Trade pricing effects of the euro

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This paper investigates whether the euro boosted Eurozone integration by impeding pricing to market behaviour. The pricing strategies of exporters from 20 countries (Eurozone and non Eurozone) are studied to identify variations in the average cost mark-up and exchange rate pass through. Preliminary findings suggests that euro has not accelerated the speed of convergence of export prices within the area but rather brought about a one time jump in convergence around the date of its adoption. Pricing to market estimations reveal no changes in the average mark-up nor in the exchange rate pass through elasticity. Overall, we find that the euro's introduction has had little impact on trade pricing behaviour.

1. INTRODUCTION

The belief that a single-currency enhances a single-market was deeply-seated in the mind of European policy makers when they embraced the Economic and Monetary Union (EMU) and its goal of a single currency. For example in 1997, Edward George, then Governor of the Bank of England asserted that "… intra European exchange rate certainty that would be provided by a single currency could – through increased competition as a result of greater price transparency and lower transaction costs, and through the associated improvement in resource allocation – really increase the benefits that are to be derived from the single market." Indeed this belief is what led the Commission to name its flagship report on monetary union "One Market, One Money". But have these beliefs been confirmed by reality? With the euro coming up to its 10th birthday, we now have enough data to draw some tentative answers to that question.

Intuitively, there are two channels through which the euro could theoretically affect trade pricing between euro-using nations. The first is the direct effect on variable trade costs. For example, if a common currency lowered transaction costs by, say 1%, the price of exports from France to

[1] The view expressed in this study are those of the authors and do not necessarily reflect those of the Bank of Italy.

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Germany could be reduced by 1% without the exporters changing their price-cost margin. Hedging and administrative costs related to multiple currencies also fall in this direct-effect channel, although they have to affect marginal costs if they are to feed directly into pricing decisions. The second channel is more indirect; it concerns market structure and firms ability to price discriminate. Whenever firms are able to segment their consumers, they tend to charge different prices to different customers in pursuit of profit. This happens domestically – for example, as with lower movie theatre prices for students and retired people – but also internationally. To the extent that the euro moves the Eurozone toward one great big market (one market, one money, to coin a phrase), the euro should diminish firm's ability to segment their customers in different Eurozone markets. Such an outcome would clearly change the way Eurozone-based firms would price their exports in various Eurozone markets. A related mechanism could come from the often-cited transparency effect. That is, as customers are more easily able to compare prices across markets, they may become more price-sensitive. Such a change could reduce the variance in prices across Eurozone markets, but it could also put overall downward pressure on export prices. Transparency, however, is not the only way in which the euro could affect price-cost margins in the Eurozone. To the extent that common euro usage increases market integration, the euro could well have a direct pro-competitive effect in the Eurozone markets.

In this paper we first review the basic economics of pricing as a means of organising our thinking before turning to the existing literature. Subsequently we look at the prima facie evidence and then we derive a simple theoretical framework and use it to estimate the trade price effects of the euro's introduction using detailed trade price data.

2. THE BASIC ECONOMICS OF PRICE SETTING AND THE EURO

Prices are set by firms bent on making money. In a standard monopolistic competition setting, firms choose price to equate their perceived marginal revenue to their marginal cost. The well-known formula for marginal revenue is the price times 1-1/ε, where ε is the perceived demand elasticity.[2] Solving the 'perceived marginal revenue equals marginal cost' formula, we get the standard pricing equation: $p = \mu m$, where 'mu' stands for the price-cost mark-up (the inverse of 1-1/ε), and 'm' stands for marginal cost; p stands for price. As usual in microeconomics, all the variables here are measured in terms of the numeraire, so there is no price illusion.

In the closed economy context, it is just that simple. In an open economy, some extra considerations come into play. First, when a firm located in Home sells to a customer located in Foreign, the relevant marginal cost must include the bilateral trade cost as well as production cost. We can express this as a factor of proportionality, τ, where τ equals 1+T and T is the tariff-equivalent of the trade cost. Second, the foreign customer will see the price expressed in the Foreign currency while the exporter will see the price in the Home currency, so we have two consumer prices, p and p*; the Foreign price, p*, equals 'e' times p, where 'e' is the number of Foreign currency units per Domestic currency units. With these points in mind, for a given product (we omit the product subscript to reduce confusing clutter):

$$p^* = \mu[p^*]\tau(m/e) \quad \Leftrightarrow \quad p = \mu[p^*]\tau m \qquad (1)$$

[2] 'Perceived' since it depends on the firm's perceptions of the strategic play of its competitors.

Here we stress the fact that the mark-up may depend on the local price, p*, by making the mark-up, μ, a function of p*. Since p* equals p times e, we approximate the true μ[p*] function with a log-linear function

$$\mu[p^*] = \mu(p\ e)^{\gamma}$$

Plugging this into the first order condition and gathering terms:

$$\ln p = \frac{\gamma}{1-\gamma}\ln e + \frac{\ln \bar{\mu} + \ln m + \ln \tau}{1+\gamma} \qquad (2)$$

This is often called a pricing-to-market equation (for a given product) since it relates the change in the exchange rate to export prices in the origin country's currency. For example, the famous Dornbusch (1987) article on pricing-to-market works with a linear demand curve that implies less than full pass-through.[3]

2.1.1. Euro's impact on bilateral pricing

Now, consider the impact that adoption of the euro would have on the pricing equation, (1), and thus on the (2). There are two main channels:

#1) the direct impact via the euro's effect on bilateral trade cost τ (exactly as in the Rose effect literature), and

#2) the indirect impact via the common currency's effect on the optimal mark-up via the demand elasticity.

The cost-lowering effect, #1, is well understood and and needs no repeating here. Effect #2 is a different. Since μ equals 1/(1-1/ε), the euro can only affect the mark-up via its impact on the perceived demand elasticity. Industrial organisation theory teaches us that perceived demand elasticity can depend upon many things such as the equilibrium price (if the residual demand curve is not isoelastic), the degree of competition, and the substitutability of rival goods. Most of the informal stories concerning the euro's impact on prices turn around 'pricing transparency' and facilitation of price arbitrage. Both of these suggest a change in firms' perceptions that would make them believe that the demand they face is more price-sensitive, i.e. as more elastic. This would lead to a lowering of the optimal mark-ups.

3. LITERATURE REVIEW

The literature on European price convergence has not come to a consensus view. The studies that found that the euro has had a significant effect include papers like Allington, Kattuman and Waldmann(2005), Imbs et alias (2004), Isgut (2002), Matha (2003), and Parsley and Wei (2001). However other studies find no evidence of faster price convergence or changes in pricing behaviour. Baye et alias (2005) and (2002), Engel and Rogers (2004), Lutz (2003), Rogers (2002) are the main papers in the field.

The conflicting results are accounted for by several factors. First, the datasets employed in these studies cannot be exhaustive, many concentrate on a few goods like Baye et alias (2005) and (2002), Engel and Rogers (2004), Lutz (2003), Rogers (2002), Math (2003) and Parsley and Wei (2001).

[3] Linear demand gets less elastic as prices fall, so a devaluation of the Home currency lowers p*, but by less than the depreciation since p rises.

Some of these consider a single good although some are based on comprehensive datasets of hundreds of goods such as Allington, Kattuman and Waldmann (2005) and Isqut (2002). A second problem is the lack of consensus on the definition of price dispersion. Some studies use the log average of price difference, the average price volatility or mean squared error, the coefficient of variation, the log of absolute average difference, or the difference between minimum and maximum prices. Some authors use national prices, other use local (city) prices. Some studies are purely cross sectional while others use panel data and the studies differ along other econometric-techniques dimensions as well.

Many of the studies use consumer prices. This choice has an important drawback if we believe the essential channel of price convergence to be trade. The idea that the euro can foster price convergence must square with the fact that the distribution chain is composed of different stages and involves numerous players. There exists an initial producer/exporter which sells to an importer, then at least one wholesale dealer and, before the good reaches the final consumer, there is an additional stage at retail level. Prices paid by each of them do not necessarily change identically. One can imagine that they move together, but issues of market power and the curvature of demand and supply curves will enter the analysis, thus muddying the inference that any changes observed where due to the euro.

One approach that avoids such issues was introduced by Knetter (1989). Instead of using consumer prices, it uses export prices denominated in the exporter's currency as suggested by the sort of theory discussed in the previous section. He used, for example, to study how US and German exporters discriminate across destinations. Goldberg and Knetter (1995) used the approach to look at the US beer market, and Goldberg and Knetter (1997) employed it for the Japanese, Canadian and German automobile market. Caselli (1996) focuses the analysis on leading European countries and is able to ascertain that the exchange rate pass-through (ERPT) is higher in more competitive markets but decreases with the size of the destination market; for example exports to Germany and USA typically display less ERPT. More recently a series of papers have focused on price discrimination of European exporters. Falk and Falk (2000) measures price discrimination by German exporters in 70 items during a period of large deutsche mark fluctuations. They conclude that pricing to market is observed for the USA, Japan, Italy and Spain in chemical and fertilizers, but not in machinery. Finally Gil-Pareja (2002) and Gil-Pareja and Sosvilla-Rivero (undated) analyze the level of price segmentation in Europe. They do not explicitly concentrate on the euro effects nor on pricing to market. Bugamelli-Tedeschi (2007) provide an exhaustive study of ERPT which, by including both oligopolistic and competitive industries and all the destinations of European firms, characterize ERPT behaviour as a function of market and industry structure. Their new results show that ERPT is almost complete after an appreciation of domestic currency but rather incomplete when the exchange rate depreciates. Below we review the main contributions to this literature.

3.1. Main contributions to the literature

Allington et al. (2005) focus on a measure of price dispersion, comparing the pre-euro and post-euro behaviour of their measure for nations that are inside the Eurozone and nations that are not. To control partly for many other integrating policy changes, they limit the universe to members of the EU15. They find robust results which show that the euro significantly lowered price dispersion within the euro group. The data they use is Eurostat's 'Comparative price level indices' for individual consumption expenditure in about 200 product groups for all EU15 countries during the 1995–2002 (annual data).

The authors also report that there was not a sudden change in dispersion, but that the euro's introduction accelerated the declining dispersion that was ongoing during the 1990s (which was probably driven by EU market integration). Moreover, they find enormous differences across

product categories. The key to the authors' finding is a difference-in-difference result. The basic idea is to see whether the change in dispersion between the pre- and post-euro periods (the 'difference') is substantially different between the Eurozone nations and the other EU members (the difference between the differences). If the euro did diminish price dispersion, the Eurozone (EZ) group's pre-versus-post difference should be bigger than the non-EZ group's.

Comparing the differences, they find that while there are some products where the non-EZ group saw more convergence, there were far more product groups where the euro seems to have promoted price convergence. What all this suggests is that the euro does seem to have promoted price convergence in the euro group, although the effect is clearly not overwhelming.

Using a different price data set, Beck and Weber (2003) look at prices in 81 cities and 10 types of goods during 1991–2002, finding that that the euro significantly reduced cross-border relative price volatility. The effect, however, is not immediate and certainly not complete. Isgut (2002) finds similar results using two balanced panels of 116 cities and 69 goods and 79 cities and 123 goods in 2001 and concluded that the same currency reduces price differences generally by 2–3 percent (using standard deviations of log price differences across city pairs) and in the EMU specifically, by 5 percent, even when EU had been controlled for.

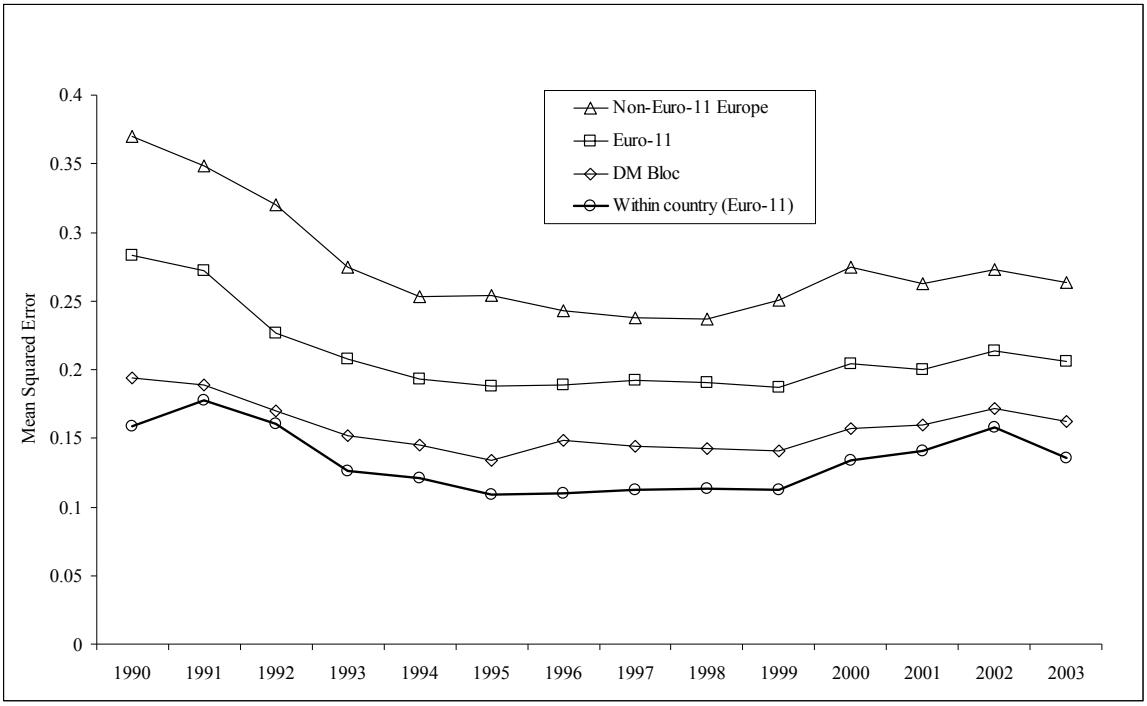

Figure 1: Engel and Rogers (2004) Price dispersion data by group.
Source: Engel and Rogers (2004), Figure 4.

The impact of currency union is confirmed by Lutz (2003) using data on the Belgium-Luxembourg currency union (set up in 1953) and the rest of the EU. He focuses on price convergence for 90 automobile models during 1993–98. His results suggest a 4% lower price differential within the currency union even when the other determinants of economic integration had been controlled.

Yet another study confirming the Allington et al (2005) results is Foad (2005). This paper uses an original dataset, namely monthly data on prices facing U.S. State Department for employees living abroad as reflected in their permitted per diem for lodging, meals and incidental expenses for 201 cities in 16 countries, from 1995 to 2002. The author finds that the impact of the euro on cross-border price volatility varied by country size. Within the Eurozone, cross-border price volatility did not change between the small countries, but fell significantly between the large Eurozone countries.

Imbs et al (2004) use a unique dataset on television prices across European countries and regions. They find that Eurozone members display lower price dispersion than non-EMU countries and that regional price dispersion is comparable to intra-EMU dispersion.

While all these papers find that the euro had a price impact, none of them finds that it was sudden and well defined as is to case for the estimated trade volume relationships. One paper that contradicts these findings is Engel and Rogers (2004). They use data gathered by the Economists Intelligence Unit on consumer prices of 101 traded goods and 38 non-traded items in 18 European cities (11 in Eurozone countries and 7 in non Eurozone countries) for the years 1990-2003. The authors find no evidence that the euro decreased price dispersion among Eurozone members, although they do find that there has been a significant reduction in price dispersion throughout the decade of the 1990s.

Why do Engel and Rogers (2004) find such different results? A look at their data and the critique of Giovanni Veronese from the Bank of Italy, is revealing. The authors take as their measure of price dispersion the mean squared error of the log difference in prices between cities. The salient points from the cross-section aspect of the raw data are:

- Price dispersion is greater among non-euro nations than it is among the euro-11.
- Price dispersion among both euro and non-euro nations is greater than members of the DM bloc (a group that had experienced very little exchange rate variability in the 10 years leading up to the euro's introduction).
- Price dispersion across cities within a single nation is even lower than that of the DM bloc.

On the face of it, these cross-group comparisons suggest that the level of price dispersion is roughly correlated with the degree of exchange rate variability.

The time series facts, however, seem to tell a different story. Price dispersion in all four groups shows a clear decline in the early 1990s, but the decline stops around the time of the euro's introduction. Indeed, it even seems to increase somewhat. Thus the time-series facts seem to suggest that the euro had no impact on price dispersion, or even raised the degree of dispersion.

The problem with this conclusion is that these results are not conditional on other factors. In particular, Veronese suggests that there was a powerful force driving increased dispersion in the post-1999 period, namely the divergence of national inflation rates in the Eurozone that occurred just after the euro's launch. The big-push to meet the Maastricht criteria led to a substantial drop in Eurozone nations' inflation. In the figure this shows up in a drop in the standard deviation of inflation rates since they were all converging on the three lowest rates as per the criteria. The diverging inflation rates should have been reflected in an increased dispersion of prices. Moreover, since this belt-tightening-and-loosening exercise was not undertaken by the non-euro nations, one should have expected to see a greater rise in the Eurozone's price dispersion than that of the non-Eurozone. Of course controlling for this sort of factor is exactly what the econometrics is for, but Engel and Rogers (2004) do not consider domestic inflation to be a factor.

Some of other earlier studies, such as, Parsley and Wei (2001), also find no euro effect, but this is not in contradiction to the later positive findings since their data stops at 2000, and papers such as Allington et al (2005) suggest that the euro's price effect does not involve a jump in 1999.

4. PRIMA FACIE EVIDENCE: EXPORT PRICE CONVERGENCE

Economic logic suggests that a common currency should narrow the range of price differences for similar goods within the Eurozone. We consider prima facie evidence that the euro's introduction changed trade pricing behaviour.

We use export unit values data derived from HS6 bilateral trade data. Specifically, we use the so-called unit-value index which is obtained by dividing the value measure by the quantity measure (the comtrade database reports both value and quantity for many trade flows). For each HS6 product, there exist as many export prices as there are origin-destination pairs. In our dataset that has 19 nations each good has potentially 342 different prices in every period. Using euro membership as a discriminating factor, we put all 342 prices into one of four categories: prices that are from one EZ nation and in another (in-in), prices that are from non-EZ nations and in another non-EZ nations (out-out), prices that are from non-EZ nations and in an EZ nation (out-in), and finally the in-out prices. We then analyse how price dispersion evolves in the four groups.

The concept of convergence we have in mind is not a convergence to long-run values, but rather concerns convergence to the actual average price within a group of prices. To this end, we compute price averages by product-year-origin for each group and estimate a standard speed of convergence regression. Specifically, the estimates were obtained using random effect model and correcting for product heterogeneity.[4] The results are shown in Table 1.

Table 1: Speed of convergence within EZ versus other control groups, 1995-2004.

	γ00	γ01	γ10	γ11	γ00*D99	γ01*D99	γ10*D99	γ11*D99
Convergence coefficient	-0.188	-0.158	-0.119	-0.186	0.017	0.13	0.047	-0.082
s.e.	[0.052]***	[0.035]***	[0.041]***	[0.025]***	[0.027]	[0.030]***	[0.034]	[0.046]*
Observations	356499	R2	0.09					

Notes: Random effects estimator (cluster products) of speed of convergence and its change after the euro's introduction in 1999. The γ coefficient is the rate of convergence parameter with the suffix indicating the direction of the flow in the standard from-to sequence; that is, 11 is within the Eurozone, 01 is from outside to inside, etc.

What we see is that all the prices are converging to within group averages to a reasonable rate, but the EZ11 group shows one of the two highest convergence rate. Post 1999, the three control groups of prices experience the same or slower rates, but the point estimate on the EZ11 group is negative, significant and sizeable suggesting faster convergence within the Eurozone.

Another way to look at the some issue is to estimate year-by-year convergence parameters for the four groups separately. This is done in Table 2.

[4] We believe this to be the correct estimation procedure when first differences have already eliminated possible constant unobservable effect and price differences may vary considerably over products.

Table 2: Speed of export price convergence, Eurozone vs. three control groups

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
γ_{00}	-0.089	-0.208	-0.262	-0.234	-0.054	0.159	-0.121	0.108	-0.099	-0.218	0.078
	[0.242]	[0.116]*	[0.167]	[0.108]**	[0.140]	[0.112]	[0.091]	[0.134]	[0.073]	[0.087]**	[0.204]
γ_{10}	-0.14	0.037	-0.313	-0.025	-0.183	-0.131	-0.14	-0.073	-0.148	-0.058	-0.109
	[0.106]	[0.102]	[0.042]***	[0.114]	[0.126]	[0.074]*	[0.064]**	[0.149]	[0.079]*	[0.081]	[0.094]
γ_{01}	-0.178	-0.181	0.003	-0.203	-0.294	-0.132	-0.063	-0.289	-0.265	-0.261	-0.019
	[0.240]	[0.133]	[0.140]	[0.147]	[0.106]***	[0.236]	[0.146]	[0.176]	[0.181]	[0.103]**	[0.161]
γ_{11}	-0.123	-0.338	-0.039	-0.252	-0.337	-0.003	-0.152	-0.208	0.092	-0.228	-0.111
	[0.083]	[0.052]***	[0.224]	[0.109]**	[0.049]***	[0.225]	[0.137]	[0.095]**	[0.099]	[0.179]	[0.086]
c	-5.169	-5.402	1.332	1.51	-1.139	0.676	4.305	8.958	8.129	2.98	4.478
	[0.890]***	[0.610]***	[0.621]**	[0.719]**	[0.578]**	[0.874]	[0.727]***	[1.104]***	[0.854]***	[0.718]***	[1.082]***
Observations	32409	32409	32409	32409	32409	32409	32409	32409	32409	32409	32409
R2	0.01	0.05	0.04	0.05	0.09	0.02	0.02	0.04	0.06	0.14	0

Notes: Random effects estimator (cluster products) of speed of convergence.

It is easier to see the relative evolution of the convergence parameters when they are plotted as in Figure 2. While there is a good deal of noise in the chart, it does seem that price convergence within the Eurozone accelerated right after the adoption of the euro in 2000 (the coefficient becomes more negative so that the gap between a typical price and the average closes more quickly). This initial inspection of the data strongly suggests that the euro has had a one shot effect on pricing, but has not modified the convergence rate afterwards. We turn now to a more formal investigation based on the pioneering work of Michael Knetter.

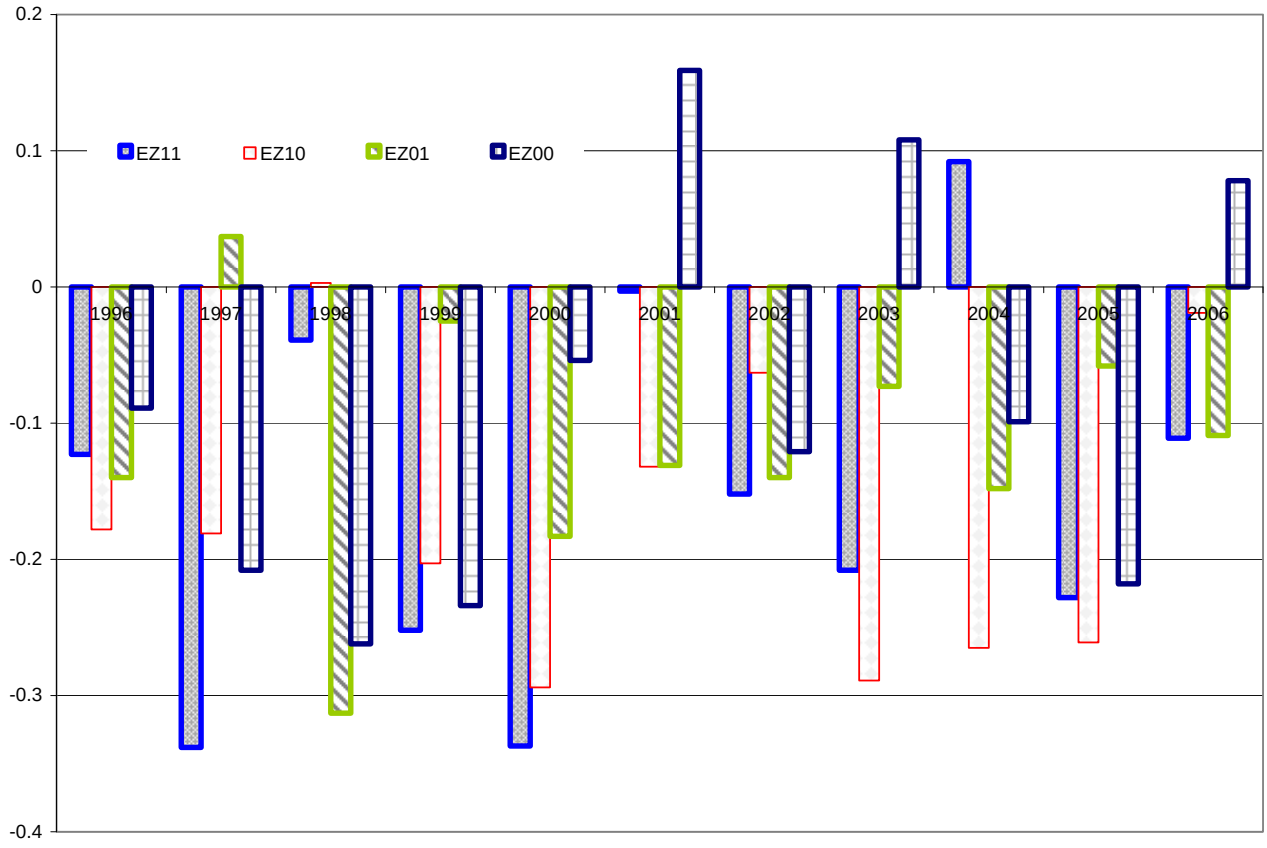

Figure 2: Convergence parameters in the EZ and three control groups.

5. NEW EVIDENCE

Using the simple theory discussed above, we estimate pricing-to-market equations on detailed trade data for the Eurozone nations (Germany, France, Italy, Spain, Netherlands, Portugal, Greece, Austria, Finland , Ireland and Belgium with Luxembourg as a single entity[5]), 3 non-EZ members of the EU (Great Britain, Sweden and Denmark) and 5 outsiders (Switzerland, Norway, Canada, US, and Japan). We use annual data at the HS6 digit level (about 5,000 products) for 1995-2006 period obtained from UNCTAD database (Comtrade). Computational limitations, in terms of number of regressors, prevent us from working with the full data set (more than 9 million data points). This leads us to work with datasets organised by the exporter (i.e. each data set concerns only one origin nation, but 18 destinations) but even this is not sufficient since the dimension of the panel would be something like number of product categories (thousands) times 18 destinations and this exceeds our capacity. To reduce the size and possibly clean the dataset, we focus only on products that are exported every year to at least 10 (more than half) out of 18 partners[6]. The idea is that these are product where pricing is more consistent since they are more important to the exporter. Furthermore as partial solution to issue of misreporting that plagues the database and that could invalidate the estimations, we drop altogether those products whose export unit value changes more than 50 per cent from one year to the next (see Bugamelli Tedeschi (2007) for similar solutions). Moreover to avoid as much heterogeneity as possible within the product lines, we eliminate every "n.e.s." (not elsewhere specified) product line, which normally groups within a single HS6 digits category those items without a specific code.

Data on bilateral exchange rate were obtained from the International Financial Statistics database maintained by the IMF. Finally the bilateral exchange rates of Eurozoners are always expressed in euros to avoid the sudden change in the numeraire in 1999. In practice what we did was rescaling each bilateral exchange rate according to the exchange rate parities of euro members with the euro.

5.1. Estimating equations

Estimation of the pricing-to-market equation is made difficult by a lack of data on marginal costs and bilateral trade costs. To address the latter problem, we note that the τ here is identical to the one in the gravity model, so we can use the same proxies. Thus, we assume that the log of τ_{odt} equals $-\beta_1 EZ + \beta_2 \ln Dist_d + \beta_3 \ln Z_{dt}$, where EZ is the euro dummy, it takes on the value of one after 1999 for countries which adopted the euro as national currency, $Dist_d$ is bilateral distance and Z_{dt} is all other factors, such as Single Market integration measures. Marginal cost is hard to proxy for, but in panel data, we can get around this by exploiting the fact that marginal cost for an exporter is the same for every destination in any given period. This allows us to replace the marginal cost term with a time-varying dummy for the exporter, denote as D_t. Denoting the origin nation (i.e. the exporting nation) as nation-o and the destination nation as nation-d, the pricing-to-market equation (for a given product and for a given origin nation) is:

$$\ln p_{odt} = \frac{\gamma}{1-\gamma} \ln e_{odt} + \frac{\ln \overline{\mu} + \ln m_t - \beta EZ + \beta_2 \ln Dist + \beta_3 \ln Z_{odt}}{1+\gamma}$$

[5] Trade data for Belgium and Luxembourg are reported as Benelux from 1995 onward; this makes impossible to distinguish between the two origins.

[6] For the main countries we further restricted our attention to products exported to almost the totality of trade partners, namely for Germany we focused only on products exported to every partner (18), for Italy on products sold to at least 17 partners, for France to at least 16 partners, for Netherlands products sold to at least 15 partners.

The second channel of euro effects is a change in the perceived elasticity, namely γ. In the estimating equation this shows up as interaction terms between all of the coefficients and the euro dummy, EZ, that 'turns on' after 1999 for exports to Eurozoners (for Greece it becomes 1 only in 2001). Recalling that we estimate on data sets that contain one origin-nation and several destination nations, the resulting estimating equation is thus:

$$\ln p_{dt} = c + EZ + D_t + D_d + \beta_d \ln e_{dt} + \beta_{EZ} EZ \ln e_{dt} + \varepsilon_{dt} \qquad (3)$$

where the pair-specific variables that don't vary over time (e.g. distance) have been grouped into the dummy D_d, the variables that vary over time but not by pair (e.g. the marginal cost) into the year dummy D_t, and the variables that shift with the introduction of the euro (e.g. the reduction in τ) into the Eurozone dummy (EZ). This equations holds for each product, but we omit the product subscript for notation convenience.

Importantly the bilateral exchange rate becomes unity after 1999 among Eurozone members, so the term $\beta_{EZ} EZ \ln e_{dt}$ collapse to zero if the exporting nation has adopted the euro. Thus for Eurozone members, we are unable to distinguish how the euro operated through the two channels; all the action will come through standard intercept dummy, EZ. For non-Eurozone members, the effect may come both from the intercept dummy and the slope dummy on the exchange rate (the interaction term).

5.2. Results

The full regression results are shown in the next section. Here we just collect the estimates of the EZ dummy and its interaction term with the exchange (for non-EZ exporters) in Table 3.

The results in Table 3 confirm the findings of existing studies that the euro did not reduce export prices within the Eurozone. The left panel of the table shows the estimated EZ coefficient for the Eurozoners. Using the standard notations, the EZ dummy for EZ exporters to EZ markets written as EZ11.Recall that according to our theory, this coefficient includes both the impact of lower bilateral costs engendered by common euro-usage as well as the change in mark-up due to changes in the perceived demand elasticity stemming from, for example, greater pricing transparency. Unfortunately, we cannot distinguish between these two channels – what we called the direct and indirect effect – but it is noteworthy that the parameter is never negative, except for Greece, and sometimes it is significantly positive. Export prices within the Eurozone have not been lowered by the adoption of a single currency.

The right panel of the table shows the EZ estimates for non-EZ exporters. Also for this set of countries, EZ is almost never significant with one important exception being Great Britain which has lowered its average export price by eight cents. Note that EZ here means that only the destination market uses the euro, so it is marked EZ01. The second estimate reported in the right panel "EZ10*ln (ex. rate)" show the estimate of how the pricing-to-market elasticity changed after the euro's introduction. The hypothesis is that outsiders should find it more difficult to price discriminate among Eurozone markets after 1999; one alternative hypothesis is that the euro may have induced outsiders to treat Eurozone like one big destination and thus more likely to price-to-market. In other words, the literature in the past has ascertained that the ERPT in big markets, namely the USA is very low and most of the exchange rate variability falls back on the producer's shoulders. The alternate hypothesis is that the Eurozone gained a similar international position. The results here suggests that neither hypotheses can be confirmed, or at least not yet. The coefficients are neither positive nor negative and mainly insignificant. Only USA and Switzerland show a negative and significant coefficient on the exchange rate which should represent an increase in the

ERPT, but the variation is negligible (around 1 per cent). It is indeed striking the variation in Greek export prices, which anyway may depend on the small size of the dataset.

Table 3: Impact of the euro on pricing to market

Exporter:	EZ11	s.e.	No Id=products*partners	Exporter:	EZ01	s.e.	EZ10* ln(ex. rate)	s.e.	No Id=products* partners
Germany	0.00	[0.008]	2878	Great Britain	**-0.09**	**[0.032]*** **	0.00	[0.004]	1287
France	**0.03**	**[0.013]** **	1436	Sweden	-0.22	[0.544]	0.00	[0.003]	1510
Italy	**0.02**	**[0.008]*** **	2230	Denmark	-0.36	[0.589]	0.00	[0.003]	890
Spain	0.01	[0.012]	1301	Switzerland	0.12	[0.131]	**-0.01**	**[0.003]*** **	1502
Belgium	0.01	[0.010]	2323	Norway	0.74	[0.689]	-0.01	[0.005]	293
Ireland	-0.03	[0.034]	56	Japan	0.59	[1.059]	0.00	[0.003]	901
Netherlands	-0.01	[0.025]	890	USA	-0.02	[0.019]	**-0.01**	**[0.005]***	432
Portugal	**0.08**	**[0.016]*** **	439	Canada	0.17	[0.148]	-0.01	[0.005]	74
Austria	0.01	[0.016]	776						
Greece	**-1.13**	**[0.287]*** **	99						
Finland	0.01	[0.017]	622						

Notes: Panel fixed effect (panel dimension is product-partner) with year-product dummies; Robust standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%.

5.2.1. Price-to-market: EZ vs non-EZ destinations

One thing that our empirics can shed light on is the degree to which countries price to market when it comes to various destinations. Inspection of Table 4 shows that most of the pricing-to-market (PTM) elasticities are already insignificant during the 1995-1999 period (we cannot estimate them afterwards since the logs of bilateral exchange rates are all zero by definition). What this may mean is that firms in the large Eurozone nations were already treating the other EZ nations as if they were domestic – at least in terms of pass-through pricing. Of course, there was extremely little bilateral exchange rate variation for most of the EZ11 pairs and this plagues the results and tends to make them insignificant; it is evident in the coefficient of the bilateral exchange rate between Germany and Austria. On the contrary where variation is still sizeable, the estimate suggest that there was some degree market segmentation. Nonetheless often even significant ERPT coefficients are relatively small; suggesting that exporters located in the Eurozone did adjust their prices to absorb the competitive loss stemming from an appreciation, or raise profit margins in response to a competitiveness-boosting depreciation, but only partially.

An interesting and common result of our estimation is that ERPT coefficients for non Eurozone destinations tend to shrink after 1999. This may be interpreted as a sign of smaller possibility for Eurozone members to price-discriminate among destination markets or rather less interest in doing so.

The findings are quite different for the non-EZ destinations. Here most of the PTM elasticities are positive, significant and relatively large, indicating that the large EZ nations were treating these nations as segmented from others. To understand that, it is worth noting that a positive coefficient tells us that firms absorb some of the consumer price changes that would have otherwise stemmed from a bilateral exchange rate movement. We know that this implies segmented markets, since such absorption implies that there will be different prices in different markets when prices are converted to a common currency. If markets were thoroughly integrated, such price gaps would trigger arbitrage that would either eliminate the price differences or prevent the firms from creating them in

the first place. The largest ERPT estimates refers to United States, confirming their role of privileged destination where the price is really set in the internal market and exporters can only adjust their price to it. Finally there is some evidence that the degree of exchange rate pass through has increased after the adoption of the euro.

Studying the same estimates for the small EZ nations, namely Belgium, Ireland, Netherlands, Portugal, Austria, Greece and Finland (Table 5), we note that there is some more PTM within the euro group prior to 1999 for the small nations. Part of this may be due to the narrower range of products. The pre-1999 average PTM elasticity for these nations with respect to markets that eventually joined the euro area is an order of magnitude smaller than those with respect to nations that were outside the euro area.

For completeness, we include the regression results for the non-EZ exporters (Table 6). The results for non-EZ origins tend to confirm, except for Great Britain, that the Eurozone has always been treated as a single entity and that price segmentation was already difficult within the area before the adoption of the common currency. This set of results do not suffer from small variabillity of the bilateral exchange rate hence cannot be justified on that basis.

Table 4: Pricing to market regression for large EZ nations, 1995-2006

	Germany	France	Italy	Spain	Average
EZ11	0.00	**0.03**	**0.02**	0.01	0.02
	[0.008]	**[0.013]****	**[0.008]*****	[0.012]	
ler_AUT	61.60	**1.99**	**0.58**	1.09	16.31
	[46.744]	**[0.659]*****	**[0.125]*****	[0.893]	
ler_BEL	2.74	**0.98**	**0.36**	0.82	1.22
	[4.130]	**[0.535]***	**[0.112]*****	[0.733]	
ler_DEU		**1.70**	**0.69**	**1.33**	1.24
		[0.479]***	**[0.109]*****	**[0.619]****	
ler_ESP	0.29	1.07	**0.56**		0.64
	[0.511]	[0.747]	**[0.137]*****		
ler_FIN	0.31	0.41	**0.38**	0.25	0.34
	[0.952]	[0.697]	**[0.166]****	[0.913]	
ler_FRA	-0.14		**0.63**	-0.62	-0.04
	[0.319]		**[0.144]*****	[0.506]	
ler_GRC	0.05	0.00	**0.15**	**0.31**	0.13
	[0.088]	[0.003]	**[0.068]****	**[0.111]*****	
ler_IRL	0.28	0.60	-0.19	0.33	0.25
	[0.196]	[0.373]	[0.295]	[0.341]	
ler_ITA	**0.28**	**0.42**		**0.34**	0.35
	[0.096]***	**[0.201]****		**[0.164]****	
ler_NLD	-0.37	**1.39**	**0.47**	0.94	0.60
	[1.728]	**[0.504]*****	**[0.112]*****	[0.591]	
ler_PRT	**-1.60**	0.83	0.51	-1.04	-0.33
	[0.785]**	[1.053]	**[0.148]*****	[1.265]	
ler_GBR	**0.19**	0.06	**0.39**	0.08	0.18
	[0.050]***	[0.069]	**[0.076]*****	[0.056]	
ler_GBRez	-0.04	**-0.09**	**-0.06**	-0.04	-0.06
	[0.033]	**[0.045]****	**[0.034]***	[0.040]	
ler_SWE	0.01	0.02	0.11	-0.01	0.03
	[0.040]	[0.065]	[0.149]	[0.049]	
ler_SWEez	**0.01**	-0.01	0.00	**-0.02**	0.00
	[0.005]**	[0.009]	[0.006]	**[0.007]*****	
ler_DNK	0.05	-0.05	**0.48**	0.03	0.13
	[0.036]	[0.053]	**[0.188]****	[0.050]	
ler_DNKez	0.00	0.01	**-0.02**	**-0.02**	-0.01
	[0.006]	[0.009]	**[0.006]*****	**[0.008]****	
ler_CHE	**0.16**	**0.08**	**0.38**	**0.25**	0.22
	[0.036]***	**[0.058]**	**[0.118]*****	**[0.059]*****	
ler_CHEez	**-0.09**	**-0.08**	**-0.11**	**-0.12**	-0.10
	[0.023]***	**[0.037]****	**[0.029]*****	**[0.037]*****	
ler_NOR	**0.11**	**0.16**	0.22	**0.31**	0.20
	[0.044]**	**[0.064]****	[0.220]	**[0.071]*****	
ler_NORez	**-0.04**	0.00	**-0.05**	**-0.03**	-0.03
	[0.006]***	[0.010]	[0.009]***	**[0.010]****	
ler_JPN	0.03	0.01	**0.25**	0.02	0.08
	[0.135]	[0.148]	**[0.056]*****	[0.206]	
ler_JPNez	**-0.02**	**-0.02**	**-0.01**	-0.01	-0.01
	[0.006]**	**[0.007]*****	**[0.004]*****	[0.010]	
ler_CAN	**0.24**	**0.44**	**0.47**	**0.02**	0.29
	[0.049]***	**[0.091]*****	**[0.090]*****	**[0.073]**	
ler_CANez	**-0.14**	**-0.15**	**-0.09**	**-0.25**	-0.16
	[0.038]***	**[0.058]*****	**[0.037]****	**[0.052]*****	
ler_USA	**0.52**	**0.63**	**0.77**	**0.46**	0.59
	[0.054]***	**[0.103]*****	**[0.087]*****	**[0.103]*****	
ler_USAez	**-0.26**	**-0.30**	**-0.41**	**-0.09**	-0.26
	[0.067]***	**[0.113]*****	**[0.092]*****	**[0.116]**	
Constant	1.71	1.54	2.11	0.96	
	[0.028]***	[0.033]***	[0.032]***	[0.025]***	
Observations	22274	12646	19430	15612	
Number of id	2878	1436	2230	1301	
R-squared	0.30	0.34	0.32	0.47	

Notes: Panel fixed effect (panel dimension is product-partner) with year-product dummies; Robust standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Pricing to market regression for small and medium EZ nations, 1995-2006

	Belgium	Ireland	Netherlands	Portugal	Austria	Greece	Finland
EZ11	0.008	-0.027	-0.01	**0.075**	0.014	**-1.126**	0.009
	[0.010]	[0.034]	[0.025]	**[0.016]*** **	[0.016]	**[0.287]*** **	[0.017]
ler_AUT	**-9.311**	0.528	**-0.091**	-1.38	0	**-1.141**	2.167
	[4.868]*	[1.034]	**[0.055]***	[1.528]	[0.000]	**[0.640]***	[1.930]
ler_BEL	0	**1.566**	-0.002	0.454	6.459	0.453	-1.585
	[0.000]	**[0.492]*** **	[0.061]	[1.107]	[8.821]	[0.711]	[1.435]
ler_DEU	**-6.173**	**2.141**	-0.022	0.387	42.851	-0.112	0.937
	[3.393]*	**[0.708]*** **	[0.044]	[0.937]	[71.896]	[0.651]	[0.992]
ler_ESP	-0.53	-0.117	-0.018	0.97	-0.054	0.659	0.904
	[0.509]	[0.937]	[0.046]	[1.998]	[1.034]	[0.623]	[0.931]
ler_FIN	-0.346	**4.35**	-0.041	**2.809**	0.775	-0.344	0
	[0.790]	**[1.902]** **	[0.055]	**[1.520]***	[1.544]	[3.324]	[0.000]
ler_FRA	**-0.648**	1.35	0.074	0.578	-0.394	0.019	**1.502**
	[0.328] **	[0.927]	[0.048]	[0.836]	[0.539]	[0.013]	**[0.588]** **
ler_GRC	0.013		-0.082	**-0.505**	0.109	0	-0.126
	[0.087]		[0.052]	**[0.171]*** **	[0.177]	[0.000]	[0.165]
ler_IRL	0.117		0.01	**1.994**	0.077	0.183	**1.115**
	[0.189]		[0.075]	**[0.593]*** **	[0.410]	[0.572]	**[0.352]*** **
ler_ITA	**0.5**	0.093	0.335	**1.148**	**0.699**	-0.681	**0.494**
	[0.107]* **	[0.734]	[0.211]	**[0.356]*** **	**[0.206]*** **	[1.266]	**[0.230]** **
ler_NLD	3.554	**1.281**	**0.129**	-0.406	-3.821	0.098	-0.767
	[2.665]	**[0.578]** **	**[0.053]** **	[0.842]	[3.100]	[0.538]	[0.966]
ler_PRT	-0.375	**2.351**	**-0.133**	0	-1.825	-0.249	4.692
	[0.572]	**[0.896]*** **	**[0.075]***	[0.000]	[1.289]	[0.702]	[2.557]*
ler_GBR	**0.116**	0.412	**0.34**	**0.257**	**0.249**	**1.445**	**0.295**
	[0.045]* **	[0.255]	**[0.072]*** **	**[0.097]*** **	**[0.077]*** **	**[0.465]*** **	**[0.094]*** **
ler_GBRez	-0.06	**-0.259**	-0.009	**0.127**	-0.071	**-2.733**	-0.094
	[0.033]*	**[0.151]***	[0.012]	**[0.062]** **	[0.054]	**[0.688]*** **	[0.063]
ler_SWE	0.022	-0.073	**0.573**	**0.19**	**0.111**	**2.048**	0.071
	[0.034]	[0.250]	**[0.195]*** **	**[0.074]** **	**[0.060]***	**[1.133]***	[0.047]
ler_SWEez	0.002	0.046	-0.058	**-0.036**	**-0.025**	**0.688**	0.002
	[0.006]	[0.031]	[0.151]	**[0.010]*** **	**[0.010]*** **	**[0.185]*** **	[0.009]
ler_DNK	**0.076**	0.077	0	0.109	-0.034	-0.371	**0.232**
	[0.032] **	[0.230]	[0.000]	[0.076]	[0.063]	[0.287]	**[0.051]*** **
ler_DNKez	**-0.012**	**0.07**	0	**-0.043**	-0.008	**0.612**	**-0.018**
	[0.006] **	**[0.032]** **	[0.000]	**[0.011]*** **	[0.011]	**[0.146]*** **	**[0.011]***
ler_CHE	0.021	**-0.611**	**0.743**	**0.353**	**-0.158**	-0.631	-0.02
	[0.041]	**[0.306]** **	**[0.300]** **	**[0.089]*** **	**[0.061]** **	[0.586]	[0.066]
ler_CHEez	-0.022	0.167	-0.016	**-0.153**	**-0.079**	**2.691**	-0.001
	[0.028]	[0.213]	[0.021]	**[0.053]*** **	**[0.042]***	**[0.759]*** **	[0.045]
ler_NOR	-0.08		0.087	**0.198**	**0.276**	**1.968**	0.06
	[0.051]		[0.274]	**[0.089]** **	**[0.075]*** **	**[1.143]***	[0.057]
ler_NORez	-0.008		-0.149	**-0.047**	**-0.031**	**0.726**	**-0.021**
	[0.007]		[0.276]	**[0.012]*** **	**[0.011]*** **	**[0.220]*** **	**[0.010]** **
ler_JPN	**-0.351**		**0.191**	0.109	-0.128	**4.666**	0.003
	[0.167] **		**[0.098]***	[0.284]	[0.170]	**[2.778]***	[0.158]
ler_JPNez	**-0.021**		-0.014	-0.012	-0.009	**0.487**	**-0.018**
	[0.008] **		[0.012]	[0.013]	[0.009]	**[0.205]** **	**[0.008]** **
ler_CAN	0.023		0.244	0.107	**-0.21**	-0.16	**0.323**
	[0.074]		[0.257]	[0.111]	**[0.106]** **	[0.626]	**[0.094]*** **
ler_CANez	**-0.132**		-0.015	**-0.273**	-0.055	**3.051**	**-0.125**
	[0.052] **		[0.030]	**[0.067]*** **	[0.073]	**[1.059]*** **	**[0.062]** **
ler_USA	**0.297**	**-0.484**	**0.349**	**0.853**	0.138	**-3.129**	**0.824**
	[0.083]* **	**[0.253]***	**[0.076]*** **	**[0.115]*** **	[0.120]	**[0.933]*** **	**[0.116]*** **
ler_USAez	-0.005	**0.627**	0.007	**-0.24**	**0.312**	-1.498	**-0.343**
	[0.095]	**[0.290]** **	[0.017]	**[0.132]***	**[0.134]** **	[2.788]	**[0.133]** **
Constant	0.984	0.937	3.538	1.952	1.729	2.199	1.232
	[0.017]***	[0.051]***	[0.053]***	[0.038]***	[0.028]***	[0.652]***	[0.031]***
Observations	27876	672	10680	5268	9312	1188	7464
Number of id	2323	56	890	439	776	99	622
R-squared	0.47	0.5	0.36	0.34	0.35	0.92	0.54

Notes: Panel fixed effect (panel dimension product-partner) with year-product dummies; Robust standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Pricing to market regression for non-EZ nations, 1995-2006

	Great Britain	Sweden	Denmark	Switzerland	Norway	Japan	Canada	USA
EZ01	**-0.085**	-0.219	-0.356	0.115	0.74	0.589	0.17	-0.021
	[0.032]* **	[0.544]	[0.589]	[0.131]	[0.689]	[1.059]	[0.148]	[0.019]
lxrEURO	-0.001	0	-0.004	**-0.008**	-0.007	-0.002	-0.006	**-0.01**
	[0.004]	[0.003]	[0.003]	**[0.003]*** **	[0.005]	[0.003]	[0.005]	**[0.005]***
lxr_AUT	0.168	-0.086	-0.19	0.278	0.353	0.115	0	-0.297
	[0.108]	[0.251]	[0.293]	[0.274]	[0.326]	[0.214]	[0.000]	[0.344]
lxr_BEL	**0.274**	-0.095	-0.178	0.272	0.336	0.119	0.246	0.024
	[0.096]* **	[0.251]	[0.293]	[0.274]	[0.326]	[0.214]	[0.292]	[0.112]
lxr_DEU	0.115	-0.094	-0.185	0.251	0.334	0.119	0.263	0.143
	[0.092]	[0.251]	[0.293]	[0.273]	[0.326]	[0.214]	[0.294]	[0.104]
lxr_ESP	0.07	-0.097	-0.18	0.224	0.353	0.118	**0.538**	0.099
	[0.095]	[0.250]	[0.292]	[0.271]	[0.325]	[0.214]	**[0.308]***	[0.121]
lxr_FIN	**0.323**	-0.118	-0.17	0.258	0.335	0.136	**0.647**	0.191
	[0.100]* **	[0.250]	[0.292]	[0.271]	[0.325]	[0.214]	**[0.326]** **	[0.137]
lxr_FRA	**0.237**	-0.1	-0.165	0.287	0.346	0.126	0.363	-0.06
	[0.091]* **	[0.251]	[0.293]	[0.276]	[0.327]	[0.214]	[0.298]	[0.119]
lxr_GRC	**0.304**	-0.119	-0.18	0.131	0.326	0.109	0.127	**-0.233**
	[0.127] **	[0.243]	[0.283]	[0.240]	[0.315]	[0.211]	[0.254]	**[0.108]** **
lxr_IRL	0.16	-0.114	-0.173	0.266	0.388	0.115	0.196	-0.204
	[0.099]	[0.249]	[0.291]	[0.267]	[0.323]	[0.213]	[0.300]	[0.201]
lxr_ITA	**0.325**	-0.095	-0.185	0.261	0.325	0.122	0.249	0.221
	[0.095]* **	[0.251]	[0.293]	[0.276]	[0.327]	[0.214]	[0.301]	[0.153]
lxr_NLD	**0.221**	-0.094	-0.162	0.225	0.369	0.113	0.167	-0.071
	[0.094] **	[0.251]	[0.293]	[0.273]	[0.324]	[0.214]	[0.302]	[0.115]
lxr_PRT	0.073	-0.094	-0.182	0.206	0.301	0.113	0.422	-0.077
	[0.099]	[0.250]	[0.292]	[0.271]	[0.326]	[0.214]	[0.304]	[0.172]
lxr_GBR		**0.108**	**0.247**	**0.33**	**0.436**	-0.019	-0.312	0.01
		[0.060]*	**[0.072]*** **	**[0.072]*** **	**[0.102]*** **	[0.074]	[0.232]	[0.080]
lxr_SWE	**0.159**		**0.49**	**0.207**	**0.361**	**0.149**	-0.135	0.019
	[0.090]*		**[0.160]*** **	**[0.088]** **	**[0.147]** **	**[0.065]** **	[0.223]	[0.076]
lxr_DNK	0.086	**0.284**		-0.215	0.398	**0.214**	-0.388	0.027
	[0.101]	**[0.125]** **		[0.187]	[0.288]	**[0.059]*** **	[0.577]	[0.088]
lxr_CHE	0.178	**0.317**	**0.469**		0.264	**-0.116**	-0.006	-0.063
	[0.156]	**[0.101]*** **	**[0.229]** **		[0.278]	**[0.059]** **	[0.465]	[0.083]
lxr_NOR	**-0.364**	**0.279**	-0.012	-0.383		-0.065	-0.669	-0.141
	[0.138]* **	**[0.081]*** **	[0.183]	[0.243]		[0.062]	[0.550]	[0.099]
lxr_JPN	0.242	**0.51**	**0.262**	**0.093**	**0.301**		0.193	0.105
	[0.157]	**[0.071]*** **	**[0.085]*** **	**[0.051]***	**[0.087]*** **		[0.229]	[0.093]
lxr_CAN	-0.296	**0.381**	0.241	**0.226**	**0.542**	0.072		-0.069
	[0.255]	**[0.100]*** **	[0.214]	**[0.106]** **	**[0.169]*** **	[0.085]		[0.063]
lxr_USA	**0.553**	**0.4**	**0.364**	**0.33**	**0.484**	**0.292**	-0.003	
	[0.100]* **	**[0.049]*** **	**[0.070]*** **	**[0.047]*** **	**[0.083]*** **	**[0.085]*** **	[0.133]	
Constant	1.096	3.715	3.876	3.048	2.828	8.028	1.341	2.312
	[0.045]***	[0.339]***	[0.370]***	[0.085]***	[0.398]***	[0.634]***	[0.122]***	[0.039]***
Observations	14157	16610	9790	16522	3223	9911	814	5184
No.products	1287	1510	890	1502	293	901	74	432
R-squared	0.39	0.44	0.35	0.33	0.47	0.41	0.46	0.49

Notes: Panel fixed effect (panel dimension is product-partner) with year-product dummies; Robust standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%.

6. CONCLUDING REMARKS

This paper reviewed the existing evidence on the euro's effects on trade pricing. Some studies found the price convergence was faster after the euro's introduction but others found the opposite. As far as convergence is concerned, we present fresh evidence using the latest data and best econometric techniques. We have mixed finding – i.e. prices converge faster after the euro within the Eurozone with respect to the other "control groups" – when we assume that there was only one

change in the convergence rate and that change occurred in 1999. However, when we estimate year-by-year convergence rates, we see that the rate has declined steadily in the Eurozone in 2000 but the pace has slowed down afterwards suggesting more the existence of a single jump at a given date rather than a persistent change in the rate of convergence. We believe that this finding helps explain the lack of consensus in the empirical literature and it leads us to believe that the euro has indeed promoted market integration in terms of pricing.

To test this more carefully, we provide a theoretically based empirical analysis (inspired by the empirical strategy by Knetter 1989) that presents more precise evidence on the market integration hypothesis. The basic idea is simple. When markets are segmented internationally, firms can charge different prices to different markets in order to maximise profits – what Krugman (1986) calls pricing-to-market. Using panel data, we can test this by observing the co-movements of export prices for the same product to different nations in response to bilateral exchange rate movements. If the exporter is pricing-to-market – a clear sign that markets are segmented – then the export price in the exporter's currency will adjust to absorb some of the exchange rate fluctuation. For example, a bilateral appreciation would lead to a cut in the exporter's price measured in his own currency as the firm attempts to moderate the increase in the price faced by consumers in the foreign market. A key drawback of this technique is its inability to directly address the disappearance of bilateral exchange rate fluctuation after the euro. Thus we cannot estimate whether Eurozone firms treated Eurozone markets as more or less integrated after the euro.

The fact that in our sample, the variation of the bilateral exchange rate of Eurozoners vis-à-vis other Eurozoners is very low, invalidates part of the pricing to market estimations but it does not affect the difference in difference estimates of the EZ dummies; indeed countries with relatively high exchange rate volatility before 1999, like Italy and to some extent France and Ireland, have significant PTM coefficients. However, we can detect shifts in pricing and here our new empirical finding is noteworthy.

For most of the euro area members, we find that the introduction of the euro has no impact on export prices except Italy, France and Portugal where the difference in difference estimate reveal that it induced a rise in prices by 2, 3 and 7 per cent respectively.

Part of the value added of this paper comes from having looked at the issue of the Eurozone price convergence from the point of view of exporters located outside the euro borders and having provided first evidence on whether their perception of the Eurozone has changed after 1999. The answer is on overall negative: the ERPT coefficient have not been modified, nor have been the pricing strategies of outsiders. It appears that non Eurozone exporters found it difficult to discriminate among members even before the adoption of the euro. Great Britain is the only country to show an appreciable reduction in the level of export prices of those goods sold to the Eurozone and is also the only country that was able to price-discriminate the Eurozoners.

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