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Pricing to the Euro-Market

Virginia Di Nino
Graduate Institute of International Studies

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Graduate Institute of International Studies
Avenue de la Paix 11A, 1202 Geneva, Switzerland
dinino1@hei.unige.ch

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Abstract

This paper investigates the strategic pricing to Euroland as it is implemented by exporters of 18 countries (Eurozone and non Eurozone). Initial findings support that general export-prices convergence is faster within Eurozone then elsewhere and seems to have accelerated in the Euro-age. The average mark-up variations in reaction to exchange rate evolution are studied, based on theoretically founded premises, to shore up the idea that Euro-market's structure underwent modifications as consequence of the monetary union. Results suggest that firms have responded to exchange rate elimination irrespective of member status and proceeded to gauge across members pricing reaction to exchange rate fluctuations.

Keywords: Pricing-to-market; Export-prices; European Monetary Union.
JEL Classification: D4; F14; F15

1 Introduction

In 1990 , when the European Commission published the report: "One market, one money", which discusses at length the consequences of and the alternatives for common currency adoption, politicians and technocrats cared mainly about the creation of a single internal market. Had another report been published a few years later, it would have been titled "One money, one market". The belief that single-currency enhances single-market was deeply-seated in the mind of European Technocrats as official speeches of diverse European central bankers and European authorities testify[1].

Indeed this belief has theoretical foundations, which explain the existence of a conspicuous empirical literature. The creation of a common currency area, by eliminating exchange rate risk and hedging costs, forcefully reduces internal transaction costs and generates arbitrage opportunities that trigger price homogeneity, enhance competition and transparency. The mechanism can be applied to every type of market: services, financial instruments and goods market in general.

While trade can be viewed as the channel through which single market deepens and develops, price homogeneity is one of its main features. The importance attributed in Europe to this aspect of integration is reflected in the creation of a network on Inflation Persistence (IPN) at the ECB that studied the evolution of consumer prices and their duration and concluded that nor the first converged nor the second shortened after EMU.

[1]Dr. Hans Meyer,Chairman of the Governing Board of the Swiss National Bank, considers the approach of the Euro, speech given to the Swiss-American Chamber of Commerce in Zurich on 4/11/1997:

> "...first a single currency is a desirable addition to the European single market. Cross-border transactions will no longer be impeded by the need to exchange one currency for another or by uncertainties about the future developments of exchange rates."

Mr. E.A.J George, Governor of the Bank of England, looks at the prospects for the UK economy and developments towards European Monetary Union,speech given at the Liverpool and District Bankers' Institute Bi-Annual Dinner in Liverpool 12/03/1997 and discusses the advantages and disadvantages of EMU, speech given to the British Chamber of Commerce in Hong Kong on 23/09/1997

> "...any manufacturer will tell you... about the great advantage of intra European exchange rate certainty..."

> "..intra European exchange rate certainty that would be provided by a single currency could nevertheless–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."

Mr Heikensten,Deputy Governor of the Bank of Sweden, looks at the consequences for Sweden of joining EMU in the speech given at the Baker and Mckenzie's EMU seminar held in Stockholm on 5/02/1997:

> "The idea behind a single currency in Europe is simple. One currency is better than many it makes things work more efficiently. Eliminating the need to exchange currencies reduces transaction costs. The exchange rate stability facilitates trade and investments, not least for small and medium-sized companies. More direct prices comparisons should lead in turn to stronger competition and downward pressure on prices, to the benefit of consumers."

Although copious, the literature on European price convergence has not reached a univocal result. Empirical works are not in agreement and researchers have been waving between affirmative and negative answers. Among those who found positive and significant effects of the EMU on price convergence are recent papers like Allington, Katttuman, Waldmann.(2005), Imbs et alias (2004), Isqut (2001) Matha (2003) Parsley and Wei (2001), however there are also many works that deny the existence of faster price convergence Baye et alias (2005) and (2002), Engel and Rogers(2004), Lutz (2003), Rogers (2002).

Several reasons are responsible for these conflicting results. The datasets employed in these studies cannot be exhaustive, many concentrate on a few goods (Baye et alias (2005) and (2002), Engel and Rogers(2004), Lutz (2003), Rogers (2002) Math(2003) Parsley and Wei (2001), some on merely one good and only a few are based on a comprehensive dataset of hundreds of goods (Allington, Katttuman, Waldmann.(2005) and Isqut (2002). There is no unique definition of what is price dispersion, which is measured by using different statistics each time: the log average of price difference, the average price volatility or mean squared error, the coefficient of variation, the log of absolute average difference and the difference between minimum and maximum price. Moreover some empirical works are based on national prices other use local (city) prices. Some studies are purely cross sectional, a minority disposes of panel database; consequently econometric techniques differ.

The only least common denominator of the previous empirical literature is the use of "consumer prices" as base to compute statistics. This choice has an important drawback if we believe the essential channel of price convergence to be import/export. 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's an initial producer/exporter company which first sells to an importer, then at least one wholesale dealer and, before getting to the final consumer, there's an additional stage at retail level. Prices paid by each of them do not necessarily change identically. One can imagine that they co-move, but must consider that they are also determined by market power, market structure and the curvature of demand and supply of these players.

Consequently employing final consumer prices in empirical studies, prevents researchers from assessing the contribution of each actor to price evolution. It cannot be determined to what extent changes in export prices will be passed onto the next stage, whether disinflation or inflation are generated by reduction in the cost mark-up of the retail dealer, the producer, the wholesale dealer or a combination of the above. It cannot be identified whether unit export prices converged but retailers slowed down or voided the effect. The behavior of retailers and wholesalers is indeed determined also by country specificity. The research is therefore limited to investigating the average "pass-through effect".

These reasons induce rethinking the issue from a different perspective. As the first input for price convergence is always provided by the initial producer/exporter, the following player in the chain reviews his pricing policy only as a reaction to modifications of his purchasing or selling conditions. Therefore answers to this problematic question must come from studies on export prices, exporters behaviour and their pricing to market strategies.

This approach, at the same time solve the issue of computing the correct statistic for price convergence since it allows to model the reduced equation of pricing to the Euro-market.

The idea was formally expressed, for the first time, in Krugman (1986) when he asserted that "foreign firms did not cut their prices as dollar rose, and they will maintain their pricing to market as the dollar falls, thus these observers argue that the effect of a decline in the US dollar on import prices will be small".

In other words, firms optimal pricing strategy is to set as many prices as there are supplied markets according to their level of segmentation. Only when markets are integrated, firms are not able, nor find it optimal, to price-discriminate. Having said that, a different way to ascertain whether the European Monetary Union fostered integration in Europe, is to investigate the strategic behavior of exporters.

Knetter (1989) ideated a simple methodology, applicable to various competition contexts, that consents to estimate the coefficient of price reaction to exchange rate variation and avoid specific and cumbersome assumptions about cost and demand functions.

The approach has first been employed to study how US and German exporters discriminate cross-destination. It concluded that US export-prices appear insensitive to exchange rate fluctuations while German export-prices adjust to stabilize price in the destination market. Empirical works in this field, probably due to topic relevance or approach ease, multiplied and generated a wide literature. Nonetheless, existing studies often linger on a few countries, mainly USA, Germany, Japan and/or limit their attention to a few markets: Goldberg and Knetter (1995) for the beer market and Goldberg and Knetter (1997) for the Japanese, Canadian and German automobile market. More recently a series of papers have focused on price discrimination of European exporters. Falk and Falk (2000) measures price discrimination of German exporters in 70 items during a period of large Deutsche mark fluctuations (1988-1994). They conclude that pricing to market is observed for the USA, Japan, Italy and Spain in chemical and fertilizers, but not in machinery products. Finally Gil-Pareja (2002) and Gil-Pareja and Sosvilla-Rivero (undated) analyse the level of price segmentation in Europe, but they do not explicitly concentrate on the euro effects or on pricing to market.

To the contrary, this work adopts/adapts Knetter's framework and directly investigates to what extent foreign (located outside Eurozone) and Eurozone exporters' price setting strategies were modified by the EMU creation. Have common currency, unitary monetary policy, identical exchange rate fluctuations, reduced foreign firm incentive to optimally mark-up "member" markets differently?

While, due to data shortage (data on sectoral production are disclosed only quinquennially), direct investigations of the Eurozone (EZ) production and industrial structure have not been possible so far, we esteem that this work can still shed light on this issue indirectly, to the extent that modifications in pricing policy are, among others, determined by market structure modifications.
Ultimately this investigation focuses on the degree of market segmentation in Europe before and after the introduction of the euro from the perspective of EZ and non EZ exporters. To the purpose, Knetter's methodology will be modified in two dimensions: we will provide measures of *average* (product-pooling instead of product) market segmentation to verify the existence of *changes* in Eurozone market-segmentation.
In next section, the paper elaborates the theoretical basis, and continues in section 3 with data description and related issues. The empirical approach and results are presented in section 4, section 5 concludes.

2 The theoretical foundations and its empirical implications

In the context of perfect competition firms are unable to strategically respond to market mutations while, in imperfectly competing markets, firms set prices optimally in order to maximize profit and consider the exchange rate variations to be an important price determinant.
Below we set up the optimization problem of monopolists exporting to many countries,at the same time, and compute pricing equation as function of marginal cost and exchange rate. Similar price equation are obtained under imperfect competition.

2.1 A multi-market monopoly model

This monopolist exports his production to many markets and maximizes the following profit equation:

$$\Pi\left(p_1....p_d\right) = \sum_d p_d q_d(e_d * p_d) - C\left(\sum_d q_d(e_d * p_d)\right)$$

Profits are a function of destination specific (d) export prices (p_d), and the quantity produced for each market (q_d). Evidently they also depend on total cost $(C\left(Q\right))$ which is itself function of (Q), total production. Finally (Q) is simply the sum cross-destination of (q_d) and depends on foreign currency prices (p_d^*) and the bilateral exchange rates (e_d).
Standard results prove that, at the optimum, the marginal profit from an additional unit sold to any market is zero, and that the marginal cost of production is the same cross-destinations, for any given Q. Therefore production is allocated so to equalize marginal profits cross destinations.

The derivation of the reduced equation for one destination (the remaining ones are identically derivable)is stated below. It represents the backbone of the following empirical investigation. From f.o.c. we obtain:

$$\frac{\partial \Pi\left(p_1.p_d...p_n\right)}{\partial p_d} = 0 = q_d(e_d * p_d) + e_d * p_d \frac{\partial q_d(e_d * p_d)}{\partial p_d^*} - MC_q \frac{\partial q_d(e_d * p_d)}{\partial p_d} e_d \tag{1}$$

By defining $p_d^* = p_d * e_d$, the price expressed in the destination country's currency and $\eta_d = -\left[\frac{\partial q_d(e_d * p_d)}{\partial p_d^*}\frac{p_d^*}{q_d(e_d * p_d)}\right]$ as the elasticity of foreign market demand with respect to price, dividing equation (1) by quantity, we obtain:

$$\frac{\partial \Pi\left(p_1....p_d\right)}{\partial p_d} = 0 = 1 - \eta_d + \frac{\eta_d}{p_d} MC_q \rightarrow p_d = MC_q\left(\frac{\eta_d}{\eta_d - 1}\right) \tag{2}$$

A variation in the bilateral exchange rate will impact on the price in the destination country and will change the quantity produced through two channels; namely the marginal cost (MC) and η_d:

$$d\log(p_d) = d\log\left(MC_q\right) + d\left(\log\left(\frac{\eta_d}{\eta_d - 1}\right)\right)$$

$$\frac{dp_d}{p_d} = \frac{dMC_q}{MC_q} + \frac{1}{\eta_d(1-\eta_d)} d\eta_d \tag{3}$$

where $\frac{dMC_q}{MC_q}$ is equal to :

$$\frac{dMC_q}{MC_q} = \frac{MC_{qq}\left[\sum_j \frac{\partial q_j}{\partial p_j^*}\left(p_j de_j + dp_j e_j\right)\right]}{MC_q} \tag{4}$$

while $d\eta_d$ is equal to:

$$d\eta_d = \frac{\partial \eta_d}{\partial p_d^*} p_d^* \left(\frac{dp_d}{pd} + \frac{de_d}{e_d}\right)$$

Therefore the total differential of price equation can be written as:

$$\frac{dp_d}{p_d} = \frac{dMC_q}{MC_q} + \frac{\frac{\partial \eta_d}{\partial p_d^*} p_d^*}{\eta_d * (1-\eta_d)}\left(\frac{dp_d}{pd} + \frac{de_d}{e_d}\right)$$

By rearranging the terms and simplifying the equation we obtain:

$$\frac{dp_d}{p_d} = (1-\beta_d)\frac{dMC_q}{MC_q} + \beta_d \frac{de_d}{e_d} \tag{5}$$

where β_d is defined:

$$\beta_d = \frac{\frac{\partial \ln \eta_d}{\partial \ln p_d^*}}{(1-\eta_d) - \frac{\partial \ln \eta_d}{\partial \ln p_d^*}}$$

Investigation of equation (5) shows how export price reacts to exchange rate movements and marginal cost modifications. Since the marginal cost of production is also affected by variation in exchange-rates, as equation (4) proves, then exchange rate variation movements generate two types of effects; a direct and an indirect one through the marginal cost. Nonetheless, the two shocks have different properties. On the one hand the marginal cost affects identically prices to any destination and inasmuch is the same across destinations, on the other hand the direct effect is destination specific.

Few final comments on equation (5) and a little warning note are due. If the demand equation is not a c.e.s. then the import elasticity η_d changes when p_d^* does. As η_d is part of β_d, the latter cannot be considered a structural parameter and variation of the exchange rate modifies the reduced coefficient. We conclude that Knetter's method suffers from Lucas critique. In general one way to test the severeness of this critique is to stress coefficient estimates by changing the sample period. When coefficients prove stable to sample modifications the critique is not an important issue. We tested our results and proved it to be a minor problem; results are reported in the appendix A.2.2.

2.2 Initial consideration on pricing to the Euro-market

Although monetary unions eliminate exchange rates among members, it is not evident that they also have an effect on β's (measure of firms' strategic reaction to exchange rate variation). The timing, the rules of euro enforcement, as well as bilateral parity reflected the need to eliminate arbitrage opportunities, of any type, also in goods. When those arbitrage possibilities, which imply structural break in β's are ruled out, the shift from a national to a common currency could generate a discontinuity in equation (5) through a reduction in the marginal cost of production and the impact on β_d by altering market structures.

A priori we can make only a series of considerations on what the EMU might have produced in Europe in terms of market segmentation.

When hedging and transaction costs disappeared, incentives to re-selling activities were generated within the EZ that are likely to have induced exporters to review their pricing strategy. In other words the Eurozone, when viewed as one big country, grew in monopsony power vis-a-vis its main trading partners, and that may result in variations of β_d.

In this framework β_d depends on the producer's perception of price elasticity in the destination market which can be altered by the EMU in different ways. On the one hand,in general, big countries have more purchasing power than many small countries of equal size;

if Euroland is viewed as whole block, it is surely considered one of, if not the main trading partner for exporters located both outside and within euro borders. The new scenario increases the perceived elasticity of substitution and persuades exporters to stabilize their prices to Euroland even more firmly (increase in β_d). On the other hand, theory says that in highly competitive markets mark-ups are in general smaller. Hence if the EMU fostered competition, at least in the internal market, we should be able to detect a decrease in β_d. We deduce that it is impossible to predict theoretically the sign of the change in β_d even though we suppose the first effect to be stronger for outside exporters and the second for internal market producers.
Exporters fall then into two categories: euro exporters, shielded from euro rate risk and costs, and the r.o.w exporters who face fewer, namely one in twelve destinations, exchange rate risks and lower transaction costs. Our theoretical framework is surely suitable to analyze pricing strategies of exporters from outside into the euro-zone. Among members, as the EMU wiped out the exchange rate, this strategy may appear unsuitable but we explain in the following pages how our set-up is able to capture a change in mark-up levels induced by fostered competition. We formalize these hypotheses with a small modification of equation (5) as illustrated in section (4.2).

Before we proceed to estimations, we briefly describe the database employed and a few related issues, and introduce to empirical results with the analysis of price convergence in Europe. It produces first impressions on unit export values evolution and seems to suggest a faster convergence among members in the EMU period.

3 Data

3.1 Database description

The database consists of HS [2] sub-heading (six digits classification) unit export values for 19 origin countries:Austria, Belgium (Belgium plus Luxembourg),Canada, Denmark, Finland, France, Germany, Great Britain, Greece, Japan, Italy, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, Portugal, USA and as many destination countries. Although data were available from 1990 onward, the period under examination is the decennium 1995 to 2004; we restricted the sample to a period of relative exchange rate stability in order to avoid devaluations of early nineties; behind this choice there is the intention to isolate consequences of the EMU from other causes. Unit export values were obtained as trade values over trade volumes. In empirical literature they are calculated and applied at a very

[2] Harmonized Commodity Description and Coding System (HS) of tariff nomenclature is an internationally standardized system of names and numbers for classifying traded products developed and maintained by the World Customs Organization (WCO) an independent intergovernmental organization with over 160 member countries based in Brussels, Belgium.

detailed level of detail(seven or eight digits) to avoid, as much as possible, heterogeneity inside categories. While the HS classification at 8-digits often coincides with a 6 digits one (on average we have less than two 8-digits lines for each 6-digits category), 6-digits classification permits a direct comparison of items across countries which 8 digits does not. Moreover when 8-digits provides in fact finer item classification, it rarely exceeds the 3/4 lines per 6-digits sub-heading. In light of all that we consider the HS 6 digits more appropriate for cross-country analysis and chose it for this study. Annual bilateral exchange rates were obtained from the statistics of the IMF database.
This strand of literature has often undergone a critique concerning the suitability of unit export values to correctly address the pricing to market issue. To not underestimate the problem, we dedicate the next sub-section to compute the possible bias and its effect on the estimations.

3.2 What is exactly the measurement bias generated by unit export values?

As stated earlier, the database only contains volumes ($\sum\limits_v dq_{vd}$) and values of export ($\sum\limits_v p^r_{vd} q_{vd}$) for 6-digits HS-product category. The lack of firm level data prevents the computation of export prices (p_{vd}) which are replaced by unit export values:

$$p^r_d = \frac{\sum\limits_v p_{vd} q_{vd}}{\sum\limits_v q_{vd}} \tag{6}$$

This introduces a measurement error in the dependent variable which has recoils on the estimations. Moreover we expect the quantity sold of each variety to plausibly differ across destinations. Comparing ideal $\left(\frac{dp_{vd}}{p_{vd}}\right)$ and real $\left(\frac{dp^r_d}{p^r_d}\right)$ data we make an overall assessment on the seriousness of the introduced bias.
From equation (5) we know the value of $\frac{dp_{vd}}{p_{vd}}$; below we compute $\frac{dp^r_d}{p^r_d}$.

$$\frac{dp^r_d}{p^r_d} = \frac{\sum\limits_v dp_{vd} q_{vd} + p_{vd} dq_{vd}}{\sum\limits_v p_{vd} q_{vd}} - \frac{\sum\limits_v dq_{vd}}{\sum\limits_v q_{vd}}$$

$$\frac{dp^r_d}{p^r_d} = \frac{\sum\limits_v p_{vd} q_{vd} \frac{dp_{vd}}{p_{vd}}}{\sum\limits_v p_{vd} q_{vd}} + \frac{\sum\limits_v p_{vd} q_{vd} \frac{dq_{vd}}{q_{vd}}}{\sum\limits_v p_{vd} q_{vd}} - \frac{\sum\limits_v dq_{vd}}{\sum\limits_v q_{vd}} \tag{7}$$

The first term on the right hand side is the weighted average of (5) and does not imply particular biases in the estimate of β_d except for the fact that it will be read as the average mark-up reaction to movements of the exchange rate. The second and the third term are more problematic: they only offset each other and then disappear from the expression when p_{vd} is the same across goods and generates a measurement bias which reveals to be proportional to price dispersion within its category, in any other case.

Computing the percentage variation in the quantity produced of each varieties is given by:

$$\frac{dq_{vd}}{q_{vd}} = \frac{p^*_{vd}}{q_{vd}} \frac{\partial q_{vd}}{\partial p^*_{vd}} \left(\frac{de_d}{e_d} + \frac{dp_{vd}}{p_{vd}} \right) = \eta_{vd} \left(\frac{de_d}{e_d} + \frac{dp_{vd}}{p_{vd}} \right) \tag{8}$$

and replacing the definition of $\frac{dp_{vd}}{p_{vd}}$ and $\frac{dq_{vd}}{q_{vd}}$ in (7) we obtain:

$$\frac{dp^r_d}{p^r_d} = \frac{\sum\limits_v p_{vd} q_{vd} \left[(1-\beta_{vd}) \frac{dMC_{vq}}{MC_{vq}} + \beta_{vd} \frac{de_d}{e_d} \right]}{\sum\limits_v p_{vd} q_{vd}} + \frac{\sum\limits_v p_{vd} q_{vd} \eta_{vd} \left(\frac{de_d}{e_d} + \frac{dp_{vd}}{p_{vd}} \right)}{\sum\limits_v p_{vd} q_{vd}} - \frac{\sum\limits_v q_{vd} \eta_{vd} \left(\frac{de_d}{e_d} + \frac{dp_{vd}}{p_{vd}} \right)}{\sum\limits_v q_{vd}}$$

$$\begin{aligned} \frac{dp^r_d}{p^r_d} = & \frac{\sum\limits_v \frac{dMC_{vq}}{MC_{vq}} (1-\beta_{vd}) p_{vd} q_{vd} (1+\eta_{vd})}{\sum\limits_v p_{vd} q_{vd}} - \frac{\sum\limits_v q_{vd} \eta_{vd} (1-\beta_{vd}) \frac{dMC_{vq}}{MC_{vq}}}{\sum\limits_v q_{vd}} + \\ & + \left\{ \frac{\sum\limits_v \left[p_{vd} q_{vd} \left(\beta_{vd} + \eta_{vd} (1+\beta_{vd}) \right) \right]}{\sum\limits_v p_{vd} q_{vd}} - \frac{\sum\limits_v q_{vd} \eta_{vd} (1+\beta_{vd})}{\sum\limits_v q_{vd}} \right\} \frac{de_d}{e_d} \end{aligned}$$

We wonder to what extent it is possible to control for the bias. Time dummies, that with firm level data would have captured the marginal cost of production, are able to fully account for the weighted average marginal cost of production, provided varieties are equally weighted across destinations, but most likely they are not. The destination fixed effect, that with firm level data would have identified the existence of segmentation in a market, no longer provides such information. Nonetheless they control for cross destination differences in the definition of unit export values (p^r_d). Unfortunately they are unable to capture variation in (p^r_d) when q_{vd} varies. In this sense the destination fixed effect is not a precise measure of market segmentation.

Despite that,as the bias grows with aggregation, the use of very detailed data, as we do in this work, tends to minimize its seriousness.

4 Empirical models and results

4.1 Evidences of price convergence within the Euro-market

For each product there exists as many export prices as the origin-destination pairs. In this dataset disposing of 19 origins and 18 destinations, each good has potentially 342 different prices. Using euro membership as a discriminant, the 342 prices were allocated in 4 different subsets. We assign, to the first subset, prices of those goods produced by non EZ countries for non EZ countries, in the second subset, unit export prices of goods produced by EZ members for non members, in a third one, prices of goods traveling in the opposite direction and in the fourth, the internal market export prices. Finally, each set was further divided into two groups: a pre-EMU and a post-EMU group.

The concept of convergence we have in mind has nothing to do with convergence towards long run values p, but rather with price dispersion across groups of prices. To test its existence we proceeded to compute price averages by product-year-origin and each group (therefore we count 4 average values multiplied by the number of year and origin countries per product). The adopted classification permits to specify different speeds of convergence (γ_{ij}) respectively for members (i=1, j=1), for non members-members prices (i=0, j=1), for members-non members(i=1, j=0) and for non members unit export values (i=0, j=0). The four γ_{ijeuro} measure changes in the speed of convergence in the Euro age. Finally to ensure uniformity among prices and comparability, unit export values are all expressed in current value US dollars.

With this classification in mind we came up with a convergence equation where the first difference of prices is regressed on the difference with respect to average value computed as illustrated above.

$$(\Delta p_{odpt}) = c + \sum_{i=0;j=0}^{i=1;j=1} \gamma_{ij} \Delta \overline{p}_{pij} + \sum_{i=0;j=0}^{i=1;j=1} \gamma_{ijeuro} \Delta \overline{p}_{pijemu} \tag{9}$$

We indicate with Δp_{odpt} the change in unit export price of product p exported from o to d at time t; with $\Delta \overline{p}_{pij}$ the difference between p_{odpt-1} and the average price for product p of the associated subset. For internal EZ-market prices the mean is computed as follow:

$$\left(\frac{1}{\sum_{i=1;j=1;pr=p}(1)} \sum_t p_{odpt} \middle| i = 1; j = 1; pr = p \right) \tag{10}$$

Negative γ indicates that for values of p_{odpt-1} below the average, price will raise in the next period and viceversa for p_{odpt-1} above the average. Notice that the equation can be reformulated so that p_{odpt} results in a weighted average of its lag value and the mean. Result are reported in table (1) [3].

Table 1: The speed of price convergence before and after EMU

ΔPt	R.E coef. ["cluster product" s.e.]
$\Delta P00$	-0.481
	[0.088]***
$\Delta P10$	-0.692
	[0.234]***
$\Delta P01$	-0.619
	[0.379]
$\Delta P11$	-0.869
	[0.122]***
$\Delta P11emu$	-0.101
	[0.127]
$\Delta P00emu$	0.168
	[0.086]**
$\Delta P10emu$	0.244
	[0.254]
$\Delta P01emu$	0.24
	[0.457]
Constant	193.412
	[69.717]***
Observations	5438501
Number of id	834554
R-squared	0.15

Immediately we notice that export prices have been converging for each subset of countries, then we remark that speeds do differ and that (γ_{01}) is indeed insignificant and finally we spot that the convergence is much faster within EZ borders. Our attention is particularly focused on the sign taken up by γ_{ijemu}. Investigation of this second set of coefficients suggest a general slowdown in price convergence in the period 1999-2004; under this general conditions it is even more remarkable that the only γ_{euro} to take on the negative sign is the one concerning internal market price.

This section can be considered an initial assessment on European price convergence and a good start for the following analysis. We were able to prove that while convergence was already faster among EMU members there is weak evidence of its acceleration after 1999, which is reinforced by the fact that convergence in the same period slows down for the other sub-groups.

[3]Estimates were obtained using random effect model and adjusting the standard errors for product heteroschedasticity. 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

4.2 Pricing to the euro-market

4.2.1 Pooled estimations

This first study of the evolution of European markets during the "EMU-age" is carried out following Knetter (1989). We regress the log of unit export prices on time-product specific effect, which proxy variation in production cost, destination specific effects which capture import price elasticity and measure the existence of imperfect competition in each given market and, finally, the log of the bilateral exchange rate per partner. The log of price is expressed in units of exporter currency, the exchange rate is in units of the exporter currency per one unit of the importer currency; it highlights exporters attitude to dampen or exacerbate price volatility when exchange rates fluctuate.

$$\log\left(p_{nc}\right)_{odtp} = c + d_{tp} + d_{dp} + \sum_{d} \beta_d * \log(er)_{od} + \sum_{d} \beta_{d99} * \log(er)_{od99} \tag{11}$$

When d_{dp} is different from zero, a market is segmented, if on top of that β_d is also significant then the demand schedule is non iso-elastic and the markup charged to consumers varies along with the exchange rate. Finally, a negative sign on β_{d99} tends to reduce price stabilization in the destination market, which means that exporters perceive a lower elasticity of substitution after 1999. In more elastic markets optimality conditions impose to stabilize prices even more firmly.
The reasons that may lead to a break in the parameter in 1999 may be diverse, not only the formation of the EMU. Treating separately each destination market we do not force this cause to be common to a subset of countries representing the Eurozone. Because of this we name the first equation the unrestricted model and present below an alternative specification (the restricted model) where euro members are treated as a single nation. If the reason is common to members then γ_2 will be significant.

$$\begin{aligned} \log\left(p_{nc}\right)_{odyp} = c + d_{tp} + d_{dp} + \sum_{d \neq euro_d} \beta_d * \log(er)_{od} + \\ + \sum_{d \neq euro_{d99}} \beta_{d99} * \log(er)_{od99} + \gamma_1 \log(EUer) + \gamma_2 \log(Euroer) \end{aligned} \tag{12}$$

Equation (12) is a modification of (11), where instead of nineteen β_d (the number of destination countries in our sample) we have only eight of them (one for each non euro destination), while the eleven euro members are treated as a whole group and the average pricing is captured in γ_1. The different behaviour, if any, after 1999 is isolated in γ_2. In this equation we are aware of manipulating the structure of the model, especially for unit values of goods exported from non Eurozone to the Eurozone, since in the period 1995-1999 the 11 member currencies were freely and "independently" floating vis-a-vis non European currencies. Trying to capture in one parameter, γ_1, the reaction of exporters to 11 different currencies is an approximation, but we deem it necessary to be able to read γ_2 as a difference in difference estimate, which is what matters most in this literature. Finally it is worth reminding the reader that the Eurozone has been subject to very similar depreciation and appreciation in the bilateral exchange rate vis-a-vis external countries far before the beginning of the EMU-age. To confirm what we say we report in the appendix the evolution of bilateral exchange rate with US$ and appreciation depreciation of each member ex rate with the US over the sample period.

To focus specifically on exports of the most important goods for the origin country, the analysis was restricted to those products with a relevant value of trade (trade larger than the 10th percentile) [4], exported to every destination, in every period. For Canada and Norway these restrictive conditions implied that only one product was left. The number of datapoints per country are reported at the bottom of tables (2(a)),(2(b)), (3(a)) and (3(b)), (3(c)). The number of products is obtained by dividing data points by the number of years and partners ($10 * 18 = 180$).

Finally while results of the unconstrained model,equation (11) are reported in the appendix , below are collected outcomes of the constrained model, where the Eurozone is explicitly treated as a single nation.

Being that the bilateral exchange rate is expressed in units of the exporter per unit of the importer currency, a depreciation of the exporter currency will raise the value of $exrate$. If producers want to stabilize the price in the destination market, then p_{nc} must decrease/increase to offset at least partially any appreciation/depreciation of their currency. In general, we expect a positive sign on β_d and γ_1, while we have no priors on β_{d99} and γ_2.

Interpretation of the exchange rate coefficient is intuitive and represented by the percentage change of the exporter price in response to a given depreciation/appreciation rate. For instance if the exchange rate depreciates by 20% and β_d is 0.4 then price will adjust by 8% to counteract exchange rate movements.

Results show that pricing policy after 1999, vis a vis almost all trading partners, were modified by Japan, Sweden, United Kingdom and Denmark but only the last three have done so systematically for the whole Eurozone (see results of the constrained model). Remarkably, the fact that producers operating inside the European Union have modified their pricing strategy as a consequence of change in Europe market structure, induce to think that the

[4]For United Kingdom, Germany, Italy and France products were so numerous that to estimate the equation the bar was raised to the 50th percentile.

Table 2: Pricing to the Euro-Market: pooled estimations for "in-out" export prices

(a)

exporter	CANADA		SWITZERLAND		DENMARK		GREAT BRITAIN	
	constrained		constrained		constrained		constrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CANADA			0.298	-0.352	-0.06	-0.017	-0.446	-0.098
			[0.297]	[0.373]	[0.458]	[0.040]	[0.379]	[0.047]**
SWITZERLAND	-0.461	2.732			0.815	-0.016	0.096	-0.063
	[0.639]	[0.644]***			[0.677]	[0.026]	[0.188]	[0.048]
DENMARK	-0.333	0.033	0.613	-0.014			-0.003	-0.02
	[0.757]	[0.036]	[0.416]	[0.017]			[0.194]	[0.017]
GREAT BRITAIN	0.605	0.038	-0.18	0	0.158	-0.015		
	[1.923]	[0.255]	[0.170]	[0.028]	[0.338]	[0.014]		
JAPAN	-0.676	0.004	-0.14	0	0.218	0.039	-0.218	-0.023
	[0.782]	[0.025]	[0.183]	[0.006]	[0.341]	[0.015]**	[0.166]	[0.008]***
NORWAY	-1.737	0.132	-0.219	-0.018	0.407	-0.953	-0.587	-0.006
	[1.045]*	[0.090]	[0.433]	[0.016]	[0.777]	[0.524]*	[0.230]**	[0.018]
SWEDEN	0.219	-0.034	0.019	-0.025	0.327	0.102	0.13	-0.023
	[0.822]	[0.050]	[0.217]	[0.014]*	[0.465]	[0.144]	[0.200]	[0.017]
USA	-0.192	0.092	-0.26	0.094	0.154	-0.05	0.774	-0.156
	[0.640]	[0.054]*	[0.173]	[0.073]	[0.331]	[0.021]**	[0.319]**	[0.075]**
EMU	0.037	-0.032	0.452	0.001	0.226	0.007	0.289	-0.006
	[0.607]	[0.019]*	[0.148]***	[0.002]	[0.291]	[0.004]*	[0.110]***	[0.003]*
Constant	-0.277		5.177		5.058		3.512	
	[1.027]		[0.270]***		[0.220]***		[0.286]***	
Observations	180		34560		14760		19620	
Number of groups	18		3456		1476		1962	
R-squared	0.03		0.19		0.16		0.72	

(b)

exporter	JAPAN		NORWAY		SWEDEN		USA	
	constrained		constrained		constrained		constrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CANADA	0.287	0.001	-0.805	0.182	-0.371	0.038	-1.298	0.241
	[0.139]**	[0.005]	[0.983]	[0.072]**	[0.276]	[0.025]	[0.337]***	[0.110]**
SWITZERLAND	-0.091	0.006	0.302	-0.054	-0.026	0.007	-0.286	0.123
	[0.128]	[0.006]	[1.737]	[0.069]	[0.234]	[0.015]	[0.273]	[0.154]
DENMARK	0.136	0.015	0.115	-0.654	-0.11	0.055	-0.151	-0.045
	[0.143]	[0.012]	[1.088]	[0.696]	[0.254]	[0.108]	[0.245]	[0.033]
GREAT BRITAIN	-0.278	-0.035	0.106	-0.015	0.005	-0.002	0.017	-0.245
	[0.089]***	[0.004]***	[0.725]	[0.032]	[0.213]	[0.012]	[0.254]	[0.082]***
JAPAN			0.351	-0.078	-0.173	0.002	-0.268	0.009
			[0.761]	[0.044]*	[0.203]	[0.015]	[0.176]	[0.009]
NORWAY	0.381	0.053			-0.641	0.383	0.529	-0.029
	[0.165]**	[0.013]***			[0.349]*	[0.254]	[0.293]*	[0.033]
SWEDEN	-0.234	0.01	-1.348	1.456			-0.302	0.014
	[0.150]	[0.015]	[1.286]	[0.866]*			[0.200]	[0.025]
USA	0.025	-0.027	0.043	0.084	0.13	-0.01		
	[0.138]	[0.005]***	[0.701]	[0.043]*	[0.195]	[0.016]		
EMU	0.52	0	0.165	-0.004	0.536	-0.011	0.304	0.001
	[0.080]***	[0.003]	[0.571]	[0.011]	[0.149]***	[0.003]***	[0.130]**	[0.005]
Constant	7.311		5.835		5.189		5.313	
	[0.175]***		[0.399]***		[0.088]***		[0.283]***	
Observations	17460		3420		30060		16020	
Number of groups	1746		342		3006		1602	
R-squared	0.48		0.18		0.32		0.21	

Fixed effect estimates, where panel dimension is identified by combination of destination-product. The first product and the first year have been dropped to avoid perfect multicollinearity, all d_{dp} and d_{yp} are interpretable as difference to the base case embodied in the constant term. Robust standard errors are in square brackets. * significant at 10%;** significant at 5%; *** significant at 1%.

Table 3: Pricing to the Internal Market: pooled estimations for "in-in" export prices

(a)

exporter	AUSTRIA		BELGIUM		FINLAND		FRANCE	
	constrained		constrained		constrained		constrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CANADA	-0.093	0.021	-0.38	0.081	0.298	0.054	-0.006	0.121
	[0.410]	[0.023]	[0.351]	[0.017]***	[0.653]	[0.058]	[0.436]	[0.041]***
SWITZERLAND	0.181	-0.021	0.778	0.001	-0.723	0.025	0.014	0.003
	[0.726]	[0.022]	[0.615]	[0.013]	[1.015]	[0.051]	[0.616]	[0.027]
DENMARK	0.383	-0.016	4.675	0.02	3.603	0.359	-0.099	-0.05
	[2.549]	[0.068]	[1.818]**	[0.018]	[4.369]	[0.250]	[6.488]	[0.328]
GREAT BRITAIN	0.587	-0.024	0.696	-0.006	0.29	-0.017	0.389	0.008
	[0.343]*	[0.012]**	[0.233]***	[0.007]	[0.503]	[0.022]	[0.331]	[0.015]
JAPAN	0.213	-0.076	0.342	-0.086	0.551	0.035	0.552	-0.026
	[0.357]	[0.021]***	[0.293]	[0.045]*	[0.599]	[0.027]	[0.346]	[0.017]
NORWAY	0.934	0.167	0.71	-0.004	0.772	-0.187	0.322	-0.306
	[0.626]	[0.083]**	[0.523]	[0.024]	[0.725]	[0.129]	[0.596]	[0.160]*
SWEDEN	-0.061	0.044	0.565	-0.001	0.423	-0.118	-0.52	0.145
	[0.498]	[0.073]	[0.327]*	[0.015]	[0.643]	[0.091]	[0.588]	[0.114]
USA	0.5	0.011	0.833	-0.015	0.496	-0.027	0.761	0.011
	[0.336]	[0.015]	[0.255]***	[0.012]	[0.510]	[0.029]	[0.325]**	[0.022]
EMU	-0.352	-0.012	-0.288	0.004	0.199	0.018	0.077	-0.006
	[0.313]	[0.004]***	[0.213]	[0.003]	[0.470]	[0.007]***	[0.286]	[0.004]
Constant	5.765		5.705		4.642		4.987	
	[0.163]***		[0.237]***		[0.425]***		[0.239]***	
Observations	15840		18540		6300		9900	
Number of groups	1584		1854		630		990	
R-squared	0.15		0.2		0.12		0.19	

(b)

exporter	GERMANY		GREECE		IRELAND		ITALY	
	constrained		constrained		constrained		constrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CANADA	0.157	-0.011	0.013	-0.143	-2.459	-0.014	-0.193	-0.007
	[0.216]	[0.113]	[1.409]	[0.290]	[1.473]*	[0.051]	[0.221]	[0.005]
SWITZERLAND	0.225	0.216	-2.955	-0.673	-0.498	-0.041	-0.175	-0.006
	[0.306]	[0.083]***	[2.269]	[0.273]**	[1.446]	[0.028]	[0.162]	[0.003]*
DENMARK	1.073	0.017	0.978	0.048	-7.024	-0.001	0.19	-0.009
	[1.347]	[0.015]	[2.308]	[0.055]	[8.688]	[0.145]	[0.207]	[0.004]**
GREAT BRITAIN	-0.006	-0.013	-0.122	1.276	-0.335	-0.092	-0.214	-0.01
	[0.131]	[0.013]	[1.344]	[0.726]*	[1.287]	[0.051]*	[0.169]	[0.003]***
JAPAN	0.064	-0.014	1.702	-0.034	0.019	-0.672	-0.156	-0.018
	[0.147]	[0.005]***	[1.033]*	[0.036]	[1.546]	[0.265]**	[0.149]	[0.012]
NORWAY	-0.268	-0.078	0.508	-0.114	-5.307	0.091	-0.659	-0.003
	[0.240]	[0.011]***	[2.515]	[0.067]*	[2.480]**	[0.056]	[0.243]***	[0.005]
SWEDEN	-0.064	0.008	-2.02	0.068	0.329	-0.061	-0.323	-0.018
	[0.201]	[0.009]	[1.905]	[0.046]	[2.541]	[0.101]	[0.263]	[0.005]***
USA	0.079	0.077	-0.142	-0.45	-3.84	0.098	0.151	-0.009
	[0.135]	[0.028]***	[0.999]	[0.381]	[1.311]***	[0.046]**	[0.144]	[0.004]**
EMU	0.175	0.003	2.56	0.001	-0.243	-0.027	0.355	-0.008
	[0.121]	[0.002]*	[1.092]**	[0.020]	[0.860]	[0.014]*	[0.118]***	[0.003]***
Constant	4.016		3.647		5.413		8.553	
	[0.219]***		[2.009]*		[3.357]		[0.444]***	
Observations	25740		1800		540		14400	
Number of groups	2574		180		54		1440	
R-squared	0.39		0.33		0.08		0.2	

(c)

exporter	NETHERLAND		PORTUGAL		SPAIN	
	constrained		constrained		constrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99
CANADA	-0.304	0.291	0.389	-0.033	0.634	0.025
	[0.366]	[0.162]*	[0.429]	[0.009]***	[0.457]	[0.012]**
SWITZERLAND	-0.947	-0.324	1.138	-0.025	0.526	0.027
	[0.715]	[0.137]**	[1.017]	[0.010]**	[0.819]	[0.012]**
DENMARK	-1.138	-0.022	1.982	0.007	-7.097	0.042
	[1.395]	[0.027]	[3.005]	[0.011]	[3.750]*	[0.020]**
GREAT BRITAIN	0.588	-0.024	0.526	-0.003	-0.087	0.011
	[0.211]***	[0.024]	[0.399]	[0.007]	[0.365]	[0.008]
JAPAN	0.549	-0.009	0.735	-0.158	-0.399	0.487
	[0.265]**	[0.011]	[0.445]*	[0.136]	[0.536]	[0.278]*
NORWAY	0.767	0.143	0.545	0.01	-0.352	0.034
	[0.497]	[0.029]***	[0.751]	[0.014]	[0.617]	[0.015]**
SWEDEN	0.842	0.063	-0.337	0.031	0.323	0.011
	[0.298]***	[0.016]***	[0.741]	[0.014]**	[0.628]	[0.013]
USA	0.687	-0.109	0.52	0.007	0.279	0.013
	[0.226]***	[0.051]**	[0.363]	[0.008]	[0.357]	[0.010]
EMU	-0.368	0	0.124	0	0.044	0.018
	[0.189]*	[0.003]	[0.337]	[0.005]	[0.325]	[0.004]***
Constant	2.924		5.935		7.983	
	[0.314]***		[0.780]***		[0.817]***	
Observations	31500		3420		11340	
Number of groups	3150		342		1134	
R-squared	0.61		0.22		0.14	

Fixed effect estimates, where panel dimension is identified by the combination of destination-product. The first product and the first year have been dropped to avoid perfect multicollinearity, all d_{dp} and d_{yp} are interpretable as difference to the base case embodied in the constant term. Robust standard errors are in square brackets.
* significant at 10%;** significant at 5%; *** significant at 1%

European Economic Union may be part of the story.

In the unrestricted model Austria, Belgium, Spain, Finland, Portugal, Italy and France reviewed strategic pricing to almost all partners but only Austria, Finland, Germany, Ireland, Italy and Spain did so vis-a-vis the whole Eurozone after the creation of the EMU.

The estimates of the euro's effect are plausible and of the order of *-3% to 2%*. Among non members the sign taken on by γ_2 is positive for Sweden and negative for Denmark and the UK. The coefficient captures the difference with respect to γ_1 and, broadly speaking, tends to be negative if γ_1 is large and positive when γ_1 is small, suggesting the existence of convergence to a common γ_1, common mark-up.

While for members, γ_2 is not a measure of mark up adjustment to the exchange rate (as the exchange rate has been eliminated in 1999), it captures exporters price modification to the Eurozone. Indeed a similar story can be told for members where γ_2 is negative for Italy, Austria and Ireland and tends to decrease only when γ_1 is in fact large relative to the group mean. This result is fully in line with the first hints from section 4.1, countries with low price levels raised their prices and countries starting from high price levels lowered them. The process is slow and changes do not appear to be revolutionary, they are always in the range of *-1 to 2%*.

The issue of Lucas critique, which we have discussed earlier in this work, has been checked with a simple but effective strategy. Our estimations have been repeated for different sample periods, namely excluding one year (1995) and then two (1995 and 2004), where the choice of the year to exclude has been made being careful to maintain a continuous sample period. As a result, while β coefficients are to some extent subject to Lucas critique, changes in such parameters captured by β_{d99} and γ_2 are shielded from it. This last finding induces to suppose that the parameter bias doesn't change much across time and that coefficients representing the difference in two level measure are not affected. This set of results is reported in the appendix (A.2.2).

4.2.2 Estimations of typical products

Although pooling cross products does not generate biases in the estimation of β_d, β_{d99}, γ_1, γ_2, as long as product data are used, market structure, segmentation and competition differ across goods and investigations of pricing to market are normally conducted separately for each product. The database we use, for its dimension, impedes a complete investigation of products by reporter. Here we describe results for the car-sector and some other typical products like chocolate for Switzerland, pasta for Italy, extra virgin olive oil for Greece Spain and Italy, beer for Germany, and whiskey for Ireland, mobile telephones for Sweden, Finland and Italy.

The equations (13) and (14) reproduced below are the product correspondent of equations

(11) and (12), where product-year and product-destination specific effects have simply been replaced by year and destination dummies.

$$\log{(p_{nc})_{ody}} = c + d_t + d_d + \sum_d \beta_d * \log(er)_{od} + \gamma_1 \log(EUer) + \gamma_2 \log(Euroer) \qquad (13)$$

$$\log{(p_{nc})_{ody}} = c + d_t + d_d + \sum_{d \neq euro_d} \beta_d * \log(er)_{od} + \gamma_1 \log(EUer) + \gamma_2 \log(Euroer) \qquad (14)$$

The appendix A.2.3 contains pictures of the EMU effect on mark-ups for each product composing the bundles of goods employed in pooled regressions.
Remarkably, as expected, Japanese reveal to keep their cars' prices almost constant in the destination market. This pricing strategy is implemented, as the results of the unrestricted model proves, without exception, with all its trading partners. In addition they offset 82% of the variation in the Euro-rate so that prices in the Eurozone stay almost unaltered. Finally $\gamma 2$ proves that Japanese car producers stabilize prices to the Eurozone even more after 1999. British producers also modified their pricing strategy to Eurozone but tend to stabilize export prices less than before. Surprisingly enough, Belgium moves its producer price almost one to one with the European exchange rates this attitude was also strengthened by 1.1% with the monetary union. Finally Germany does price the Euromarket but there is no evidence that it has modified its mark up after 1999.
The unconstrained model [5] shows that Germany prices only the most important markets like: Great Britain, Ireland, Italy, Japan and the USA. France is an example of a country pricing strategically only close markets like Spain, Austria, Switzerland,Great Britain and also Norway, Sweden and Japan. Italy finds it strategic to price only the British market.
The idea to analyze the car sector came from the need to find an important good exported by all countries, next table instead focuses on products that are typically exported only by a few countries and are renown worldwide. We analyze the olive oil exported by Greece, Spain, and Italy, pasta exported by Italy, beer by Germany and whisky by Ireland, Swiss, Belgium and Italian chocolate and finally Finnish, Swedish, and Italian mobile phones.
In general the pricing strategy of pasta and oil producers in Italy is common for the whole Eurozone, but has not undergone any modification with the monetary union. German beer-exporters set one price for Euroland and do not move it. They have also increased their policy of price stabilization by 2.8% with the EMU. The same is true for Irish whisky. Results for cellular phones are not reliable for a series of consideration: first, the sector

[5]Results of the unconstrained model for the car-sector and other typical goods are not reported in the appendix but are available upon request.

Table 4: Pricing to the car-sector

(a)

exporter	AUT		BEL		CHE		DEU		DNK	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CAN	-0.071	0.034	-1.677	0.135	2.147	3.837	-0.798	0.17	-2.889	-0.189
	[0.922]	[0.036]	[0.826]**	[0.050]***	[2.405]	[1.864]**	[0.489]	[0.187]	[6.240]	[0.250]
CHE	0.357	0.084	0.658	0.004			-0.763	0.213	-1.986	0.035
	[1.637]	[0.046]*	[0.607]	[0.009]			[0.519]	[0.142]	[4.424]	[0.124]
DNK	3.527	0.048	-0.014	-0.003	3.402	-0.038	0.401	-0.008		
	[3.364]	[0.120]	[1.008]	[0.013]	[3.579]	[0.152]	[1.059]	[0.019]		
GBR	13.429	-0.12	0.252	-0.027	-2.905	1.506	-0.008	-0.094	-0.982	-0.081
	[3.670]***	[0.153]	[0.477]	[0.011]**	[2.184]	[0.425]***	[0.268]	[0.029]***	[3.513]	[0.067]
JPN	-0.218	0.061	-0.616	-0.074	3.274	0.17	0.379	0.024	1.014	0.3
	[0.825]	[0.070]	[0.477]	[0.087]	[3.040]	[0.081]**	[0.364]	[0.014]*	[3.572]	[0.058]***
NOR	-0.08	0.505	0.325	0.012	3.157	-0.259	-0.103	-0.087	1.886	-2.53
	[0.845]	[0.157]***	[0.565]	[0.022]	[3.211]	[0.161]	[0.501]	[0.027]***	[4.262]	[1.566]
SWE	-0.115	0.155	-0.696	-0.019	3.524	0.029	-0.515	-0.014	0.168	-0.97
	[0.835]	[0.143]	[0.544]	[0.034]	[1.826]*	[0.103]	[0.395]	[0.016]	[4.910]	[1.190]
USA	0.043	0.04	-0.416	-0.02	2.679	-1.286	0.013	0.012	-1.614	0.465
	[0.693]	[0.028]	[0.480]	[0.017]	[2.143]	[0.660]*	[0.293]	[0.068]	[3.783]	[0.281]
EUexrate	**0.601**	**-0.032**	**0.944**	**0.011**	**-0.461**	**-0.004**	**0.656**	**-0.003**	**1.611**	**0.012**
	[0.680]	**[0.014]****	**[0.469]****	**[0.006]***	**[2.167]**	**[0.036]**	**[0.248]*****	**[0.003]**	**[3.520]**	**[0.042]**
Constant	2.413		4.933		2.647		4.659		6.117	
	[0.722]***		[0.288]***		[3.996]		[0.406]***		[3.087]**	
Observations	172		180		178		720		162	
R-squared	0.79		0.59		0.25		0.33		0.2	

(b)

exporter	ESP		FIN		FRA		GBR		ITA	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CAN	-4.231	0.053	-1.42	0.051	1.379	-0.164	-6.168	-1.114	5.988	-0.152
	[3.555]	[0.059]	[0.940]	[0.126]	[1.543]	[0.211]	[4.809]	[0.572]*	[4.179]	[0.061]**
CHE	0.315	-0.019	-0.723	0.047	1.175	-0.065	0.534	-1.238	0.909	0.001
	[0.711]	[0.020]	[1.980]	[0.103]	[0.343]***	[0.013]***	[1.931]	[0.655]*	[0.689]	[0.019]
DNK	-1.523	-0.015	-10.325	-0.64	-4.871	0.108	2.911	-0.506	0.003	0.007
	[4.090]	[0.038]	[3.510]***	[0.694]	[1.834]***	[0.177]	[2.185]	[0.290]*	[0.626]	[0.020]
GBR	0.357	-0.035	0.081	-0.013	1.068	-0.091			1.157	-0.026
	[0.429]	[0.022]	[0.610]	[0.018]	[0.243]***	[0.016]***			[1.857]	[0.013]*
JPN	-0.076	-0.177	0.144	0.041	0.785	0.078	-2.264	-0.143	0.844	-0.03
	[1.028]	[0.592]	[0.666]	[0.023]*	[0.217]***	[0.013]***	[1.714]	[0.083]*	[1.086]	[0.059]
NOR	-1.697	-0.018	0.267	-0.018	1.381	-0.522	0.177	-0.316	-0.222	0.008
	[0.978]*	[0.038]	[0.835]	[0.150]	[0.553]**	[0.174]***	[1.191]	[0.198]	[1.108]	[0.024]
SWE	0.342	0.02	0.411	0.385	0.831	0.03	1.448	-0.406	-0.244	0.014
	[0.627]	[0.030]	[0.747]	[0.137]***	[0.421]**	[0.094]	[2.063]	[0.276]	[1.738]	[0.023]
USA	-0.424	-0.011	-0.67	-0.049	-2.166	0.258	-8.08	-2.211	4.343	-0.005
	[0.780]	[0.033]	[0.720]	[0.067]	[1.698]	[0.223]	[7.288]	[1.223]*	[1.744]**	[0.070]
EUexrate	**0.391**	**0**	**0.187**	**0.012**	**0.225**	**0.002**	**0.785**	**-0.176**	**-0.064**	**0.001**
	[0.370]	**[0.019]**	**[0.610]**	**[0.010]**	**[0.196]**	**[0.004]**	**[0.616]**	**[0.053]*****	**[1.463]**	**[0.013]**
Constant	7.231		4.45		4.143		3.865		5.232	
	[1.223]***		[0.558]***		[0.241]***		[1.824]**		[5.850]	
Observations	176		179		360		540		180	
R-squared	0.12		0.6		0.2		0.71		0.4	

Table 5: Pricing to the car-sector

(a)

exporters	JPN		NLD		SWE		USA	
importers	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CAN	-0.07	-0.005	3.504	1.545	3.16	0.13	1.234	-0.12
	[0.158]	[0.006]	[2.993]	[1.841]	[3.182]	[0.254]	[0.697]*	[0.187]
CHE	0.129	0.031	1.29	-0.098	-0.528	0.153	-0.155	-0.553
	[0.110]	[0.006]***	[1.247]	[0.281]	[2.071]	[0.132]	[0.879]	[0.485]
DNK	0.079	0.017	5.084	0.068	-3.96	-0.392	0.167	-0.129
	[0.188]	[0.016]	[2.709]*	[0.053]	[1.998]**	[0.768]	[0.909]	[0.120]
GBR	-0.33	-0.029	0.259	-0.045	6.093	-0.353	0.415	0.576
	[0.115]***	[0.006]***	[0.736]	[0.067]	[2.956]**	[0.172]**	[0.627]	[0.193]***
JPN			-1.5	-0.12	4.702	-0.024	0.552	-0.002
			[1.324]	[0.077]	[2.587]*	[0.104]	[0.377]	[0.016]
NOR	0.103	0.052	0.639	-0.053	-2.03	0.698	1.384	-0.206
	[0.149]	[0.014]***	[0.966]	[0.050]	[2.759]	[1.648]	[0.565]**	[0.074]***
SWE	0.091	0.083	-0.238	-0.028			0.139	-0.05
	[0.243]	[0.028]***	[0.746]	[0.050]			[0.411]	[0.056]
USA	0	0.011	-1.461	0.651	6.404	-0.9		
	[0.348]	[0.016]	[2.206]	[0.844]	[5.861]	[0.682]		
EUexrate	**0.819**	**0.027**	**0.279**	**0.01**	**-3.701**	**-0.016**	**-0.43**	**-0.011**
	[0.069]* **	**[0.006]*** **	**[0.706]**	**[0.008]**	**[2.437]**	**[0.028]**	**[0.222]***	**[0.013]**
Constant	11.831		3.461		2.801		8.357	
	[0.167]***		[1.197]***		[1.391]**		[0.485]***	
Observations	360		179		180		540	
R-squared	0.52		1		0.3		0.23	

Estimates have been obtained with a panel fixed effect where panel dimension is identified by the combination of destination-product. Robust standard errors are in square brackets. * significant at 10%;** significant at 5%; *** significant at 1%.

Table 6: Pricing to typical products

product	olive oil		olive oil		olive oil		pasta		beer		whiskie	
exporter	ESP		GRC		ITA		ITA		DEU		IRL	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CAN	0.415	0.023	3.059	-0.024	-1.261	0.001	-1.008	-0.012	0.237	-0.156	-0.195	-0.418
	[0.566]	[0.019]	[2.398]	[0.049]	[0.448]***	[0.014]	[0.966]	[0.013]	[0.330]	[0.257]	[0.818]	[0.115]***
CHE	0.137	0.041	0.925	0.035	-1.476	-0.002	-0.592	-0.011	-1.775	0.13	0.255	0.556
	[1.156]	[0.021]**	[2.289]	[0.041]	[0.349]***	[0.012]	[0.600]	[0.006]*	[0.788]**	[0.280]	[1.129]	[0.157]***
DNK	7.819	-0.006	2.142	0.061	-1.923	-0.04	0.757	0	11.631	0.232	-0.005	0
	[1.402]***	[0.016]	[3.625]	[0.058]	[0.408]***	[0.016]**	[0.995]	[0.010]	[3.255]***	[0.084]***	[0.535]	[0.019]
GBR	-0.128	0.002	1.764	0.027	-0.47	-0.013	-0.571	0.038	-0.564	0.031	-2.063	1.799
	[0.386]	[0.006]	[2.212]	[0.037]	[0.372]	[0.010]	[0.884]	[0.014]***	[0.302]*	[0.059]	[1.059]*	[0.478]***
JPN	0.23	0.345	4.948	-0.479	-0.731	-0.047	-0.133	-0.045	-1.332	-0.027	-1.618	0.012
	[0.449]	[0.143]**	[2.741]*	[0.331]	[0.309]**	[0.030]	[0.538]	[0.039]	[0.481]***	[0.033]	[0.987]	[0.039]
NOR	0.869	0.006	3.438	-0.014	-1.414	0.02	-0.675	0.014	-2.647	0.201	-1.314	-0.004
	[0.646]	[0.017]	[2.461]	[0.072]	[1.025]	[0.018]	[0.820]	[0.012]	[1.450]*	[0.093]**	[1.614]	[0.043]
SWE	0.704	0.019	0.991	0.024	0.783	-0.023	0.139	-0.01	-2.185	0.21	-1.3	-0.054
	[0.544]	[0.013]	[1.828]	[0.051]	[0.996]	[0.016]	[1.188]	[0.017]	[0.662]***	[0.066]***	[0.823]	[0.025]**
USA	0.35	0	2.648	-0.013	-0.873	-0.006	-1.059	0.015	-0.435	0.071	-0.559	-1.133
	[0.413]	[0.008]	[2.314]	[0.043]	[0.324]***	[0.011]	[0.454]**	[0.007]**	[0.424]	[0.142]	[0.725]	[0.347]***
Eurozone	**-0.171**	**-0.002**	**-2.38**	**-0.013**	**0.821**	**-0.019**	**0.899**	**-0.01**	**1.057**	**0.028**	**1.854**	**0.001**
	[0.385]	**[0.007]**	**[2.159]**	**[0.047]**	**[0.318]****	**[0.012]**	**[0.401]****	**[0.006]**	**[0.325]*****	**[0.009]*****	**[0.699]*****	**[0.008]**
Constant	4.893		10.698		6.964		4.224		2.548		5.343	
	[0.646]***		[3.849]***		[1.142]***		[1.440]***		[0.705]***		[1.574]***	
Observations	180		172		180		540		180		180	
R-squared	0.88		0.16		0.81		0.16		0.35		0.57	

product	chocolate		chocolate		chocolate		cell		cell		cell	
exporter	CHE		BEL		ITA		FIN		ITA		SWE	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
CAN	1.128	-0.581	-0.376	0.113	-0.205	0.066	9.365	0	-1.834	0.353	-4.936	-0.106
	[0.685]	[0.586]	[1.304]	[0.053]**	[1.763]	[0.047]	[4.386]**	[0.000]	[9.729]	[0.163]**	[3.084]	[0.312]
CHE			-1.13	0.129	-2.297	0.021	21.509	-1.073	-0.658	0.01	-3.967	0.015
			[2.815]	[0.061]**	[1.536]	[0.026]	[30.855]	[1.174]	[4.930]	[0.059]	[2.253]*	[0.161]
DNK	-6.054	0.045	-1.111	0.102	0.402	0.025	-19.317	2.06	13.842	0.2	-3.464	0.995
	[1.656]***	[0.092]	[2.891]	[0.039]***	[0.989]	[0.028]	[26.543]	[2.128]	[8.408]	[0.149]	[3.572]	[1.245]
GBR	0.929	-0.051	-1.209	0.047	1.593	0.01	-7.148	-0.394	7.82	0.122	-6.172	0.418
	[0.472]*	[0.047]	[0.931]	[0.013]***	[1.426]	[0.016]	[3.330]**	[0.210]*	[3.196]**	[0.039]***	[2.874]**	[0.135]***
JPN	1.231	0.033	-1.231	0.057	1.317	-0.093	-4.664	0	8.993	-0.031	-1.523	-0.186
	[0.586]**	[0.014]**	[0.961]	[0.049]	[1.057]	[0.075]	[5.058]	[0.000]	[3.309]***	[0.330]	[3.613]	[0.224]
NOR	1.363	-0.051	-0.19	-0.249	-7.328	0.079	1.625	1.877	-2.558	-0.02	-5.504	4.227
	[2.503]	[0.068]	[1.691]	[0.101]**	[3.821]*	[0.086]	[6.258]	[2.094]	[8.577]	[0.097]	[3.516]	[2.409]*
SWE	2.445	0.085	1.956	-0.092	-1.766	0.044	16.265	1.019	-9.834	0.217		
	[0.867]***	[0.051]*	[2.088]	[0.104]	[2.538]	[0.029]	[4.848]***	[1.170]	[7.212]	[0.102]**		
USA	0.423	0.081	-1.471	0.024	0.121	0.029	3.711	-0.146	9.696	0.035	-6.822	0.308
	[0.538]	[0.186]	[0.975]	[0.034]	[1.157]	[0.020]	[5.291]	[0.662]	[2.893]***	[0.089]	[3.170]**	[0.406]
Eurozone	**-0.749**	**0.022**	**1.072**	**0.011**	**-0.771**	**0.007**	**1.789**	**0.05**	**-8.267**	**0.055**	**4.084**	**-0.044**
	[0.534]	**[0.007]*****	**[0.939]**	**[0.013]**	**[1.068]**	**[0.018]**	**[3.607]**	**[0.083]**	**[1.824]*****	**[0.028]***	**[2.528]**	**[0.038]**
Constant	0.299		4.539		15.358		5.813		47.063		7.534	
	[1.026]		[0.762]***		[4.289]***		[4.249]		[7.549]***		[1.318]***	
Observations	180		180		172		130		533		144	
R-squared	0.44		0.34		0.28		0.42		0.25		0.34	

Estimates have been obtained with a panel fixed effect where panel dimension is identified by the combination of destination product. Robust standard errors are in square brackets. * significant at 10%;** significant at 5%; *** significant at 1%.

is in continuous evolution, new models appear on the market every year and this makes the category really heterogeneous, in addition, for technological goods, prices tend to drop dramatically after a few years. The two reasons together can justify the prevalence of large and negative values on the β_d coefficients. In general a coefficient that is too big or too negative may also indicate the presence of an aggregation bias.

5 Concluding remarks

This paper sets the bases and shows the way for studying the evolution of the Euro-market's segmentation. The technique applied, although largely accepted and used, is not perfect when other than firm level data are employed in the estimations. We lingered on the bias coming from the usage of too aggregate data.

While previous empirical literature on price convergence focused exclusively on internal market convergence, it neglected to consider the importance Euroland may have acquired vis-a-vis its main trading partners and the effect that transaction costs reduction produced on their pricing strategies. Here we attempt a first measurement of whether exporters from within and outside the Eurozone have a new perception of the euro-block.

The study provides separately two measures of prices reaction to exchange rate movements which need different interpretations. In the pooled regression estimates can be read, as an average response, to the exchange rate of the goods' price in the basket. Although a-typical in this literature, a pooled approach was necessary to have a single comprehensive measure of exporters reaction to the EMU creation. Indeed we obtained a couple of interesting findings. Initially, on average, among non-members those with a large exchange rate coefficient tended to reduce it after 1999 and those with relatively small ones tended to increase the reaction to exchange rate movements. All in all foreign exporters to the Eurozone are slowly harmonizing their pricing strategies.

For EMU members the logic applies differently, after 1999, when the exchange rate was eliminated, we expected prices to converge in the internal market and indeed the γ_2 coefficient captures possible convergence toward a mean European price level. We did find some hints of significant coefficients negative for countries starting from high price levels and positive for nations starting out with lower price levels.

Interestingly, some of the most dynamic countries in terms of exports to Eurozone appear also to have significantly modified their pricing strategy to it: Austria, Belgium, Great Britain, Finland, Sweden and Canada.

The analysis of some special goods highlighted the tendency of exporters to be active in foreign markets only when the good is strategic for their economy: Japanese cars, Italian pasta and oil, German beer. At the same time, studying product markets separately evidenced that aggregation bias concentrates on those goods which are subject to frequent price revision, like technological goods.

Future research must try to reproduce this work, once available, with firm level data that avoid aggregation bias. Moreover, estimation can be repeated taking care of including only strategic and most homogeneous product-category and excluding heterogeneous categories and tech-goods subject to frequent price revision.

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A Appendices

A.1 The evolution of bilateral exchange rate

A.2 Alternative estimations and tests

A.2.1 Results from the unconstrained model

A.2.2 Lucas Critique: testing existence and severeness

A.2.3 A graphical representation of the impact EMU had on pricing of sample goods

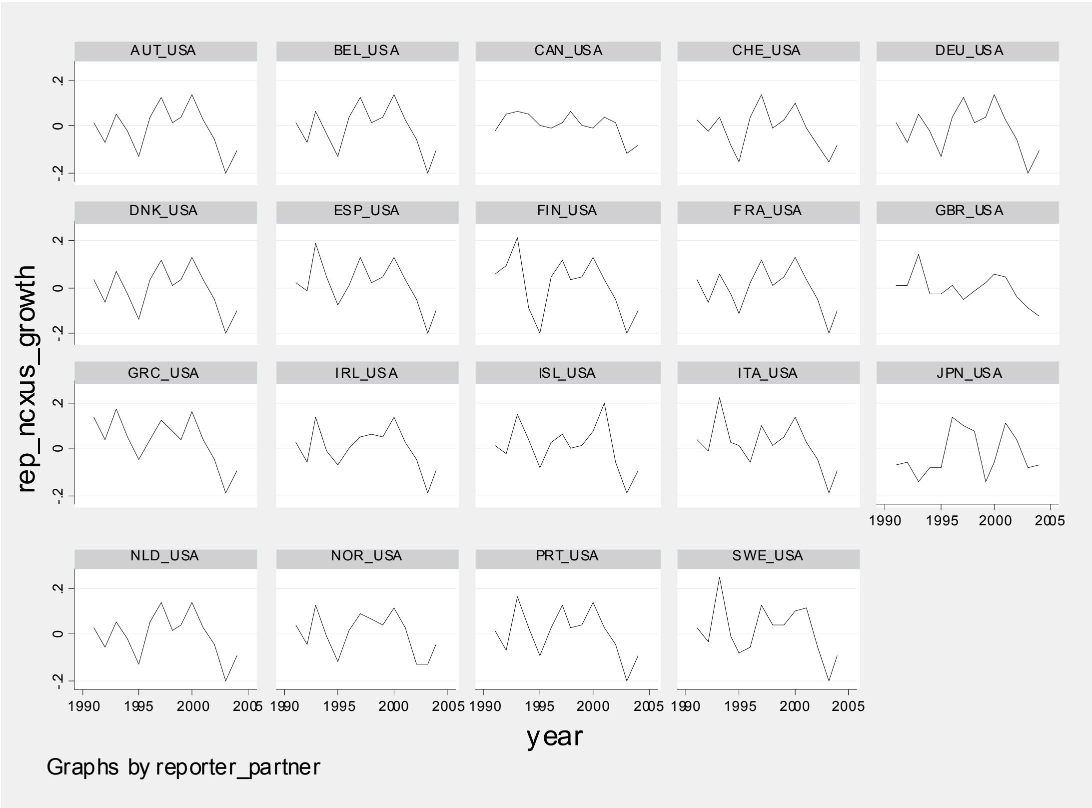
The numerous pictures reported in this appendix reproduce the outcomes of our pricing equation by product and exporters. In this section graphical representation replace tables, to communicate visually the results, because it less space-demanding.

For each origin country a basket of numerous and different goods was employed to obtain pooled estimates.

Here the price of each one of these goods has been separately analyzed and estimates of euro interaction terms per each product in the basket have been depicted. A blue bar corresponds to products with significant γ_2, insignificant effect are identified by empty bars.

Table 7: Bilateral exchange rates

(a)



(b)

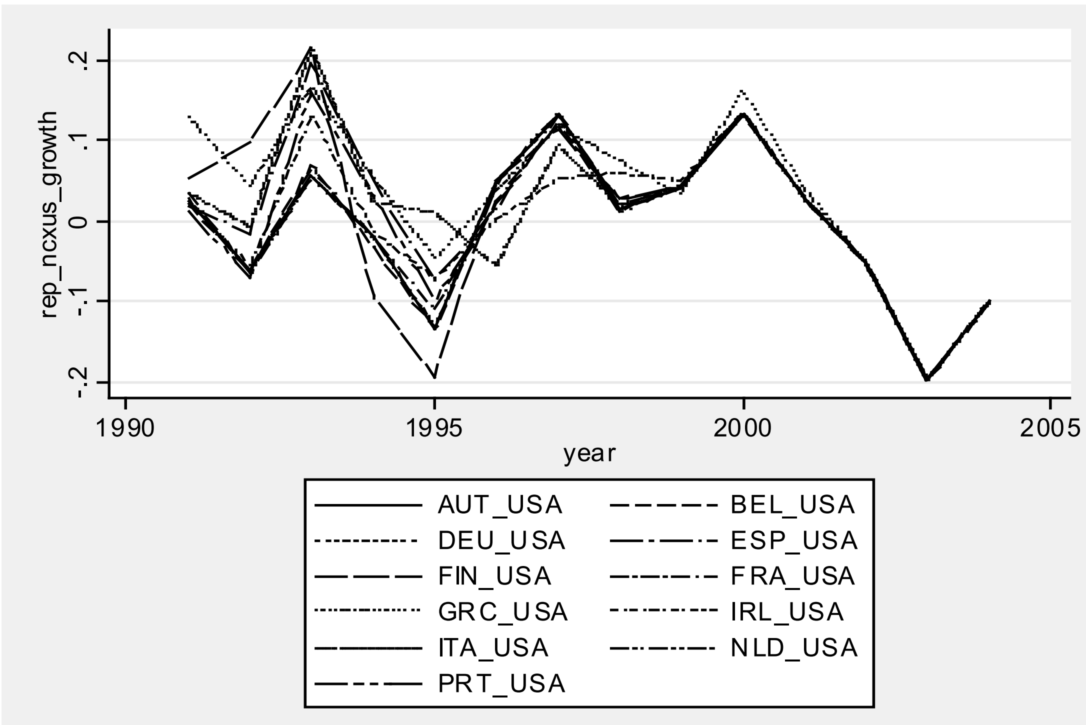


Table 8: Estimating the unconstrained model: the case of outside exporters

exporter	Pooled CAN only 1 product		Pooled CHE		Pooled DNK		Pooled GBR		Pooled NOR		Pooled JPN		Pooled SWE		Pooled USA	
	unconstrained		unconstrained		unconstrained		unconstrained		unconstrained		unconstrained		unconstrained		unconstrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
AUT	-2	-0.349	1.214	-0.037	-0.227	0.291	0.666	-0.066	-0.403	-0.091	0.253	0.073	1.665	-1.853	0.043	0.009
	[4.325]	[0.366]	[0.406]***	[0.018]**	[2.173]	[0.155]*	[0.218]***	[0.030]**	[2.367]	[0.288]	[0.208]	[0.027]***	[0.322]***	[0.310]***	[0.286]	[0.042]
BEL	0.781	-0.024	0.943	-0.009	-5.991	0.105	0.56	-0.062	1.118	-0.075	0.632	0.039	0.218	-0.536	0.56	-0.05
	[0.694]	[0.030]	[0.483]*	[0.013]	[2.154]***	[0.057]*	[0.213]***	[0.021]***	[1.440]	[0.075]	[0.141]***	[0.046]	[0.296]	[0.089]***	[0.236]**	[0.027]*
CAN			0.88	-0.412	0.285	-0.133	0.149	-0.292	-0.679	0.289	0.887	0.018	-0.152	0.506	-0.59	-0.164
			[0.278]***	[0.381]	[0.352]	[0.071]*	[0.404]	[0.100]***	[0.809]	[0.080]***	[0.151]***	[0.011]*	[0.246]	[0.082]***	[0.414]	[0.234]
CHE	-0.424	2.732			1.059	-0.125	0.593	-0.267	0.464	0.052	0.489	0.024	0.347	0.463	0.311	-0.281
	[0.215]*	[0.694]***			[0.616]*	[0.062]**	[0.205]***	[0.099]***	[1.737]	[0.076]	[0.138]***	[0.011]**	[0.236]	[0.077]***	[0.306]	[0.252]
DEU	-0.658	0.283	1.671	-0.302	-0.315	-0.104	0.464	-0.209	1.661	0.229	0.373	-0.004	0.609	0.531	0.421	-0.25
	[0.701]	[0.562]	[0.444]***	[0.185]	[1.761]	[0.068]	[0.204]**	[0.082]**	[1.004]*	[0.066]***	[0.123]***	[0.012]	[0.279]**	[0.088]***	[0.223]*	[0.156]
DNK	-0.296	0.033	1.178	-0.038			0.494	-0.096	-1.002	1.063	0.711	0.044	-1.504	4.291	0.256	-0.123
	[0.488]	[0.039]	[0.437]***	[0.025]			[0.222]**	[0.037]**	[1.214]	[0.885]	[0.154]***	[0.019]**	[0.411]***	[0.712]***	[0.264]	[0.052]**
ESP	-0.722	0.015	1.235	-0.011	3.951	0.069	0.507	-0.024	0.653	-0.048	1.803	-0.841	1.809	-0.264	0.648	-0.041
	[0.330]**	[0.014]	[0.430]***	[0.009]	[2.232]*	[0.030]**	[0.194]***	[0.016]	[1.294]	[0.035]	[0.344]***	[0.276]***	[0.364]***	[0.046]***	[0.218]***	[0.019]**
FIN	-0.534	-0.04	0.526	0.005	-2.639	-1.299	0.421	-0.087	-0.055	0.504	0.622	0.042	-0.608	2.065	0.023	-0.064
	[1.122]	[0.097]	[0.465]	[0.033]	[2.387]	[0.423]***	[0.218]*	[0.041]**	[1.100]	[0.308]	[0.183]***	[0.020]**	[0.296]**	[0.323]***	[0.267]	[0.059]
FRA	-0.724	0.088	-0.056	-0.003	3.722	-1.527	0.697	-0.067	-1.629	2.218	0.584	0.003	-0.468	2.435	0.516	-0.167
	[0.458]	[0.056]	[0.366]	[0.025]	[4.114]	[0.714]**	[0.204]***	[0.038]*	[1.161]	[0.509]***	[0.133]***	[0.017]	[0.380]	[0.435]***	[0.220]**	[0.050]***
GBR	0.641	0.038	0.257	0.041	0.454	-0.09			0.29	0.054	0.297	-0.021	0.496	0.304	0.066	0.047
	[1.965]	[0.274]	[0.112]**	[0.040]	[0.172]***	[0.038]**			[0.451]	[0.039]	[0.091]***	[0.008]**	[0.149]***	[0.052]***	[0.333]	[0.170]
GRC	-1.333	0.029	1.015	-0.013	0.144	0.053	-0.112	-0.024	-0.602	-0.051	0.91	-0.158	0.996	-0.257	0.598	-0.033
	[0.705]*	[0.021]	[0.347]***	[0.010]	[0.859]	[0.029]*	[0.180]	[0.014]*	[1.574]	[0.054]	[0.261]***	[0.084]*	[0.376]***	[0.038]***	[0.276]**	[0.020]*
IRL	6.457	0.26	-0.072	0.096	0.5	-0.06	0.701	-0.974	2.169	0.08	0.565	0.021	0.639	0.348	0.417	0.433
	[3.600]*	[0.541]	[0.393]	[0.067]	[0.968]	[0.044]	[0.357]**	[0.509]*	[1.958]	[0.061]	[0.198]***	[0.013]*	[0.383]*	[0.055]***	[0.288]	[0.245]*
ITA	4.391	-0.053	0.161	-0.005	0.251	0.037	1.202	-0.045	0.303	-0.038	0.394	-0.011	1.495	-0.144	0.365	-0.015
	[3.079]	[0.029]*	[0.185]	[0.004]	[0.532]	[0.016]**	[0.286]***	[0.011]***	[1.282]	[0.018]**	[0.111]***	[0.018]	[0.422]***	[0.024]***	[0.211]*	[0.011]
JPN	-0.639	0.004	0.336	-0.008	0.373	0.098	0.183	-0.053	0.567	-0.142			0.474	-0.3	0.093	-0.02
	[0.532]	[0.027]	[0.114]***	[0.008]	[0.180]**	[0.034]***	[0.161]	[0.016]***	[0.540]	[0.051]***			[0.148]***	[0.052]***	[0.174]	[0.017]
NLD	-0.762	0.018	1.177	-0.309	-0.743	-0.182	0.866	-0.219	1.002	0.128	0.698	0.022	0.422	0.604	0.311	-0.155
	[0.808]	[0.348]	[0.530]**	[0.136]**	[1.688]	[0.075]**	[0.229]***	[0.079]***	[0.987]	[0.074]*	[0.169]***	[0.015]	[0.261]	[0.095]***	[0.261]	[0.139]
NOR	-1.701	0.132	0.219	-0.039	-0.683	0.664	-0.088	-0.077			0.954	0.082	-6.265	8.689	0.937	-0.103
	[0.915]*	[0.097]	[0.419]	[0.022]*	[1.081]	[0.923]	[0.251]	[0.035]**			[0.173]***	[0.020]***	[1.069]***	[1.407]***	[0.311]***	[0.050]**
PRT	0.693	-0.066	-0.103	-0.015	5.221	0.045	0.454	-0.044	-1.259	-0.063	0.856	-0.264	0.579	-0.294	0.297	-0.035
	[0.657]	[0.030]**	[0.501]	[0.009]	[4.027]	[0.030]	[0.233]*	[0.016]***	[1.704]	[0.038]	[0.248]***	[0.142]*	[0.408]	[0.043]***	[0.357]	[0.023]
SWE	0.256	-0.034	0.51	-0.045	0.234	0.996	0.639	-0.095	0.329	-0.405	0.346	0.042			0.102	-0.058
	[0.598]	[0.054]	[0.199]**	[0.021]**	[0.438]	[0.480]**	[0.222]***	[0.034]***	[1.215]	[1.029]	[0.160]**	[0.021]*			[0.227]	[0.044]
USA	-0.156	0.092	0.123	0.194	0.476	-0.145	1.385	-0.482	0.138	0.174	0.583	-0.012	0.373	0.381		
	[0.220]	[0.058]	[0.125]	[0.101]*	[0.160]***	[0.050]***	[0.325]***	[0.168]***	[0.380]	[0.051]***	[0.131]***	[0.010]	[0.136]***	[0.067]***		
Constant	0.524		5.487		6.057		4.248		5.232		7.235		5.976		5.589	
	[1.378]		[0.347]***		[0.931]***		[0.347]***		[0.741]***		[0.196]***		[0.210]***		[0.315]***	
Observations	180		34560		14760		19620		3420		17460		30060		16020	
umber of grou	18		3456		1476		1962		342		1746		3006		1602	
R-squared	0.29		0.19		0.17		0.72		0.18		0.49		0.33		0.22	

Table 9: Estimating the unconstrained model: the case of internal exporters

(a)

exporter	Pooled Austria		Pooled Belgium		Pooled Spain		Pooled Finland		Pooled Greece		Pooled Ireland	
	unconstrained		unconstrained		unconstrained		unconstrained		unconstrained		unconstrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
AUT			-8.074	0.273	-0.366	0.165	-7.512	-0.416	3.323	-0.062	-3.125	-0.123
			[17.257]	[0.063]***	[2.965]	[0.046]***	[5.072]	[0.137]***	[4.523]	[0.097]	[2.512]	[0.057]**
BEL	-19.75	-0.382			-3.285	0.264	-1.375	-0.127	7.085	-0.11	2.601	-0.079
	[22.054]	[0.102]***			[2.232]	[0.078]***	[4.009]	[0.057]**	[3.939]*	[0.124]	[1.933]	[0.051]
CAN	-0.451	0.175	-0.738	0.185	0.669	0.094	0.404	0.266	0.091	-0.009	-0.066	-0.324
	[0.282]	[0.050]***	[0.289]**	[0.025]***	[0.331]**	[0.025]***	[0.457]	[0.096]***	[1.134]	[0.053]	[1.133]	[0.321]
CHE	-0.252	0.136	0.425	0.105	0.448	0.098	-0.752	0.241	2.232	-0.041	-2.915	-0.862
	[0.651]	[0.049]***	[0.573]	[0.022]***	[0.751]	[0.025]***	[0.900]	[0.092]***	[1.253]*	[0.030]	[2.235]	[0.316]***
DEU	68.721	0.197	-9.049	0.119	-0.447	0.094	0.253	0.253	-1.475	0.014	1.859	-0.401
	[82.491]	[0.049]***	[12.180]	[0.021]***	[1.968]	[0.024]***	[3.797]	[0.097]***	[3.281]	[0.036]	[2.268]	[0.222]*
DNK	0.979	0.522	4.165	0.219	-8.012	0.149	3.824	-0.892	-4.233	0.001	1.205	-0.013
	[2.620]	[0.169]***	[1.893]**	[0.039]***	[3.728]**	[0.039]***	[4.328]	[0.506]*	[9.249]	[0.152]	[2.538]	[0.075]
ESP	-0.592	-0.133	-0.1	-0.219			1.939	-0.052	3.27	0.367	-0.216	-0.07
	[2.208]	[0.040]***	[1.546]	[0.044]***			[3.283]	[0.036]	[3.231]	[0.544]	[2.255]	[0.030]**
FIN	-3.561	0.453	-1.413	0.161	-3.093	0.095			2.31	-0.016	0.866	-0.028
	[3.813]	[0.119]***	[2.511]	[0.034]***	[3.078]	[0.033]***			[4.318]	[0.054]	[1.595]	[0.083]
FRA	1.721	0.445	-0.719	0.218	-5.455	0.131	-0.069	-2.544	5.781	0.022	0.757	-0.041
	[1.550]	[0.136]***	[1.240]	[0.035]***	[3.195]*	[0.035]***	[3.126]	[1.209]**	[2.962]*	[0.059]	[1.938]	[0.067]
GBR	0.302	0.084	0.375	0.076	-0.037	0.07	0.484	0.11	2.216	-0.088	-0.635	2.113
	[0.176]*	[0.034]**	[0.130]***	[0.016]***	[0.185]	[0.020]***	[0.210]**	[0.050]**	[0.806]***	[0.054]	[0.840]	[0.909]**
GRC	-3.781	-0.043	-0.745	-0.186	0.183	-0.444	2.097	-0.093			-1.277	-0.029
	[1.097]***	[0.039]	[0.626]	[0.036]***	[0.867]	[0.173]**	[1.517]	[0.038]**			[1.694]	[0.035]
IRL	-0.199	0.091	0.182	0.095	-1.105	0.079	0.962	0.2	-2.018	0.038		
	[0.691]	[0.036]**	[0.544]	[0.017]***	[0.781]	[0.020]***	[1.210]	[0.059]***	[1.919]	[0.024]		
ITA	0.635	-0.069	0.341	-0.08	0.943	-0.123	-0.42	-0.037	1.797	0.063	-5.716	-0.063
	[0.480]	[0.020]***	[0.312]	[0.017]***	[0.634]	[0.043]***	[0.776]	[0.019]*	[1.009]*	[0.110]	[3.811]	[0.027]**
JPN	-0.011	-0.225	0.306	-0.361	-1.338	1.802	0.823	-0.055	2.572	-0.647	1.569	-0.058
	[0.175]	[0.046]***	[0.205]	[0.065]***	[0.537]**	[0.503]***	[0.365]**	[0.042]	[1.007]**	[0.271]**	[0.689]**	[0.042]
NLD	-18.667	0.128	14.238	0.129	-0.626	0.108	-0.783	0.307	6.968	-0.011	1.109	-0.321
	[9.114]**	[0.056]**	[12.842]	[0.023]***	[1.923]	[0.025]***	[3.771]	[0.117]***	[5.502]	[0.075]	[1.933]	[0.165]*
NOR	0.243	0.823	0.269	0.207	-0.379	0.142	1.709	-1.016	-2.706	0.097	0.49	-0.171
	[0.576]	[0.201]***	[0.489]	[0.046]***	[0.532]	[0.037]***	[0.609]***	[0.331]***	[2.387]	[0.059]	[2.463]	[0.082]**
PRT	2.815	-0.13	-1.964	-0.189	1.237	-1.813	2.945	-0.071	6.229	0.077	2.712	-0.043
	[2.276]	[0.038]***	[1.362]	[0.040]***	[2.959]	[0.571]***	[3.882]	[0.033]**	[4.964]	[0.701]	[3.316]	[0.035]
SWE	-0.62	0.833	0.165	0.222	0.429	0.122	0.953	-0.793	2.856	-0.054	-2.124	0.011
	[0.426]	[0.229]***	[0.282]	[0.042]***	[0.548]	[0.038]***	[0.479]**	[0.261]***	[2.499]	[0.104]	[1.763]	[0.063]
USA	0.101	0.145	0.472	0.08	0.293	0.078	0.583	0.144	-1.284	0.102	-0.086	-0.767
	[0.142]	[0.041]***	[0.154]***	[0.020]***	[0.157]*	[0.023]***	[0.213]***	[0.068]**	[0.819]	[0.048]**	[0.515]	[0.453]*
Constant	-0.838		5.406		10.861		5.227		5.266		2.545	
	[9.148]		[2.947]*		[1.517]***		[1.246]***		[4.457]		[2.603]	
Observations	15840		18540		11340		6300		540		1800	
umber of grou	1584		1854		1134		630		54		180	N
R-squared	0.15		0.2		0.14		0.13		0.1		0.34	

Table 10: Estimating the unconstrained model: the case of internal exporters

(a)

exporter	Pooled Netherland		Pooled Portugal		Pooled Germany		Pooled Italy		Pooled France	
	unconstrained		unconstrained		unconstrained		unconstrained		unconstrained	
importer	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99	exrate	exrate99
AUT	5.361	0.022	0.226	0.112	31.321	-0.008	0.502	-0.064	-0.641	-0.498
	[6.634]	[0.033]	[1.990]	[0.026]***	[37.676]	[0.016]	[0.201]**	[0.023]***	[1.527]	[0.081]***
BEL	5.096	0.017	0.54	0.158	7.759	-0.005	0.275	-0.067	0.103	-0.245
	[12.641]	[0.021]	[1.167]	[0.037]***	[6.521]	[0.011]	[0.240]	[0.030]**	[1.457]	[0.034]***
CAN	-0.603	0.155	0.517	0.026	0.313	0.053	0.187	-0.04	-0.09	0.412
	[0.338]*	[0.222]	[0.270]*	[0.014]*	[0.196]	[0.168]	[0.187]	[0.016]**	[0.334]	[0.053]***
CHE	-1.117	-0.48	1.184	0.035	0.349	0.294	0.18	-0.038	-0.176	0.293
	[0.705]	[0.215]**	[0.994]	[0.015]**	[0.313]	[0.172]*	[0.169]	[0.016]**	[0.552]	[0.044]***
DEU	-3.008	-0.63	1.509	0.078			0.783	-0.042	-0.095	0.356
	[4.982]	[0.474]	[1.082]	[0.012]***			[0.174]***	[0.016]***	[1.457]	[0.046]***
DNK	-1.355	0.017	1.833	0.096	1.318	0.005	0.525	-0.051	-0.29	-3.299
	[1.449]	[0.050]	[2.977]	[0.018]***	[1.365]	[0.027]	[0.242]**	[0.020]**	[6.652]	[0.499]***
ESP	0.864	0.016	-4.341	1.907	0.133	0.007	0.209	-0.114	-1.662	-0.15
	[1.163]	[0.013]	[4.457]	[0.297]***	[0.668]	[0.007]	[0.246]	[0.046]**	[2.660]	[0.020]***
FIN	-2.191	0.065	1.294	0.086	-0.254	-0.005	-0.094	-0.052		
	[2.123]	[0.057]	[1.892]	[0.017]***	[1.430]	[0.029]	[0.264]	[0.021]**		
FRA	-0.371	0.049	0.25	0.087	0.118	-0.004	0.648	-0.048	1.636	4.502
	[0.870]	[0.052]	[1.740]	[0.016]***	[0.621]	[0.027]	[0.195]***	[0.020]**	[2.027]	[0.700]***
GBR	0.239	-0.064	0.679	0.047	0.172	0.001	0.157	-0.039	0.444	0.187
	[0.124]*	[0.049]	[0.211]***	[0.011]***	[0.064]***	[0.030]	[0.102]	[0.014]***	[0.172]**	[0.026]***
GRC	-1.694	0.025	0.027	-0.745	-0.081	-0.004	-0.001	-0.16	0.509	-0.112
	[0.665]**	[0.014]*	[1.010]	[0.178]***	[0.337]	[0.008]	[0.166]	[0.064]**	[0.752]	[0.020]***
IRL	-0.923	0.066	2.065	0.047	0.68	0.033	0.491	-0.035	0.011	0.244
	[0.483]*	[0.058]	[1.124]*	[0.013]***	[0.378]*	[0.039]	[0.630]	[0.015]**	[0.867]	[0.032]***
ITA	0.042	0.005	0.154	-0.165	0.38	0.003			0.061	-0.078
	[0.284]	[0.009]	[0.580]	[0.027]***	[0.157]**	[0.005]			[0.501]	[0.010]***
JPN	0.16	0.001	0.329	0.53	0.242	-0.018	0.243	-0.104	0.744	-0.163
	[0.183]	[0.016]	[0.304]	[0.174]***	[0.084]***	[0.009]**	[0.113]**	[0.042]**	[0.195]***	[0.023]***
NLD			-0.107	0.065	1.812	-0.267	0.304	-0.039	-2.673	0.284
			[1.353]	[0.013]***	[3.112]	[0.278]	[0.176]*	[0.017]**	[1.408]*	[0.057]***
NOR	0.384	0.178	0.635	0.101	-0.071	-0.089	-0.29	-0.046	1.924	-2.122
	[0.473]	[0.049]***	[0.671]	[0.021]***	[0.210]	[0.023]***	[0.250]	[0.021]**	[0.543]***	[0.269]***
PRT	0.103	0.03			0.082	0	0.159	-0.132	1.467	-0.125
	[1.211]	[0.013]**			[0.895]	[0.007]	[0.257]	[0.049]***	[4.291]	[0.021]***
SWE	0.471	0.095	-0.228	0.125	0.12	-0.002	0.036	-0.061	0.306	-1.183
	[0.256]*	[0.040]**	[0.606]	[0.022]***	[0.168]	[0.021]	[0.250]	[0.021]***	[0.524]	[0.192]***
USA	0.37	-0.179	0.623	0.063	0.239	0.105	0.533	-0.041	0.668	0.246
	[0.148]**	[0.093]*	[0.133]***	[0.012]***	[0.077]***	[0.061]*	[0.080]***	[0.015]***	[0.160]***	[0.036]***
Constant	4.543		4.864		8.603		8.43		5.28	
	[2.413]*		[1.258]***		[4.275]**		[0.515]***		[1.016]***	
Observations	31500		3420		25740		14400		9900	
Number of groups	3150		342		2574		1440		990	
R-squared	0.61		0.25		0.4		0.2		0.2	

Estimates have been obtained with a panel fixed effect where panel dimension is identified by the combination of destination product. Robust standard errors are in square brackets. * significant at 10%;** significant at 5%; *** significant at 1%.

Table 11: Test parameters estimates for the severeness of lucas critique

Sample period	95-04		96-04		96-03	
Exporter	EUexrate	Euroexrate	EUexrate	Euroexrate	EUexrate	Euroexrate
AUSTRIA	-0.352	-0.012	-0.517	-0.011	-0.439	-0.011
	[0.313]	[0.004]***	[0.542]	[0.005]**	[0.550]	[0.005]**
BELGIUM	-0.288	0.004	-1.078	0.006	-1.014	0.004
	[0.213]	[0.003]	[0.339]***	[0.003]*	[0.348]***	[0.003]
CANADA	0.037	-0.032	0.056	-0.033	0.258	-0.032
	[0.607]	[0.019]*	[1.107]	[0.027]	[1.182]	[0.031]
DENMARK	0.226	0.007	0.081	0.009	0.25	0.01
	[0.291]	[0.004]*	[0.518]	[0.004]**	[0.522]	[0.004]**
FINLAND	0.199	0.018	0.495	0.018	0.589	0.02
	[0.470]	[0.007]***	[0.734]	[0.007]***	[0.773]	[0.007]***
FRANCE	0.077	-0.006	0.096	-0.004	0.043	-0.003
	[0.286]	[0.004]	[0.445]	[0.004]	[0.453]	[0.004]
GERMANY	0.175	0.003	-0.023	0.002	-0.018	0.002
	[0.121]	[0.002]*	[0.178]	[0.002]	[0.180]	[0.002]
GREAT BRITAIN	0.289	-0.006	0.999	-0.025	0.291	-0.006
	[0.110]***	[0.003]*	[1.298]	[0.016]	[0.140]**	[0.004]
GREECE	2.56	0.001	3.01	0.001	2.347	0.016
	[1.092]**	[0.020]	[1.551]*	[0.023]	[1.714]	[0.023]
IRELAND	-0.243	-0.027	0.999	-0.025	1.087	-0.021
	[0.860]	[0.014]*	[1.298]	[0.016]	[1.299]	[0.016]
ITALY	0.355	-0.008	0.353	-0.006	0.337	-0.003
	[0.118]***	[0.003]***	[0.193]*	[0.004]*	[0.193]*	[0.004]
JAPAN	0.52	0	0.609	0.002	0.574	0.002
	[0.080]***	[0.003]	[0.084]***	[0.004]	[0.091]***	[0.004]
NETHERLAND	-0.368	0	-1.214	0.001	-1.058	0.002
	[0.189]*	[0.003]	[0.327]***	[0.003]	[0.332]***	[0.003]
NORWAY	0.165	-0.004	-0.401	-0.006	-0.838	-0.01
	[0.571]	[0.011]	[0.648]	[0.012]	[0.699]	[0.012]
PORTUGAL	0.124	0	-0.612	-0.001	-1.014	0.004
	[0.337]	[0.005]	[0.519]	[0.005]	[0.348]***	[0.003]
SPAIN	0.044	0.018	-0.008	0.022	-0.198	0.021
	[0.325]	[0.004]***	[0.467]	[0.005]***	[0.480]	[0.005]***
SWEDEN	0.536	-0.011	1.177	-0.013	1.388	-0.014
	[0.149]***	[0.003]***	[0.254]***	[0.003]***	[0.275]***	[0.004]***
SWITZERLAND	0.452	0.001	0.506	0.001	0.554	0.001
	[0.148]***	[0.002]	[0.191]***	[0.003]	[0.193]***	[0.003]
USA	0.304	0.001	0.434	0.005	0.433	0.007
	[0.130]**	[0.005]	[0.151]***	[0.006]	[0.168]***	[0.006]

Estimates have been obtained with a panel fixed effect where panel dimension is identified by the combination of destination product. Robust standard errors are in square brackets. * significant at 10%;** significant at 5%; *** significant at 1%.

Figure 1: Product estimations

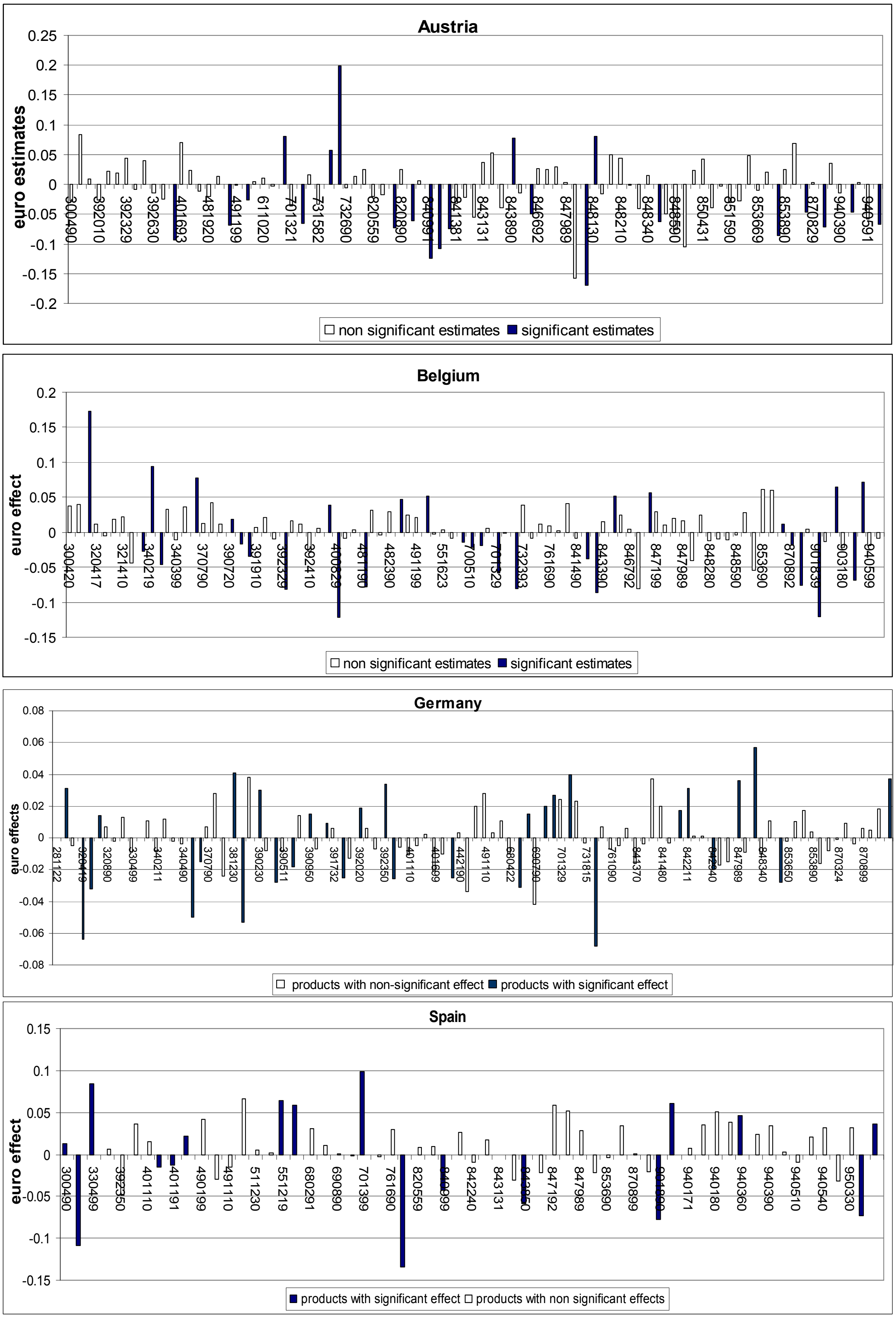


Figure 2: Product estimations

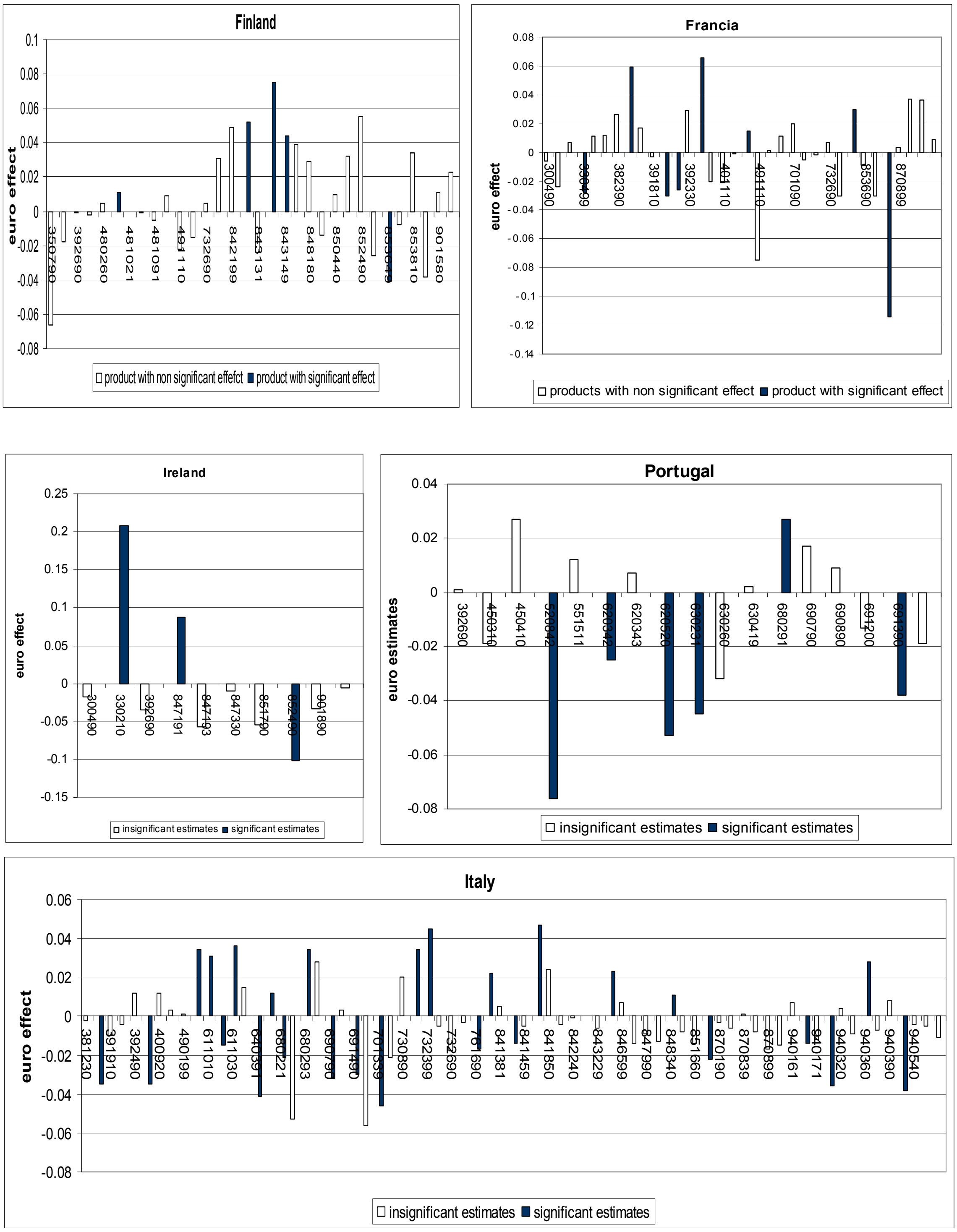


Figure 3: Product estimations non member countries