

# Agricultural Price Convergence across Transition Countries

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**Abstract.** This paper studies the price convergence of wheat in transitional economies to the world markets with special emphasis on the effect of the prospect of becoming a European Union member. The results show that Central and Eastern European countries were about twice as fast at integrating to world markets than the Commonwealth of Independent States and the Southeast European States.

**JEL Classification Codes:** Q10, Q18, P22.

**Keywords:** Transition countries, agriculture, price convergence, panel unit root.

## 1. Introduction

Since the collapse of communism in Central and Eastern Europe and the Former Soviet Union in the late 1980s and the early 1990s, economists have studied the structural change associated with the shift from communism to capitalism. Most economies started their transition by phasing out non market prices and satisfy comprehensive price liberalization with some enforcement actions, the so-called first phase of transition. These economies

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attempted to reduce the abuse of market power and promote a competitive environment, by removing the quantitative and administrative import and export restrictions. Most of the economies had completed the first phase of transition in their first years of transition and moved towards the next phases.<sup>1</sup> The challenges transition economies faced were similar, however, these countries have followed greatly diverse transition paths both in terms of speed and sequence of steps of transition. Also, the degree of success of this transition has varied significantly among the countries both in terms of the results and the smoothness of the process.

The difference in restructuring process has been especially remarkable in agriculture. The Commonwealth of Independent States (CIS)<sup>2</sup> were very slow in liberalizing agricultural markets unlike the Central and Eastern European (CEE)<sup>3</sup> countries and the Southeast European (SEE)<sup>4</sup> states. The CEE governments immediately ceased controlling agricultural prices and reduced subsidies substantially (Hartell and Swinnen, 1998; Trzceciak and Duval, 1999), while the CIS governments were more gradual on decontrolling the agricultural markets (Csaki and Nash, 1997; Csaki and Fock, 2001). Similarly, in land reform, the CEE countries proceeded faster than the CIS. The principle instrument of the CEE governments was restitution of farms to pre-collectivization landowners or their heirs. For a number of reasons restitution did not happen in the CIS, instead a two-step process was implemented. In the first step, the land ownership was transferred from the state to the collective which typically consisted of people living and working on the collective farms. In the second step, ownership rights were given to the people as land shares. These shares, in practice, were “paper shares” which did not directly link the specific plots of lands and the individual owners of those (Rozelle and Swinnen, 2003).

Such different policy instruments, and the sequence and speed of implementing these instruments, resulted in significantly diverse output, productivity and price levels in those countries. One group of studies treating

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<sup>1</sup> Privatization, enterprise restructuring, banking reforms, protection of property rights and business contracts.

<sup>2</sup> The CIS are Armenia, Azerbaijan, Kazakhstan, Malta, Russian Federation, and Turkmenistan.

<sup>3</sup> CEE countries are Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

<sup>4</sup> The SEE countries are Bulgaria, Macedonia the Former Yugoslavia Republic, and Romania.

such differences focused on optimal transition process and speed<sup>5</sup>. Another group of studies attempted to explain why certain policies and speed of transition were chosen in some countries but not in others by looking into their initial conditions and other positive elements.<sup>6</sup>

Another group of studies has investigated the effect of the European Union (EU) on member countries' convergence. Most of these studies analyzed the impact of the EU on income convergence<sup>7</sup> while others focused on output and productivity convergence<sup>8</sup>. Price convergence studies were generally on the aggregate level, and thus looked at the convergence of inflation among the member countries<sup>9</sup>. Most researchers found convergence (though sometimes weak) among the member countries. Sosvilla-Rivero and Gil-Pareja (2004) is one example of a study that found faster price convergence for counties which entered the Exchange Rate Mechanism earlier.

In this paper we analyze the effect of the prospect of joining the EU on price convergence with world markets for one agricultural product, wheat. We believe that by reducing transaction costs, eliminating trade barriers, harmonizing policies, and facilitating technology diffusion between partner countries, regional agreements can speed up price convergence for wheat.<sup>10</sup> We expect relative wheat prices in the CEE countries would converge faster than the CIS and the SEE transition countries.

The remainder of the paper is organized as follows. Section 2 describes the data and the estimation method to capture the speed of

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<sup>5</sup> See Castanheira (2003).

<sup>6</sup> See Roland and Verdier (1999), and Brezis and Schnyzetzer (2003).

<sup>7</sup> See Sohinger (2005), Lopez-Bazo, Vaya, Mora, and Surinach (1999), and Sanz and Velazquez (2004).

<sup>8</sup> See Korhonen (2003), Murinde, Agung, and Mullineux (2004), Hitiris and Nixon (2001), and Gardiner, Martini and Tyler (2004).

<sup>9</sup> See Camarero and Tamarit (2000).

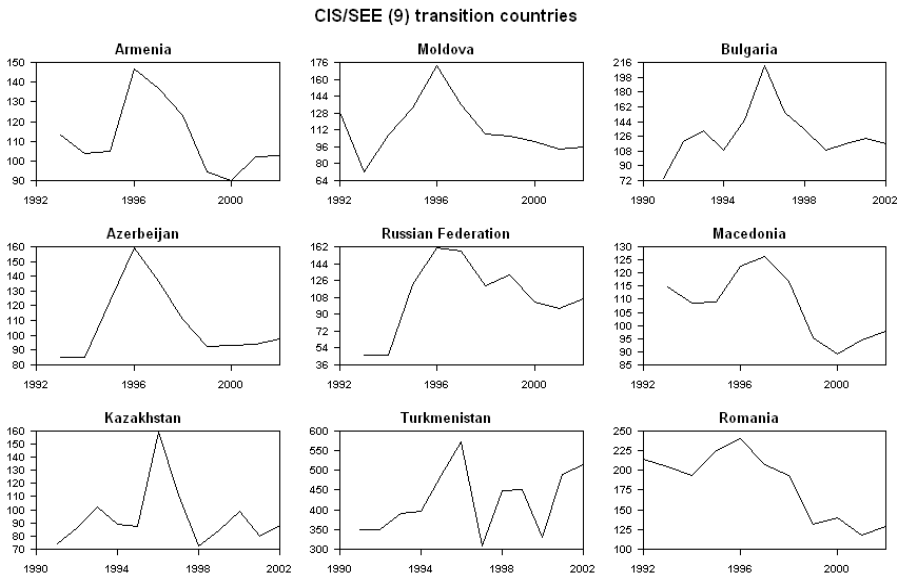
<sup>10</sup> Among transition countries CEE countries were considered as prospective EU members almost immediately after communist regimes collapsed. Since becoming a full member of the EU was certain and agreed social goal among CEE countries, *acquis communautaire* of the EU has forced the pace of reforms and determined their shape. Moreover, the EU has given considerable assistance to the CEE countries from the early days of their candidacy. Annual reports on the progress of applicant countries for EU membership are published. Since 1998 civil servants from the EU countries have worked in applicant countries to advise and help train their officials on Common Agricultural Policy (CAP) of the EU.

convergence for wheat relative prices across transition countries. The panel tests are explained in section 3. Section 4 reports and discusses the results we obtained from the panel tests. Concluding remarks are contained in the final section.

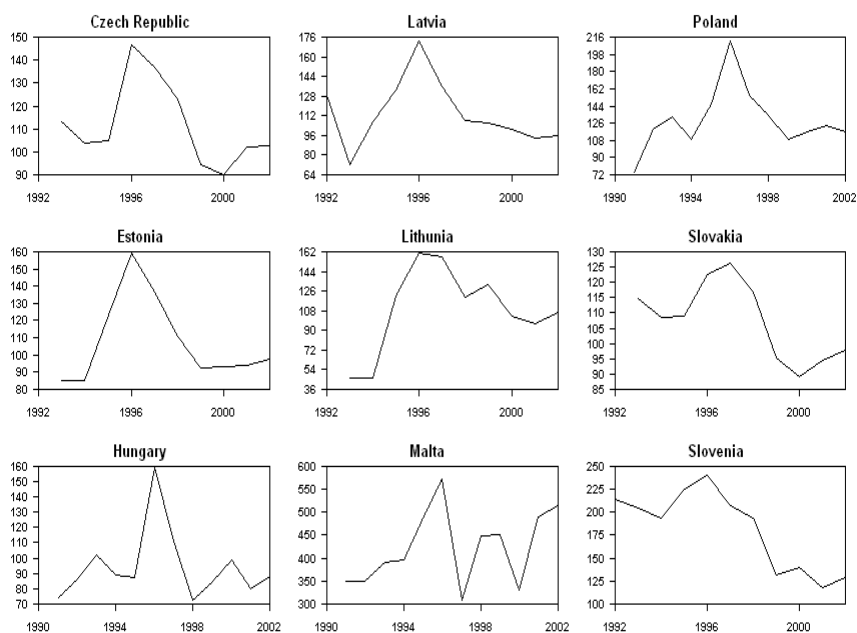
## 2. Data and the Estimation method

We obtained the price data for wheat from the Food and Agricultural Organization (FAO) statistics. Wheat prices were in local currencies; therefore we converted the local currency data to a common currency, the US dollar. Data starts from 1991, since transition for most of the sample countries starts in 1991 and ends in 2002 due to the availability of the data. We included eighteen transition countries in our sample and divided the sample into two to compare the speed of convergence. The first sample presents the new members of the EU as of May 2004, which are the CEE transition countries (a total of 9), and the second sample presents the rest of the transition countries, which are the CIS (a total of 6) and the SEE (a total of 3) countries. Figure 1 presents the behavior of wheat prices for the two samples.

**Figure 1: The behavior of relative wheat prices for the CEE and the CIS/SEE countries**



CEE (9) transition countries (new EU members)



We treat the world average wheat prices as a numeraire country in our sample and calculate the log relative wheat prices by taking the log difference between each country in our sample and the numeraire country. The world average includes the wheat prices from 81 countries, constituting 80 percent of the world population. We then test whether the behavior of the price levels are characterized as a unit root or a mean reverting process, since price levels tend to exhibit strong trends and are not stationary. Nonstationarity invalidates classic estimation procedures as these procedures ignore the time-series properties of prices, hence leading to inconsistent estimates. However, the stationarity properties of price levels are essential in understanding the nature of shocks on price levels, hence, we test whether price levels are stationary with well-known univariate tests. The model we estimate is the augmented Dickey Fuller (ADF) equation for testing the unit

root hypothesis. According to the univariate test results, not a single country exhibit stationary relative wheat price behavior.<sup>11</sup>

### 3. Panel Tests

Some recent studies have shown that by using panel data instead of a time-series approach, the power of unit root tests increases. One can also get more important information by using the cross sectional variation in a data set (Frankel and Rose (1996), Oh (1996), Wu (1996), Cecchetti et al. (1998)). Therefore, we continue our analysis by estimating different specifications of the ADF equation with individual and time specific effects to test for a possible unit root.

$$\Delta p_{it} = \alpha_i + \vartheta_t + \beta p_{it-1} + \sum_{j=1}^{k_i} \delta_j \Delta p_{it-j} + \varepsilon_{it}$$

In this model,  $\Delta$  denotes the first difference operator,  $i$  denotes the transition country,  $t$  denotes the year,  $p$  denotes the natural logarithm of relative wheat prices,  $p_t = \ln(p_{it}) - \ln(p_{it-1})$ ,  $k$  denotes the order of lag of log relative price difference, and  $\varepsilon$  denotes the white noise error term. While the null hypothesis states that unit root is present,  $H_0: \beta = 0$ , the alternative hypothesis states that convergence exists,  $H_0: \beta < 0$ .

One problem with Levin and Lin's hypothesis is that not allowing heterogeneity across groups may cause the whole panel to be modeled as stationary, even though there may be a large proportion of non-stationary series in the panel. Karlsson and Lothgren (2000) were critical of this

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<sup>11</sup> Notice that the period examined in this study includes 12 years or less. It is well known that unit root tests have very low power unless the time series is very long. In the literature, there are studies that indicate the law of one price (LOP) for individual commodities holds in the long run, but not in the short run (Protopapadakis and Stoll (1983, 1986), Froot and Rogoff (1994)). Additionally, Levin and Lin (1993), indicated from simulation exercises that the problem of limited power in unit root tests is severe for small samples. They claim that if 50 observations are generated by a stationary univariate model with a first-order autocorrelation of 0.9, the ADF test procedure (allowing for intercept and time trend, and using a 5 percent confidence level) rejects the unit root hypothesis in only 8 percent of the replications.

process, holding that if one country presents a stationary process this is enough to reject the unit root for the whole panel. The Im, Pesaran and Shin test procedure, on the other hand, allows for heterogeneity across groups. However, this point of concern does not apply for our study, since not a single country in our sample exhibited stationarity.<sup>12</sup> The Im, Pesaran and Shin test procedure, however, has another feature that differs from the Levin and Lin test procedure. The Levin and Lin test requires a strong condition, such that  $N/T \rightarrow 0$  for asymptotic validity, especially in small samples. Im, Pesaran and Shin (1997) relax this assumption requiring that  $N/T \rightarrow k$  for any finite positive constant. Because of the second feature of the Im, Pesaran and Shin test, we report both Levin and Lin and Im, Pesaran and Shin test results. However, we do not evaluate the Im, Pesaran and Shin test results since the other features of the test are not consistent with the data and the aim of this study.

We consider three different specifications of the model. The first specification of the model does not include any specific effects. The second specification includes individual specific effects in the model. The third specification includes time specific effects along with individual specific effects in the model.

#### 4. Panel Results

Table 1 shows the panel test results for the three different specifications of the model. Bias-adjusted panel estimates of  $\beta$  are presented in the table along

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<sup>12</sup> Note that Im, Pesaran and Shin test implicitly considers only balanced panel data (which is not the case for this study) but also does not provide an estimated beta coefficient, and hence it is impossible to discuss the speed of convergence of relative wheat prices. They estimate each equation separately by OLS as in univariate tests, and obtain test statistics by taking the averages of ADF t-statistics for each equation. In addition, Im, Pesaran and Shin perform the LM test, which is based on the standardized cross section average of the individual LM statistics in their 1997 study. Their simulations indicate better performance of the t-test and LM test over the Levin and Lin test in small samples, where the t-test performs better than the LM-test.

with the corrected t-statistics.<sup>13</sup> The distribution of the unit root tests statistic is not affected when individual specific fixed effects are modeled, however the coefficient on the lagged dependent variable becomes downward biased. This bias can be easily corrected since the degree of bias does not depend on the actual values of the fixed effects. Therefore, Levin and Lin propose two transformations of the t-statistics (called LL1 and LL2) that are normally distributed as individuals,  $N$ , and time,  $T$ , goes to infinity.<sup>14</sup> Additionally, half-lives are calculated for convergence as  $-\ln(2)/\ln(1+\beta)$  for both estimated beta coefficient and bias-adjusted estimated beta coefficient.

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<sup>13</sup> Nickell (1981) suggests the following formula for adjustment.

$$\text{plim} = (\hat{\rho} - \rho) = (A_T B_T) / C_T, \text{ where, } A_T = -(1 + \rho) / (T - 1),$$

$$B_T = 1 - (1/T)(1 - \rho^T) / (1 - \rho), \text{ and } C_T = 1 - 2\rho(1 - B_T) / [(1 - \rho)(T - 1)].$$

<sup>14</sup> Although we report both statistics, we prefer to discuss the second transformation of the t-statistics (LL2), since the standard normal distribution does not provide very accurate critical values for this statistics if the time series dimension is very small. Moreover, Karlsson and Lothgren (1999) found in a simulation study for  $T=10$  and  $N=10$ , the two tests move in different directions, but for  $T=10$  and  $N>25$ , the second Levin and Lin test (LL2) has the correct size and is the most powerful test. The standardized t-statistics  $[\text{If } \frac{\sqrt{N}}{T} \rightarrow 0, \text{ then } \sqrt{1.25}t_\beta + \sqrt{1.875N} \Rightarrow N(0,1)]$  converge to a standard normal distribution when  $(N)^{1/2}/T$  goes to infinity. But as  $(N)^{1/2}/T$  rises, the higher order terms of downward bias become increasingly important, and this the statistics diverge toward negative infinity. Additionally, adding time specific effects or a constant term into the model does not change these asymptotic results.

**Table 1: Panel Unit Root Test Results**

Period	$\hat{\beta}$	$\tau$	<i>adjusted</i>		<i>Adjusted</i>		<i>adjusted</i>	
			$\hat{\beta}$	$\tau$	$\tau$	$\tau$	half-life	half-life
<i>No effects:</i>								
<i>transition countries</i>								
<i>1991-2002</i>								
CEE (new EU) [9]	-0.1059	-2.30						
CIS / SEE [9]	-0.1287	-2.13						
<i>Individual specific effects:</i>								
<i>transition countries</i>								
<i>1991-2002</i>								
CEE (new EU) [9]	-0.8824	-18.89	-0.7902	-19.30	-17.01	-0.58	0.32	0.44
CIS / SEE [9]	-0.6486	-9.06	-0.5402	-8.31	-6.02	-0.42	0.66	0.89
<i>Time specific effects:</i>								
<i>transition countries</i>								
<i>1991-2002</i>								
CEE (new EU) [9]	-0.9343	-11.64	-0.8460	-11.20	-8.91	-0.58	0.66	0.89
CIS / SEE [9]	-0.6118	-8.28	-0.5010	-7.44	-5.15	-0.42	0.73	1.00

Unit root panel test critical values at *one percent* significance level when individual specific effects are included are  $-7.51$  for  $N=20$  and  $T=10$ , and  $-5.77$  for  $N=10$  and  $T=10$ , where  $N$  stands for number of countries and  $T$  stands for time period.

Critical values of IPS  $\tau$  statistics for DF regressions containing only an intercept at *one percent* significance level is  $-2.06$  when  $N=20$  and  $T=10$ ,  $-2.32$  when  $N=10$  and  $T=10$ .

The top panel of Table 1 presents the estimated coefficient and the t-statistics when there are no fixed effects. This specification of the model is useful in evaluating the significance of assumed differences of relative wheat price behavior across transition countries by not allowing for different unconditional means across these countries under the alternative hypothesis of stationarity. The results indicate that all estimates for the two groups of transition countries are not significant. Half-lives are estimated to be around three to four years. This result shows that including cross-sectional variation

in the model is important to capture relative price convergence and is consistent with our objective.

The second panel of Table 1 gives the results for relative price behavior of wheat when individual specific effects are included into the model. The results show that presence of unit root is rejected for relative wheat prices for both samples significantly when panel tests are conducted. The Im, Pesaran and Shin test does not support this result.<sup>15</sup> The adjusted half-life for relative wheat prices for the CEE countries is estimated to be 0.44 years. In other words, it takes approximately 6 months for one time deviation from the original relative wheat price to be reduced by half. On the other hand, the adjusted half-life for relative wheat prices for the CIS/SEE countries is estimated to be 0.89 years. Thus, it takes approximately 11 months for one time deviation from the original relative wheat price to be reduced by half.

Slower convergence for the CIS/SEE transition countries for wheat prices relative to the world average suggests us that the CIS/SEE countries were not as fast as the CEE countries at liberalizing their agricultural market structures. This may be because the CEE countries dramatically reduced input subsidies and tore down planning systems, while the CIS were more gradual. Moreover, the CEE countries and the CIS have followed different strategies (in terms of form, sequence and speed of policies) on providing private property rights and a regulatory environment and in building market institutions. Additionally, the CEE countries had the guidance and enforcement mechanisms of the EU supporting this transition. Considering that transition from planned economies to free markets generally requires politically infeasible decisions, the enforcement mechanism of the EU was significant. Rozelle and Swinnen (2003) give credit also to psychological tendencies of the CEE countries towards the West.

Foreign direct investments may be another possible reason for the findings. The CEE countries were more successful in integrating world markets. The domestic companies taken over by the foreign firms have not only helped to create viable agro-food businesses, but also created spillover effects on other local companies. Similarly, penetration of western financial

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<sup>15</sup> See Maddala and Wu (1999) for arguments on the shortcomings of Levin and Lin tests, and Im, Pesaran and Shin tests and comparison of these two tests with the Fisher test. Also see Banerjee (1999) for an overview and discussions of these tests. Also see Im, Pesaran and Shin (1997) for power comparison of Levin and Lin tests with  $t$  and LM tests for different  $N$  and  $T$  with serially correlated errors.

institutions and instruments was more prevalent for the CEE countries than CIS countries.

When we remove the assumption of independence across these countries by removing the effect of time specifics from the data, the speed of convergence between the two groups of countries does not differ from each other significantly, since this specification removes the shocks that are common to all transition countries.<sup>16</sup> This model specification simply requires subtracting the cross section averages from the data, following Levin and Lin's (1993) procedure, to eliminate the time effect. That is, we calculate the mean of log relative wheat prices of the transition countries in question for each year and subtract it from the log relative wheat prices.

The results are presented in the last panel of Table 1. According to the results, there appears to be a significant price convergence for wheat for both groups of countries where the CEE countries show slightly faster convergence than the CIS/SEE countries. Adjusted half-life for wheat is estimated to be 0.89 years and 1.00 year for the CEE and the CIS/SEE countries, respectively. Thus, it takes about 11 and 12 months for one time deviation from the original relative wheat price to be reduced by half for the CEE and the CIS/SEE countries, respectively.

## 5. Conclusion

In this paper we examined the price convergence of wheat of transitional economies to the world markets with special emphasis on the effect of the prospect of becoming an EU member. We found that the CEE countries integrate the world markets faster than the CIS. Since prices are one of the most important tools for functioning markets which directly affect output, productivity and efficiency, this result is very significant.

The results of this study suggest that the prospect of becoming an EU member has helped the CEE countries on their integration to the world markets, even though agriculture is one of the least integrated markets to the world market in the EU. These countries had to adjust their regulatory environment to the Common Agricultural Policy of the EU, which helped

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<sup>16</sup> The method is not different than including time specific effects in the regression model. It captures the influence of shocks that induce cross-sectional dependence. This step does not affect the limiting distributions of the panel test statistics.

them to overcome the political problems of transition. Moreover, due to their membership prospect, they received more interest from foreign financial and manufacturing companies compared to CIS countries. In turn, contract innovations and vertical integration of foreign manufacturing companies may have solved many significant problems of the CEE countries while foreign banks provided vital credits and loans to agro-food companies.

## References

- Abuaf, N. and Jorion, P. (1990) "Purchasing Power Parity in the Long Run." *The Journal of Finance* 45, no. 1: 157-174.
- Banerjee, A. (1999) "Panel Data Unit Roots and Cointegration: An Overview." *Oxford Bulletin of Economics and Statistics*, Special Issue: 607-629.
- Brezis, E. and Schnytzer, A. (2003) "Why are Transition Paths in China and Eastern Europe Different? A Political Economy Perspective." *Economics of Transition* 11, no. 1: 3-23.
- Camarero, M., Esteve, V. and Tamarit, C. (2000) "Price Convergence of Peripheral European Countries on the Way to the EMU: A Time Series Approach." *Empirical Economics* 25: 149-168.
- Castanheira, M. (2003) "Public Finance and Optimal Speed of Transition." *Economics of Transition* 11, no.: 435-462.
- Csaki, C., and Nash, J. (1997) "The Agrarian economies of Central and Eastern Europe and the Commonwealth of Independent States." World Bank Discussion Paper No. 387.
- Frankel, J.A. (1986) "International Capital Mobility and Crowding Out in the US Economy: Imperfect Integration of Financial Markets or Goods Market?" In: Hafer R. (Ed), *How Open is the US Economy*, Lexington.
- Frankel, J.A. (1990) "Zen and the Art of Modern Macroeconomics; A Commentary on Exchange Rates, the Current Account, and Monetary Policy." In: A. C. Stockman. In: Haraf, W., Willett, T. (Eds), *Monetary Policy for a Global Economy*; Washington.
- Frankel, J.A. and Rose, A.K. (1996) "A panel project on purchasing Power Parity: Mean Reversion within and Between Countries." *Journal of International Economics* 40: 209-224.
- Froot, K.A. and Rogoff, K. (1995) "Perspectives on PPP and Long-Run Real Exchange Rate." In: *Handbook of International Economics* 3, Elsevier, 1647-1688.

- Gardiner, B, Martin, R. and Tyler, P. (2004) "Competitiveness, Productivity and Economic Growth Across the European Regions." *Regional Studies*; 38(9): 1045-1067.
- Genberg, H. (1978): "Purchasing Power Parity under Fixed and Flexible Exchange Rates." *Journal of International Economics* 8, 247-276.
- Hartell, J. and Swinnen, J. (1998) "Trends in Price and Trade Policy Instruments in Central European Agricultural and Food Markets." *The World Economy* 21, no. 2: 261-279.
- Hitiris, T. and Nixon, J. (2001) "Convergence of Health Care Expenditure in the EU Countries." *Applied Economics Letters* 8: 223-228.
- Im, K.S., Pesaran, M.H. and Shin, Y. (1997) "Testing for Unit Roots in Heterogeneous Panels." Mimeo, Trinity College, Cambridge.
- Isard, P. (1977) "How Far We Push the Law of One Price?" *American Economic Review* 67: 942-949.
- Karlsson, S. and Löthgren, M. (2000) "On the Power and Interpretation of Panel Unit Root Tests." *Economics Letters* 66: 249-255.
- Korhonen, L. (2003) "Some Empirical Tests on the Integration of Economic Activity between the Euro Area and The Accession Countries A Note." *Economics of Transition* 11, no. 1: 177-196.
- Levin, A. and Lin, C. (1992) "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties." University of California, San Diego, Discussion paper, 92-93.
- Levin, A. and Lin, C. (1993) "Unit Root Tests in Panel Data: New Results." University of California, San Diego, Discussion paper, 93-56.
- Lopez-Bazo, E., Vaya, E., Mora, A. and Surinach, J. (1999) "Regional Economic Dynamics and Convergence in the European Union." *Annals of Regional Science* 33: 343-370.
- Maddala, G.S. and Wu, S. (1999) "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test." *Oxford Bulletin of Economics and Statistics*, Special Issue: 607-629.

- Murinde, V., Agung, J. and Mullineux, A, (2004) "Patterns of Corporate Financing and Financial System Convergence in Europe." *Review of International Economics* 12, no. 4: 693-705.
- Protopapadakis, A.A. and Stoll, H.R. (1983) "Spot and Future Prices and the Law of One Price." *Journal of Finance* 38: 1431-1456.
- Protopapadakis, A.A. and Stoll, H.R. (1986) "The Law of One Price in International Commodity Markets: A Reformulation and Some Formal Tests." *Journal of International Money and Finance* 5: 335-360.
- Roland, G. and Verdier, T. (1999) "Transition and Output Fall." *Economics of Transition* 7, no. 1: 1-28.
- Rozelle, S. and Swinnen, J. (2004) "Success and Failure of Reforms: Insights from the Transition of Agriculture." *Journal of Economic Literature* 42, no. 2: 404-456.
- Sanz, I., and Velazquez, J. (2004) "The Evolution and Convergence of the Government Expenditure Composition in the OECD Countries." *Public Choice* 119: 61-72.
- Sohinker, J. (2005) "Growth Convergence in European Transition Economies the Impact of Foreign Direct Investment." *Eastern European Economics* 43, no. 2: 73-94.
- Trzeciak-Duval, A. (1999) "A Decade of Transition in Central and Eastern European Agriculture." *European Review of Agricultural Economics* 26, no. 3: 283-304.
- World Bank (2001) "Commonwealth of Independent States: An Update." ECSSD Working Paper.