Journal of Applied Economics, Vol. VII, No. 2 (Nov 2004), 271-301

EXPORT MARKET INTEGRATION IN THE EUROPEAN UNION

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Submitted December 2002; accepted June 2004

This paper examines the degree and recent evolution (1988-2001) of export-price dispersion among European Union countries. It also explores the effect of exchange rates on export-price dispersion by reviewing the experience of some European countries that participated in the exchange rate stability zone. The results indicate that export-price dispersion across European Union countries was usually lower than across OECD countries. Moreover, although there is little evidence of convergence, this is stronger across European Union countries. Finally, even though price dispersion was often lower across European Union countries where exchange rates have been relatively stable than across countries with relatively volatile exchange rates, exchange-rate stability has not significantly contributed to export-price convergence across participating countries over the sample period.

JEL classification codes: F15; F30
Key words: export market integration, European Union, exchange rates

I. Introduction

The integration of national economies in Europe is the focus of intense

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debate in policy-making circles.[1] One anticipated effect of European market integration is price convergence. Specifically, the elimination of barriers to trade as a result of the single market programme and the adoption of the single currency should reduce the potential for price discrimination across European Union (EU) markets. Although documenting price convergence trends over time is of interest in itself, it also provides an indicator of the evolution of product market integration.

A growing number of papers have been published on the subjects of price and inflation convergence in the EU (see, e. g., Caporale and Pittis, 1993; Hafer and Kutan, 1994; Holmes, 1998; Camarero, Esteve and Tamarit, 2000; Rogers, Hufbauer and Wada, 2001; Gámez-Amián and Morales-Zuma, 2002; and Sosvilla-Rivero and Gil-Pareja, 2004). By contrast, since the seminal paper by Pratt, Wise and Zeckhauser (1979) there have been few empirical studies documenting the extent and types of price dispersion (see Roberts and Supina, 2000; Alessandria, 2002; Lach, 2002, among others) and these fail to address the behaviour of exporters in the European markets. Indeed, to our knowledge, only Knetter and Slaughter (2001) consider prices charged by exporters to various destination markets. These authors study export-price convergence across OECD markets from two source countries: Germany and the United States.[2] The present paper attempts to fill a part of that gap by investigating the degree of export-price dispersion among European Union Member States and its evolution in the recent past.

On the other hand, since the European Monetary System (EMS) represented an important intermediary step to European Monetary Union (EMU), fostering economic integration and economic policy coordination in the EU (see, e. g., Sosvilla-Rivero and Pérez-Bermejo, 2004), we devote particular attention to the export-price dispersion experienced by countries whose currencies

[1] See for example the report of the European Commission from December 2002 "Economic Reform: Report on the Functioning of Community Product and Capital Markets" [COM (2002) 743 final].

[2] Knetter and Slaughter (2001) analyse export price convergence but not price dispersion. Their data sample includes 29 German export industries from 1975-87 and 16 US export unit value series from 1973-85. In both cases, the cross section of destination markets varies by product.

participated in the core of EMS and in the early years of EMU. In this regard, it has been claimed that international trade in a regime of relatively fixed exchange rates such as that established by EMS would result in price convergence. Therefore, by analysing export-price dispersion among EMS countries with different degrees of exchange rate stability we hope to shed new light on the success of this exchange rate agreement in terms of imposing price discipline among its members.

The approach taken here marks a departure from traditional literature on price convergence in that it uses highly disaggregated data. Most work with disaggregated products compares prices of goods sold in different locations (which include different amounts of value added that are non-tradable, such as distribution and retail services) and/or produced in different countries (raising questions concerning the homogeneity of the goods and differences in terms of production costs). Moreover, the sample size of most studies is limited in the extent of cross-section or time series variation. Goldberg and Verboven (2001) focus on price convergence in the European automobile market. Haskel and Wolf (2001) examine absolute prices for goods sold by IKEA, a Swedish furniture retailer. Crucini, Telmer and Zachariadis (2000) use actual prices for a large sample of items in European cities, but only for 1985. Similarly, De Serres, Hoeller and De la Maisonneuve (2001) analyse price dispersion in Europe using data for one point in time only (1998). Lastly, Rogers (2001) and Rogers, Hufbauer and Wada (2001) investigate price level convergence and inflation in Europe using data from 1990, 1995 and 1999.

Our approach offers two main advantages. Firstly, the use of export prices at the border of the exporting country means that no assumptions about transportation costs or the competitiveness of distribution networks in the buying countries are required, in contrast to an approach comparing prices of goods in different countries. The only critical assumption is identical products. However, this assumption seems more reasonable in our case compared to when the comparison is based on goods produced in different countries. The idea that place of production is a critical element of product differentiation was formalised in the demand system initially advocated by Armington (1969). Indeed, the so-called Armington assumption (product differentiation by place of production) is now commonly used in empirical work in international economics. Secondly, the sample used allows us to examine export prices

across groups of destination markets, products and source countries. By investigating price dispersion and price convergence in multiple dimensions, we hope to offer a comprehensive analysis of these issues.

The paper is organised as follows. Section II discusses the approach used to study price dispersion and price convergence over time, which is based on export prices at a common location. section III presents the data and section IV sets out the empirical findings. Finally, section V concludes the paper.

II. The Law of One Price and Export Market Integration

Much work in recent years has focused on testing the validity of the law of one price across countries. There are two versions - absolute and relative- of the law of one price. The absolute version states that, in the absence of transfer costs, identical traded products should sell for the same price in different countries when expressed in a common currency. The intuition is that international arbitrage should operate until prices are aligned. According to the relative version, common currency prices for a particular product should change in the same way over time in different countries and, therefore, the law is compatible with the existence of a stable price differential across markets.

Most empirical literature on the law of one price examines the validity of its relative version for two main reasons. First, arbitrage is not cost-free: trading between locations has costs (transportation and trade barriers, for instance) and thus prices are highly unlikely to be identical across locations. However, such costs may give rise to a stable price differential across markets. Second, as noted by Goldberg and Knetter (1997) and Knetter (1997), the preference for testing the relative version is a consequence of data limitations rather than research interest (typically, the data employed in price comparisons is in the form of price indices in different countries whose levels are arbitrary).

This paper focuses on the absolute version of the law of one price. The basis of our approach is that the same arbitrage forces that result in products at different locations differing in price by no more than transfer costs also mean that products at the same geographical point carry identical prices. This is because these costs are zero if products are at the same location. This notion can be applied to f.o.b. export prices. The export currency price for an identical

product at the border of the exporter country should be the same across buyers. Thus, price discrimination by exporters across destinations at a common location is inconsistent with the law of one price. At this juncture, it is important to note that there are limits to the use of price dispersion as an accurate indicator of integration. Even within fully integrated markets, export prices may vary to some extent due to changes in income or to exchange rate fluctuations. In addition, data limitations may mask product differentiation across markets.[3] Therefore, analysis of export-price dispersion can only provide a rough indication of export market integration.

III. Data

The data used in this study are based on the annual f.o.b. value and quantity of exports to selected destination countries for a number of eight-digit products in seven source countries -Belgium-Luxembourg, France, Germany, Italy, the Netherlands, Spain and the United Kingdom[4]- during the sample period 1988-2001. For each source country, given the destination-specific values and quantities of shipments, destination-specific unit values are constructed over the sample period to be used as a measure of export prices. The data source is Eurostat's statistics on external trade (Comext database). Since January 1, 1988 the Combined Nomenclature is the tariff and statistical codification system of the European Union countries, replacing the old nomenclatures Nimexe (statistical) and CCT (Common Customs Tariff).[5]

The products were selected with several factors in mind. One aim was to choose products which are important export industries in the source countries being studied. Another was to select products for which unit values are suitable measures of prices. Last but not least was the desire to select products with a

[3] In this paper we use unit values, so destination-specific quality differences in the product may give rise to differences in unit values, even though prices for identical varieties are the same. However, it is important to note that the scope for quality differences is likely to be minimal for most of the products studied here.

[4] The remaining European Union Member States were not considered as source countries because too few products met the selection criteria.

[5] The product classification code changes in 1988 precluded a longer data sample.

significant volume of exports from each source country to a common set of destinations over the entire sample period.[6] The number of products considered in the sample of source countries ranges from 15 to 32 of the approximately 10,000 eight-digit subheadings of the Combined Nomenclature. However, it is worth noting that the value of the exports of the selected products accounts for a significant percentage of the total value of exports from each source country: 14.3% (on average over the sample period) in Belgium-Luxembourg, 10.4% in France, 13.1% in Germany, 6.2% in Italy, 4.1% in the Netherlands, 20.0% in Spain, and 6.6% in the United Kingdom.

The destination markets selected were OECD countries in which exporters had a significant volume of shipments over the entire sample period.[7] The selection of large export destinations was made with the aim of improving the accuracy of the unit values as a measure of average prices. Large destinations are preferred in constructing unit values, since erratic variation in exports to small destinations may well increase the amount of noise in the unit value series.[8]

Before analysing the empirical results, it is worth emphasising three features of the sample. First, the sample provides variation in terms of product type. Second, most of the products are exported from more than one of the source countries in the sample. It is useful to compare the empirical evidence across source countries. Third, for each source country there is a set of common destinations across products. Specifically, for each export source the common set of destination markets includes the remaining six Member States from the list of source countries. This enables us to study price dispersion and price convergence among an important (in terms of sales) common set of export

[6] A more detailed description of the selection of products appears in the Appendix 1.

[7] As a result of this selection criterion all the destination markets selected belong to the following sub-sample of OECD countries: Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States. Therefore, Iceland, New Zealand, and the less developed countries of the OECD (Czech Republic, Hungary, Korea, Mexico, Poland, Turkey, and Slovak Republic) are not included in the set of destination markets in any source country-product pair.

[8] For reasons of space, we do not report the list of the destination markets considered for each source country-product pair. This is, however, available from the authors on request.

destinations, as well as to analyse the influence of exchange rates on these aspects.[9]

IV. Empirical Results

As indicated above, we study the dispersion of export prices across markets and over time using export unit values from seven source countries: Belgium-Luxembourg, France, Germany, Italy, the Netherlands, Spain, and the United Kingdom. As a measure of export-price dispersion we use the coefficient of price variation. The coefficient of variation, which is the ratio of the standard deviation to the mean, has often been used as a measure of price dispersion by the European Commission, the European Central Bank and in academic work.[10] For the purposes of this paper, it has advantages over alternative measures occasionally used to analyse price dispersion, such us range (the difference between the maximum price and the minimum price), standard deviation, max-min ratio (the ratio of the maximum price to the minimum price) or max-mean ratio (the ratio of the maximum price to the mean price). The coefficient of variation is invariable to changes of scale, which is useful for comparing -for example- price dispersion across products or, for a given product, price dispersion over time.[11] This affords an advantage with respect to the first two measures. Moreover, although the range and max-min ratio provide a measure of the total spread of the data, they only take into account the two extreme values of the data.[12] Similarly, the max-mean ratio only

[9] For each source country, sales to the common set of export destinations (EU6 in the tables) account for a large percentage of exports. Specifically, on average over the sample period, total exports to the common set of destinations account for 93.3% (70.2%) of exports to the European Union (world) in Belgium-Luxembourg, 91.7% (56.9%) in France, 84.7% (46.3%) in Germany, 88.6% (49.9%) in Italy, 91.8% (70.7%) in the Netherlands, 83.7% (55.8%) in Spain, and 79.6% (44.0%) in the United Kingdom.

[10] See for instance European Commission (1997, 1999a, 1999b, and 2001), European Central Bank (2001, and 2002), Roberts and Supina (2000), Sorenson (2000), De Serres, Hoeller, and De la Maisonneuve (2001), Haskel and Wolf (2001), and Knetter and Slaughter (2001).

[11] Obviously, the higher the coefficient of variation, the greater the price dispersion.

[12] Since both measures take into account only the maximum and minimum price, they are susceptible to considerable distortion if there is an unusual extreme observation.

considers all the observations in the computation of the mean, in contrast to the coefficient of variation, which takes into account each of the data observations in both the numerator (which measures the average spread around the mean) and the denominator (the mean).[13]

In the present study, for each source country-product pair, the coefficient of variation is calculated for each year across several sets of destination markets. The average coefficients of variation over the sample period are then calculated in order to investigate the extent of price dispersion. For the purpose of assessing price convergence, the time series of coefficients of variation for each source country-product pair (CV_t) are regressed on a constant and a linear time trend (TIME):

$$CV_t = \alpha + \beta\, TIME + \mu_t \qquad (1)$$

where α and β are parameters to be estimated, and u_t is the error term. If price dispersion declined steadily, we would expect the regression to yield a negative and statistically significant coefficient for the linear time trend.

Tables 1-7 (see Appendix 2) present the results for the products considered in each of the seven source countries. Specifically, each table reports for each product the average coefficient of variation over the sample period and the estimated linear trend in the coefficients of variation for four different samples. The first sample uses export prices for a sub-sample of OECD countries (indicated in the tables as OECD). In this case, it is important to note that the set of destinations is not fixed and, therefore, the variation in the results across products may partly reflect variation in the markets in the sample. This caveat notwithstanding, the sample is useful in that it provides a benchmark that allows us to evaluate the evidence of export-price dispersion across the common set of European Union Member States. The second sample uses export prices for the remaining six European Union Member States from the list of source countries (EU6 in the tables). Here, for each source country, the

[13] The standard deviation also takes into account all the observations but, in contrast to the coefficient of variation, the standard deviation is of little use for comparing dispersion between two data sets which do not have the same mean or in which observations are in different units of measurement.

set of destination markets is common for all products in the sample. For example, for Belgian-Luxembourg exports (Table 1) the common set of destination markets is the group of countries comprising France, Germany, Italy, the Netherlands, Spain and the United Kingdom. The third sample (EU6 group A) examines price dispersion and price convergence for EU6 countries whose currencies have participated continuously in the Exchange Rate Mechanism (ERM) of the EMS from the outset (Belgium-Luxembourg, France, Germany, and Netherlands).[14] During the sample period these continuous ERM members have maintained broadly stable bilateral exchange rates among themselves and, in particular, against the German mark. Finally, the fourth sample (EU6 group B) includes EU6 countries whose currencies have shown considerable fluctuations in value relative to the German mark (Italy, Spain, and United Kingdom).

Interestingly, the distinction made between group A and group B countries is consistent with that made in European Commission (1995). Moreover, the two groups roughly correspond to those found in Jacquemin and Sapir (1996), who apply principal component and cluster analyses to a wide set of structural and macroeconomic indicators to form a homogeneous group of countries. Lastly, the two groups are essentially the same as those found by Fernández-Rodríguez, Sosvilla-Rivero, and Andrada-Félix (1999) to afford relevant information to help improve the prediction of the currencies in each group on the basis of the behaviour of the other currencies; empirical evidence presented in Sosvilla-Rivero and Maroto-Illera (2003) suggests that they presented different probabilities of maintaining a given regime during the EMS.

Here, we focus firstly on the similarity between export prices and their convergence over time in EU6. The analysis is based on a comparison of the

[14] The centrepiece of the EMS was the ERM, an adjustable peg system in which each currency had a central rate expressed in the European Currency Unit (ECU), predecessor of the euro. These central rates determined a grid of bilateral central rates *vis-à-vis* all other participating currencies, and defined a band around these central rates within which the exchange rates could fluctuate freely. In order to keep these bilateral rates within the margins, the participating countries were obliged to intervene in the foreign exchange market if a currency approached the limits of its band. If they decided by mutual agreement that if a particular parity could not be defended, realignments of the central rates were permitted.

empirical evidence in both the EU6 and OECD country groups. The average coefficient of variation over the 1988-2001 period is higher among the OECD group than among EU6 countries in 110 of the 134 source country-product pairs. Analysis of results by source countries reveals that this is true in the following percentages of products: Belgium-Luxembourg, 71%; France, 100%; Germany, 88%; Italy, 80%, Netherlands, 73%; Spain, 78%; United Kingdom, 87%. Regarding the extent of export-price dispersion, the coefficients of variation are below 0.15 (0.10) in 53% (22%) of the source country-product pairs in the OECD sample. The percentages rise to 77% (47%) for the sample of European Union countries, indicating a relatively high level of market integration. In summary, the results indicate that export-price dispersion tends to be lower among EU6 countries than among the sample of OECD countries. It seems, therefore, that the reduction in export-price dispersion is more than a world-wide phenomenon and reflects the closer integration of the EU6 economies brought about by the gradual removal of capital controls and the abolition of restrictions on the movement of goods and labour in the EU.

As noted earlier, a feature of the sample is that most products are exported from at least two source countries. This allows us to identify the products for which the evidence of a high or a low degree of export-price dispersion in the EU6 sample is pervasive across the source countries. For several products (*malt beer*, *fertilisers*, *washing preparations*, *additives for lubricants*, *self-adhesive paper*, *flat rolled products of iron*, *aluminium alloys*, and *ball bearings*) the average coefficient of variation exceeds 0.10 in virtually all (25 out of 26) the source country-product pairs. In contrast, the measure of export-price dispersion is below 0.10 for all or most of the pairs in *common wheat*, *polyvinyl chloride*, *copper wire* and *washing machines* (in all pairs considered in each case), *polyethylene* (7 out of 9), *car tyres*, and *truck and bus tyres* (10 out of 13), and *paper for writing* (11 out of 14). This is true also in the case of 17 of the 25 pairs of the automobile industry, even though automobiles are among the most differentiated products included in the sample.[15]

Turning to price convergence, it can be seen that during the period 1988-

[15] Only 1 of the 25 source country-product pairs for the automobile industry shows an average coefficient of variation greater than 0.15.

2001 only 62 of the 134 estimates for the sample of OECD destination markets are negative and only 21 are statistically significant at the 10% level. On the other hand, 36 of the 72 positive coefficients are statistically significant. If we focus on the EU6 sample, an increase in the number of negative estimated coefficients is seen, although again most are not statistically significant. Specifically, 26 of the 76 negative coefficients reach the aforementioned significance level. Of the 58 positive coefficients, 26 are significant at that level. One factor that may account for the scant evidence of convergence and the number of significant positive coefficients is the existence of pricing to market (see, e. g., Obstfeld and Rogoff, 2001 and Gil-Pareja, 2002). Another factor is the use of unit values as a measure of export prices. Unit-value data are susceptible to quality change. Therefore, as noted by Knetter and Slaugther (2001), if product varieties have become more specialised in a destination-specific manner over time, this may account for increasing dispersion in unit values.

By source countries, in the EU6 sample the negative coefficients clearly predominate in exports from two countries: Belgium-Luxembourg and Spain. For the remaining source countries, the results are split evenly between both possibilities. Finally, the analysis by products highlights a tendency for dispersion to fall over time in nine pairs of the tyre industry, the coefficient being statistically significant in four cases. The same result is found in *paper for writing*. No pervasive trend -towards lower or higher dispersion- is evident for the remaining products.

Secondly, we examine the impact of exchange rates on export-price dispersion and convergence patterns.[16] To this end, we analyse whether the EU6 countries with relatively stable exchange rates (group A) experienced a lower export-price dispersion and a stronger tendency towards convergence than countries with relatively volatile exchange rates (group B).

[16] Exchange rate fluctuations affect relative export prices between countries in the case of an incomplete exchange rate pass-through. Empirical studies measuring the degree of exchange rate pass-through suggest that European exporters, with the exception of the United Kingdom, often price to market by revising export prices to absorb part of the impact of exchange rate changes (see for example the papers by Knetter, 1993; and Gil-Pareja, 2002). For a detailed discussion of the role of exchange rates on price convergence, see European Commission (1997).

As noted in the introductory section, the single currency should reduce the potential for price discrimination across participating countries. Theoretical support for this notion is provided by Friberg (2001), who shows that a monetary union promotes market integration by reducing the option value of segmenting markets. Nicoletti *et al.* (2001) have addressed the possible direct effect of monetary integration on the degree of price competition. In their study -using prices over 200 categories of goods and services observed in 1985, 1990, 1993, and 1996- the authors find that countries in the D-mark area have a higher level of price similarity, but there is no evidence of stronger price convergence compared to other EU countries. The results lead them to conclude that it is the similarity of economic structures rather than participation in the D-mark area that is behind price similarity, thus casting doubts on the hypothesis that closer monetary integration in itself will increase product-market competition significantly and, therefore, price convergence across the Euro Zone.

In our case, the average coefficient of variation is lower among group A countries than among group B in 60% of the source country-product pairs. By source countries, the percentages of products for which this result holds are as follows: Belgium-Luxembourg, 65%; France, 59%; Germany, 75%; Italy, 53%; Netherlands, 67%; Spain, 56%; United Kingdom, 33%. The inclusion of Italy, Spain and the United Kingdom among the set of source countries in this analysis is open to criticism because, although exchange rates have been relatively stable across group A countries, the exchange rate variability between the source country and the destination markets may affect export-price dispersion if the degree of exchange rate pass-through differs across destinations. Hence we will concentrate on exports from Belgium-Luxembourg, France, Germany and the Netherlands. For these source countries, the average coefficient of variation is lower among group A countries in 67% of pairs. Regarding the degree of export-price dispersion, the coefficient of variation is below 0.15 (0.10) in 90% (72%) of cases for group A and in 86% (49%) for group B.[17] These results indicate that countries in both groups, particularly in group A, are closely integrated with each other.

[17] For the full sample of source countries the coefficient of variation is below 0.15 (0.10) in 86% (67%) of cases for group A, compared to 84% (52%) for group B.

The relatively higher price similarity across group A countries suggests that a stable exchange rate regime may contribute to price convergence. However, progress toward reducing export-price dispersion has been relatively lower among group A than among group B over the sample period. In the former, 38 of the 86 estimates are negative and only 11 are statistically significant at the 10% level, whereas in the latter significantly lower dispersion over time is seen in 23 of the 48 negative coefficients. On the other hand, the regressions show a significant tendency for dispersion to increase in 26 pairs for group A and in 14 pairs for group B.[18] By way of explanation one could argue that already by the first years of the sample period used in this paper a high price convergence may have been attained among the more stable ERM founding members, in contrast to that seen among newcomers (Spain in 1989 and the UK in 1990) or in those with more volatile currencies (Italy, whose currency left the ERM in September 1992 and did not rejoin until November 1996). In order to test this hypothesis we have investigated the sub-periods 1988-93, 1988-94 and 1988-95. In all cases the picture that emerges is very similar to that seen for the entire sample period (1988-2001), which suggests that prior to 1988 some price convergence may already have been achieved among group A, unlike group B.[19] This is consistent with the conclusion reached in Sosvilla-Rivero and Gil-Pareja (2004), in which, using monthly data for Consumer Price Indices for 11 EU countries during the period 1975-95, we found that the estimated speeds of convergence were higher for countries whose currencies participated continuously in the ERM from the outset (maintaining broadly stable bilateral exchange rates) than for the sample overall.

V. Concluding Remarks

This paper has shed new light on the discussion concerning price dispersion

[18] The full sample of source countries provides broadly the same picture. For group A, 60 (74) estimates are negative (positive) and 21 (36) are statistically significant. For group B, the figures are 68 (66) and 32 (25), respectively.

[19] For reasons of space, we do not report the results for the different sub-periods. However, they are available from the authors on request.

in the European Union. We have examined separate export product classes and destination markets in the recent past, using OECD countries as a benchmark. We have also explored the effect of exchange rates on export-price dispersion by reviewing the experience of a number of European countries that participated in the exchange rate stability zone.

The main findings are as follows. Firstly, our results suggest that between 1988 and 2001 export-price dispersion across the sample of European Union countries was usually lower than across OECD countries. Even though there is little evidence of convergence, this tends to be stronger across European Union countries. Secondly, we find that price dispersion was often lower across European Union countries where exchange rates have been relatively stable than across countries with relatively volatile exchange rates. However, it seems that exchange-rate stability has not significantly contributed to export-price convergence across participating countries over the sample period.

Extrapolation of these results to the impact of the European Monetary Union on price convergence suggests that the monetary integration alone is unlikely to suffice to reduce the degree of export-price dispersion. However, this extrapolation must be performed with caution for several reasons. To begin with, the European Monetary Union is a more credible and irrevocable monetary arrangement than fixed exchange rates. Secondly, the unprecedented monetary turmoil experienced in the ERM during 1992-93 may have affected our results, since it led to an impressive increase in volatility in all the currencies analysed in this paper (see Sosvilla-Rivero, Fernández-Rodríguez, and Bajo-Rubio, 1999). Finally, one could argue that by 1988 some price convergence may already have been achieved among the more stable ERM founding members, in contrast to that seen among newcomers (Spain in 1989 and the UK in 1990) or those with more volatile currencies (Italy, whose currency left the ERM in September 1992 and did not rejoin until November 1996). Nevertheless, although monetary stability may aid price convergence, it does not necessarily lead to complete convergence, given that the existence of trade costs and the possibility for exporters to charge destination-specific prices may account for persistent international price differentials.

Appendix 1

In this paper we study price dispersion and price convergence using export unit values (the value of exports divided by the quantity). The criteria for selecting the products are therefore important and deserve explanation. For each source country, the product selection was carried out in three stages. Firstly, the main exported products in terms of value were selected. Secondly, given that we were interested in analysing products for which the unit values are satisfactory measures of prices for the purposes of this study, many of the products were excluded from the initial selection for two main reasons: the relatively high heterogeneity in the product category and the light weight of the product. These reasons motivated the exclusion of products such as food preparations, books, parts of car engines, parts and accessories of motor vehicles, parts and accessories of tractors, articles of jewellery, products of the furniture industry, parts of turbo-jets, aeroplanes, automatic data processing machines, parts and accessories of data processing machines, electronic integrated circuits, toilet waters, perfumes, beauty or make-up preparations, and medicaments, among others. Thirdly, in order to analyse price dispersion and price convergence among a common set of export destinations in all the products, we identified from the remaining sample the destination markets that had been selected in most of the products. For the products exported from each source country, the list of destination markets usually included the remaining source countries of our sample. Accordingly, our final selection comprised only those products that included all the remaining source countries in the set of destination markets.

Appendix 2

Tables 1-7 report, for each source country-product pair, the average coefficient of variation over the period 1988-2001 (which is used in the analysis of export-price dispersion), and the estimated linear trend in the time series of coefficients of variation (which is used to investigate export-price convergence) in the four samples analysed in this paper.

Table 1. Average Coefficients of Variation and Trends in Belgian-Luxembourg Export-price Dispersion[a]

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Fertilizers (type 2)	0.19	-0.002	0.12	-0.003	0.09	-0.005 *	0.10	-0.001
Washing preparations	0.20	-0.009 *	0.24	-0.001	0.24	0.013 ***	0.15	0.006
Additives for lubricants	0.14	-0.000	0.13	-0.003	0.08	0.003	0.16	-0.008 *
Polyethylene (type 1)	0.24	-0.001	0.07	-0.003 *	0.06	-0.001	0.06	-0.005 ***
Polyethylene (type 2)	0.11	-0.001	0.06	-0.002	0.05	0.003 *	0.05	-0.006 *
Polypropylene	0.11	-0.002	0.12	-0.005	0.08	-0.000	0.12	-0.004
Polyvinyl chloride	0.10	-0.004	0.08	-0.006 ***	0.08	-0.007 ***	0.06	-0.008 ***
Car tires	0.12	0.001	0.12	-0.003 *	0.13	0.004 *	0.12	-0.012 ***
Truck and bus tires	0.09	0.000	0.09	-0.004 **	0.08	-0.002	0.07	-0.005
Paper writing (type 4)	0.08	-0.003	0.05	-0.000	0.03	-0.001 **	0.05	0.003 *
Self-adhesive paper	0.16	0.004	0.12	-0.001	0.10	0.003	0.11	-0.006
Flat rolled products of iron	0.13	-0.001	0.14	-0.000	0.06	0.004 *	0.18	0.005
Copper wire	0.04	-0.001	0.01	-0.000	0.02	-0.002 ***	0.02	-0.009 *

Table 1. (Continued) Average Coefficients of Variation and Trends in Belgian-Luxembourg Export-price Dispersion[a]

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Aluminium alloys	0.12	0.004	0.12	0.002	0.11	-0.000	0.12	0.001
Autos, 1000-1500cc (gas.)	0.11	-0.004***	0.12	-0.003	0.11	-0.009***	0.11	0.002
Autos, 1500-3000cc (gas.)	0.23	-0.005	0.10	0.007***	0.10	-0.002	0.09	0.016***
Autos, 1500-2500cc (diesel)	0.13	0.002	0.09	0.003***	0.07	-0.001	0.10	0.007***

Notes: [a] 1988-2001; * significant at 10%; ** significant at 5%; *** significant at 1%. CV denotes the average coefficient of variation in export unit values across destination markets over the sample period. Each trend is the coefficient estimate of annual export-price dispersion (measured as the coefficient of variation) regressed on a time trend. Regressions include a constant. Country Groups are defined in the text. The exact Combined Nomenclature codes for each products are not included to shorten the table.

Table 2. Average Coefficients of Variation and Trends in French Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Common wheat	0.08	0.003	0.05	0.002*	0.02	-0.000	0.05	0.000
White sugar	0.26	0.000	0.06	-0.001	0.06	0.002	0.05	-0.004*
Washing preparations	0.19	-0.005	0.17	-0.001	0.15	0.010***	0.14	-0.003
Additives for lubricants	0.16	0.002	0.14	-0.002	0.17	-0.000	0.12	-0.006*
Polyethylene (type 1)	0.14	0.015**	0.01	0.002	0.04	0.001	0.06	0.004
Polyethylene (type 2)	0.11	-0.001	0.10	-0.003	0.07	-0.000	0.11	-0.008
Polypropylene	0.13	0.005	0.08	0.001	0.06	0.000	0.09	0.003
Polyvinyl chloride	0.12	0.006***	0.06	-0.000	0.06	0.003*	0.05	-0.003
Acrylic polymers	0.39	0.030***	0.15	0.001	0.13	0.013**	0.14	-0.005
Car tires	0.14	0.001	0.09	-0.002	0.11	-0.001	0.06	-0.002
Truck and bus tires	0.17	-0.004	0.07	-0.004***	0.07	-0.000	0.04	-0.001*
Paper writing (type 1)	0.22	0.011***	0.10	0.001	0.06	0.005**	0.11	0.000
Paper writing (type 2)	0.10	0.003**	0.07	-0.004**	0.03	-0.003	0.09	-0.005**

Table 2. (Continued) Average Coefficients of Variation and Trends in French Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Paper writing (type 4)	0.07	-0.001	0.05	-0.001	0.04	0.001	0.05	-0.003*
Flat rolled products of iron	0.14	0.002	0.14	0.002	0.14	0.007	0.11	-0.004
Copper wire	0.06	0.006**	0.04	0.006***	0.05	0.011***	0.02	0.001
Aluminium alloys	0.17	-0.002	0.11	-0.003	0.08	0.003*	0.11	-0.017***
Ball bearings	0.34	0.030***	0.25	0.026***	0.30	0.032***	0.13	0.006
Autos, 1000-1500cc (gas.)	0.16	-0.005*	0.10	-0.000	0.04	0.003***	0.14	-0.003
Autos, 1500-3000cc (gas.)	0.16	-0.002	0.09	0.006***	0.07	0.000	0.10	0.014***
Autos, 1500-2500cc (diesel)	0.13	0.001	0.11	0.003	0.07	0.001	0.12	0.007
Light commercial vehicles	0.11	-0.000	0.07	-0.009***	0.03	-0.001	0.09	-0.009***

Note: See Table 1.

Table 3. Average Coefficients of Variation and Trends in German Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Malt beer	0.22	0.013***	0.23	0.016***	0.14	0.003	0.23	0.018***
Synthetic organic pigments	0.19	0.017***	0.11	0.007***	0.08	0.010***	0.10	-0.001
Paints and varnishes [1]	0.23	-0.001	0.14	0.001	0.12	-0.013***	0.13	0.006
Paints and varnishes [2]	0.17	0.002	0.14	0.008**	0.07	0.004*	0.18	0.010*
Printing ink	0.29	-0.001	0.22	-0.003	0.17	-0.006**	0.23	-0.010**
Surface-active agents	0.26	0.010***	0.20	-0.021***	0.07	0.001	0.22	-0.021***
Washing preparations	0.56	-0.035***	0.16	-0.003	0.17	-0.000	0.13	-0.008
Polyethylene (type 1)	0.09	-0.003	0.03	-0.001	0.04	-0.002*	0.03	0.001
Polyethylene (type 2)	0.09	-0.001	0.08	-0.001	0.08	-0.002	0.06	0.002
Polypropylene	0.29	-0.001	0.19	0.012***	0.10	-0.007**	0.22	0.019***
Polyvinyl chloride	0.16	0.016***	0.06	0.003	0.05	-0.001	0.06	0.002
Polyether alcohols	0.15	0.011***	0.09	-0.003*	0.06	-0.007***	0.08	0.003*
Polyurethanes)	0.15	-0.002	0.07	0.006***	0.06	0.001	0.07	0.010***
Car tires	0.11	0.007***	0.10	-0.002	0.14	-0.001	0.06	-0.002

Table 3. (Continued) Average Coefficients of Variation and Trends in German Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Truck and bus tires	0.10	-0.001	0.04	0.000	0.03	0.002**	0.05	-0.004**
Newsprint	0.07	-0.003*	0.06	-0.001	0.04	0.002*	0.08	-0.002
Paper writing (type 1)	0.39	0.025***	0.10	-0.003	0.09	0.004*	0.09	-0.001
Paper writing (type 2)	0.13	-0.005	0.07	-0.002	0.06	-0.001	0.05	0.001
Paper writing (type 3)	0.19	-0.002	0.12	-0.011***	0.09	-0.012***	0.10	-0.003
Paper writing (type 4)	0.08	0.003	0.08	0.005*	0.06	0.006**	0.07	0.006**
Nappies	0.09	0.003	0.09	-0.001	0.03	-0.002	0.11	-0.005*
Flat rolled products of iron	0.22	0.008**	0.19	-0.004	0.15	0.005	0.11	-0.004
Copper wire	0.03	-0.003***	0.03	-0.003*	0.02	-0.001	0.03	-0.003**
Solid profiles of alumin. alloys	0.17	0.003	0.10	0.006***	0.06	0.000	0.11	0.012***
Aluminium alloys	0.17	-0.007**	0.13	-0.008***	0.05	0.002	0.15	-0.020***
Washing machines	0.10	0.001	0.09	-0.002*	0.05	0.003***	0.07	-0.007***
Ball bearings	0.33	-0.012**	0.15	0.002	0.17	0.002	0.14	0.002

Table 3. (Continued) Average Coefficients of Variation and Trends in German Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Autos, 1000-1500cc (gas.)	0.13	0.007	0.13	0.002	0.09	-0.003	0.13	0.001
Autos, 1500-3000cc (gas.)	0.21	-0.003	0.19	0.001	0.23	-0.001	0.29	0.011***
Autos, over 3000cc (gas.)	0.11	0.003*	0.07	0.001	0.06	0.003*	0.07	-0.001
Autos, 1500-2500cc (diesel)	0.15	-0.004	0.11	0.002	0.11	-0.002	0.08	-0.002
Light commercial vehicles	0.09	0.003***	0.10	0.004***	0.05	0.005***	0.13	0.002*

Notes: [1]*polyesters*; [2]*synthetic polymers.* See Table 1.

Table 4. Average Coefficients of Variation and Trends in Italian Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Polypropylene	0.21	-0.003	0.17	-0.002	0.14	-0.007 *	0.12	0.011
Car tires	0.16	0.003 *	0.09	-0.000	0.10	-0.002	0.03	-0.001
Truck and bus tires	0.13	-0.003 **	0.08	-0.004 ***	0.07	-0.005 ***	0.15	0.003
Paper for writing (type 2)	0.10	0.002	0.06	0.002	0.06	0.002	0.05	-0.000
Paper for writing (type 4)	0.06	0.001	0.04	-0.002 **	0.04	0.000	0.02	-0.002
Women's footwear	0.32	-0.017 ***	0.18	-0.008 ***	0.19	-0.010 ***	0.17	-0.009 *
Marble	0.27	-0.003	0.29	0.008 **	0.15	0.007 *	0.56	0.018 **
Glazed tiles (type 3)	0.28	0.025 ***	0.34	0.030 ***	0.08	0.007 ***	0.29	0.037 ***
Washing machines	0.14	0.003 **	0.09	0.004	0.09	0.004	0.09	0.004 *
Ball bearings	0.52	0.038 ***	0.15	-0.006 ***	0.13	0.002	0.16	-0.015 ***
Autos, 1000-1500cc (gas.)	0.12	-0.002 *	0.09	0.003 *	0.07	-0.005 ***	0.12	0.015 ***
Autos, 1500-3000cc (gas.)	0.21	-0.004	0.10	0.005	0.07	0.000	0.15	0.014 **
Autos,1500-2500cc (diesel)	0.09	0.002	0.10	0.003	0.08	0.001	0.10	0.011 **
Light commercial vehicles	0.09	0.003 *	0.08	0.004 ***	0.06	0.004 **	0.08	0.004
Bicycles and other cycles	0.31	-0.016 ***	0.19	-0.002 ***	0.19	-0.026 ***	0.08	0.002

Note: See Table 1.

Table 5. Average Coefficients of Variation and Trends in Dutch Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Malt beer	0.33	0.019 ***	0.15	0.001	0.14	0.011 *	0.10	-0.001
Fertilisers (type 1)	0.13	-0.000	0.12	-0.002	0.08	-0.002	0.14	0.003
Linear polyethylene	0.13	0.004	0.11	0.003	0.10	0.006 *	0.11	0.004
Polyethylene (type 1)	0.08	0.004 **	0.05	-0.003 **	0.04	-0.000	0.05	-0.004 *
Polypropylene	0.12	0.001	0.10	-0.000	0.08	-0.003	0.13	0.001
Polyvinyl chloride	0.07	0.006 ***	0.07	0.006 ***	0.09	0.011 ***	0.05	-0.001
Acrylic polymers	0.16	0.012 ***	0.16	0.017 ***	0.10	0.000	0.20	0.022 ***
Car tires	0.09	0.001	0.09	0.003	0.08	0.002	0.09	0.001
Paper for writing (type 1)	0.27	0.021 *	0.11	0.002	0.08	0.005 **	0.11	0.001
Paper for writing (type 2)	0.07	-0.001	0.06	-0.004 ***	0.04	0.001	0.04	-0.003
Paper for writing (type 3)	0.13	0.003 ***	0.09	-0.001	0.08	0.008 ***	0.06	-0.003 *
Flat rolled products of iron	0.17	-0.003	0.16	-0.002	0.13	-0.002	0.15	0.001
Aluminium alloys	0.08	0.001	0.06	-0.004 *	0.03	0.000	0.07	-0.005 *
Solid profiles of alum. alloys	0.21	-0.006	0.22	-0.004	0.10	0.002	0.21	-0.008
Autos, 1500-3000cc (gas.)	0.15	-0.009 ***	0.11	0.002	0.11	0.009 **	0.07	-0.004

Note: See Table 1.

Table 6. Average Coefficients of Variation and Trends in Spanish Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Fresh or chil. sweet peppers	0.11	0.008***	0.06	-0.001	0.06	-0.000	0.04	0.004*
Fresh or dried almonds	0.07	-0.002	0.07	-0.003	0.05	0.000	0.09	-0.008*
Virgin olive oil	0.14	-0.002	0.08	0.005**	0.08	0.003	0.06	0.008***
Prepared olives	0.25	-0.010***	0.21	-0.010***	0.19	-0.008*	0.28	-0.014**
Polyethylene (type 1)	0.10	-0.010*	0.11	-0.010	0.10	-0.012	0.10	-0.002
Polyethylene (type 2)	0.11	0.004	0.12	0.004	0.09	-0.003	0.12	0.007
Polypropylene	0.15	-0.007	0.15	-0.008	0.15	-0.009	0.05	0.002
Car tires	0.20	-0.004*	0.17	-0.005	0.13	0.006**	0.20	-0.041**
Truck and bus tires	0.16	-0.005*	0.14	-0.003	0.16	-0.005	0.06	-0.005*
Chemical wood pulp	0.06	0.004*	0.05	-0.001	0.05	0.002	0.03	-0.004**
Glazed tiles (type 1)	0.21	0.013***	0.16	0.016***	0.07	0.006**	0.13	0.013***
Glazed tiles (type 2)	0.19	0.002	0.09	-0.001	0.10	0.004	0.05	-0.005*
Glazed tiles (type 3)	0.19	0.001	0.09	-0.008***	0.10	-0.010***	0.10	-0.003

Table 6. (Continued) Average Coefficients of Variation and Trends in Spanish Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Autos, 1000-1500cc (gas.)	0.10	-0.003 *	0.07	-0.002	0.06	-0.002	0.08	-0.003
Autos, 1500-3000cc (gas.)	0.10	0.004	0.09	0.000	0.07	0.001	0.09	-0.001
Autos, 1500-2500cc (diesel)	0.09	-0.004 ***	0.09	-0.002	0.07	-0.007 **	0.07	0.002
Light commercial vehicles	0.13	0.001	0.14	0.003	0.16	0.003	0.02	0.000
Motorcycles under 50 cc	0.29	-0.013	0.11	0.006	0.11	0.010	0.08	0.001

Note: See Table 1.

Table 7. Average Coefficients of Variation and Trends in UK Export-price Dispersion

Product	Country Group							
	OECD		EU6		EU6 group A		EU6 group B	
	CV	Trend	CV	Trend	CV	Trend	CV	Trend
Common wheat	0.07	-0.003	0.06	-0.004	0.06	-0.005	0.03	0.001
Whisky	0.25	0.022 ***	0.17	0.013 ***	0.20	0.016 ***	0.07	0.001
Washing preparations	0.34	0.006	0.34	0.092	0.24	-0.006	0.28	0.028 *
Additives for lubricants	0.26	0.019 ***	0.23	-0.000	0.16	0.005	0.29	-0.010
Polypropylene	0.34	0.013	0.30	-0.005	0.23	-0.012	0.43	-0.003
Car tires	0.11	0.002	0.08	0.002	0.08	0.005 **	0.05	-0.002
Truck and bus tires	0.13	0.008 ***	0.07	0.008 ***	0.08	0.008 ***	0.05	0.001
Paper for writing (type 2)	0.26	0.043 ***	0.24	0.042 ***	0.14	0.006 **	0.10	0.002
Self-adhesive paper	0.25	0.006	0.14	0.002	0.13	-0.001	0.14	0.009
Flat rolled products of iron	0.35	0.018 **	0.22	-0.002	0.16	0.004	0.09	0.002
Aluminium alloys	0.22	0.006	0.24	0.008	0.17	0.005	0.27	0.010
Autos, 1000-1500cc (gas.)	0.10	-0.007 ***	0.11	-0.007 ***	0.10	-0.007 *	0.06	-0.009 ***
Autos, 1500-3000cc (gas.)	0.18	-0.011 ***	0.08	-0.005 **	0.08	-0.006 ***	0.05	-0.000
Autos, over 3000cc (gas.)	0.18	0.008 **	0.14	0.009 *	0.13	0.013 ***	0.08	0.001
Autos, 1500-2500cc (diesel)	0.09	-0.010 ***	0.07	-0.004 **	0.06	-0.004	0.03	0.005 ***

Note: see Table 1.

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