-0.27	-0.27*
2002									(0.15)	(0.08)	(0.08)	(0.22)	(0.09)	(0.14)	(0.15)	(0.12)	(0.15)	(0.16)	(0.08)	(0.11)	(0.08)	(0.11)	(0.17)	(0.10)

continued

	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
10 1997-1999									-0.58*	-0.22	-0.68*	-0.33	-0.77*	-0.75*	-0.37**	-0.41**	-0.46*	-0.25**	-0.50**	-0.64*	-0.83*	-1.09*	-0.29
									(0.19)	(0.11)	(0.17)	(0.17)	(0.17)	(0.18)	(0.16)	(0.20)	(0.14)	(0.11)	(0.21)	(0.18)	(0.14)	(0.21)	(0.16)
2000-2002									-0.29**	-0.43*	-0.64*	-0.64*	-0.41**	-1.00*	-0.31	-0.69*	-0.43**	-0.21	-0.70*	-0.34*	-0.77*	-0.23	-0.27
									(0.14)	(0.16)	(0.21)	(0.21)	(0.19)	(0.23)	(0.17)	(0.15)	(0.19)	(0.17)	(0.21)	(0.11)	(0.15)	(0.18)	(0.17)
11 1997-1999										-0.69*	-0.74*	-0.75*	-0.87*	-0.60**	-0.92*	-0.87*	-0.59*	-0.50*	-0.72*	-0.82*	-1.06*	-0.87*	-0.87*
										(0.12)	(0.19)	(0.25)	(0.25)	(0.23)	(0.30)	(0.26)	(0.18)	(0.15)	(0.14)	(0.23)	(0.29)	(0.23)	(0.22)
2000-2002										-0.73*	-0.40*	-0.53*	-0.50*	-0.51*	-0.39**	-0.63*	-0.70*	-0.59**	-0.25**	-0.47*	-0.73*	-0.37*	-0.65*
										(0.13)	(0.14)	(0.17)	(0.16)	(0.17)	(0.19)	(0.20)	(0.20)	(0.22)	(0.12)	(0.15)	(0.19)	(0.15)	(0.21)
12 1997-1999											-0.33	-0.60**	-0.71*	-0.53*	-0.62*	-0.30	-0.15	-0.56*	-0.75*	-0.53*	-0.30	-0.21	-0.44*
											(0.22)	(0.24)	(0.19)	(0.15)	(0.21)	(0.18)	(0.17)	(0.16)	(0.18)	(0.19)	(0.17)	(0.23)	(0.14)
2000-2002											-0.33*	-0.56*	-0.32**	-0.66*	-0.39**	-0.43	-0.39**	-0.39*	-0.28**	-0.34**	-0.44**	-0.44**	-0.69*
											(0.11)	(0.19)	(0.13)	(0.19)	(0.16)	(0.28)	(0.17)	(0.14)	(0.12)	(0.16)	(0.16)	(0.20)	(0.22)
13 1997-1999												-0.26**	-0.54*	-0.38**	-0.38**	-0.57*	-0.39*	-0.40*	-0.50**	-0.49**	-0.55**	-0.47*	-0.63*
												(0.12)	(0.15)	(0.15)	(0.17)	(0.14)	(0.10)	(0.13)	(0.19)	(0.22)	(0.24)	(0.16)	(0.18)
2000-2002												-0.38*	-0.49**	-0.51**	-0.36**	-0.53*	-0.43**	-0.34*	-0.20	-0.37*	-0.51**	-0.31	-0.48*
												(0.14)	(0.19)	(0.20)	(0.17)	(0.18)	(0.17)	(0.11)	(0.18)	(0.14)	(0.24)	(0.19)	(0.16)
14 1997-1999													-0.97*	-0.36	-1.00*	-1.09*	-0.61*	-0.58*	-0.67*	-0.66*	-0.64*	-0.78*	-0.87*
													(0.25)	(0.18)	(0.31)	(0.23)	(0.19)	(0.18)	(0.24)	(0.21)	(0.18)	(0.24)	(0.24)
2000-2002													-0.79**	-0.22	-0.33	-0.99*	-0.72**	-0.64*	-0.48**	-0.62*	-1.08*	-0.66*	-1.01*
													(0.32)	(0.25)	(0.30)	(0.24)	(0.30)	(0.15)	(0.19)	(0.19)	(0.32)	(0.16)	(0.31)
15 1997-1999														-0.54*	-0.88*	-0.61*	-0.58*	-0.61*	-0.68*	-0.86*	-0.77*	-0.99*	-0.79*
														(0.19)	(0.25)	(0.22)	(0.16)	(0.17)	(0.11)	(0.30)	(0.20)	(0.28)	(0.22)
2000-2002														-0.35**	-0.56*	-0.36**	-0.84*	-0.16	-0.55*	-0.70*	-0.51**	-0.36	-0.28
														(0.15)	(0.14)	(0.18)	(0.26)	(0.11)	(0.10)	(0.18)	(0.22)	(0.27)	(0.17)
16 1997-1999															-0.57*	-0.40*	-0.28	-0.42*	-0.43*	-0.52*	-0.56*	-0.68*	-0.50*
															(0.17)	(0.12)	(0.14)	(0.09)	(0.11)	(0.14)	(0.14)	(0.19)	(0.13)
2000-2002															-0.32	-0.64*	-0.38**	-0.26**	-0.40*	-0.28*	-0.52*	-0.39**	-0.61*
															(0.17)	(0.18)	(0.17)	(0.12)	(0.13)	(0.09)	(0.17)	(0.16)	(0.13)
17 1997-1999																-0.23	-0.08	-0.17	-0.43*	-0.24	-0.32**	-0.27	-0.45*
																(0.17)	(0.10)	(0.09)	(0.13)	(0.18)	(0.14)	(0.14)	(0.15)
2000-2002																-0.31*	-0.33*	-0.29**	-0.27**	-0.53*	-0.29	-0.34	-0.21
																(0.11)	(0.12)	(0.11)	(0.11)	(0.16)	(0.18)	(0.20)	(0.12)
18 1997-1999																	-0.58*	-0.43	-0.36*	-0.44*	-0.50*	-0.47**	-0.52*
																	(0.09)	(0.07)	(0.07)	(0.09)	(0.09)	(0.18)	(0.11)
2000-2002																	-0.37*	-0.15	-0.19**	-0.16	-0.60*	-0.63*	-0.36*
																	(0.14)	(0.12)	(0.08)	(0.09)	(0.10)	(0.16)	(0.11)

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1997-1999																			-0.45*	-0.80*	-0.53*	-0.66*	-0.69*	-0.80*
																			(0.11)	(0.22)	(0.13)	(0.13)	(0.24)	(0.18)
2000-2002																			-0.30**	-0.34*	-0.34**	-0.65*	-0.52*	-0.56**
																			(0.13)	(0.13)	(0.16)	(0.17)	(0.18)	(0.23)
20 1997-1999																				-0.69*	-0.45*	-0.48*	-0.68*	-0.82*
																				(0.16)	(0.16)	(0.15)	(0.16)	(0.23)
2000-2002																				-0.12	-0.28	-0.46*	-0.54*	-0.64*
																				(0.11)	(0.15)	(0.16)	(0.19)	(0.16)
21 1997-1999																					-0.82*	-0.61*	-0.99*	-0.68*
																					(0.26)	(0.16)	(0.27)	(0.19)
2000-2002																					-0.30*	-0.54*	-0.56**	-0.39**
																					(0.11)	(0.16)	(0.22)	(0.15)
22 1997-1999																						-0.76*	-1.10*	-1.03*
																						(0.14)	(0.18)	(0.22)
2000-2002																						-0.35*	-0.09	-0.33**
																						(0.09)	(0.13)	(0.14)
23 1997-1999																							-0.90*	-0.55**
																							(0.29)	(0.21)
2000-2002																							-0.64*	-0.82*
																							(0.23)	(0.16)
24 1997-1999																								-0.79*
																								(0.18)
2000-2002																								-0.57*
																								(0.14)

*-significantly different from zero at 1% level of significance

** - significantly different from zero at 5% level of significance

Note: the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***increased*** significantly: the hypothesis that $|z_1| < |z_2|$ can be accepted at 10% significance level;

the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***decreased*** significantly: the hypothesis that $|z_1| > |z_2|$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table B5. Strong short-run integration

j/i	1997-1999 period														2000-2002 period					
	1	**4**	**5**	**6**	**9**	**11**	**12**	**13**	**14**	**15**	**19**	**21**	**22**	**23**	**1**	**6**	**8**	**14**	**15**	**21**
1																				
2															X					
3	X																			
4															X					
5		X																		
6																				
7															X					
8	X			X											X					
9																				
10															X					
11																				
12															X					
13	X		X												X					
14	X						X													
15	X	X							X									X		
16																				
17						X									X	X				
18				X		X									X		X			
19			X																X	
20			X																	
21	X	X																		
22						X		X							X					
23	X														X					
24	X	X	X	X	X	X				X	X	X	X	X					X	X
25												X								

Note: x indicates those market pairs for which we fail to reject the hypothesis of strong short-run integration at 5% significance level

For example, x in the sell (i; j) = (1; 3)=(horizontally; vertically) indicates that we cannot reject the hypothesis that strong short-run market integration exists between market 1 (Crimean region) and market 3 (Volyn region)

Table B6. The speed of adjustment (a percent of a shock transmitted within 6 month)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	100%	100%	100%	99%	100%	100%	100%	100%	100%	100%	100%	100%	99%	100%	100%	100%	100%	100%	96%	100%	100%	100%	100%	100%
2000	99%	99%	100%	100%	99%	99%	100%	99%	100%	100%	99%	99%	100%	100%	100%	99%	100%	99%	100%	99%	99%	100%	99%	100%
2 1999		99%	86%	72%	96%	97%	91%	96%	94%	95%	67%	78%	77%	96%	96%	95%	95%	101%	74%	94%	85%	97%	97%	79%
2000		63%	100%	81%	95%	90%	100%	96%	100%	100%	92%	100%	100%	88%	102%	100%	99%	98%	100%	95%	96%	99%	71%	100%
3 1999			100%	100%	100%	100%	101%	100%	100%	100%	108%	100%	100%	99%	100%	98%	100%	100%	96%	100%	100%	101%	100%	100%
2000			100%	100%	100%	100%	99%	100%	99%	93%	84%	99%	94%	100%	98%	100%	102%	99%	92%	97%	98%	101%	100%	92%
4 1999				100%	100%	100%	100%	100%	100%	102%	100%	100%	100%	100%	102%	100%	100%	100%	98%	100%	100%	100%	100%	100%
2000				98%	93%	99%	100%	99%	100%	70%	96%	96%	100%	98%	106%	91%	100%	98%	69%	95%	97%	100%	98%	100%
5 1999					100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	100%	100%	100%	100%	100%	99%	100%	100%	100%
2000					89%	89%	99%	87%	94%	94%	99%	97%	95%	85%	94%	81%	98%	89%	100%	90%	87%	95%	87%	99%
6 1999						100%	99%	100%	100%	100%	98%	99%	99%	99%	98%	100%	100%	100%	98%	100%	96%	99%	99%	100%
2000						99%	91%	90%	94%	75%	78%	95%	100%	98%	87%	100%	93%	101%	93%	66%	78%	96%	100%	49%
7 1999							99%	100%	100%	100%	99%	100%	100%	100%	97%	97%	101%	100%	100%	100%	100%	100%	100%	100%
2000							96%	100%	99%	91%	92%	100%	98%	98%	93%	101%	97%	91%	85%	95%	89%	99%	100%	98%
8 1999								99%	100%	101%	100%	97%	100%	100%	98%	100%	100%	100%	96%	100%	100%	100%	100%	100%
2000								95%	98%	100%	78%	93%	95%	93%	88%	94%	100%	91%	67%	86%	100%	96%	88%	96%
9 1999									98%	100%	94%	99%	95%	100%	94%	98%	95%	92%	88%	97%	99%	99%	100%	100%
2000									100%	95%	91%	100%	100%	100%	100%	103%	98%	98%	80%	97%	97%	100%	80%	95%
10 1999										100%	92%	100%	99%	100%	100%	95%	92%	101%	99%	98%	100%	100%	100%	98%
2000										97%	99%	100%	100%	99%	100%	98%	99%	95%	104%	100%	99%	100%	80%	96%
11 1999											99%	99%	100%	100%	100%	100%	100%	100%	98%	100%	99%	100%	99%	100%
2000											100%	99%	99%	99%	99%	97%	99%	99%	99%	100%	100%	100%	78%	100%
12 1999												98%	99%	99%	97%	98%	97%	96%	100%	100%	95%	91%	86%	95%
2000												95%	98%	95%	99%	97%	102%	95%	99%	92%	93%	98%	93%	100%
13 1999													96%	100%	97%	102%	102%	107%	98%	100%	99%	100%	100%	101%
2000													99%	99%	99%	97%	100%	97%	95%	89%	97%	98%	85%	99%
14 1999														100%	101%	100%	100%	100%	100%	100%	99%	100%	99%	100%
2000														100%	95%	101%	100%	99%	101%	98%	100%	100%	100%	100%
15 1999															101%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2000															98%	100%	100%	99%	65%	101%	100%	98%	95%	89%
16 1999																98%	98%	98%	97%	99%	99%	99%	99%	99%
2000																99%	99%	94%	86%	95%	91%	99%	93%	99%
17 1999																	100%	84%	104%	97%	92%	96%	102%	100%
2000																	93%	91%	82%	86%	98%	89%	95%	79%
18 1999																		100%	95%	95%	98%	97%	98%	100%
2000																		92%	62%	87%	80%	99%	97%	90%

continued

	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1999																	96%	100%	98%	100%	99%	100%
2000																	100%	100%	108%	101%	97%	101%
20 1999																		100%	95%	97%	99%	100%
2000																		105%	106%	99%	98%	100%
21 1999																			100%	100%	100%	100%
2000																			100%	99%	99%	95%
22 1999																				100%	100%	101%
2000																				92%	61%	101%
23 1999																					100%	100%
2000																					99%	100%
24 1999																						100%
2000																						98%

APPENDIX C. *Sunflower oil market*

Table C1. P-values of the test for endogeneity

i/j	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1		0.27	0.00	0.11	0.41	0.01	0.63	0.88	0.62	0.36	0.26	0.64	0.46	0.13	0.98	0.95	0.59	0.41	0.53	0.65	0.46	0.69	0.79	0.78	0.86
2			0.90	0.57	0.83	0.95	0.76	0.95	0.48	0.99	0.93	0.75	0.99	0.99	0.97	0.45	0.53	0.78	0.97	0.65	0.88	0.56	0.51	0.91	0.99
3				0.67	0.11	0.53	0.58	0.90	0.45	0.42	0.40	0.77	0.47	0.62	0.37	0.82	0.54	0.94	0.55	0.52	0.82	0.79	0.88	0.61	0.28
4					0.72	0.32	0.99	0.14	0.61	0.33	0.81	0.36	0.72	0.00	0.72	0.85	0.67	0.23	0.52	0.91	0.88	0.79	0.79	0.57	0.72
5						0.68	0.75	0.84	0.77	0.58	0.90	0.90	0.62	0.85	0.87	0.13	0.66	0.79	0.69	0.99	0.56	0.98	0.95	0.43	0.65
6							0.94	0.77	0.97	0.85	0.98	0.95	0.70	0.84	0.86	0.69	0.66	0.10	0.91	0.79	0.49	0.96	0.69	0.66	0.84
7								0.54	0.70	0.41	0.82	0.57	0.89	0.80	0.83	0.96	0.63	0.95	0.65	0.87	0.77	0.70	0.96	0.63	0.08
8									0.21	0.25	0.37	0.20	0.14	0.29	0.19	0.26	0.32	0.36	0.16	0.48	0.33	0.27	0.23	0.16	0.27
9										0.56	0.99	0.82	0.48	0.82	0.65	0.95	0.61	0.92	0.55	0.99	0.57	0.78	0.99	0.48	0.58
10											0.96	0.76	0.75	0.80	0.55	0.20	0.72	0.64	0.99	0.98	0.86	0.21	0.31	0.60	0.96
11												0.52	0.47	0.64	0.15	0.35	0.42	0.39	0.32	0.50	0.76	0.32	0.57	0.56	0.79
12													0.86	0.13	0.42	0.08	0.85	0.24	0.52	0.94	0.82	0.58	0.66	0.88	0.12
13														0.74	0.76	0.89	0.72	0.94	0.79	0.71	0.63	0.94	0.00	0.50	0.74
14															0.64	0.82	0.54	0.84	0.60	0.90	0.60	0.66	0.88	0.89	0.52
15																0.45	0.53	0.67	0.84	0.94	0.90	0.66	0.64	0.52	0.72
16																	0.09	0.60	0.49	0.61	0.34	0.23	0.14	0.05	0.47
17																		0.84	0.36	0.73	0.82	0.83	0.63	0.71	0.90
18																			0.72	0.95	0.27	0.46	0.76	0.02	0.67
19																				0.51	0.39	0.46	0.47	0.04	0.73
20																					0.59	0.49	0.82	0.70	0.79
21																						0.57	0.18	0.95	0.34
22																							0.99	0.37	0.51
23																								0.32	0.27
24																									0.91

Note: the cells in grey indicate that the hypothesis of weak exogeneity can be rejected at 10% significance level

Table C2. Long-run equilibrium parameters

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	1.00	0.64***	0.74	0.97	0.80	0.93	0.97	1.04	0.88	0.94	1.02	1.06	0.63	0.91	1.06**	1.09***	0.83***	0.94	1.31	0.69	1.05	1.00	1.11*	0.86
2000	0.68	0.62**	1.11	0.77	0.75**	0.63	1.11	0.74***	0.65**	0.84	0.75	0.93	0.77	0.68	0.68	0.76	0.73***	0.84	0.76	0.60	0.51	0.53**	0.64**	0.81***
2 1999		0.48	0.75	0.84	1.05	0.92	0.85	0.94	1.10	0.67	0.80**	1.07	0.55***	0.76	0.90	0.90	0.80	0.86*	1.21	0.88	1.10	0.95	0.99	1.15
2000		0.69***	1.28	0.75	0.72	1.03	1.18	0.82	0.73	0.93	0.86*	1.08*	0.99	0.74***	0.86	0.84	1.08*	0.87	0.98	1.06	0.63**	0.71***	0.75	0.86
3 1999			0.81	0.85	1.16	0.40***	0.51***	0.98	0.63**	0.44***	0.92	0.96	0.35***	0.74***	1.13	0.91	0.82	0.94	1.19	0.65**	0.97	0.90**	0.89	1.04
2000			1.08	1.19	1.24	1.30	0.93	0.92	1.26*	1.22	1.15**	1.58***	1.14	0.96	1.20*	1.01	1.91	0.97	0.95	1.05	1.01	0.91	1.06	1.12***
4 1999				0.30	1.47	1.27	1.10	1.28	1.13	0.90	0.98	1.79	0.74*	0.97	1.03	1.07	0.93	0.74	1.58	1.00	1.36*	1.19	1.14	1.11
2000				0.62***	0.61**	0.85	1.01	0.63***	0.56***	0.73	0.65***	0.90	0.87	0.59***	0.61***	0.70	0.66***	0.71**	0.70	0.54**	0.48***	0.52**	0.55**	0.70***
5 1999					0.86	0.86	0.91	0.85	0.90	0.67	0.86	0.83	0.34***	0.70***	0.94	0.78	0.86	0.79**	1.04	0.66***	0.84	1.03	0.94	0.93
2000					0.55***	1.13	1.11	0.96	0.83	1.12	0.97	1.07*	0.81	0.67***	0.95	0.70**	1.03	0.79**	0.95	0.55**	0.77**	0.76	0.82***	0.99
6 1999						0.33***	0.39***	0.35***	0.68***	0.31***	0.32***	0.57**	0.21***	0.31***	0.35***	0.38***	0.39***	0.44***	0.93	0.41***	0.42***	0.44***	0.39***	0.61***
2000						0.79	0.58	0.96	0.98	0.89	0.65	1.19	1.01	0.80	0.95	0.96	0.86	0.98	0.99	1.01	0.75	0.75***	0.86*	0.98
7 1999							0.90	0.98	1.17	0.78	0.84	1.09**	0.57***	0.93	0.98	0.91	0.76	0.85	1.25	0.48***	1.06	1.03	1.12	1.23
2000							0.94	0.66*	0.63**	1.05**	0.71**	0.93	0.94	0.58***	0.63**	0.74	0.74	1.11**	0.74	0.75	0.56***	0.59***	0.64	1.18**
8 1999								0.79	0.97	0.72***	0.74**	1.17	0.51***	0.74	0.82**	0.80	0.75	0.61*	1.05	0.98	0.92	0.89	0.77*	1.10
2000								1.02	1.05	0.92	0.84	1.12	0.86	0.67*	1.08	1.01	0.84	0.83	1.06	1.05	0.76	0.56***	0.86	0.70
9 1999									0.87	0.83	0.85	1.08	0.64**	0.89	0.96	0.93	0.84	0.62	1.09	0.49***	1.06	0.93	1.06***	1.08
2000									0.80**	1.36	0.98	1.28***	0.95	0.85*	0.81	1.05**	1.01	1.05***	1.02	0.31***	0.68***	0.73***	0.85**	1.10
10 1999										0.71**	0.75***	1.17	0.54***	0.86***	0.80***	0.83*	0.76*	0.72**	1.02	0.67***	0.93	0.91	0.94	1.00
2000										0.99	1.11	1.12	0.66	1.03	1.00	1.18	1.17	1.03	1.27	0.69	0.79*	0.85**	1.00	1.08
11 1999											0.92	1.44	0.68	0.61	0.99	0.89	0.52	0.67	1.19	0.50***	1.10	1.27*	1.18	1.21
2000											0.41***	0.45**	0.75	0.37***	0.57***	0.54*	0.14**	0.57***	0.77	0.31**	0.29***	0.43***	0.27***	0.56***
12 1999												0.96	0.62***	0.82	1.00	1.11	0.86	0.87	1.45**	0.66	1.11	1.20**	1.03	1.06
2000												1.13	1.06	0.94	0.89	0.96	0.93***	1.12	0.76	0.79	0.65*	0.77**	0.86	1.12***
13 1999													0.40***	0.48	0.57	0.63**	0.51*	0.52*	0.88	0.47	0.72***	0.63*	0.66**	0.36
2000													0.93	0.59**	0.70***	0.76	0.73***	0.78	0.94	0.45*	0.54***	0.58***	0.61***	0.74**
14 1999														1.10	1.37	1.39	1.26	0.98	1.73	1.28*	1.11	1.02	1.55	1.20
2000														0.56**	0.62***	0.62*	0.69*	0.70*	0.51*	0.62	0.49***	0.54**	0.49***	0.68**
15 1999															1.01	0.96	0.85	0.93	1.29*	0.96	1.05	1.05	1.04	1.03
2000															0.95	1.07	1.03	1.21	0.87	0.64	0.94	0.81*	0.80	1.15
16 1999																1.00	0.84	0.44**	1.37*	0.82	1.12	0.91	1.08	1.12
2000																1.06**	1.05	0.96	1.16	0.74	0.80***	0.80***	0.86**	0.99
17 1999																	1.02	0.74	0.95	0.24	0.99	0.97	0.90	0.84
2000																	0.49	0.94	0.68*	0.46	0.62***	0.57***	0.68***	0.68**
18 1999																		0.91	1.63*	0.41	1.08	1.11	0.93	0.97
2000																		0.88	0.82	0.76	0.72***	0.73**	0.83	1.20***
19 1999																			1.17**	0.52***	1.13	0.90	0.70	1.10
2000																			0.75**	0.76	0.54***	0.58***	0.73	0.96

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
20 1999																				0.44***	0.71**	0.73**	0.49**	0.85
2000																				0.81	0.41***	0.64***	0.58***	0.82
21 1999																					0.88***	0.66***	0.91**	0.91
2000																					0.73	0.69	0.65	0.66***
22 1999																						0.89	0.86*	0.88
2000																						0.96	1.08	1.12***
23 1999																							0.83	0.98
2000																							1.10	1.04
24 1999																								0.97
2000																								1.00

* - reject the null of perfect spatial integration ($\beta^*=1$) at 10% significance level

**- reject the null of perfect spatial integration at 5% significance level

***- reject the null of perfect spatial integration at 1% significance level

Note: the cells in grey indicate those market pairs for which the hypothesis of perfect spatial market integration cannot be rejected at 5% significance level in both sub-periods

Table C3. A point-estimate of an immediate effect (short-run) to a unit change in P_j

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-	0.65	0.21	0.44	0.78**	0.39	0.78***	0.54	0.63	0.55	0.46	0.61	0.56	0.30	0.70	0.79***	0.55	0.57	0.49	0.50	0.27	0.65	0.44	0.56	0.35
1999	(0.07)	(0.11)	(0.10)	(0.13)	(0.12)	(0.17)	(0.13)	(0.10)	(0.08)	(0.11)	(0.13)	(0.11)	(0.20)	(0.09)	(0.09)	(0.10)	(0.12)	(0.09)	(0.10)	(0.03)	(0.10)	(0.11)	(0.07)	(0.08)
2000-	0.39	0.36	0.83***	0.22	0.15	1.21***	0.27**	0.75***	0.04	0.41	0.43**	0.50***	0.43	0.35	0.19	0.16	0.64***	0.53	0.01	-0.31	0.02	0.44	-0.15	0.47
2002	(0.23)	(0.25)	(0.40)	(0.21)	(0.20)	(0.42)	(0.44)	(0.29)	(0.32)	(0.23)	(0.32)	(0.33)	(0.11)	(0.19)	(0.31)	(0.14)	(0.26)	(0.16)	(0.15)	(0.16)	(0.22)	(0.18)	(0.18)	(0.10)
2 1997-		0.28	0.66	0.75	0.46	1.07***	0.37	0.80**	0.82	0.33	0.79***	0.61	0.51	0.87*	0.93***	0.61	0.83*	0.64	0.40	0.34	0.94***	0.57	0.69	0.58
1999		(0.06)	(0.11)	(0.07)	(0.09)	(0.20)	(0.04)	(0.12)	(0.05)	(0.06)	(0.13)	(0.14)	(0.11)	(0.06)	(0.10)	(0.12)	(0.07)	(0.11)	(0.12)	(0.09)	(0.13)	(0.14)	(0.06)	(0.14)
2000-		0.55	0.97***	0.23	0.31	0.68***	0.91	0.62***	0.66	0.21	0.65***	0.67***	0.21	0.31	0.33	0.25	0.55***	0.42	0.17	0.30**	0.36	0.57	0.78***	0.46*
2002		(0.10)	(0.41)	(0.05)	(0.14)	(0.61)	(0.04)	(0.37)	(0.12)	(0.04)	(0.30)	(0.39)	(0.06)	(0.13)	(0.20)	(0.07)	(0.37)	(0.16)	(0.11)	(0.38)	(0.07)	(0.03)	(0.14)	(0.23)
3 1997-			0.77***	0.84***	0.85***	0.64***	0.65***	0.47***	0.70**	0.60	0.90***	0.41***	0.43	0.99***	1.07***	0.90***	1.08***	0.73***	0.74***	0.43	0.73***	0.79***	0.51	1.08***
1999			(0.18)	(0.22)	(0.18)	(0.28)	(0.30)	(0.43)	(0.17)	(0.14)	(0.17)	(0.39)	(0.10)	(0.05)	(0.23)	(0.16)	(0.18)	(0.19)	(0.21)	(0.09)	(0.19)	(0.14)	(0.17)	(0.17)
2000-			0.64***	0.37**	0.61***	0.17***	0.93***	0.51*	1.05***	0.23	1.07***	1.31***	-0.05	0.80	0.73***	0.14	0.55***	0.29*	0.56***	0.26*	0.76***	0.49*	0.68***	0.31**
2002			(0.63)	(0.33)	(0.26)	(0.75)	(0.18)	(0.20)	(0.42)	(0.11)	(0.44)	(0.38)	(0.30)	(0.08)	(0.41)	(0.21)	(0.44)	(0.30)	(0.36)	(0.36)	(0.31)	(0.23)	(0.44)	(0.41)
4 1997-				0.52	0.70*	1.10***	0.43*	0.87***	0.67	-0.03	0.77***	0.79**	0.70	0.61	0.75**	0.61	0.86***	0.81**	0.60**	0.45	1.00***	0.62	0.46	0.58
1999				(0.14)	(0.12)	(0.26)	(0.27)	(0.33)	(0.09)	(0.15)	(0.18)	(0.13)	(0.04)	(0.10)	(0.14)	(0.16)	(0.11)	(0.11)	(0.24)	(0.06)	(0.12)	(0.11)	(0.10)	(0.05)
2000-				0.17	0.17	0.48**	0.51	0.54	0.36	0.21	0.65	0.61	0.22	0.30	0.29	0.27	0.67	0.35	0.25	-0.10	0.26	0.25	0.39	0.37
2002				(0.22)	(0.08)	(0.31)	(0.16)	(0.12)	(0.25)	(0.28)	(0.09)	(0.13)	(0.06)	(0.19)	(0.29)	(0.07)	(0.12)	(0.17)	(0.07)	(0.04)	(0.19)	(0.19)	(0.07)	(0.11)
5 1997-					0.48	0.48	0.60	0.45	0.58*	0.30	0.74*	0.40	0.18	0.47	0.73*	0.51	0.71*	0.35	0.63*	0.34	0.73***	0.58	0.39	0.33
1999					(0.10)	(0.17)	(0.13)	(0.13)	(0.19)	(0.13)	(0.12)	(0.13)	(0.08)	(0.09)	(0.11)	(0.13)	(0.13)	(0.12)	(0.15)	(0.06)	(0.20)	(0.11)	(0.10)	(0.11)
2000-					0.32	1.04***	0.97***	0.53***	0.48***	0.07	0.34*	0.79***	0.40	0.06	0.61***	0.39	0.64***	0.16	0.60**	0.55**	0.51	0.32	0.09	0.14
2002					(0.18)	(0.38)	(0.35)	(0.35)	(0.34)	(0.26)	(0.31)	(0.39)	(0.22)	(0.21)	(0.27)	(0.16)	(0.30)	(0.19)	(0.24)	(0.24)	(0.12)	(0.19)	(0.28)	(0.28)
6 1997-						0.54*	0.58*	0.71***	0.95***	0.18	0.50	0.52	0.15	0.67	0.99***	0.73***	0.68	0.70*	0.92***	0.27	0.72*	0.45	0.57	0.76
1999						(0.20)	(0.20)	(0.28)	(0.04)	(0.14)	(0.11)	(0.11)	(0.10)	(0.09)	(0.11)	(0.20)	(0.02)	(0.13)	(0.07)	(0.07)	(0.13)	(0.12)	(0.12)	(0.09)
2000-						0.15***	0.43***	0.54*	1.03***	0.04	0.69***	1.04***	0.27*	0.55	0.75***	0.17	0.92	0.40	0.73*	0.43**	0.68***	0.46	0.78***	0.66***
2002						(0.57)	(0.40)	(0.23)	(0.08)	(0.26)	(0.26)	(0.36)	(0.33)	(0.19)	(0.24)	(0.24)	(0.03)	(0.28)	(0.11)	(0.30)	(0.21)	(0.21)	(0.32)	(0.31)
7 1997-							0.44	0.49	0.41	0.29	0.52	0.32	0.32	0.39	0.40	0.38	0.21	0.37	0.43	0.17	0.35	0.41	0.46	0.27
1999							(0.08)	(0.06)	(0.06)	(0.13)	(0.04)	(0.06)	(0.05)	(0.03)	(0.05)	(0.08)	(0.04)	(0.06)	(0.09)	(0.02)	(0.05)	(0.07)	(0.08)	(0.10)
2000-							0.21	0.13	-0.05	0.24	0.13	0.23	0.28	0.03	-0.05	0.04	0.23	0.33	-0.06	-0.12	0.03	0.12	-0.09	0.46
2002							(0.13)	(0.17)	(0.10)	(0.06)	(0.06)	(0.19)	(0.14)	(0.22)	(0.08)	(0.08)	(0.14)	(0.06)	(0.08)	(0.07)	(0.12)	(0.06)	(0.12)	(0.07)
8 1997-								0.41	0.56	0.33	0.51	0.46	0.11	0.42	0.55	0.59	0.69	0.21	0.79**	0.33	0.62	0.40	0.35	0.53
1999								(0.10)	(0.09)	(0.09)	(0.12)	(0.14)	(0.07)	(0.09)	(0.09)	(0.10)	(0.13)	(0.13)	(0.12)	(0.07)	(0.09)	(0.10)	(0.09)	(0.11)
2000-								0.27*	0.65***	-0.07	0.66***	0.75***	0.28	0.09	0.60**	0.20	0.51***	0.01	0.57**	0.28	0.57	0.12	0.25	-0.03
2002								(0.32)	(0.30)	(0.20)	(0.33)	(0.24)	(0.20)	(0.21)	(0.21)	(0.14)	(0.30)	(0.22)	(0.23)	(0.24)	(0.16)	(0.18)	(0.29)	(0.26)
9 1997-									0.69	0.51	0.63	0.54	0.42	0.73	0.89***	0.64	0.68*	0.74	0.81***	0.10	0.65	0.72	0.72	0.59
1999									(0.07)	(0.11)	(0.13)	(0.08)	(0.14)	(0.07)	(0.08)	(0.10)	(0.13)	(0.09)	(0.15)	(0.07)	(0.10)	(0.09)	(0.08)	(0.11)
2000-									0.49*	0.46	0.70***	1.06***	0.22	0.59	0.33	0.27	0.72***	0.57	0.15	0.15	0.29	0.41	0.58**	0.73***
2002									(0.25)	(0.23)	(0.36)	(0.20)	(0.26)	(0.16)	(0.20)	(0.14)	(0.32)	(0.17)	(0.22)	(0.27)	(0.18)	(0.16)	(0.25)	(0.29)

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
10 1997-1999										0.25	0.62	0.77*	0.34	0.86**	0.97***	0.74*	0.87***	0.46	0.61	0.29	0.99***	0.65	0.80*	0.85**
										(0.15)	(0.09)	(0.09)	(0.11)	(0.08)	(0.07)	(0.11)	(0.14)	(0.13)	(0.11)	(0.07)	(0.06)	(0.09)	(0.10)	(0.08)
2000-2002										-0.01	0.91***	0.95***	-0.13	0.30	0.61	0.25	0.60***	0.29	0.53	0.43*	0.63	0.21	0.84***	0.48**
										(0.25)	(0.29)	(0.28)	(0.25)	(0.20)	(0.05)	(0.15)	(0.33)	(0.20)	(0.17)	(0.26)	(0.04)	(0.19)	(0.30)	(0.27)
11 1997-1999											0.31	0.33	0.19	0.38	0.57	0.47	0.29	0.30	0.42	0.20	0.27	0.56	0.62	0.18
											(0.16)	(0.17)	(0.09)	(0.10)	(0.13)	(0.15)	(0.17)	(0.14)	(0.20)	(0.08)	(0.13)	(0.13)	(0.11)	(0.14)
2000-2002											0.57***	0.68***	0.57**	0.55**	-0.07	0.21	0.48***	0.62**	-0.07	-0.19	-0.10	0.47	0.57***	0.84***
											(0.39)	(0.48)	(0.26)	(0.23)	(0.31)	(0.19)	(0.37)	(0.23)	(0.33)	(0.30)	(0.22)	(0.20)	(0.33)	(0.33)
12 1997-1999												0.08	0.20	0.55	0.71*	0.78	0.76	0.49	0.72	0.24	0.68	0.70	0.57	0.96***
												(0.07)	(0.04)	(0.09)	(0.13)	(0.08)	(0.09)	(0.10)	(0.10)	(0.06)	(0.12)	(0.08)	(0.08)	(0.18)
2000-2002												0.63*	0.20	0.30	0.41	0.13	0.77***	0.25	0.29	0.20	0.34	0.21	0.47	0.48
												(0.15)	(0.09)	(0.18)	(0.07)	(0.11)	(0.20)	(0.17)	(0.16)	(0.22)	(0.10)	(0.13)	(0.12)	(0.14)
13 1997-1999													0.13	0.59	0.62	0.64	0.74*	0.69	0.81**	0.20	0.63	0.60	0.63	0.47
													(0.11)	(0.10)	(0.06)	(0.10)	(0.13)	(0.10)	(0.11)	(0.06)	(0.10)	(0.11)	(0.06)	(0.10)
2000-2002													0.24	0.20	0.39	0.18	0.53	0.36	0.41	0.27	0.38	0.18	0.33	0.31
													(0.25)	(0.19)	(0.02)	(0.13)	(0.27)	(0.16)	(0.18)	(0.23)	(0.16)	(0.18)	(0.08)	(0.24)
14 1997-1999														0.47	0.80***	0.46	0.78***	0.42	-0.41	0.46	0.63**	0.49*	0.51	0.40
														(0.10)	(0.13)	(0.19)	(0.19)	(0.20)	(0.25)	(0.13)	(0.19)	(0.14)	(0.23)	(0.13)
2000-2002														0.02	0.08	0.22	0.55***	0.37**	-0.04	-0.04	0.07	-0.46	-0.20	0.39
														(0.23)	(0.29)	(0.27)	(0.58)	(0.33)	(0.39)	(0.46)	(0.33)	(0.29)	(0.25)	(0.16)
15 1997-1999															1.06***	0.60	0.73*	0.75*	0.63	0.39	0.63	0.68	0.71	0.63
															(0.09)	(0.12)	(0.14)	(0.12)	(0.16)	(0.09)	(0.09)	(0.10)	(0.10)	(0.11)
2000-2002															0.06	0.02	0.88***	0.79***	-0.19	-0.18	0.15	0.56	0.78***	0.96***
															(0.25)	(0.16)	(0.35)	(0.22)	(0.27)	(0.34)	(0.14)	(0.17)	(0.29)	(0.30)
16 1997-1999																0.60	0.72*	0.61	0.56	0.23	0.76	0.55	0.73	0.49
																(0.10)	(0.12)	(0.14)	(0.13)	(0.06)	(0.07)	(0.09)	(0.08)	(0.10)
2000-2002																0.33	0.90***	0.37	0.73***	0.53**	0.77	0.16	0.43	0.23
																(0.14)	(0.29)	(0.20)	(0.20)	(0.25)	(0.05)	(0.18)	(0.26)	(0.27)
17 1997-1999																	0.99***	0.57	0.72*	0.26	0.63	0.65	0.60	0.72*
																	(0.13)	(0.15)	(0.12)	(0.07)	(0.13)	(0.12)	(0.11)	(0.12)
2000-2002																	1.08***	0.83***	0.71***	0.52**	0.74***	0.54	0.76***	0.64***
																	(0.30)	(0.25)	(0.24)	(0.28)	(0.23)	(0.20)	(0.35)	(0.30)
18 1997-1999																		0.65	0.64	0.14	0.60	0.51	0.28	0.63
																		(0.11)	(0.10)	(0.03)	(0.08)	(0.06)	(0.06)	(0.07)
2000-2002																		0.32	0.31	0.27	0.29	0.24	0.20	0.54
																		(0.16)	(0.16)	(0.15)	(0.27)	(0.07)	(0.08)	(0.15)

Continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1997-1999																			0.53	0.08	0.60	0.59	0.46	0.53
																			(0.14)	(0.08)	(0.13)	(0.11)	(0.12)	(0.10)
2000-2002																			-0.04	-0.02	0.04	0.55	0.59***	1.15***
																			(0.24)	(0.28)	(0.22)	(0.18)	(0.30)	(0.21)
20 1997-1999																				0.23	0.56	0.53	0.32	0.61
																				(0.05)	(0.10)	(0.12)	(0.13)	(0.12)
2000-2002																				0.67***	0.57	-0.02	0.05	0.13
																				(0.22)	(0.18)	(0.21)	(0.31)	(0.28)
21 1997-1999																					0.92***	0.62*	0.70**	0.73***
																					(0.23)	(0.19)	(0.18)	(0.19)
2000-2002																					0.58	-0.03	0.13	-0.26
																					(0.09)	(0.28)	(0.50)	(0.45)
22 1997-1999																						0.61	0.68	0.39
																						(0.13)	(0.10)	(0.11)
2000-2002																						0.25	0.63***	0.08
																						(0.25)	(0.29)	(0.29)
23 1997-1999																							0.65	0.77**
																							(0.12)	(0.13)
2000-2002																							0.84***	0.45
																							(0.33)	(0.26)
24 1997-1999																								0.42
																								(0.12)
2000-2002																								0.64***
																								(0.37)

* - indicates that the hypothesis of weak short-run (β_{10} =1 or β_{20} =1) integration can be accepted at 1%, but rejected at 5%

** - indicates that the hypothesis of weak short-run integration can be accepted at 5%, but rejected at 10%

***- indicates that the hypothesis of weak short-run integration can be accepted at 10%

Note: the cells in grey indicate those market pairs for which an immediate effect has significantly ***increased*** in the second period compared to the first one: the hypothesis that $\beta_{10} < \beta_{20}$ can be accepted at 10% significance level;

the cells indicate those market pairs for which an immediate effect has significantly ***decreased*** in the second period compared to the first one: the hypothesis that $\beta_{10} > \beta_{20}$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table C4. Adjustment coefficient

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1997-	-0.47*	-0.43*	-0.33*	-0.58*	-0.48*	-0.59*	-0.31*	-0.37*	-0.46*	-0.46*	-0.66*	-0.40*	-0.44*	-0.52*	-0.29**	-0.56*	-0.70*	-0.81*	-0.51*	-0.44*	-0.40*	-0.52*	-0.33*	-0.30*
1999	(0.15)	(0.12)	(0.11)	(0.20)	(0.17)	(0.15)	(0.11)	(0.12)	(0.16)	(0.12)	(0.17)	(0.12)	(0.13)	(0.15)	(0.13)	(0.14)	(0.18)	(0.19)	(0.11)	(0.10)	(0.14)	(0.15)	(0.08)	(0.10)
2000-	-0.44**	-0.39	-0.73**	-0.26	-0.43**	-0.23	-0.37	-0.71**	-0.42	-1.00*	-0.55	-0.56**	-0.42**	-0.71*	-0.38	-0.36	-0.72**	-0.48**	-0.49*	-0.09	-0.36	-0.58**	-0.64*	-0.61**
2002	(0.21)	(0.24)	(0.29)	(0.23)	(0.20)	(0.22)	(0.30)	(0.29)	(0.27)	(0.34)	(0.30)	(0.25)	(0.19)	(0.32)	(0.27)	(0.20)	(0.29)	(0.22)	(0.12)	(0.06)	(0.21)	(0.26)	(0.14)	(0.29)
2 1997-		-0.48*	-0.50*	-0.37*	-0.43*	-0.83*	-0.34*	-0.54*	-0.67*	-0.47*	-0.78*	-0.64*	-0.43*	-0.68*	-0.32*	-0.77*	-0.73*	-1.11*	-0.76*	-0.35*	-0.51*	-0.70*	-0.25*	-0.60*
1999		(0.11)	(0.13)	(0.05)	(0.14)	(0.19)	(0.02)	(0.18)	(0.08)	(0.05)	(0.13)	(0.15)	(0.08)	(0.12)	(0.11)	(0.15)	(0.09)	(0.27)	(0.11)	(0.11)	(0.15)	(0.16)	(0.04)	(0.12)
2000-		-0.64*	-0.43	-0.10*	-0.34*	-0.22	-0.51*	-0.30	-0.03	-0.20*	-0.48	-0.57	-0.15*	-0.17	-0.86*	-0.19**	-0.36	-0.25**	-0.40*	-0.22	-0.47*	-0.40*	-0.12	-0.33
2002		(0.20)	(0.30)	(0.03)	(0.11)	(0.28)	(0.03)	(0.34)	(0.04)	(0.01)	(0.38)	(0.38)	(0.06)	(0.11)	(0.26)	(0.09)	(0.27)	(0.10)	(0.08)	(0.23)	(0.14)	(0.06)	(0.07)	(0.21)
3 1997-			-0.34*	-0.53*	-0.88*	-0.54*	-0.63*	-0.42**	-0.68*	-0.69*	-0.61*	-0.46**	-0.52*	-0.56*	-0.53*	-0.47*	-0.57*	-0.46*	-0.50*	-0.61*	-0.59*	-0.84*	-0.59*	-0.84*
1999			(0.12)	(0.15)	(0.21)	(0.12)	(0.16)	(0.19)	(0.17)	(0.12)	(0.15)	(0.19)	(0.13)	(0.08)	(0.18)	(0.12)	(0.15)	(0.14)	(0.13)	(0.15)	(0.15)	(0.17)	(0.15)	(0.22)
2000-			-0.27	-0.25	-0.56	-0.40	-0.24*	-0.47**	-0.63	-0.28*	-0.87**	-0.76*	-0.23	-0.59*	-0.48	-0.33	-0.11	-0.25	-0.04	-0.19	-0.67	-0.76**	-0.96**	-0.46
2002			(0.26)	(0.31)	(0.46)	(0.27)	(0.08)	(0.20)	(0.39)	(0.10)	(0.40)	(0.22)	(0.19)	(0.12)	(0.38)	(0.18)	(0.14)	(0.23)	(0.25)	(0.17)	(0.44)	(0.36)	(0.46)	(0.31)
4 1997-				-0.32*	-0.21**	-0.61*	-0.27**	-0.47	-0.21**	-0.32*	-0.21	-0.63*	-0.35*	-0.13*	-0.16	-0.25	-0.10	-0.25**	-0.16	-0.18*	-0.46*	-0.26*	-0.29*	-0.17
1999				(0.09)	(0.10)	(0.21)	(0.12)	(0.24)	(0.08)	(0.10)	(0.11)	(0.14)	(0.06)	(0.05)	(0.10)	(0.14)	(0.28)	(0.09)	(0.11)	(0.05)	(0.13)	(0.09)	(0.09)	(0.09)
2000-				-0.10	-0.34*	-0.16	-0.27	-0.33	-0.37	-0.25	-0.56*	-0.35*	-0.06	-0.42	-0.18	-0.13	-0.26	-0.01	-0.29**	-0.12*	-0.28	-0.37	-0.32*	-0.49*
2002				(0.21)	(0.09)	(0.14)	(0.15)	(0.17)	(0.30)	(0.41)	(0.13)	(0.12)	(0.06)	(0.43)	(0.47)	(0.13)	(0.14)	(0.32)	(0.13)	(0.02)	(0.24)	(0.32)	(0.07)	(0.10)
5 1997-					-0.19	-0.23**	-0.29*	-0.26**	-0.21	-0.32*	-0.25	-0.29*	-0.30*	-0.43*	-0.18	-0.31**	-0.46*	-0.62*	-0.21	-0.30*	-0.13	-0.34**	-0.21	-0.33*
1999					(0.11)	(0.10)	(0.09)	(0.10)	(0.12)	(0.12)	(0.13)	(0.10)	(0.10)	(0.14)	(0.12)	(0.12)	(0.16)	(0.13)	(0.12)	(0.10)	(0.08)	(0.14)	(0.11)	(0.10)
2000-					-0.41**	-0.52**	-0.78**	-0.49**	-0.37	-0.42**	-0.53**	-0.76*	-0.41	-0.77*	-0.39**	-0.29	-0.46**	-0.59*	-0.53**	-0.27	-0.47**	-0.67*	-0.49**	-0.57*
2002					(0.16)	(0.22)	(0.34)	(0.21)	(0.22)	(0.21)	(0.20)	(0.28)	(0.21)	(0.25)	(0.18)	(0.18)	(0.19)	(0.18)	(0.21)	(0.14)	(0.19)	(0.24)	(0.19)	(0.19)
6 1997-						-0.71*	-0.59*	-0.50*	-0.54*	-0.67*	-0.52*	-0.47*	-0.63*	-0.62*	-0.67*	-0.39*	-0.22*	-0.44*	-0.46*	-0.61*	-0.57*	-0.82*	-0.71*	-0.67*
1999						(0.14)	(0.13)	(0.16)	(0.12)	(0.14)	(0.13)	(0.12)	(0.15)	(0.14)	(0.16)	(0.12)	(0.01)	(0.14)	(0.14)	(0.15)	(0.13)	(0.16)	(0.15)	(0.17)
2000-						-0.76*	-0.63*	-0.89*	-0.94*	-0.88*	-1.04*	-1.16*	-0.57**	-0.97*	-0.86*	-0.58*	-1.15*	-0.80*	-1.15*	-0.54*	-1.19*	-1.12*	-1.37*	-1.12*
2002						(0.23)	(0.17)	(0.17)	(0.14)	(0.23)	(0.18)	(0.26)	(0.27)	(0.20)	(0.21)	(0.20)	(0.03)	(0.25)	(0.29)	(0.19)	(0.27)	(0.29)	(0.32)	(0.28)
7 1997-							-0.14*	-0.78*	-0.15	-0.34*	-0.33*	-0.68*	-0.63*	-0.08	-0.27*	-0.20*	-0.04	-0.45*	-0.22*	-0.25*	-0.37*	-0.20*	-0.24	-0.24*
1999							(0.05)	(0.10)	(0.08)	(0.11)	(0.03)	(0.07)	(0.14)	(0.06)	(0.03)	(0.07)	(0.06)	(0.06)	(0.04)	(0.07)	(0.05)	(0.03)	(0.13)	(0.06)
2000-							-0.30*	-0.18	-0.06	-0.13	-0.58*	-0.23	-0.15	-0.13	-0.01	-0.12**	-0.33*	-0.13*	-0.24*	-0.12**	-0.20**	-0.28*	-0.22	-0.07
2002							(0.07)	(0.18)	(0.10)	(0.08)	(0.12)	(0.16)	(0.19)	(0.20)	(0.11)	(0.05)	(0.08)	(0.03)	(0.07)	(0.05)	(0.09)	(0.06)	(0.19)	(0.05)
8 1997-								-0.40*	-0.41*	-0.77*	-0.45*	-0.32**	-0.46*	-0.41*	-0.41*	-0.31*	-0.33*	-0.35*	-0.32*	-0.34*	-0.49*	-0.53*	-0.43*	-0.32**
1999								(0.12)	(0.13)	(0.12)	(0.12)	(0.14)	(0.13)	(0.14)	(0.14)	(0.10)	(0.11)	(0.12)	(0.10)	(0.13)	(0.12)	(0.14)	(0.11)	(0.12)
2000-								-0.15	-0.15	-0.31	-0.54	-0.29	-0.23	-0.28	-0.11	-0.10	-0.57	-0.08	-0.39	-0.09	-0.23	-0.58	-0.38	-0.27
2002								(0.18)	(0.18)	(0.22)	(0.40)	(0.18)	(0.24)	(0.35)	(0.17)	(0.14)	(0.44)	(0.26)	(0.25)	(0.22)	(0.28)	(0.37)	(0.29)	(0.31)
9 1997-									-0.43*	-0.45*	-0.45*	-0.63*	-1.06*	-0.16	-0.23	-0.47*	-0.24**	-0.28**	-0.39*	-0.38*	-0.75*	-0.34*	-0.32**	-0.22**
1999									(0.13)	(0.14)	(0.13)	(0.17)	(0.28)	(0.10)	(0.11)	(0.13)	(0.11)	(0.13)	(0.11)	(0.14)	(0.17)	(0.12)	(0.12)	(0.11)
2000-									-0.27	-0.33	-0.42	-0.31	-0.20	-0.41	-0.20	-0.27	-0.42	-0.33	-0.21	-0.40	-0.20	-0.23	-0.24	-0.22
2002									(0.22)	(0.29)	(0.42)	(0.21)	(0.23)	(0.32)	(0.23)	(0.18)	(0.41)	(0.23)	(0.24)	(0.27)	(0.19)	(0.23)	(0.28)	(0.38)

continued

	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
10 1997-1999									-0.85*	-0.87*	-0.39*	-0.78*	-0.93*	-0.73*	-0.64*	-0.63*	-0.52*	-0.62*	-0.59*	-0.51*	-0.96*	-0.83*	-0.54*
									(0.15)	(0.13)	(0.15)	(0.15)	(0.21)	(0.09)	(0.15)	(0.18)	(0.14)	(0.11)	(0.11)	(0.10)	(0.17)	(0.15)	(0.14)
2000-2002									-0.47	-0.83*	-0.42*	-0.19	-0.23	-0.34*	-0.29	-0.42	-0.31	-0.34	-0.12	-0.23**	-0.49	-1.21	-0.51
									(0.24)	(0.28)	(0.11)	(0.16)	(0.21)	(0.11)	(0.15)	(0.32)	(0.20)	(0.19)	(0.11)	(0.10)	(0.30)	(0.62)	(0.31)
11 1997-1999										-0.39**	-0.34**	-0.34**	-0.62*	-0.54*	-0.35**	-0.43**	-0.36**	-0.37**	-0.96*	-0.56*	-0.52*	-0.49*	-0.15
										(0.17)	(0.14)	(0.16)	(0.22)	(0.19)	(0.15)	(0.20)	(0.17)	(0.14)	(0.21)	(0.17)	(0.15)	(0.16)	(0.13)
2000-2002										-0.29	-0.28	-0.34	-0.26	-0.39	-0.29	-0.18	-0.27	-0.40	-0.15	-0.21	-0.37	-0.19	-0.42
										(0.20)	(0.13)	(0.27)	(0.20)	(0.24)	(0.24)	(0.13)	(0.24)	(0.29)	(0.14)	(0.15)	(0.21)	(0.15)	(0.24)
12 1997-1999											-0.46*	-0.55*	-0.56*	-0.44*	-0.53*	-0.58*	-0.50*	-0.55*	-0.33*	-0.27**	-0.78*	-0.23	-0.67*
											(0.08)	(0.03)	(0.15)	(0.15)	(0.14)	(0.14)	(0.13)	(0.16)	(0.11)	(0.10)	(0.14)	(0.14)	(0.15)
2000-2002											-0.38	-0.26*	-0.26	-0.44*	-0.21	-0.46	-0.17	-0.14	-0.08	-0.20**	-0.37	-0.33	-0.58*
											(0.25)	(0.07)	(0.29)	(0.13)	(0.11)	(0.28)	(0.22)	(0.11)	(0.11)	(0.10)	(0.13)	(0.22)	(0.16)
13 1997-1999												-0.82*	-0.43*	-0.29*	-0.56*	-0.35*	-0.41*	-0.37*	-0.52*	-0.81*	-0.47*	-0.46*	-0.48*
												(0.22)	(0.16)	(0.06)	(0.16)	(0.13)	(0.15)	(0.12)	(0.13)	(0.18)	(0.15)	(0.09)	(0.14)
2000-2002												-0.23	-0.12	-0.69*	-0.15	-0.10	-0.10	-0.40	-0.10	-0.40	-0.33	-0.61*	-0.22
												(0.31)	(0.32)	(0.06)	(0.18)	(0.43)	(0.25)	(0.36)	(0.13)	(0.35)	(0.35)	(0.17)	(0.32)
14 1997-1999													-0.17	-0.34*	-0.54*	-0.33*	-0.59*	-0.33*	-0.41*	-0.69*	-0.49*	-0.45	-0.36**
													(0.10)	(0.10)	(0.12)	(0.11)	(0.14)	(0.12)	(0.12)	(0.17)	(0.14)	(0.24)	(0.16)
2000-2002													-0.29	-0.46**	-0.25	-0.43	-0.38	-0.45	-0.27	-0.47	-0.46	-0.37**	-0.54*
													(0.20)	(0.23)	(0.28)	(0.33)	(0.23)	(0.23)	(0.25)	(0.28)	(0.29)	(0.16)	(0.19)
15 1997-1999														-0.39**	-0.48*	-0.70*	-0.36**	-0.50*	-0.54*	-0.43*	-0.73*	-0.49*	-0.56*
														(0.17)	(0.13)	(0.18)	(0.16)	(0.13)	(0.12)	(0.12)	(0.16)	(0.12)	(0.16)
2000-2002														-0.26	-0.35	-0.63**	-0.41	-0.21	-0.11	-0.24**	-0.38**	-0.26	-0.44
														(0.20)	(0.18)	(0.25)	(0.25)	(0.14)	(0.11)	(0.10)	(0.19)	(0.19)	(0.26)
16 1997-1999															-0.35*	-0.33**	-0.12	-0.42*	-0.30*	-0.44*	-0.99*	-0.42*	-0.51*
															(0.12)	(0.15)	(0.08)	(0.15)	(0.07)	(0.12)	(0.20)	(0.14)	(0.17)
2000-2002															-0.24	-0.49	-0.25	-0.05	-0.14	-0.41*	-0.40	-0.47	-0.26
															(0.17)	(0.29)	(0.15)	(0.13)	(0.11)	(0.13)	(0.22)	(0.24)	(0.21)
17 1997-1999																-0.16	-0.58*	-0.75*	-0.33*	-0.34**	-0.38**	-0.28**	-0.44*
																(0.15)	(0.19)	(0.20)	(0.12)	(0.14)	(0.17)	(0.13)	(0.16)
2000-2002																-0.36*	-0.56**	-0.54*	-0.27**	-0.48*	-0.53*	-0.67*	-0.43**
																(0.12)	(0.24)	(0.15)	(0.12)	(0.18)	(0.19)	(0.20)	(0.17)
18 1997-1999																	-0.36*	-0.23**	-0.30*	-0.17**	-0.43*	-0.15*	-0.30*
																	(0.13)	(0.11)	(0.05)	(0.07)	(0.11)	(0.05)	(0.10)
2000-2002																	-0.28	-0.21	-0.08	-0.25*	-0.36*	-0.57*	-0.37**
																	(0.23)	(0.12)	(0.05)	(0.08)	(0.13)	(0.12)	(0.18)

continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1997-1999																			-0.32*	-0.34*	-0.26	-0.29**	-0.33**	-0.16
																			(0.11)	(0.12)	(0.13)	(0.12)	(0.13)	(0.09)
2000-2002																			-0.45*	-0.19	-0.40**	-0.45*	-0.56**	-0.50**
																			(0.16)	(0.13)	(0.15)	(0.16)	(0.24)	(0.21)
20 1997-1999																				-0.35*	-0.39*	-0.68*	-0.45*	-0.43**
																				(0.11)	(0.12)	(0.19)	(0.13)	(0.20)
2000-2002																				-0.29**	-0.33**	-0.48	-0.78*	-0.48
																				(0.12)	(0.16)	(0.27)	(0.17)	(0.27)
21 1997-1999																					-0.90*	-0.98*	-1.03*	-0.85*
																					(0.24)	(0.14)	(0.15)	(0.14)
2000-2002																					-0.25**	-0.44	-0.53	-0.47
																					(0.10)	(0.29)	(0.32)	(0.33)
22 1997-1999																						-0.60*	-0.65*	-0.33**
																						(0.17)	(0.17)	(0.12)
2000-2002																						-0.48	-0.71*	-0.47**
																						(0.30)	(0.26)	(0.21)
23 1997-1999																							-0.62*	-1.07*
																							(0.19)	(0.21)
2000-2002																							-0.79**	-0.65*
																							(0.30)	(0.19)
24 1997-1999																								-0.46*
																								(0.13)
2000-2002																								-0.45
																								(0.37)

*-significantly different from zero at 1% level of significance

** - significantly different from zero at 5% level of significance

Note: the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***increased*** significantly: the hypothesis that $|z_1| < |z_2|$ can be accepted at 10% significance level;

the cells in grey indicate those market pairs for which in the second period the adjustment coefficient ***decreased*** significantly: the hypothesis that $|z_1| > |z_2|$ can be accepted at 10% significance level.

Standard errors are given in parentheses

Table C5. Strong short-run integration

j/i	1997-1999		2000-2002 period														
	2	**3**	**1**	**2**	**3**	**6**	**8**	**9**	**10**	**11**	**14**	**15**	**16**	**19**	**22**	**23**	**24**
1																	
2																	
3																	
4	X		X	X	X												
5					X												
6		X			X												
7																	
8			X														
9				X													
10					X												
11																	
12				X	X			X									
13				X													
14										X							
15						X											
16					X	X											
17																	
18			X				X	X			X		X				
19											X	X					
20																	
21																	
22						X											
23																	
24					X	X			X					X	X	X	
25		X			X	X		X	X	X		X					X

Note: x indicates those market pairs for which we fail to reject the hypothesis of strong short-run integration at 5% significance level

For example, x in the sell (i; j) = (2; 4)=(horizontally; vertically) indicates that we cannot reject the hypothesis that strong short-run market integration exists between market 2 (Vinnytsa region) and market 4 (Dnipropetrovsk region)

Table C6. The speed of adjustment (a percent of a shock transmitted within 6 month)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 1999	99%	107%	91%	101%	105%	101%	92%	96%	103%	97%	99%	99%	100%	98%	92%	99%	100%	100%	99%	99%	99%	100%	91%	101%
2000	100%	104%	100%	100%	100%	90%	98%	100%	108%	100%	101%	99%	100%	100%	107%	92%	100%	98%	97%	81%	100%	101%	100%	101%
2 1999		105%	103%	98%	100%	100%	90%	100%	100%	96%	99%	101%	106%	100%	102%	100%	100%	100%	100%	97%	100%	100%	102%	99%
2000		100%	100%	93%	107%	95%	99%	105%	146%	80%	99%	99%	64%	94%	100%	88%	98%	94%	92%	87%	102%	98%	111%	100%
3 1999			102%	100%	100%	100%	100%	96%	100%	100%	100%	101%	99%	100%	100%	99%	100%	102%	100%	100%	101%	100%	99%	100%
2000			99%	88%	99%	95%	94%	98%	100%	86%	100%	100%	80%	100%	99%	90%	78%	96%	101%	73%	100%	100%	100%	99%
4 1999				109%	79%	100%	82%	99%	85%	91%	100%	99%	98%	63%	82%	96%	90%	108%	81%	87%	99%	92%	95%	80%
2000				78%	97%	80%	91%	99%	96%	92%	100%	91%	68%	100%	102%	77%	104%	75%	96%	57%	99%	101%	98%	98%
5 1999					100%	83%	88%	94%	103%	96%	100%	97%	93%	101%	97%	99%	98%	100%	96%	93%	101%	97%	83%	94%
2000					103%	99%	100%	101%	101%	98%	99%	100%	97%	100%	99%	92%	99%	100%	99%	104%	98%	100%	100%	101%
6 1999						100%	99%	105%	100%	100%	98%	97%	100%	101%	100%	106%	107%	103%	97%	99%	99%	100%	100%	100%
2000						100%	100%	100%	100%	100%	100%	100%	99%	100%	100%	99%	100%	100%	100%	98%	100%	100%	101%	100%
7 1999							90%	100%	78%	93%	93%	100%	100%	73%	88%	82%	41%	96%	72%	82%	95%	87%	84%	83%
2000							109%	98%	78%	82%	99%	89%	73%	82%	81%	62%	99%	68%	89%	53%	99%	100%	97%	62%
8 1999								101%	96%	100%	96%	98%	97%	98%	98%	95%	96%	101%	92%	92%	99%	99%	97%	92%
2000								80%	81%	88%	99%	93%	83%	95%	78%	62%	100%	66%	93%	69%	85%	100%	97%	95%
9 1999									97%	96%	97%	100%	100%	89%	94%	97%	94%	108%	96%	97%	100%	96%	94%	93%
2000									100%	96%	97%	103%	72%	101%	110%	88%	101%	98%	89%	106%	102%	102%	99%	96%
10 1999										100%	100%	99%	100%	100%	100%	100%	100%	99%	98%	97%	100%	100%	100%	100%
2000										95%	100%	97%	65%	86%	96%	86%	98%	95%	84%	61%	94%	96%	100%	99%
11 1999											99%	97%	99%	101%	100%	101%	107%	107%	99%	100%	100%	99%	99%	92%
2000											100%	109%	97%	115%	98%	97%	298%	103%	101%	91%	129%	97%	119%	94%
12 1999												99%	98%	99%	96%	99%	98%	97%	99%	94%	93%	99%	87%	99%
2000												99%	79%	89%	99%	81%	96%	74%	97%	74%	104%	98%	100%	99%
13 1999													100%	96%	98%	98%	95%	103%	95%	94%	100%	96%	98%	102%
2000													79%	102%	100%	90%	113%	91%	92%	97%	100%	101%	100%	106%
14 1999														111%	89%	97%	92%	100%	90%	95%	100%	99%	98%	98%
2000														140%	111%	104%	110%	107%	101%	97%	103%	102%	104%	101%
15 1999															101%	97%	100%	107%	98%	96%	101%	100%	100%	99%
2000															107%	91%	98%	100%	91%	64%	92%	99%	94%	99%
16 1999																98%	100%	92%	100%	85%	100%	100%	98%	99%
2000																88%	100%	96%	82%	80%	100%	97%	99%	98%
17 1999																	96%	100%	100%	104%	99%	98%	87%	99%
2000																	107%	99%	104%	107%	101%	103%	100%	103%
18 1999																		99%	87%	93%	85%	98%	50%	103%
2000																		94%	92%	51%	97%	101%	99%	100%

continued

	1	2	3	4	5	6	7	8	9	11	13	14	15	16	17	18	19	20	21	22	23	24	25
19 1999																		93%	93%	95%	100%	93%	83%
2000																		100%	83%	106%	106%	100%	99%
20 1999																			88%	95%	100%	94%	97%
2000																			89%	95%	99%	100%	99%
21 1999																				100%	100%	100%	100%
2000																				85%	93%	96%	97%
22 1999																					99%	100%	90%
2000																					99%	100%	99%
23 1999																						100%	100%
2000																						100%	100%
24 1999																							97%
2000																							100%