Price Convergence in the European Union
by
Simón Sosvilla-Rivero*
Salvador Gil-Pareja**
DOCUMENTO DE TRABAJO 2002-12

May 2002

* FEDEA and Universidad Complutense de Madrid.
** Universidad de Valencia.

Los Documentos de Trabajo se distribuyen gratuitamente a las Universidades e Instituciones de Investigación que lo solicitan. No obstante están disponibles en texto completo a través de Internet: <http://www.fedea.es/hojas/publicaciones.html#Documentos de Trabajo>

These Working Documents are distributed free of charge to University Department and other Research Centres. They are also available through Internet: <http://www.fedea.es/hojas/publicaciones.html#Documentos de Trabajo>

ABSTRACT:

This paper investigates the relationship between market integration and price convergence in international markets. Using a panel data set of consumer price indices (general and by groups and classes), we examine how European market integration has affected cross-country dispersion in the European Union.

JEL classification numbers: F15; F30.

KEY WORDS: Price dispersion, Market integration, European Union.

Introduction

During the last four decades, the European Union (EU) has advanced to a closer integration by the removal of trade barriers, the establishment of a single market and the creation of the Economic and Monetary Union (EMU). In addition, there have been attempts towards tax harmonisation and structural reforms in product markets to increase competition and reduce potentially harmful distortions caused by different forms of government intervention. All these initiatives would have enhanced market integration that would have exerted downward pressure on traded goods and services prices, leading to a decline in price dispersion across EU Member States.

In this paper we will try to provide some empirical evidence on the degree of price convergence across EU countries during the 1975-1995 period using recent developments in econometric theory based on panel data unit root tests. To the extent that the price convergence hypothesis applies to the EU, some of the current divergence of inflation rates in the Euro area may simply be transitory.

The paper is organised as follows. In Section 2 we discuss the empirical framework for testing price convergence. Section 3 presents the empirical results. Finally, some concluding remarks are provided in Section 4.

2. Empirical model

Following Levin and Lin (1992), we consider the following convergence equation:

$$\Delta p_{i,t} = \alpha_i + \beta p_{i,t-1} + \sum_{j=1}^m \gamma_j \Delta p_{i,t-j} + \varepsilon_{i,t} \quad (1)$$

where Δ is the first difference operator and $p_{i,t}$ denotes the log-difference in the price of a given product in country i relative to Germany. The choice of Germany as the benchmark country is based on the central role of this country in the European Monetary System [see Bajo-Rubio *et al.* (2001)]. As can be seen, equation (1) is a panel Augmented Dickey Fuller (ADF) regression, where α_i , β and γ_j are the parameters to be estimated. The main parameter of interest is β that denotes the speed of convergence (i. e. how fast deviations from long-term price differentials are eliminated). Under the null hypothesis of no convergence, $\beta=0$ and a shock to $p_{i,t}$ is permanent (i. e., $p_{i,t}$ has a unit root). Convergence implies a negative and significantly different from zero β , with the approximate half-life of a shock to $p_{i,t}$ given by $-\ln(2)/\ln(1+\beta)$. On the other hand, the dummies α_i capture country fixed effects that account for non-time dependent, price differences across countries, such as varying sales taxes or levels of per capita income. Note that large values of the α_i 's would indicate market segmentation. Finally, the lags $\Delta p_{i,t}$ are used to account for possible serial correlation in the error term. To determine the lag order m , we make use of Campbell and Perron's (1991) top-down approach. We start by setting $m=5$: if the absolute value of the t -statistic for $\hat{\gamma}_5$ is less than 1.96 then we reset $m=4$ and re-estimate the equation. We repeat this procedure until the t -statistic of the coefficient with the longest lag is greater than 1.96.

In order to estimate equation (1) we follow the procedure proposed by Levin and Lin (1992) to test for unit root with panel data. Given the strong contemporaneous correlation in price indices across countries, we allow for a non-diagonal covariance matrix Ω_ε of the ε_{it} 's in equation (1). To correct for this cross-sectional dependence we estimate (1) with feasible generalised least squares (FGLS). Estimation with FGLS not only corrects for cross-sectional dependence in ε_{it} , it also corrects for cross-sectional heteroskedasticity in the ε_{it} 's of equation (1) (see Groen, 2000). Finite sample critical values for the FGLS t -statistic for $\hat{\beta}$ in (1) are tabulated using parametric bootstrapping with 5000 replications.

3. Empirical results

In our study we use monthly data on Consumer Price Indices (CPIs) for 12 EU countries: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom. The data comes from Eurostat, the statistical agency of the EU. Table 1 presents basic information about our data base. As can be seen, in addition to the General CPI, we have also data on the several Groups and Classes. The data set covers the 1975-1995 period, due to the fact that from 1995 Eurostat started to provide data on the new Harmonised Consumer Price in order to examine fulfilment with Maastricht Treaty demands for entry into EMU (although for some countries as France and the United Kingdom this data is only available from 1996).

As Table 1 indicates, there are a great number of missing observations in the data base. Since our main focus is on explaining price dispersion across countries, we eliminate any country which has an insufficient number of observations. In doing so, the number of countries in the sample is always the same, although the time period examined for each individual price index could vary in order to obtain a balanced panel where data is available for all countries covering the most ample period possible. In our empirical analysis we exclude Ireland. As mentioned before, in the estimation the prices are expressed as log-difference relative to Germany.

Table 2 reports the estimation results for equation (1) along with the p-values for the Levin-Lin (LL) test obtained using the parametric bootstrap procedure. As can be seen, we can decisively reject the null hypothesis of a unit root (or no convergence) in 17 out of the 26 cases considered. The exceptions are Tobacco, Alcoholic and Non-alcoholic drinks, Drink and Tobacco, Fuels and Energy, Vehicles, Public transport, Communications, Leisure and Books. It is interesting to note that, all in all, we obtain empirical evidence on price convergence for tradable goods, but not in the case of non-tradable goods or goods that are subject to special taxes or regulations.

Regarding the estimated speed of convergence it is -0.006 for the General CPI, being 115 months the implied half life of a shock. The highest estimated β is for the Fruits (-0.073) with an implied half-life of 9 months. In contrast, the lowest speed of convergence is found for Recreation (-0.001) with an estimated half-life of 693 months.

In order to check the robustness of our results to changes in the sample, and following European Commission (1995), a distinction is made between Group A and Group B countries. Group A countries are those whose currencies continuously participated in the Exchange Rate Mechanism (ERM) from its inception (Belgium, France, Luxembourg and the Netherlands). These continuous participants in the ERM maintained broadly stable bilateral exchange rates among themselves and, in particular, against the Deutschmark over the sample period. By contrast, Group B includes countries whose currencies either entered the ERM later (Italy, Portugal and Spain in 1989, the United Kingdom in 1990, and Greece in March 1998) or suspended its participation in the ERM (Italy from September 1992 to November 1994, and the United Kingdom from September 1992). In addition, the currencies of Group B countries fluctuated in value to a great extent relative to the Deutschmark (see, e. g., Sosvilla-Rivero *et al.*, 1999). As can be seen in Table 3, in 20 out of the 26 cases analysed, the exclusion of the Group B countries leads to a higher estimated speed of convergence that are statistically different from that obtained for the whole sample as indicated by the significance of the Wald test.

In Tables 4 and 5 we show the results obtained from the estimation of the convergence equation for those two groups of countries. As can be seen in Table 4, in the case of the group A of countries we can reject the null hypothesis of a unit root (or no convergence) in 18 out of the 26 cases considered. Compared with Table 2, we find evidence of price convergence in Public transport and Books at 1% level of significance, while we only obtain that evidence for Food at 10% significance level. It is interesting to note that, except for Household equipment, the estimated speeds of convergence obtained for this Group A are higher than those obtained for the whole sample.

Regarding the Group B countries, the results in Table 5 suggest that we can reject the null hypothesis of no convergence in the same cases that Table 2. In addition, the estimated speeds of convergence are always lower in this group than those obtained for the whole sample.

As a further test of robustness of the results, we have also analysed the sensitivity of the estimated β to the inclusion of the lag structure of exchange rate changes ($\sum_{i=1}^q \delta_j \Delta s_{t-j}$, where s_t is the log of the exchange rate vis-à-vis the Deutsche mark) in equation (1) in order to capture price differentials that

may results from short-term nominal rigidities. The results (not shown here, but available from the authors upon request) suggest that our estimate of the speed of convergence hardly changes compared to the specification without exchange rates presented in Tables 2, 4 and 5.

4. Concluding remarks

This paper has examined the degree of price dispersion among European Union member States during the 1975-1995 period, providing empirical evidence of an on-going process of price level convergence across EU countries, especially for traded goods. However, we fail to obtain such evidence in the cases of non-tradable goods or goods that are subject to special taxes or regulations.

When distinguishing between groups of countries, we find that for those countries whose currencies continuously participated in the Exchange Rate Mechanism from its inception maintaining broadly stable bilateral exchange rates (Belgium, France, Luxembourg and the Netherlands), the estimated speeds of convergence are higher than those obtained for the whole sample. By contrast, for countries whose currencies entered the ERM latter or suspended its participation in the ERM (Italy, Portugal, Spain, the United Kingdom and Greece), the estimated speeds of convergence are lower than those obtained for the whole sample.

References

- Bajo-Rubio, O., Sosvilla-Rivero, S. and Fernández-Rodríguez, F. (2001): “Asymmetry in the EMS: New evidence based on non-linear forecasts”, *European Economic Review* 45, 451-473.
- Campbell, J. Y. and Perron, P. (1991): “Pitfalls and opportunities : What macroeconomists should know about unit roots?”, *NBER Macroeconomics Annual* 6, 141-201.
- European Commission (1995): "The impact of exchange rate movements on trade within the single market", *European Economy, Reports and Studies*, No. 4.
- Groen, J. J. J. (2000): “The monetary exchange rate model as a long-run phenomenon”, *Journal of International Economics* 52, 299-319.
- Levin, A. and Lin, C. (1992): “Unit root tests in panel data: Asymptotic and finite-sample properties”, Discussion Paper 92-23, Department of Economics, University of California at San Diego.
- Sosvilla-Rivero, S., Fernández-Rodríguez, F. and Bajo-Rubio, O. (1999): “Exchange rate volatility in the EMS before and after the fall”, *Applied Economics Letters* 6, 717-722.

Table 1: Scope of the Consumer Price Indices

ITEM	COUNTRIES											
	BE	DE	DK	ES	FR	GR	IR	IT	LU	NL	PT	UK
General Index	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1989.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12	1975.01- 1999.12
Food	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1990.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Bread and Cereals	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Meat	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Dairy Products	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Fruit	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Tobacco	1978.01- 1995.12	1981.01- 1995.07	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1989.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12
Alcoholic and non- Alcoholic drink	1981.01- 1995.12	1981.01- 1995.07	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1989.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12	1978.01- 1995.12
Drink and tobacco	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1989.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Clothing and Footwear	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1989.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Clothing	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Footwear	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Rents	1978.01- 1995.12	1978.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1978.05- 1995.12	1981.01- 1995.12
Fuels and energy	1980.01- 1995.12	1980.01- 1995.07	1980.01- 1995.10	1980.01- 1995.12	1980.01- 1995.12	1980.01- 1995.12	1989.01- 1995.12	1980.01- 1995.12	1980.01- 1995.12	1980.01- 1995.12	1980.01- 1995.12	1980.01- 1995.12
Household equipment	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1989.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Furniture	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1989.01- 1995.12	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09
Domestic appliances	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1989.01- 1995.12	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09	1981.01- 1994.09
Transport and communications	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1989.01- 1995.12	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02	1977.01- 1995.02
Vehicles	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Public transport	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Communica-tions	1981.01- 1995.12	1981.01- 0995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Recreation	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1989.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Leisure	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.14	1981.01- 1995.12	1981.01- 1995.12
Books	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12
Other goods and services	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1989.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12	1977.01- 1995.12
Hotels	1981.01- 1995.12	1981.01- 1995.07	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1989.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12	1981.01- 1995.12

Table 2: Estimation results (whole sample)

Dep. Variable: $\Delta p_{i,k,t}$	General Index	Food	Bread and Cereals	Meat	Dairy Products	Fruits	Tobacco	Alcoholic and non. Alcoholic drink	Drink and tobacco	Clothing and Footwear	Clothing	Footwear	Rents
$p_{i,k,t-1}$	-0.006	-0.006	-0.013	-0.010	-0.013	-0.073	-0.015	-0.015	-0.006	-0.011	-0.014	-0.0154	-0.010
L-L test (p-value)	-14.704 (0.00)	-7.563 (0.01)	-10.942 (0.00)	-9.992 (0.00)	-8.984 (0.00)	-10.123 (0.00)	-4.161 (0.45)	-4.145 (0.46)	-5.449 (0.28)	-13.614 (0.00)	-12.787 (0.00)	-11.700 (0.00)	-9.894 (0.00)
BE	0.0006	0.0003	0.0009*	0.0007	0.0015	-0.0057	0.0016	-0.001	0.0015	0.0021	0.0032	0.0017	0.0002
DK	0.0014	0.0014	0.0000	0.0009	0.0022	0.0022	0.0009	-0.0022	0.0012	0.0025	0.0023	0.0019	0.0027
ES	0.0040	0.0037	0.0082	0.0038	0.0063	0.0123	0.0046	0.0052	0.0059	0.0090	0.0071	0.0000	0.0052
FR	0.0014	0.0016	0.0021	0.0019	0.0023	0.0002	0.0032	-0.0006	0.0030	0.0032	0.0031	0.0025	0.0029
GR	0.0084	0.0093	0.0173	0.0038	0.0168	0.0310	0.0107	0.0165	0.0122	0.0192	0.0209	0.0222	0.0134
IT	0.0035	0.0036	0.0053	0.0038	0.0068	0.0061	0.0042	0.0035	0.0049	0.0184	0.0068	0.0071	0.0053
LU	0.0005	0.0006	0.0014	0.0038	0.0023	-0.0029	0.0013	-0.0011	0.0012	0.0072	0.0020	0.0018	-0.0009
NL	0.0001	-0.0003	-0.0011	-0.0001	0.0002	-0.0045	1.47E-05	-0.0031	0.0005	-0.0026	-0.0039	-0.0052	0.0003
PT	0.0063	0.0055	0.0127	0.0059	0.0113	0.0233	0.0095	0.0112	0.0098	0.0000	0.0153	0.0132	0.0099
UK	0.0028	0.0022	0.0027	0.0016	0.0048	0.0053	0.0031	0.0015	0.0041	0.0000	0.0001	0.0007	0.0050
Lags of $\Delta p_{i,k,t}$	Yes (2)	Yes (2)	Yes (3)	Yes (3)	Yes (3)	Yes (3)	Yes (1)	Yes (3)	Yes (1)	Yes (3)	Yes (3)	Yes (3)	Yes (2)
Sample	75:04-95:12	77:04-95:12	81:05-95:07	81:05-95:07	81:05-95:07	81:05-95:07	78:03-90:12	81:05-95:07	77:03-95:12	77:05-95:12	81:05-95:07	81:05-95:07	78:05-95:12

Dep. Variable: $\Delta p_{i,k,t}$	Fuels and energy	Household equipment	Furniture	Domestic appliances	Transport and communications	Vehicles	Public transport	Communica-tions	Recreation	Leisure	Books	Other goods and services-	Hotels
$p_{i,k,t-1}$	-0.013	-0.009	-0.016	-0.015	-0.009	-0.015	-0.018	-0.023	-0.001	-0.016	-0.014	-0.010	-0.011
L-L test (p-value)	-5.803 (0.24)	-12.482 (0.00)	-12.054 (0.00)	-11.559 (0.00)	-8.936 (0.02)	-4.565 (0.40)	-7.217 (0.05)	-6.083 (0.20)	-12.127 (0.00)	-5.140 (0.32)	-6.617 (0.13)	-10.885 (0.00)	-11.321 (0.00)
BE	-0.0003	0.0003	0.0014	0.0010	0.0003	-0.0012	0.0008	0.0011	0.0009	0.0006	0.0020	0.0002	0.0020
DK	0.0039	0.0014	0.0025	0.0012	0.0021	0.0026	0.0033	0.0039	0.0025	0.0020	0.0038	0.0006	0.0012
ES	0.0044	0.0047	0.0000	0.0043	0.0053	0.0050	0.0052	0.0062	0.0048	0.0065	0.0069	0.0046	0.0078
FR	0.0021	0.0019	0.0033	0.0014	0.0017	0.0009	0.0021	-0.0010	0.0017	0.0018	0.0018	0.0018	0.0033
GR	0.0136	0.0110	0.0199	0.0153	0.0132	0.0124	0.0186	0.0292	0.0116	0.0237	0.0234	0.0120	0.0187
IT	0.0059	0.0043	0.0070	0.0044	0.0042	0.0034	0.0079	0.0056	0.0052	0.0087	0.0073	0.0045	0.0065
LU	-0.0013	0.0009	0.0031	0.0006	-0.0001	-0.0014	0.0004	0.0010	0.0006	0.0013	0.0003	0.0002	0.0020
NL	-0.0003	-0.0006	-0.0009	-0.0007	-6.75E-05	-0.0005	-0.002	0.0005	-0.0005	-0.0012	-0.0010	-0.0012	-0.0001
PT	0.0087	0.0089	0.0156	0.0097	0.0093	0.0126	0.0127	0.0067	0.0083	0.0091	0.0143	0.0078	0.0128
UK	0.0050	0.0023	0.0020	0.0015	0.0029	0.0030	0.0047	0.0029	0.0032	0.0049	0.0046	0.0010	0.0040
Lags of $\Delta p_{i,k,t}$	Yes (1)	Yes (3)	Yes (4)	Yes (4)	Yes (1)	Yes (4)	Yes (3)	Yes (2)	Yes (4)	Yes (4)	Yes (4)	Yes (3)	Yes (2)
Sample	81:03-95:07	77:05-95:12	81:06-94:09	81:06-94:09	77:03-95:12	84:06-95:07	81:05-95:07	81:04-95:07	77:06-95:12	84:06-95:07	81:06-95:07	77:05-95:12	81:04-95:07

Table 3: Sensitivity analysis to country group exclusion

Countries Excluded	General Index	Food	Bread and Cereals	Meat	Dairy Products	Fruits	Tobacco	Alcoholic and non. Alcoholic drink	Drink and tobacco	Clothing and Footwear	Clothing	Footwear	Rents
NONE	-0.0060	-0.0059	-0.0133	-0.0099	-0.0133	-0.0734	-0.0155	-0.0147	-0.0058	-0.0109	-0.0115	-0.0154	-0.0102
GROUP A	-0.0056 (0.4568)	-0.0056 (0.7445)	-0.0114 (0.1577)	-0.0096 (0.8141)	-0.0109 (0.1847)	-0.0475 (0.0013)	-0.0106 (0.2381)	-0.0133 (0.7156)	-0.0043 (0.1942)	-0.0097 (0.1587)	-0.0103 (0.2503)	-0.0137 (0.2200)	-0.0084 (0.1312)
GROUP B	-0.0077 (0.0464)	-0.0101 (0.0244)	-0.0299 (0.0000)	-0.0107 (0.5748)	-0.0258 (0.0000)	-0.1954 (0.0000)	-0.0363 (0.0152)	-0.0359 (0.2220)	-0.0129 (0.0057)	-0.0156 (0.8782)	-0.0140 (0.3303)	-0.0264 (0.0037)	-0.0164 (0.0037)

Countries Excluded	Fuels and energy	Household equipment	Furniture	Domestic appliances	Transport and communications	Vehicles	Public transport	Communications	Recreation	Leisure	Books	Other goods and services-	Hotels
NONE	-0.0128	-0.0088	-0.0158	-0.0152	-0.0093	-0.0147	-0.0184	-0.0225	-0.0091	-0.0157	-0.0136	-0.0098	-0.0110
GROUP A	-0.0100 (0.1468)	-0.0093 (0.5585)	-0.0172 (0.4148)	-0.0147 (0.7220)	-0.0074 (0.1266)	-0.0122 (0.4487)	-0.0143 (0.1427)	-0.0171 (0.1941)	-0.0085 (0.5221)	-0.0141 (0.6462)	-0.0104 (0.1377)	-0.0085 (0.2030)	-0.0103 (0.5596)
GROUP B	-0.0265 (0.0119)	-0.0086 (0.8720)	-0.0176 (0.3608)	-0.0248 (0.0049)	-0.0169 (0.0030)	-0.0437 (0.0126)	-0.0379 (0.0030)	-0.0391 (0.0291)	-0.0126 (0.0107)	-0.0373 (0.0202)	-0.0396 (0.0001)	-0.0154 (0.0071)	-0.0163 (0.0072)

Notes: This table presents the speed of convergence estimated for the whole sample and for two sub-samples of countries.

In bracket we show the associated p -value of the Wald statistic to test the hypothesis that estimated coefficient is equal to that obtained for the whole sample.

Table 4: Estimation results (Group A countries)

Dep. Variable: $\Delta p_{i,k,t}$	General Index	Food	Bread and Cereals	Meat	Dairy Products	Fruits	Tobacco	Alcoholic and non. Alcoholic drink	Drink and tobacco	Clothing and Footwear	Clothing	Footwear	Rents
$p_{i,k,t-1}$	-0.008	-0.010	-0.030	-0.011	-0.026	-0.195	-0.036	-0.036	-0.013	-0.011	-0.014	-0.026	-0.016
L-L test (p-value)	-9.086 (0.00)	-5.4304 (0.08)	-8.0380 (0.00)	-7.0148 (0.00)	-9.1617 (0.00)	-11.7283 (0.00)	-4.2366 (0.28)	-2.0637 (0.53)	-5.0559 (0.14)	-6.3289 (0.00)	-6.1288 (0.00)	-6.9669 (0.00)	-7.6405 (0.020)
BE	0.0004	-5.71E-05	0.0008	0.0006	0.0011	-0.0175	0.0006	-0.0006	0.0014	0.0022	0.0036	0.0020	-0.0002
DK	0.0012	0.0008	0.0000	0.0008	0.0016	0.0033	-0.0001	-0.0021	0.0008	0.0028	0.0027	0.0024	0.0030
FR	0.0011	0.0010	0.0024	0.0017	0.0020	-0.0040	0.0025	0.0005	0.0028	0.0036	0.0035	0.0028	0.0028
LU	0.0004	0.0002	0.0016	0.0035	0.0025	-0.0098	-1.89E-05	3.67E-05	0.0008	0.0022	0.0022	0.0022	-0.0016
NL	6.22E-05	-0.0004	-0.0016	-0.0001	0.0002	-0.0119	-0.0014	-0.0034	0.0002	-0.0027	-0.0043	-0.0062	9.51E-05
Lags of $\Delta p_{i,k,t}$	Yes (2)	Yes (2)	Yes (3)	Yes (3)	Yes (3)	Yes (3)	Yes (1)	Yes (3)	Yes (1)	Yes (3)	Yes (3)	Yes (3)	Yes (2)
Sample	75:04-95:12	77:04-95:12	81:05-95:07	81:05-95:07	81:05-95:07	81:05-95:07	78:03-90:12	81:05-95:07	77:03-95:12	77:05-95:12	81:05-95:07	81:05-95:07	78:05-95:12

Dep. Variable: $\Delta p_{i,k,t}$	Fuels and energy	Household equipment	Furniture	Domestic appliances	Transport and communications	Vehicles	Public transport	Communications	Recreation	Leisure	Books	Other goods and services-	Hotels
$p_{i,k,t-1}$	-0.027	-0.009	-0.018	-0.025	-0.017	-0.044	-0.038	-0.039	-0.013	-0.037	-0.040	-0.015	-0.016
L-L test (p-value)	-4.8716 (0.17)	-8.2161 (0.00)	-8.8765 (0.00)	-9.2421 (0.00)	-6.6281 (0.00)	-3.7745 (0.36)	-5.7778 (0.02)	-5.1537 (0.13)	-9.1951 (0.00)	-4.0150 (0.32)	-6.1238 (0.00)	-7.3942 (0.00)	-8.2865 (0.00)
BE	-0.0014	0.0002	0.0012	0.0008	-7.84E-05	-0.0022	0.0006	0.0008	0.0006	0.0010	0.0027	0.0001	0.0020
DK	0.0059	0.0010	0.0021	0.0011	0.0021	0.0032	0.0039	0.0048	0.0022	0.0035	0.0055	0.0002	0.0010
FR	0.0020	0.0014	0.0027	0.0012	0.0011	0.0016	0.0024	-0.0023	0.0013	0.0029	0.0018	0.0014	0.0033
LU	-0.0029	0.0007	0.0026	0.0003	-0.0005	-0.0029	-0.0003	0.0004	0.0003	0.0022	-0.0005	6.09E-05	0.0020
NL	-0.0010	-0.0004	-0.0007	-0.0007	-9.18E-05	-0.0007	-0.0008	0.0007	-0.0006	-0.0017	-0.0022	-0.0014	-0.0002
Lags of $\Delta p_{i,k,t}$	Yes (1)	Yes (3)	Yes (4)	Yes (4)	Yes (1)	Yes (4)	Yes (3)	Yes (2)	Yes (4)	Yes (4)	Yes (4)	Yes (3)	Yes (2)
Sample	81:03-95:07	77:05-95:12	81:06-94:09	81:06-94:09	77:03-95:12	84:06-95:07	81:05-95:07	81:04-95:07	77:06-95:12	84:06-95:07	81:06-95:07	77:05-95:12	81:04-95:07

Table 5: Estimation results (Group B countries)

Dep. Variable: $\Delta p_{i,k,t}$	General Index	Food	Bread and Cereals	Meat	Dairy Products	Fruits	Tobacco	Alcoholic and non. Alcoholic drink	Drink and tobacco	Clothing and Footwear	Clothing	Footwear	Rents
$p_{i,k,t-1}$	-0.006	-0.006	-0.012	-0.010	-0.011	-0.047	-0.011	-0.013	-0.004	-0.010	-0.010	-0.014	-0.008
L-L test (p-value)	-11.9346 (0.00)	-6.4339 (0.00)	-8.3497 (0.00)	-7.3200 (0.00)	-6.2039 (0.00)	-5.9350 (0.00)	-2.5788 (0.56)	-3.7062 (0.37)	-3.6465 (0.38)	-11.7540 (0.00)	-10.3841 (0.00)	-10.2478 (0.00)	-7.1473 (0.00)
ES	0.0042	0.0044	0.0077	0.0043	0.0074	0.0097	0.0051	0.0042	0.0058	0.0078	0.0065	0.0000	0.0051
GR	0.0088	0.0107	0.0162	0.0129	0.0189	0.0235	0.0111	0.0139	0.0116	0.0160	0.0189	0.0214	0.0130
IT	0.0038	0.0043	0.0051	0.0043	0.0081	0.0055	0.0050	0.0027	0.0049	0.0062	0.0062	0.0069	0.0054
PT	0.0067	0.0066	0.0120	0.0068	0.0140	0.0179	0.0109	0.0093	0.0095	0.0000	0.0139	0.0127	0.0100
UK	0.0030	0.0025	0.0025	0.0017	0.0053	0.0042	0.0035	0.0009	0.0041	0.0000	9.34E-05	0.0005	0.0049
Lags of $\Delta p_{i,k,t}$	Yes (2)	Yes (2)	Yes (3)	Yes (3)	Yes (3)	Yes (3)	Yes (1)	Yes (3)	Yes (1)	Yes (3)	Yes (3)	Yes (3)	Yes (2)
Sample	75:04-95:12	77:04-95:12	81:05-95:07	81:05-95:07	81:05-95:07	81:05-95:07	78:03-90:12	81:05-95:07	77:03-95:12	77:05-95:12	81:05-95:07	81:05-95:07	78:05-95:12

Dep. Variable: $\Delta p_{i,k,t}$	Fuels and energy	Household equipment	Furniture	Domestic appliances	Transport and communications	Vehicles	Public transport	Communications	Recreation	Leisure	Books	Other goods and services-	Hotels
$p_{i,k,t-1}$	-0.010	-0.009	-0.017	-0.015	-0.007	-0.012	-0.014	-0.017	-0.008	-0.014	-0.010	-0.0085	-0.010
L-L test (p-value)	-4.1376 (0.29)	-9.9232 (0.00)	-10.3780 (0.00)	-9.2582 (0.00)	-5.9854 (0.00)	-3.5986 (0.40)	-5.1643 (0.12)	-4.0068 (0.32)	-9.3572 (0.00)	-4.2964 (0.27)	-4.7478 (0.20)	-8.3016 (0.00)	-9.2272 (0.00)
ES	0.0042	0.0054	0.0000	0.0047	0.0052	0.0046	0.0074	0.0055	0.0057	0.0066	0.0061	0.0045	0.0083
GR	0.0126	0.0126	0.0265	0.0165	0.0124	0.0113	0.0165	0.0250	0.0134	0.0242	0.0209	0.0117	0.0199
IT	0.0056	0.0050	0.0096	0.0048	0.0042	0.0034	0.0073	0.0051	0.0061	0.0088	0.0067	0.0044	0.0070
PT	0.0084	0.0102	0.0209	0.0108	0.0092	0.0115	0.0120	0.0064	0.0097	0.0092	0.0131	0.0077	0.0137
UK	0.0045	0.0025	0.0024	0.0017	0.0028	0.0027	0.0041	0.0025	0.0037	0.0046	0.0042	0.0029	0.0042
Lags of $\Delta p_{i,k,t}$	Yes (1)	Yes (3)	Yes (4)	Yes (4)	Yes (1)	Yes (4)	Yes (3)	Yes (2)	Yes (4)	Yes (4)	Yes (4)	Yes (3)	Yes (2)
sample	81:03-95:07	77:05-95:12	81:06-94:09	81:06-94:09	77:03-95:12	84:06-95:07	81:05-95:07	81:04-95:07	77:06-95:12	84:06-95:07	81:06-95:07	77:05-95:12	81:04-95:07

RELACIÓN DE DOCUMENTOS DE FEDEA

DOCUMENTOS DE TRABAJO

- 2002-12: “Price Convergence in the European Union”, **Simón Sosvilla-Rivero y Salvador Gil-Pareja**.
- 2002-11: “Recent Trends in Occupational Segregation by Gender: A Look Across The Atlantic”, **Juan J. Dolado, Florentino Felgueroso y Juan F. Jimeno**.
- 2002-10: “Demand- and Supply-Driven Externalities in OECD Countries: A Dynamic Panel Approach”, **Salvador Barrios y Federico Trionfetti**.
- 2002-09: “Learning by Doing and Spillovers: Evidence from Firm-Level Panel Data”, **Salvador Barrios y Eric Strobl**.
- 2002-08: “Interdependent Growth in the EU: The Role of Trade”, **María García-Vega y José A. Herce**.
- 2002-07: “Export Market Integration in the European Union”, **Salvador Gil-Pareja y Simón Sosvilla-Rivero**.
- 2002-06: “Early Mortality Declines at the Dawn of Modern Growth”, **Raouf Boucekkine, David de la Croix y Omar Licandro**.
- 2002-05: “Nearest-Neighbour Predictions in Foreign Exchange Markets”, **Fernando Fernández-Rodríguez, Simón Sosvilla-Rivero y Julián Andrada-Félix**.
- 2002-04: “Demografía, empleo, salarios y pensiones”, **Juan F. Jimeno**.
- 2002-03: “La reforma de la negociación colectiva en España”, **Samuel Bentolila, Juan F. Jimeno**.
- 2002-02: “Efficiency Spillovers from Foreign Direct Investment in the EU Periphery: A comparative study of Greece, Ireland and Spain”, **Salvador Barrios, Sophia Dimelis, Helen Louri y Eric Strobl**.
- 2002-01: “Non-Linear Forecasting Methods: Some Applications to the Analysis of Financial Series”, **Oscar Bajo-Rubio, Simón Sosvilla-Rivero y Fernando Fernández-Rodríguez**.
- 2001-23: “Age at first-time homeownership in Spain”, **Namkee Ahn**.
- 2001-22: “Capital público y efectos desbordamiento. Un análisis del impacto de las infraestructuras sobre la actividad privada por Comunidades Autónomas”, **Alicia Avilés Zugasti, Rosario Gómez García y José Sánchez Maldonado**.
- 2001-21: “Employment and public capital in Spain”, **Xavier Raurich, Hector Sala y Valeri Sorolla**.
- 2001-20: “Son relevantes el capital humano y el mercado de trabajo en los modelos de contabilidad generacional?. Un estudio sobre el caso español”, **Javier Alonso Meseguer**.

TEXTOS EXPRESS

- 2001-01: “La reforma de las pensiones en el contexto internacional”, **José A. Herce y Juan F. Jimeno**.
- 2000-03: “Efectos sobre la inflación del redondeo en el paso a euros”, **Mario Izquierdo y Simón Sosvilla-Rivero**.
- 2000-02: “El tipo de cambio Euro/Dólar. Encuesta de FEDEA sobre la evolución del Euro”, **Simón Sosvilla-Rivero y José A. Herce**.