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Exchange rate pass-through to import prices in the Euro-area: a multicurrency investigation

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Abstract

Using a new database of actual import price data, and not unit value indices, for several euro area countries during the period between June 2005 and April 2011, we provide new results on the Exchange Rate Pass Through (ERPT). First, we use a multi-currency approach to distinguish between invoicing strategies across the most important currencies for euro area imports and show that the effective ERPT is primarily driven by the US Dollar ERPT. The firms which invoice in US Dollar (and in Chinese Yuan) are more concerned with demand conditions, while those which invoice in British Pound are more concerned with profit margins. Second, in contrast to several papers in the empirical literature that argue that ERPT is incomplete and its value is declining, we find that short run effective ERPT is incomplete, while long run effective ERPT is complete for a large number of products. Third, we uncover significant heterogeneity across products and countries: ERPT in US Dollar and British Pound appears higher than average for raw materials (e.g. petroleum products) and lower for transformed manufacturing products (chemical, pharmaceutical products and motor vehicles), and ERPT is higher in Spain than in the other euro area countries considered. Fourth, the 2008 global crisis triggered a temporary increase in the effective ERPT.

1 Introduction

The pass-through of exchange rate movements into import and consumer prices is at the heart of open macroeconomics. For policy makers, it is an important issue when making appropriate decisions in terms of economic policy (in particular monetary policy and exchange rate regime). It is widely accepted, theoretically and empirically, that exchange rate movements are only partially transmitted into import prices at least at the short run. This is commonly known as the phenomenon of incomplete exchange rate pass-through. Several papers in the theoretical literature try to explain and take into account this stylized fact. The micro-literature argues that exchange rate changes are partially passed through onto prices because exporting firms face a trade off between profit maximization and competitiveness in the destination market. This is the Pricing-to-Market literature. The macro-literature in turn argues that incomplete pass-through is the result of local import price stickiness due to the presence of a distributive sector in the importing country. Another important string of literature focuses on currency-invoicing, starting from the seminal paper of Grasman (1973) who studied the currency denomination of Swedish exports and imports.[1]

Several issues remain unsettled and the paper attempts to provide new answers. First, the paper relies on new data on import prices, and not on import unit values, the latter being solely the ratio of the value of a given shipment to its weight are subject to multiple biases when the bundle of goods changes over time. Second, although it has received recently a great deal of attention in the theoretical literature, empirical investigation of the link between exchange rate pass-through and currency invoicing has never been fully explored, namely the impact on the degree of ERPT of the currency choice for invoicing. The difficulty arises from data availability. Therefore, and unlike micro-data analysis, exchange rate pass-through elasticities into import prices have been estimated using aggregate measures of prices and trade-weighted exchange rate. This is a poor approximation of transaction that occurs at the level of extremely detailed goods, where the currency used for invoicing plays an important role in determining the extent of pass-through.[2] Therefore, to shed light on this issue, this study adopts a multi-currency approach of the exchange rate pass-through using aggregate import price index. This requires to distinguish between ***bilateral*** and ***multilateral*** (or *effective*) exchange rate pass-through. This distinction is important mainly due to the fact that trade patterns evolve over time and bilateral

[1] See Krugman (1987) and Anderton (2003) for the Pricing-to-Market literature, Monacelli (2003) for the macro-literature, and Bacchetta and Van Wincoop (2005), Goldberg and Tille (2008), and Cui et al. (2009) for the currency-invoicing literature. Moreover, care must be taken when interpreting the term currency-invoicing. In practice, there may be a difference between the currency in which firms set prices and the currency of transaction. What we refer hereafter currency-invoicing is the currency in which firms set prices.

[2] The extent of pass-through is different depending on which currency prices are denominated. Gopinath et al. (2010) showed for the United States that pass-through into imports priced in US-Dollar is lower than non-Dollar pass-through.

exchange rates may move in the opposite direction. Hence, bilateral pass-through may offset each other both in the short and long run. When this situation occurs, multilateral pass-through may be very low.

Third, the structure of country composition in the import basket, that is the change of exporting partners over time, influences the extent of exchange rate pass-through. When an importing firm decides to shift its imports towards a new country, the impact of exchange rate changes into the import price of this good will no longer be the same. This is especially true when this leads to a change in the currency of invoicing.[3] As a consequence, in order to take into account the influence of trade patterns on the extent of exchange rate pass-through, it is more realistic to adjust each period weights affected to each exporter's trade partners variables, such as bilateral exchange rate and export price, by using a **time-varying** weight in the estimation.

Fourth, cross-country pass-through differences may occur even for countries grouped in a region, such as the Euro-area. Heterogeneity of exchange rate pass-through within Euro-area countries is explored in this study by using cross-country and cross-industry Panel estimation. Essentially, the cross-country specification yields a measure of the international degree of market power of firms and the degree of local market competition in the importing country.

The rest of the paper is organized as follows: section 2 provides a summary of the recent literature; section 3 describes the data; section 4 discusses the empirical strategy; the results are discussed in section 5. Section 6 concludes.

2 Review of the literature

Apart from the factors behind the choice of the type of currency in which to set prices, the recent literature focuses on the link that exists between ERPT and currency invoicing. An important issue raised by the availability of the micro-data and namely the empirical work of Gopinath et al. (2010).

2.1 The determinants of currency invoicing

2.1.1 Micro-determinants

At the micro-level, the currency decision for invoicing by exporting firms are influenced by the uncertainty that prevails in the international trade environment due to exchange rate volatility. When goods are priced in the currency of the importing country (LCP),

[3] Takatoshi et al. (2005) have noted the importance of changes in import composition across diversified trading partners on the extent of exchange rate pass-through and its variation over time. Gopinath and Rigobon (2008) argued, among others, that a part of the decline in exchange rate pass-through for the United States is explained by the shift in country composition of imports towards developing countries, such as China.

profits, transformed in the currency of exporting country, will be subject to uncertainty. When goods are priced in the producer currency (PCP) or in a third vehicle currency (VCP), for instance the US-Dollar, exporters face demand uncertainty because the local currency prices of imported goods will move one-to-one with exchange rate fluctuations in the destination market. Exporting firms therefore choose to price their goods in the currency (LCP or PCP) that yields higher expected profit, or in a third vehicle currency (VCP) that is more stable to reduce both profit and demand uncertainty.[4] Formally, there are two driving forces in the optimal choice of the currency of invoicing which are the variance of exchange rate and the covariance between exchange rate and marginal cost. For ease of the presentation, let us consider a foreign exporting firm that sells to the home importing country and has to choose between PCP or LCP (or possibly VCP).[5]

Let us assume that exporters face demand that belongs to the CES class function. Denote S_t the exchange rate defined as the home currency price of foreign currency. That is, an increase in S_t is a depreciation of the home currency. In order to highlight the invoicing decision pattern, let us also assume that the exporting firm decides to set price of its goods in its own currency and see what factors drive the firm to confirm or deviate from its initial decision and implement respectively PCP or LCP (or eventually VCP) when setting its price. On the one hand, the variance of the exchange rate increases the value of the expected profit of the exporting firm due to exchange rate volatility. This provides an incentive for PCP. On the other hand, the negative correlation between exchange rate and marginal cost (an appreciation of the home currency, hence in a two-country world, a depreciation of the foreign currency leads to an increase of marginal cost),[6] diminishes expected value of the exporting firm profit. Therefore, firms choose PCP when the variance of the exchange rate is greater than the negative correlation between exchange rate and marginal cost.[7] However, when the marginal cost is more sensitive to exchange rate movements, exporters will choose a currency invoicing strategy that limits the negative impact on their (expected) profits. Thus, it will choose LCP (the so-called **hedging** phenomena) or to VCP when it

[4]Under the special case where exchange rate is the only source of uncertainty, exporting firms choose PCP if profits are convex in the exchange rate and LCP if profits are concave in the exchange rate. Profits in turn are convex (concave) in the exchange rate if the market demand curve is convex (concave). See for instance Baron (1976) , Giovannini (1988), Donnenfeld and Zilcha (1991) , Friberg (1998) . It is worth noting however that by construction, profits under the CES (Constant-Elasticity-of-Substitution) demand function that is commonly used in the NOEM and New-Keynesian general equilibrium model is convex. That is, if exchange rate is the only source of uncertainty, exporting firms will always find optimal to price in their own currency.

[5]Bacchetta and van Wincoop (2005) extended the subsequent currency invoicing decision in a context of a multi-currency analysis. The generalization is straightforward and we refer interested readers to their papers for details.

[6]This is the case when costs are convex in demand, that is, a rise in demand leads to a rise in costs but to a greater proportion (this is true for the case of decreasing return to scale production function), and when imported input or foreign outsourcing take a large part in the production process.

[7]See appendix A for formal definition of the exporting firm profit under PCP and LCP, as well as its currency invoicing decision.

chooses an invoicing strategy close to that of its competitors and price its goods in a more stable and strong vehicle currency (the so-called **herding** phenomena), especially if the degree of the elasticity of substitution among goods is higher as shown in Goldberg and Tille (2008).

It is worth noting that what is known as **asymmetric currency pricing** may occur when foreign firms that export to the home country practice PCP whereas home country exporting firms practice LCP in that country. This is the case of the United States where the US exporters will globally price in US Dollar and goods exported to the US are also globally set in US Dollar. More particularly, using unpublished micro data collected by the Bureau of Labor Statistics, Gopinath and Rigobon (2008) state that close to 97% of US exports and 90% of US imports are priced in dollars.

2.1.2 Macro-determinants

At the macro-level, macro-economic variables such as inflation, banking system developments, foreign exchange market, business cycle, world trade share and wage are important determinants of currency invoicing. It is well known that firms tend to price in the currency of the country that experience relatively low inflation which in turn yields even more price stability for that country.[8] Low-inflation environment in turn is brought about by more credible monetary policy as is the case in many industrialized countries. Therefore, a country that experiences price stability and which currency is used in international trade will have a reduced degree of ERPT into domestic prices.[9] Moreover, as argued by Ligthart and da Silva (2007), trade is denominated in the currency of a country that has higher world trade share, stronger currency (expected to appreciate), deeper foreign exchange market and well-developed banking system. The business cycle plays a role via the demand condition when firms face a high degree of competition. In this case, an economic downturn in the country of sale decreases demand leading firms to practice LCP in order to maintain market share. The currency of a country where currency-transaction costs are low, notably due to the bigger size of the exchange market, or/and where its world trade share is high, is commonly used as vehicle currency.

2.1.3 Factors behind heterogeneity of pass-through

Depending on the type of goods, the impact of micro and macro-determinants on currency invoicing decision of a firm is different. Devereux and al. (2004) and Goldberg and Tille (2008) study the explicit role of industry-specific features in contrast to macro-economic variability. They argue that the macro-economic environment plays an important role

[8] See for example Taylor (2000), Devereux and Yetman (2003), Devereux and al. (2004) , Bacchetta and Van Wincoop (2005) and Choudhri and Hakura (2006).

[9] It is empirically supported in a study of Bailliu and Fujii (2004) for industrialized countries in early 1990s. Moreover, Gopinath et al. (2010) argued that, for United States, imported goods priced in Dollar will experience lower pass-through than goods priced in other currency.

in determining the choice of currency invoicing for differentiated products. In contrast, producers of homogeneous goods characterized by high elasticity of demand, the so-called Walrasian goods, are much more influenced by micro-determinants. They always try to set their prices in line with their competitors leading them to hedge in local currency of sale or to herd in a single vehicle currency that has a dominant role for the industry.

Finally, it is worth noting that there is large development of macro-economic modeling literature on currency invoicing and ERPT. The only difference compared to the standard NOEM and DSGE model is the inclusion of the currency invoicing decision developed above in the firm's optimization problem. To cite a few, Bacchetta and Van Wincoop (2005) formally linked micro-economic and macro-economic strands of literature by integrating the existing partial equilibrium theoretical literature into the NOEM general equilibrium. Devereux and al. (2004) and Corsetti and Pesenti (2004) studied the extent of ERPT based on endogenous currency invoicing driving by the structural determinants of the model. Engel (2004) introduced the role of price stickiness in the invoicing decision and the notion of **optimal degree of ERPT** when prices are fully flexible. Finally, Goldberg and Tille (2008), in a partial equilibrium approach, introduced the role of third non-counterparty currency which they called **vehicle** or **dominant currency**.

2.2 Dynamic link between currency invoicing and pass-through

An important issue in the pass-through literature is the link that exists between the exchange rate pass-through and the currency invoicing decision of a firm. To what extent import price changes due to exchange rate movements are influenced by the currency invoicing decision of exporters or vice-versa? In order to shed light on this issue, let us first define what is known in the literature as the **unconditional** exchange rate pass-through. It is defined as the unconditional correlation between exchange rate and optimal price that is obtained under flexible price setting and firm's profit maximization, or simply as the linear projection of the (log) optimal price on the (log) exchange rate. It therefore measures the extent of price changes due to exchange rate movements when exporters can freely adjust prices in order to maximize profits. This is the reason why it is sometimes called **desired** exchange rate pass-through.

Now, consider the general and more realistic case where prices are sticky. That is, after being set, prices will remain unchanged for a given amount of time. Therefore, if the desired exchange rate pass-through is low, exporters will be better off when setting their prices in the currency of the importers or in a stable vehicle currency. If instead it is high, they will be better off when choosing to set prices in their own currency. In these cases, exporters reduce profits uncertainty and, thus, deviation from optimal plan (the one obtained under flexible prices) that may occur until they can adjust prices will be less severe. It is therefore the desired pass-through (before prices are set) that influences the invoicing decision of firms, which in turn determines the extent of exchange rate pass-

through (after prices have been set). This is a generalization[10] of the proposition given in Friberg (1998) who argued that sufficient conditions on demand and cost for incomplete exchange rate pass-through are also sufficient conditions for exporters to set their prices in the importer's currency in order to get the highest expected profits under exchange rate uncertainty.

Moreover, one may ask if the currency decisions of firms, and hence the extent of ERPT, may be altered by the size, the sign and/or the persistence of the exchange rate movements. First, does a small and a large depreciation (respectively, an appreciation) affect similarly the pricing decisions of firms? This question rises the issue of non-linearity and asymmetry in the extent of ERPT. As argued by Bussière (2007), one could have two types of firms regarding their response to exchange rate movements. Notice that the export price reaction function is decreasing with respect to exchange rate movements. That is, following an appreciation (respectively, a depreciation) of the exporters' currency, export prices decrease (respectively, increase) when firms adjust. However, the extent of the response (the form of the curve) depends on firms strategy. On the one hand, firms that are more concerned with demand condition will have a concave export reaction function. That is, the more the exporters' currency appreciates (respectively, depreciates), the more (respectively, the less) firms react by decreasing (respectively, by increasing) their prices in order to maintain market share. This yields a higher ERPT into import prices during the appreciation of the importers' currency than during the depreciation. In other words, ERPT into import prices increases (respectively, decreases) the more importers' currency appreciates (respectively, depreciates). On the other hand, firms that are more concerned with profit margin will have a convex export reaction function and, therefore, adjust less (respectively, more) their prices the more the exporters' currency appreciates (respectively, depreciates). In this case, ERPT into import prices is higher during the depreciation of the importers' currency than during the appreciation.[11] Second, do pricing decisions of firms depend on the persistence of exchange rates movements? As far as the currency invoicing decision of an exporting firm is concerned, and hence the extent of the ERPT, exchange rate changes that are **expected** to be temporary or permanent will have a similar effect. This is because when firms set prices, they maximize a discounted string of future

[10]Notably Engel (2006) who gave the formal derivation of the link between exchange rate pass-through and currency invoicing. Gopinath et al. (2010) extended its analysis in a more general dynamic setting and argued that currency choice based on pass-through can not be predicted solely by short and long run desired pass-through but rather on its entire path. This is what they called **medium pass-through** and is defined as the weighted average of the entire path of the desired pass-through by the probability of price non-adjustment. In a general equilibrium model where marginal cost and exchange rate are endogenous and are driven by structural shocks of the model and depend on the currency choice of all firms, Bhattarai Saroj (2009) and Mirzoev (2004) found that asymmetry invoicing in times of persistent depreciation and appreciation leads to asymmetric exchange rate pass-through.

[11]Notice that there exists several papers on non-linear and asymmetry of the ERPT. To cite a few, Mirzoev (2004), Coughlin and Pollard (2004) and Bhattarai Saroj (2009) provide a theoretical approach of these phenomenons. Empirical studies in turn were done by Coughlin and Pollard (2000) for the United States, by Faruqee (2004) for euro area and Wickremasinghe and Silvapulle (2004) for Japan.

expected profit. Hence, as stated previously, their pricing decisions are based on the entire path of the desired pass-through. Therefore, permanent expected exchange rate changes will reinforce firms in their decisions. However, an **unexpected** changes in the exchange rate and/or demand condition will influence their invoicing strategies and hence the extent of the ERPT. For instance, the financial crisis and the world trade collapse on 2008.

3 Data description

In this study, we rely on monthly import price index for the period 2005M6 to 2011M4, published by Eurostat. More precisely, our empirical analysis uses import prices rather than unit value indices which have been used until now to study exchange rate pass-through for Euro-area countries. Import price index, available at the monthly frequency, measures actual transaction prices of imported goods. Therefore, using import price indices allows us to take into account in our analysis an important range of properties that are tracked by the price index unlike the unit value index such as the price movements and changes in demand of comparable rival items over time, the price-determining characteristics of one good (quality change and adjustment of the products over time, quantity of units sold, transport provided, rebates, service and guarantee conditions, ...), and the change in the composition of country's import bundles. In addition to be a price index, it is a CIF (Cost, Insurance, Freight) price at the border excluding all duties and taxes. Indeed, there is a broad agreement on the drawbacks of the unit value index due to its very nature. For example, Knetter (1989), and Takagi and Yoshida (2001) argued that the unit value indices are imperfect proxies for trade prices due to measurement errors. Moreover, they are very volatile due to frequent quantity adjustments. That is, the unit value indices may change just because of a change in quantity without any change in price. However, data availability for Euro-area prevented so far previous studies from using price indices. More particularly, the import price index was officially introduced by the Regulation (EC) No 1158/2005 of the European Parliament and of the Council of 6 July 2005 amending Council Regulation (EC) No 1165/98 concerning short-term statistics, published in the Official Journal of 22 July 2005. Data was available since 2005.

Nevertheless, import prices we use in our estimation are an aggregate index of manufacturing products at 2-digit level of the EU Classification of Product and Activity (CPA) classification but not a disaggregated price.[12] Therefore, unlike micro-based studies, it is

[12]Section C at 2-digit level of CPA (Statistical Classification of Products by Activity in the European Economic Community) classification, from C10 to C32. Note that due to data non-availability, the manufacture of beverages (C11), the manufacture of tobacco products (C12) and the Printing and reproduction of recorded media (C18) are not maintained in our study. Product disaggregation and label are as follows: C10 Manufacture of food products (Food), C13 Manufacture of textiles (Text), C14 Manufacture of wearing apparel (Weap), C15 Manufacture of leather and related products (Leath), C16 Manufacture of wood and of products of wood and cork (Wood), C17 Manufacture of paper and paper products (Pape), C19 Manufacture of coke and refined petroleum products (Petro), C20 Manufacture of chemicals and chemi-

not possible to identify the exact bilateral exchange rate used for the transaction (nor the currency of invoicing) in order to estimate the appropriate bilateral elasticity of ERPT, the country of origin of each imported goods which prices are used to calculate the aggregate import price indices, nor the weights of the different categories of goods that compose each price index. These lacks of information do not permit multi-currency analysis of exchange rate pass-through using aggregate data. However, the structure of the model, which will be presented in details in the next section, allows us to take into account and bypass these problems.

Exchange rate pass through into import prices is estimated for some Euro-area countries which are Germany, France, Greece, Netherlands and Spain; and for aggregate euro area defined as the first 16 member countries, hereafter referred to as "euro-area(16)". In this study, we focus on imports coming from extra-Euro-area countries. This is because even if intra-Euro-area trade takes a large part in the total trade, pricing decision of exporting firms' from Euro-area countries is not directly affected by exchange rate fluctuations.

This study extends the general empirical approach commonly used in several studies to allow for a multiple currency study of the exchange rate pass-through and to take into account exporting firms' pricing behavior. More particularly, we follow the Campa and Gonsalez Mingues (2004)'s segmented international market approach, or alternatively of price discrimination, especially for manufactured products. International prices are obtained as a weighted average of export prices of different firms exporting to Euro-area. Effective exchange rate is also calculated in the same manner using the same weights as for the export prices. Especially in our study, we consider the first three non Euro-area countries trading partners, that is, United States, United Kingdom and China. Formally, the international export price index of a good z is defined as:

$$p^*(z)_t = (p^{us}(z)_t)^{\pi_t^{us}}.(p^{uk}(z)_t)^{\pi_t^{uk}}.(p^{ch}(z)_t)^{\pi_t^{ch}} \tag{1}$$

and effective exchange rate as:

$$e_t = (e_t^{us})^{\pi_t^{us}}.(e_t^{uk})^{\pi_t^{uk}}.(e_t^{ch})^{\pi_t^{ch}} \tag{2}$$

where for $x = us, uk, ch$, π_t^x is a **time varying** weight for exporting country x that verifies $\pi_t^{us} + \pi_t^{uk} + \pi_t^{ch} = 1$, $p^x(z)_t$ is the export price index of exporting country x and e_t^x is the nominal bilateral exchange rate defined as Euro currency per unit of respectively US-Dollar,

cal products (Chem), C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations (Phar), C22 Manufacture of rubber and plastic products (Rubb), C23 Manufacture of other non-metallic mineral products (Nmmp), C24 Manufacture of basic metals (Metal), C25 Manufacture of fabricated metal products (Fmet), C26 Manufacture of computer, electronic and optical products (Comp), C27 Manufacture of electrical equipment (Elec), C28 Manufacture of machinery and equipment (Mach), C29 Manufacture of motor vehicles, trailers and semi-trailers (Vehi), C30 Manufacture of other transport equipment (Otra), C31 Manufacture of furniture (Furn) and C32 Other manufacturing (Oman).

Pound-Sterling and Chinese-Yuan.[13]

Taking USA, China and UK as trade partners was especially motivated by the importance of their respective currency within international trade invoicing prevailing in the Euro-area. We decide to maintain the Chinese-Yuan in our analysis due to the government official decision in 2005 that allows the Yuan as invoicing currency in China's foreign trade and see if it has modified the pricing behavior of Chinese exporting firms. Moreover, not considering the Yuan, and hence the Chinese marginal cost, will generate an important bias in the estimation of the ERPT.[14] The main objectives of this study are, on the one hand, to isolate the impact of changes in each currency, which are the US-Dollar, the Pound-Sterling and the Yuan, on import prices, and on the other hand, to shed a light on the difference between bilateral and multilateral exchange rate movements' impact on import prices.

4 Empirical Strategy

In this section, we present the empirical approach used to estimate the ERPT for Manufacturing products (Manuf). In order to take into account demand conditions in the importing country, we use in our model the industrial production index (IPI) as in Goldberg and Knetter (1997). Performing Augmented Dickey Fuller (ADF) test shows the existence of a unit root for a large part of the time series. Therefore, all variables are transformed into monthly changes in order to control for non-stationarity. Estimating long-run cointegration relationship between import price, exchange rate and export price is not performed in this study because the estimation period is too short.

[13] Details concerning the computation of the weight can be found in appendix D (Table 3). For the United States, export price index are extracted from the Bureau of Labor Statistics (BLS). Producer Price Index of exported goods for the United Kingdom in turn are extracted from the Office for National Statistics. Whereas for China, Export Producer Price Index are extracted from Datastream (Key Mnemonic: CHPROPRCX).

[14] Dées et al. (2008) find that ERPT into import prices coming from emerging economies (mainly China) has risen due to changing pricing behavior on the contrary of that coming from developed economies (among of them the United Kingdom) which has decreased. As they argued, it could be the result of a gain in the comparative advantages on capital goods (characterized by high ERPT or low Pricing-to-Market) reinforced by a loss in the comparative advantages on consumption goods (characterized by low ERPT) for emerging economies and a gain in market share over time leading firms to decrease their incentive to price-to-market. Moreover, as stated in Cui et al.(2009), Chinese authorities conducted in July 2009 a trial scheme where some enterprises are asked to invoice their trade in the Chinese-Yuan.

4.1 Individual estimation

We perform empirical estimations of the ERPT elasticities for each currency using the following multicurrency model for good z imported by country h:

$$\begin{aligned}\Delta lnp^h(z)_t = &\sum_{i=0}^{4} \alpha_i^{us} \Delta lnusd_{t-i} + \sum_{i=0}^{4} \alpha_i^{uk} \Delta lnpou_{t-i} + \sum_{i=0}^{4} \alpha_i^{ch} \Delta lnyua_{t-i} \\ &+ \sum_{i=0}^{4} \beta_i \Delta lnp^*(z)_{t-i} + \gamma \Delta lnipi_t^h + cte\end{aligned} \tag{3}$$

where $usd_t = (e_t^{us})^{\pi_t^{us}}$, $pou_t = (e_t^{uk})^{\pi_t^{uk}}$, $yuan_t = (e_t^{ch})^{\pi_t^{ch}}$ refer, respectively, to US-Dollar, Pound and Chinese-Yuan weighted bilateral nominal exchange rate defined as the Euro price of one unit of foreign currency.[15] The demand condition in the importing country h are measured by $\Delta lnipi_t^h$. Estimating import price index as a function of different weighted-exchange rates alleviates the problem of *non-identification* of the relevant bilateral exchange rate, the weights of each good composing the import price index and the imported goods' country of origin mentioned in the previous section. Estimated coefficients $\hat{\alpha}_i^{us}$, $\hat{\alpha}_i^{uk}$, $\hat{\alpha}_i^{ch}$ measure the impact of change in each currency taken separately. Moreover, as explained in Gopinath and Rigobon (2008), the country from which the good is imported may switch during the life of the good, thus, currency of transaction may change too. Therefore, it is more realistic to adjust each period weights affected to each trade partners' variables, namely the bilateral exchange rate and the export price, by using the **time-varying** weights $\pi_t^{x=us,uk,ch}$ in the estimation.

Moreover, in order to take into account some possible bias in the estimated coefficient, we perform bootstrap estimation[16] of ERPT elasticities and correct for the biais when it exists, following the rule of thumb recommended by Efron and Tibshirani (1993). Following Campa, Goldberg and Gonsales Mingez (2005), **short run** (one month) exchange rate pass-through elasticity is given by the estimated coefficient α_0, whereas **long run** (four months) elasticity is given by the sum of the pass-through estimated coefficients for the

[15] Import price of good z denominated in domestic currency (Euro) for a country h is giving by:

$$p^h(z)_t = e_t . p^*(z)_t$$

where $p^*(z)_t$ and e_t are given respectively by equation (1) and (2). Therefore,

$$p^h(z)_t = (e_t^{us})^{\pi_t^{us}} . (e_t^{uk})^{\pi_t^{uk}} . (e_t^{ch})^{\pi_t^{ch}} . p^*(z)_t$$

taking logarithm and first difference yield:

$$\Delta lnp^h(z)_t = \Delta ln(e_t^{us})^{\pi_t^{us}} + \Delta ln(e_t^{uk})^{\pi_t^{uk}} + \Delta ln(e_t^{ch})^{\pi_t^{ch}} + \Delta lnp^*(z)_t$$

then, adding lags of exogenous variables, the industrial production index $\Delta lnipi_t^h$ and denoting $usd_t = (e_t^{us})^{\pi_t^{us}}$, $pou_t = (e_t^{uk})^{\pi_t^{uk}}$, $yuan_t = (e_t^{ch})^{\pi_t^{ch}}$, we arrive at equation (3).

[16] Details on methodology used are presented in appendix B. Results are available upon request.

contemporaneous exchange rate and its first four lags, that is $\sum_{i=0}^{4} \alpha_i$. Moreover, to evaluate the global impact of the three main currencies that can be interpreted as the impact of Euro currency movements on import prices, overall **short run** (resp. **long run**) exchange rate pass-through elasticity is given by the sum of **short run** (resp. **long run**) estimated coefficients of each foreign currency, that is: $\alpha_0^{SUM} = \alpha_0^{us} + \alpha_0^{uk} + \alpha_0^{ch}$ (resp. $\sum_{i=0}^{4} \alpha_i^{SUM} = \sum_{i=0}^{4} \alpha_i^{us} + \sum_{i=0}^{4} \alpha_i^{uk} + \sum_{i=0}^{4} \alpha_i^{ch}$).

4.2 Panel estimation

In order to estimate cross-industry and cross-country exchange rate pass-through and to study heterogeneity within country members' of the Euro-area, we also perform panel estimation. Elasticities of ERPT into import prices are obtained using the Least Square Dummy Variables method. We estimate fixed effect panel multicurrency model of ERPT for *cross-industry* and *cross-country* analysis. This is done in order to control for any unobserved country and industry-specific deterministic trend.[17] **Cross-industry** empirical model is provided, for a given country, by:

$$\begin{aligned} \Delta lnp_{z,t}^{h} = & \sum_{i=0}^{4} \alpha_i^{us,h} \Delta lnusd_{t-i} + \sum_{i=0}^{4} \alpha_i^{uk,h} \Delta lnpou_{t-i} + \sum_{i=0}^{4} \alpha_i^{ch,h} \Delta lnyua_{t-i} \\ & + \sum_{i=0}^{4} \beta_i^{h} \Delta lnp_{z,t-i}^{*} + \gamma^{h} \Delta lnipi_{t}^{h} + \sum_{z=1}^{N} f_z \mathbb{1}_z \end{aligned} \tag{4}$$

Where h and z refer, respectively, to an importing country and to a category of imported goods or products. $N = 20$ is the number of categories of manufacturing products. $\mathbb{1}_z$ is a product-specific dummy variable. **Cross-country** empirical model in turn is provided, for a given product, by:

$$\begin{aligned} \Delta lnp_{h,t}^{z} = & \sum_{i=0}^{4} \alpha_i^{us,z} \Delta lnusd_{t-i} + \sum_{i=0}^{4} \alpha_i^{uk,z} \Delta lnpou_{t-i} + \sum_{i=0}^{4} \alpha_i^{ch,z} \Delta lnyua_{t-i} \\ & + \sum_{i=0}^{4} \beta_i^{z} \Delta lnp_{z,t-i}^{*} + \gamma^{z} \Delta lnipi_{h,t} + \sum_{h=1}^{C} f_h \mathbb{1}_h \end{aligned} \tag{5}$$

Where $C = 5$ is the number of countries (Germany, Greece, Spain, France and Netherlands) and $\mathbb{1}_h$ is a country-specific dummy variable.

[17] More particularly, we have performed a **Hausman test** to have information about the specification of our model and the test of equalities of individual fixed effects to get preliminary information about cross-country and cross-industry heterogeneity. Hausman test concludes that the difference between fixed and random effect estimators is statistically insignificant. Therefore, we choose fixed effect model to estimate the extent of the ERPT, all the more that we do not sample a subset of an entire population but have a time series observation as variables. However, homogeneity test concludes that there is some heterogeneity across country and industry fixed effects.

5 Results

When performing the empirical analysis, there are two assumptions on which we focus: LCP assumption, which is equivalent to zero pass-through, and PCP (or VCP) assumption, for which there is full transmission of exchange rate changes into import prices, which is also known as complete ERPT. LCP assumption is verified when the null hypothesis, $H_0 : \alpha_0 = 0$ for short term pass-through and $H_0 : \sum_{i=0}^{4} \alpha_i = 0$ for long term pass-through, are not rejected at the 95% level. Whereas, PCP (or VCP) assumption is verified when the null hypothesis, $H_0 : \alpha_0 = 1$ for short term pass-through and $H_0 : \sum_{i=0}^{4} \alpha_i = 1$ for long term pass-through, is not rejected at the 95% level.

Detailed results appear in the appendix D. For short term pass-through, when it is not statistically different from zero (resp. from one), that is $H_0 : \alpha_0 = 0$ (resp. $H_0 : \alpha_0 = 1$) is not rejected, estimated coefficient is marked with plus sign ($^{+}$) in the results table (resp. with double plus sign ($^{++}$)). The same notation is adopted for long term pass-through.

Whenever both the null hypothesis of zero and complete pass-through are rejected (for short and long-run) and pass-through coefficient lies between 0 and 1, there is incomplete pass-through and it is expressed with bold character. However, there are some cases where pass-through is either largely negative (e.g. smaller than -0.50) or largely greater than one (e.g. greater than 1.50). For those pass-through coefficients, an unilateral test of the null hypothesis $H_0 : \alpha_0 = 0$ versus the alternative hypothesis $H_a : \alpha_0 < 0$ or $H_0 : \alpha_0 = 1$ versus $H_a : \alpha_0 > 1$ is performed for short term pass-through as well as for long term pass-through. Whenever the null hypothesis is rejected, estimated coefficient is also expressed with bold character.

Effects of bilateral exchange rate movements on import prices are captured by the estimated coefficients α^{us}, α^{uk} and α^{ch} which can be referred to as ***bilateral exchange rate pass-through elasticities***, hereafter BERPT. Short term BERPT is captured by α_0^{us}, α_0^{uk}, α_0^{ch} and that of long term by $\sum_{i=0}^{4} \alpha_i^{us}$, $\sum_{i=0}^{4} \alpha_i^{uk}$, $\sum_{i=0}^{4} \alpha_i^{ch}$. Coefficient α^{SUM} in turn is referred to as ***multilateral exchange rate pass-through elasticities***, hereafter MERPT, where $\alpha_0^{SUM} = \alpha_0^{us} + \alpha_0^{uk} + \alpha_0^{ch}$ for short term and $\sum_{i=0}^{4} \alpha_i^{SUM} = \sum_{i=0}^{4} \alpha_i^{us} + \sum_{i=0}^{4} \alpha_i^{uk} + \sum_{i=0}^{4} \alpha_i^{ch}$ for long term. It measures changes in import prices due to changes in Euro vis-à-vis all its trade partners' or the overall effects on import prices of different BERPT. This is in general due to shocks that affect importer's economic environment or macroeconomic policy decision which lead to currency movements vis-à-vis all trade partners', that is in our study, a depreciation or an appreciation of the Euro.

5.1 ERPT estimates

A common result with pricing-to-market approach is that international market for manufacturing products are sufficiently segmented. Therefore, exporters price discriminate across national markets and prefer reducing mark-up to offset exchange rate depreciation in order to protect market shares. That is, at least over some time horizon, exporters set

price in the local currency of sale. However, Obstfeld and Rogoff (2000) provide anecdotical and empirical results consistent with exporter's currency invoicing (PCP) rather than LCP. Results from ERPT elasticities estimation for manufacturing products below highlight this debate for the Euro-area case.

5.1.1 Individual estimation

Table D.4 reports estimated coefficients of the ERPT for the currencies of the three main trade partners' of Euro-area using equation (3). However, for the sake of clarity and to ease interpretation, Table 1 summarizes these results for US Dollar BERPT and MERPT.

Short term Pass through				
	Zero	Incomplete	Complete	Above unity
US Dollar	60	32	21	6
%	50.4%	26.9%	17.6%	5%
Multilateral	58	38	19	4
%	48.7%	31.9%	16%	3.4%
Long term Pass through				
	Zero	Incomplete	Complete	Above unity
US Dollar	51	14	49	5
%	42.9%	11.8%	41.2%	4.2%
Multilateral	69	6	44	0
%	58%	5%	37%	0%

Source Table D.4 in Appendix D - number of cases and % of total for individual equations, with ERPT not significantly different from zero ('zero'), different from 0 and 1, not different from 1, above 1.

Table 1: ERPT elasticities individual estimation

The fine product disaggregation of the manufacturing products highlights some interesting findings. Firstly, in the debate on the size of the ERPT coefficient, we find that the short term pass-through is in general statistically not different from zero and when it is incomplete, its value is low. Indeed, according to Table 1, in half of the cases, the pass-through is close to zero, while 26 to 31% of the cases exhibit an incomplete pass-trough.

The exceptions are the manufactured product associated with a low level of transformation of raw materials such as the manufacture of leather and related products (Leath), the manufacture of coke and refined petroleum products (Petro), and the manufacture of basic metals (Metal) for which the ERPT is complete. In fact, price of these products are essentially more sensitive to international price fluctuations within raw materials market. This also explain the large value of ERPT coefficients into import prices of these products (a 2.4% increase in German import prices of the manufacture of coke and refined

petroleum products in response to 1% change of the Euro-Dollar bilateral exchange rate). Secondly, long term exchange rate pass-through into import prices in general is complete in around 40% of cases (41% of products invoiced in US Dollar and 37% overall). For these products, the estimated long-run coefficients are not statistically different from one. These long term results, as well as those of short-term above, are consistent with Obstfeld and Rogoff (2000)'s findings.[18] They argued that when exporters set prices in the local currency of sale, it only applies to contracts of 90 days or less. Nevertheless, one may now isolate the impact of bilateral as well as multilateral exchange rate movements into import prices. Thirdly, notice that even though long term Euro-Dollar bilateral exchange rate for manufacture of leather and related products (Leath) has significant impact on import prices for Netherlands, this is not the case for multilateral one. The US-Dollar BERPT is offset by Pound BERPT. That is, apart from price stickiness or firms' price setting behavior, observed multilateral incomplete (or zero) pass-through may arise because bilateral exchange rate pass-through on import prices cancel each other out. Fourthly, for some products such as the manufacture of leather and related products (Leath), coke and refined petroleum products (Petro), and basic metals (Metal), estimated ERPT coefficients are extremely large. As explained in Gopinath and Rigobon (2008), homogeneous goods have higher price-elasticity of demand than differentiated goods. Therefore, prices of homogeneous goods are more volatile (or there is low import-price stickiness in the importing country) than prices of differentiated goods. In other words, exchange rate pass-through coefficient is higher for homogeneous goods compared to that of differentiated goods.

5.1.2 Fixed effect results

Cross-industry estimation results are given in Table D.5. The short and long run Euro-Pound and Euro-Yuan BERPT are either statistically not different from zero or incomplete. It is also worth noting that changes in the Euro-Dollar bilateral exchange rate have a more significant impact on import prices compared to that of the Euro-Pound and the Euro-Yuan. Concerning MERPT, short term pass-through is incomplete except for Greece where it is not statistically different from zero and for Spain where it is complete. Long term MERPT in turn is complete except for Greece and Netherlands where it is incomplete.

Cross-country results in the Table D.6 are summarized in the following table for US Dollar BERPT and MERPT.

[18] Campa and Goldberg (2002) found that short and long run pass-through are respectively equal to 0.61 and 0.77 in their study of 25 OECD countries using quarterly data. Anderton (2003) found 0.5 and 0.7 for extra Euro-area imports using quarterly data over the period 1989-2001. Bailliu and Fujii (2004) found 0.75 and 0.91 for industrialized countries using annual data over the period 1977-2001. However, it is worth noting that our analysis uses monthly data which may explain that our pass-through estimates are low compared to studies that use lower frequency data, especially if the response of prices after exchange rate changes is delayed due for example to the existence of menu cost or price stickiness.

Short term Pass through				
	Zero	Incomplete	Complete	Above unity
US Dollar	1	18	1	0
%	5%	90%	5%	0%
Multilateral	3	15	1	1
%	15%	75%	5%	5%
Long term Pass through				
	Zero	Incomplete	Complete	Above unity
US Dollar	3	10	6	1
%	15%	50%	30%	5%
Multilateral	5	9	4	2
%	25%	45%	20%	10%

Source Table D.6 in Appendix D - number of cases and % of total for individual equations, with ERPT not significantly different from zero ('zero'), different from 0 and 1, not different from 1, above 1.

Table 2: ERPT elasticities with cross-country fixed effects

It shows that the short run Euro-Dollar BERPT is not statistically different from zero (in only 5% of the cases) or incomplete (in 90% of the cases) except for the manufacture of leather and related products (Leath) where it is complete. Long term Euro-Dollar BERPT, however, is either incomplete or complete (respectively in 50% and 30% of the cases) except for the manufacture of wood and wood products (wood), the manufacture of chemicals and chemical products (Chem) and that of machinery and equipment (Mach) where it is not statistically different from zero. Concerning Euro-Pound and Euro-Yuan BERPT, they are either not statistically different from zero or incomplete, in the short as well as in the long run, except for the manufacture of basic metals (metal) where the long run Pound BERPT is complete (1.057). The estimates of the MERPT elasticities in turn are heterogeneous. For instance, the short and long run MERPT are both not statistically different from zero for the manufacture of furniture (Furn), incomplete for the manufacture of textiles (Text) and complete for the manufacture of leather and related products (Leath). However, **MERPT is in general driven by the estimates of the Euro-Dollar BERPT**. Notice also that cross-country estimates of the ERPT are extremely high for the manufacture of coke and refined petroleum products (Petro) and that of basic metals (Metal) as is the case in the individual estimation of the previous sub-section.

5.1.3 Global analysis

Cross-country and industry fixed effect panel estimation is reported in the Table D.7. The Euro-Dollar and Euro-Pound BERPT are both incomplete in the short and long run. The estimated value of Euro-Yuan BERPT elasticities in turn is very low. It confirms that

despite the official decision, the government incentive to establish the use of the Chinese-Yuan as invoicing currency in China's foreign trade is not applied in practice by Chinese exporting firms. Hence, at least during our estimation period, Chinese exports are invoiced either in Euro or in a vehicle currency which is generally the US-Dollar. Concerning the **MERPT**, **it is incomplete in the short run but complete in the long run**. Moreover, it is interesting to note that the estimated value of the MERPT is primarily driven by the Euro-Dollar BERPT. This confirms the importance of the United States as trade partner but also the role played by the US-Dollar as a vehicle currency in international trade.

5.2 Heterogeneity of ERPT within Euro-area countries

Although results are consistent across products and countries, it is interesting to go beyond the results in Table 1 (and Table D.4) and investigate the heterogeneity of pass through across countries and products. Indeed the value of estimated ERPT coefficients are heterogeneous according to different type of products (or industries) within a country or according to different importer's country for one industry. That is, ERPT pass-through is both *industry* and *country-specific*. As such, the analysis is a further analysis and extension of the individual equations estimated in 5.1.1.

5.2.1 ERPT mean deviations across products

To evaluate cross-industry heterogeneity within a given country, we estimate the mean of the ERPT across products, calculate for each product the deviation of the ERPT from that mean and test if the deviation is statistically significant or not. The pass-through mean deviations across products is presented in Table D.8.

Short term and long term mean of the ERPT for each importer's country are reported in the third row of each sub-panel that is labeled MEAN. It is worth noting that the Dollar BERPT and MERPT (SUM) MEAN is statistically significant at 5% level for both short and long run. Whereas, Pound and Yuan BERPT MEAN are in general not statistically significant. Moreover, the mean of the pass-through of Spain is higher than the other countries and is statistically significant.[19]

Below the row of the MEAN are presented the deviations of pass-through from its mean for each category of manufactured products. Let us take the case of Germany. In the short run, deviations of the US-Dollar pass-through from its mean are in general not statistically different from zero except for the manufacture of coke and refined petroleum products (Petro), chemical products (Chem), basic metals (Metal) and motor vehicles,

[19] Campa and Minguez (2004) found a similar results with Spain having the highest ERPT compared to other Euro-area countries. They found an estimates of the short and long run ERPT equal respectively to 0.93 and 1.20 using monthly unit value indices of import prices from 1989 to 2001. Campa et al. (2005) found an estimates of 0.81 for the short and 1.04 for the long run ERPT for Spain from 1989 to 2004 again with the highest ERPT compared to other Euro-area countries.

trailers and semi-trailers (Vehi) where deviations are respectively equal to 1.951, −0.377, 0.675 and −0.395, and are significantly different from zero at 5% level. That is, for instance, the estimated value of the Euro-Dollar BERPT on the German manufacture of coke and refined petroleum products (Petro) import prices is statistically higher by 1.951 pts than the mean (across products) of the Euro-Dollar BERPT in Germany. In the long run, only the manufacture of refined petroleum products (Petro), chemical products (Chem) and motor vehicles (Vehi) deviate from the German long run Euro-Dollar BERPT mean.

Notice, however, that the category of products in which ERPT deviates from its mean differs according to countries. Nonetheless, pass-through within importer's country is in general homogeneous across industry except for Spain. For the latter, deviations from the mean are positive (higher pass-through) for petroleum products in USD and Pound Sterling, and negative (lower pass-through) for chemical products, pharmaceutical products, machinery, motor vehicles and other transport equipment in USD if we consider deviations that are statistically significant both at the short and long run.

5.2.2 ERPT mean deviations across countries

To evaluate cross-country heterogeneity for a given industry, we estimate the mean of the ERPT across countries, calculate for each country the deviation of the ERPT from that mean and test if the deviation is statistically significant or not. The pass-through mean deviations across countries is presented in the Table D.9. Cross-country mean in the short and the long run ERPT are reported in the third column for each category of goods. This estimation reflects two main characteristics of each industry.

On the one hand, the short and long run *cross-country mean of the ERPT reflect international degree of monopolistic power* of an industry. That is, an industry that has a high degree of monopolistic power can practice a PCP strategy which leads to higher degree of ERPT regardless of importing countries of destination. For example, the long run cross-country mean estimates of the Euro-Dollar BERPT of the manufacture of leather and related products (Leath), refined petroleum products (Petro) and basic metals (Metal) industries are respectively equal to 0.916, 3.081 and 1.029. Whereas when exporting firm faces a higher degree of competition in international market, there is a low degree of (even zero) ERPT. For example, the manufacture of machinery and equipment (Mach) industry where the short and the long run cross-country mean of estimated Euro-Yuan BERPT are respectively equal to 0.035 and 0.026.

On the other hand, the short and the long run *cross-country deviation of ERPT from its mean reflect the degree of competition* that the industry faces within the importing country, taking into account the **competition from local firms**. When an exporting firm faces a high degree of competition, the extent of the ERPT tends to be low and therefore the mean deviation tends to be statistically not different from zero. The opposite happens when the exporting firm does not face a significant competition.

To summarize, the cross-country mean of the ERPT reflects the degree of international

market competition whereas the cross-country mean deviations reflect the degree of importer's local market competition that exporting firms' face. In the case of Spain, the origin of the high value of the ERPT stated in the previous paragraph can be identified by looking at the deviation of the ERPT from the cross-country mean. If we take the case of the Dollar BERPT and the MERPT (SUM) for Spain, significant positive value of the deviation across countries (hence, higher pass-through) indicates that the industry pass-through exchange rate changes more in Spain. It is therefore possible to identify which industries drive the high value of the ERPT observed in Spain by looking at the significant positive mean deviation of the ERPT in the Table D.9. Notice that the opposite case appears for Greece with numerous significant negative value of the mean deviation of the ERPT.

5.3 Financial crisis and ERPT

Figure 2 reports time varying estimates of the ERPT from 2007M12 to 2011M4 using cross-country and industry panel analysis.[20] As argued by Mirzoev (2004), exporting firms' invoicing decisions may change over time. That is, the pricing strategy of firms may change depending on the state of the world especially if changes are unexpected such as the 2008 global crisis. Moreover, time varying analysis of the ERPT raises the issues of **non-linearity** and **asymetry** in the value of the ERPT. As stated in section 2.2, there exists two types of firms regarding their currency pricing strategies.

On the one hand, firms that are more concerned with demand condition will pass-through a depreciation of their currencies in order to decrease the nominal value of their goods once converted in the importers' currency. That is, ERPT will rise. In case of an appreciation of their currencies, they will in turn adjust (lower) prices in order to contain the rise in the nominal value of their goods once converted in the importers' currency. That is, ERPT will decrease. Firms that price their goods in US Dollar and Yuan fall within that category. Especially, from 2007M12 to 2008M7, depreciations of the US Dollar and the Yuan are followed by an increase in the Euro-Dollar and Euro-Yuan BERPT.

On the other hand, firms that are more concerned with profit margin will adjust (rise) prices following a depreciation of their currencies. That is, ERPT will decrease. Whereas, they will pass-through an appreciation of their currencies to maintain the nominal level of their profits. That is, ERPT will rise. Firms that price their goods in Pound fall within that category. Especially, from 2007M12 to 2008M7, depreciation of the Pound are followed by a decrease in Euro-Pound BERPT.

[20] The time varying cross-country and industry panel estimates are obtained by starting the estimation using the initial period from 2005M6 to 2007M12, which yields the pass-through estimates for 2007M12, and thereafter adding each time one observation until 2011M4. We adopt this method in order to see the influence of each observation added on the extent of the ERPT. Notice that the initial period until 2007M12 is chosen in order to have enough estimation period and, hence, a significant estimates.

5.3.1 Change in demand condition

During the world trade collapse, namely the third quarter of 2008, whatever the pricing strategy chosen, the sharp decrease in the world demand leads firms to adjust their prices (a decrease) to maintain market share. That is, the appreciation of the US Dollar and the Yuan are followed by a decrease in the ERPT in order to contain the rise in the nominal value of prices in Euro. Whereas, the depreciation of the Pound are passed-through in order to decrease the nominal value of prices in Euro. However, more explanations are needed for the short term Euro-Dollar BERPT that has increased during the appreciation of the US Dollar. In fact, the Dollar BERPT has decreased in the beginning of the Dollar appreciation period reflecting the will to maintain market share, but as the appreciation became important, firms were no longer able to adjust prices. As argued by Bussière (2007), there exists a certain limit where lowering prices, therefore, profit margin, would yield a negative mark-up. That is, once this limit reached, firms pass-through exchange rate movements into import prices and, hence, ERPT begin to rise.

5.3.2 Change in financial constraint

Several studies on international trade state that exporting firms rely heavily on credit to finance their activities due to payment delay. Namely, the volume of their exports is closely related to the amount of credit that they can obtain. Georg Strasser (2011) provides a comprehensive review of this literature. Mainly, he argued that as for the volume of the exports, the pricing strategy of firms is also influenced by their access to credit. Exporting firms that have an ease access to credit are able to price in the local currency of sale because they are able to support loss in profits whenever the importers' currency depreciates. On the contrary, firms that are constrained financially will price in their own currency. In other words, in response to exchange rate movements, firms that are able to access easily to credit can adjust easily their mark-up unlike financially constrained firms. Therefore, the impact of the financial crisis on the extent of the ERPT is closely linked to the changing financial constraints of firms that occurs during this period. Namely, due to the credit crunch, one can expect to have a higher value of ERPT during the crisis.

5.3.3 Temporary increase of the MERPT

In sum, the short and long run MERPT have raised during the financial crisis in response to the important changes in world demand condition and financial constraint, but the increase was not persistent. The temporary nature of the impact comes from the unexpected nature of the changes that occur during the crisis as detailed in section 2.2. Moreover, it is worth noting that the value of the MERPT has decreased after the crisis to remain to their stable value of around 0.45 at the short run and 1 at the long run. That is, we **do not find**

evidence of declining MERPT stated in the recent literature,[21] and the MERPT is incomplete in the short run but complete in the long run.

[21] Dées et al. (2008) arrived at the same conclusion and argued that there is no clear evidence of decline or a rise in the degree of the aggregate (developed and emerging economies) ERPT into import prices in their estimation period. However, the Asian crisis triggered a temporary rise in the degree of the ERPT of goods coming from emerging economies.

6 Conclusion

In conclusion, the international transmission of exchange rate movements into import prices depends on which currencies are used (or predominantly used) for contract invoicing in international trade market. The main contribution of this study is the multicurrency analysis of the exchange rate pass-through into import prices. Trade patterns evolve over time and evaluating the impact of different currencies on import prices is quite natural and legitimate. This multicurrency analysis allows to distinguish between "*bilateral exchange rate pass-through*" into import prices due essentially to bilateral exchange rate movements between Euro-area and one of its trade partner, and what we called "*multilateral exchange rate pass-through*" which measures the impact of changes in the Euro currency vis-à-vis all trade partners' into import prices.

We find that estimates of the exchange rate pass-through elasticities are in general statistically not different from zero or low in the short run, except for products composed essentially of raw materials such as the manufacture of leather or related products (Leath), coke and refined petroleum products (Petro) and basic metals (Metal), whereas complete exchange rate pass-through prevails in general in the long run, even if some long term ERPT coefficients are not different from zero or incomplete. More particularly, aggregate MERPT is incomplete in the short run but complete in the long run. Moreover, we find that the estimated value of the MERPT is primarily driven by the Euro-Dollar BERPT and firms that invoice their products in US Dollar (and in Yuan) are more concerned with demand condition as opposed to firms that invoice in Pound that are more concerned with profit margin.

The study of the ERPT heterogeneity across countries and industries brings two interesting findings. On the one hand, cross-industry analysis shows that the Euro-Dollar and Euro-Pound BERPT are higher than average for raw materials (eg. petroleum products) and lower for manufacturing products (eq. Chemical products). On the other hand, cross-country mean of the exchange rate pass-through can be used to measure the degree of international market competition, whereas cross-country mean deviation can be used to measure the degree of importer's local market competition faced by exporting firms. Moreover, the cross-country mean deviation enables us to identify which industries drive the high (respectively, the low) value of the ERPT observed for Spain (respectively, for Greece).

Finally, the recent financial crisis has had an impact on the extent of the ERPT via the important change in the world demand condition and the financial constraint of firms during this period. Namely, the effective pass-through (MERPT) has increased due to the world trade collapse and the credit crunch. However, the effect is not persistent due to the unexpected nature of the changes that occur during the crisis. Moreover, we do not find evidence concerning the declining of the effective (MERPT) exchange rate pass-through stated recently in the empirical literature.

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Appendix A: Currency Invoicing Decision

In a dynamic and stochastic model characterized by CES class demand function and price stickiness, profit of an exporting firm i, expressed in its own currency, is given by:

$$\Pi_t^{*,pcp}(i) = E_t \sum_{s=0}^{\infty} Q_{t,t+s}^* (\theta_F)^s \left(P_{F,t+s}^{*,pcp}(i) - MC_{t+s}^* \right) \left(\frac{P_{F,t+s}^{*,pcp}(i) S_{t+s}}{P_{F,t+s}} \right)^{-\epsilon} C_{F,t+s}$$

where variables marked with and without asterisk are expressed respectively in the producer's and home's currency. ϵ denotes the constant elasticity of substitution that is assumed to be greater than unity and θ_F^s is the probability that the price set at time t still holds s period ahead. $Q_{t,t}^*$ is firm's discount factor, $P_{F,t}(i)$ is the price of foreign imported good coming from individual exporting firm i, $P_{F,t}$ is the home aggregate imported price index, $C_{F,t}$ is the aggregate home consumption of imported goods, and MC_t^* is the exporting firm marginal cost. Profit under PCP is therefore convex in the exchange rate $(1/S_t)$ as long as $\epsilon > 1$. It is worth noting for comparison that profit of exporting firm under LCP is linear in the exchange rate and is given by:

$$\Pi_t^{*,lcp}(i) = E_t \sum_{s=0}^{\infty} Q_{t,t+s}^* (\theta_F)^s \left(\frac{P_{F,t+s}^{lcp}(i)}{S_{t+s}} - MC_{t+s}^* \right) \left(\frac{P_{F,t+s}^{lcp}(i)}{P_{F,t+s}} \right)^{-\epsilon} C_{F,t+s}$$

Therefore, following for example an appreciation of home currency (a decrease in S_t), profit of the exporting firm will increase both under PCP and LCP. One the one hand, profit under PCP increases because of a rise in demand for foreign goods (this is the expenditure switching effect) that follows a fall in the home currency price of imported goods when domestic currency appreciate. On the other hand, profit under LCP increases because an appreciation rises the value of the profit expressed in the domestic currency. However, profit under PCP is higher than that under LCP when marginal cost is not affected by exchange rate movements.

Up to a first order approximation, profits under different invoicing strategy (LCP, PCP and VCP) are the same. Therefore, currency invoicing decision of a firm is a second order problem and is based on the second moment of the exchange rate and marginal cost. Concerning notation, hatted variables that follow denote their log-deviation from their steady state value. The general invoicing decision rule using the definition of profits defined above is formally given in Bhattarai Saroj (2009). Foreign exporting firms choose PCP if

$$\left[\frac{1}{2} \sum_{s=0}^{\infty} (\beta\theta_F)^s \, Var_t \left(\hat{S}_{t+s} \right) + \sum_{s=0}^{\infty} (\beta\theta_F)^s \, Cov_t \left(\widehat{MC}_{t+s}^*, \hat{S}_{t+s} \right) \right] > 0 \tag{6}$$

In Devereux and al. (2004) , their model is static and prices are set one period before the

current state of the world is known.[22] Therefore, foreign firms choose PCP if

$$\left[\frac{1}{2}Var_{t-1}\left(\hat{S}_t\right) + Cov_{t-1}\left(\widehat{MC}_t^*, \hat{S}_t\right)\right] > 0$$

In Gopinath et al. (2010) , which is a special case of (6) when the elasticity of substitution is constant, they use **desired price** noted $\tilde{P}_{t+s}$ instead of marginal cost. This leads to the notion of **medium pass-though**, denoted β_{MR}, defined as the weighted average of the exchange rate pass-through coefficients into the desired prices. Therefore, firms choose PCP when medium pass-through is high. That is,

$$\beta_{MR} = \sum_{s=0}^{\infty} (\beta\theta_F)^s \left[\frac{Cov_t\left(\tilde{P}_{t+s}, \hat{S}_{t+s}\right)}{Var_t\left(\hat{S}_{t+s}\right)}\right] > \frac{1}{2}$$

In Engel (2006) , firms adjust every period ($\theta_F = 0$) before observing the current state of the world. Therefore, firms choose PCP if

$$\frac{Cov_{t-1}\left(\tilde{P}_{t+s}, \hat{S}_{t+s}\right)}{Var_{t-1}\left(\hat{S}_{t+s}\right)} > \frac{1}{2}$$

Appendix B: Bootstrap Appendix

Appendix B.1: Individual times series estimation

Despite the quality of the import price index compared to the unit value index, those series are only available from 2005 for the Euro-area and its members' country. In order to see the impact of the financial crisis onto the ERPT elasticities, we have used the sub-period ranging from 2005M6 to 2007M12 (period before the crisis) to estimate the value of the ERPT for 2007M12 and thereafter adding each time one observation to get a time-varying estimates of the ERPT until 2011M4. Having short estimation period, especially for the first sub-period, may leads to some estimation bias for the coefficient of the ERPT. Therefore, in order to bypass this problem and to construct a confidence interval, we perform bootstrap simulation to identify the bias. Nevertheless, following the *rule of thumb* recommended by Efron and Tibshirani (1993), we only correct for the bias only if

$$\text{test-biais} = \frac{|\text{biais}(\alpha)|}{\text{std-boot}(\alpha)} > 0.25 \tag{7}$$

[22] That is, decision is made at time $t-1$ and they used $Cov_{t-1}\left(\widehat{MC}_t^*, \hat{S}_t\right)$ and $Var_{t-1}\left(\hat{S}_t\right)$

where "std-boot" is the standard-deviation of elasticities of ERPT given by bootstrap simulation and the "biais" is calculated as follows:

$$\text{biais}(\alpha) \approx \frac{1}{B}\sum_{b=1}^{B}\hat{\alpha}^{(b)} - \hat{\alpha}^{ols} \tag{8}$$

This is because in this case, the root mean squared error of α can not be larger than 3.1% of the standard error. The bootstrap algorithm implemented in this study is the so-called **residual bootstrap** and is given as follows:

1. the equation (3) on page 12 can be written in more compact notation given by

   $$Y = X\beta + \epsilon$$

   where β is the vector of coefficients of the regression and is composed of a constant, a vector of coefficients of the exchange rates α and a vector containing the coefficients of the export price index and the industrial production index δ, that is,

   $$\underset{(22\text{x}1)}{\beta} = \begin{pmatrix} cte \\ \underset{(15\text{x}1)}{\alpha} \\ \underset{(6\text{x}1)}{\delta} \end{pmatrix}$$

   Let $\hat{\beta}^{ols} = (X'X)^{-1}X'Y$ be the estimate of β and ϵ_t, for $t = 1, \ldots, T$, be the residual from OLS estimation, and define its empirical cdf as F_t.

2. draw independently with replacement from F_t to produce the bootstrap residuals $\epsilon_t^{(b)}$, $t = 1, \ldots, T$.

3. define $Y^{(b)} = X\hat{\beta} + \epsilon^{(b)}$

4. this provides the bootstrap value of $\hat{\beta}$ given by

   $$\hat{\beta}^{(b)} = (X'X)^{-1}X'Y^{(b)}$$

5. repeat the steps 2 to 4 for $b = 1, \ldots, B$ where in our study $B = 5000$ and collect the bootstrap value $\hat{\beta}^{(b)}$, $b = 1, \ldots, 5000$

Note that the residual bootstrap method is valid only if the residuals from OLS estimation are homoskedastic. Therefore, before implementing algorithm and interpreting the results, we have performed residual khi-square homoskedasticity test and at the same time the Jarque-Bera normal test. The results of these tests conclude that the model is homoskedastic. We then implement the algorithm and resume some statistics calculated from the bootstrap value of β. Definition and interpretation of statistics put in the tables (which is available upon request) are given as follows:

- **erpt** is the OLS estimate of α given by $\hat{\alpha}^{ols}$

- **erpt-boot** is the bootstrap estimate of α defined as the mean of bootstrap values $\hat{\alpha}^{(b)}$. That is,

$$\textbf{erpt-boot} = \frac{1}{B}\sum_{b=1}^{B}\hat{\alpha}^{(b)} \quad \text{where} \quad B = 5000$$

- **std-boot** is the standard deviation of the bootstrap estimates of α and is given by

$$\textbf{std-boot} = \sqrt{\frac{1}{B-1}\sum_{b=1}^{B}(\hat{\alpha}^{(b)} - \text{erpt-boot})^2}$$

- **biais** and **test-biais** are given respectively by equation (8) and (7)

- **corrected-erpt** is the biais-corrected estimation of α, that is,

$$\text{corrected-erpt} = \hat{\alpha}^{ols} - \text{biais}(\alpha)$$

  Note that following the *rule of thumb* recommended by Efron and Tibshirani (1993), if we don't need to correct for the biais, then corrected-erpt = $\hat{\alpha}^{ols}$. That is, $\hat{\alpha}^{ols}$ gives a consistent and statistically unbiased estimation of α.

- **p-value** is the bootstrap p-value of a linear restriction test.

To construct bootstrap p-value of the linear restriction test, we implement the following algorithm:

1. The null hypothesis under a linear restriction is $H_0 : A\beta = a$ where A is a row vector of dimension (1x22) and a a scalar. For example, to test if the long run US-Dollar BERPT is equal to 1, that is, $\sum_{i=0}^{4}\alpha_i = 1$, A is set to be equal to $(0, 1, 1, 1, 1, 1, 0, \ldots, 0)$ and $a = 1$.

2. Calculate the estimates of β by OLS under the null hypothesis, noted $\hat{\beta}^{(0)}$, using the following equality[23]

$$\hat{\beta}^{(0)} = \hat{\beta}^{ols} - (X'X)^{-1}A'[A(X'X)^{-1}A']^{-1}(A\hat{\beta}^{ols} - a)$$

   where $\hat{\beta}^{ols} = (X'X)^{-1}X'Y$.

3. A test statistics is given by

$$T = \frac{||Y - X\hat{\beta}^{(0)}||^2}{||Y - X\hat{\beta}^{ols}||^2} - 1 \geq 0$$

   .

[23] from Hardle and Simar (2003)

4. Define the residual under the null hypothesis as $\epsilon^{(0)} = Y - X\hat{\beta}^{(0)}$ and $F_t^{(0)}$ its empirical cdf.

5. Draw independently with replacement from $F_t^{(0)}$ to produce the bootstrap residuals $\epsilon_t^{(b)}$, $t = 1, \ldots, T$.

6. Let $Y^{(b)} = X\hat{\beta}^{(0)} + \epsilon^{(b)}$ be the bootstrap sample of Y under the null hypothesis.

7. Therefore, the bootstrap sample of β under the null hypothesis is given by

$$\hat{\beta}^{(b)} = (X'X)^{-1}X'Y^{(b)}$$

.

8. Calculate $\hat{\beta}^{(b,0)} = \hat{\beta}^{(b)} - (X'X)^{-1}A'[A(X'X)^{-1}A']^{-1}(A\hat{\beta}^{(b)} - a)$

9. A bootstrap test statistic is therefore obtained as

$$T^{(b)} = \frac{||Y^{(b)} - X\hat{\beta}^{(b,0)}||^2}{||Y^{(b)} - X\hat{\beta}^{(b)}||^2} - 1 \geq 0$$

10. Repeat the step 5 to 9 for $b = 1, \ldots, B$ to generate the bootstrap value $T^{(b)}$ of the test statistics.

11. The p-value is defined as p-value $= Prob(T^{(b)} \geq T|H_0)$ and is given by

$$\text{p-value} = \frac{1 + num\{T^{(b)} \geq T\}}{1 + B}$$

where $num\{T^{(b)} \geq T\}$ gives the number of the statistic $T^{(b)}$ greater than or equal to T and $B = 5000$.

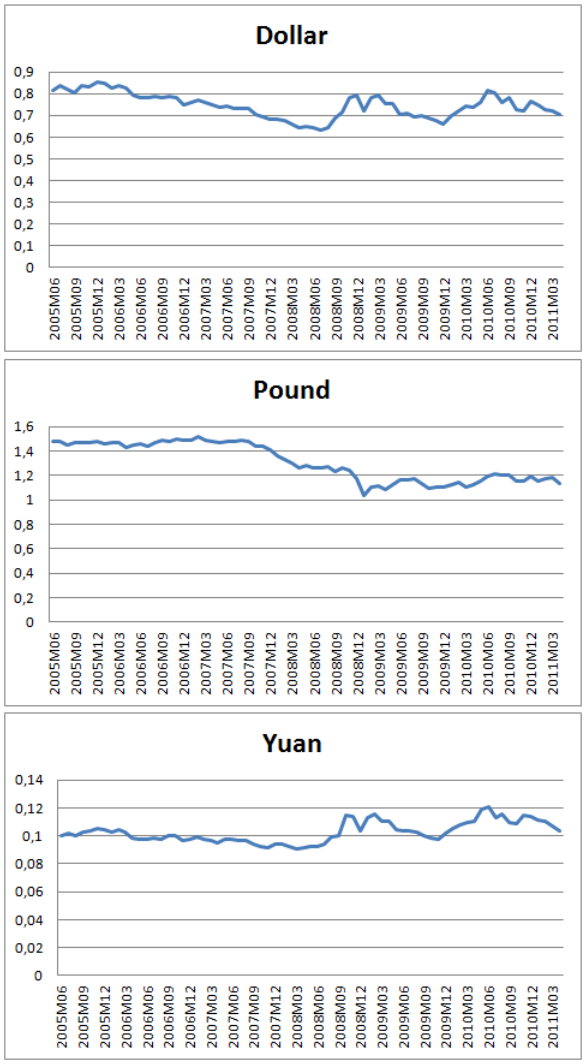
Following the *rule of thumb* recommended by Efron and Tibshirani (1993), it follows from the bootstrap estimation that all the exchange rate pass-through bias are not significant. Therefore, OLS estimates in our study are consistent and unbiased estimates of ERPT elasticities.

Appendix B.2: Panel estimation

In order to obtain robust standard errors for the fixed effect estimator, we also perform panel bootstrap. In general, the procedure is the same as that of individual time series described in the previous subsection. Nevertheless, instead of resampling residuals, we use the key assumption that observations are independent over individual i and do bootstrap pairs procedure, considering time series for a given individual i as a block, that resamples with replacement over i.

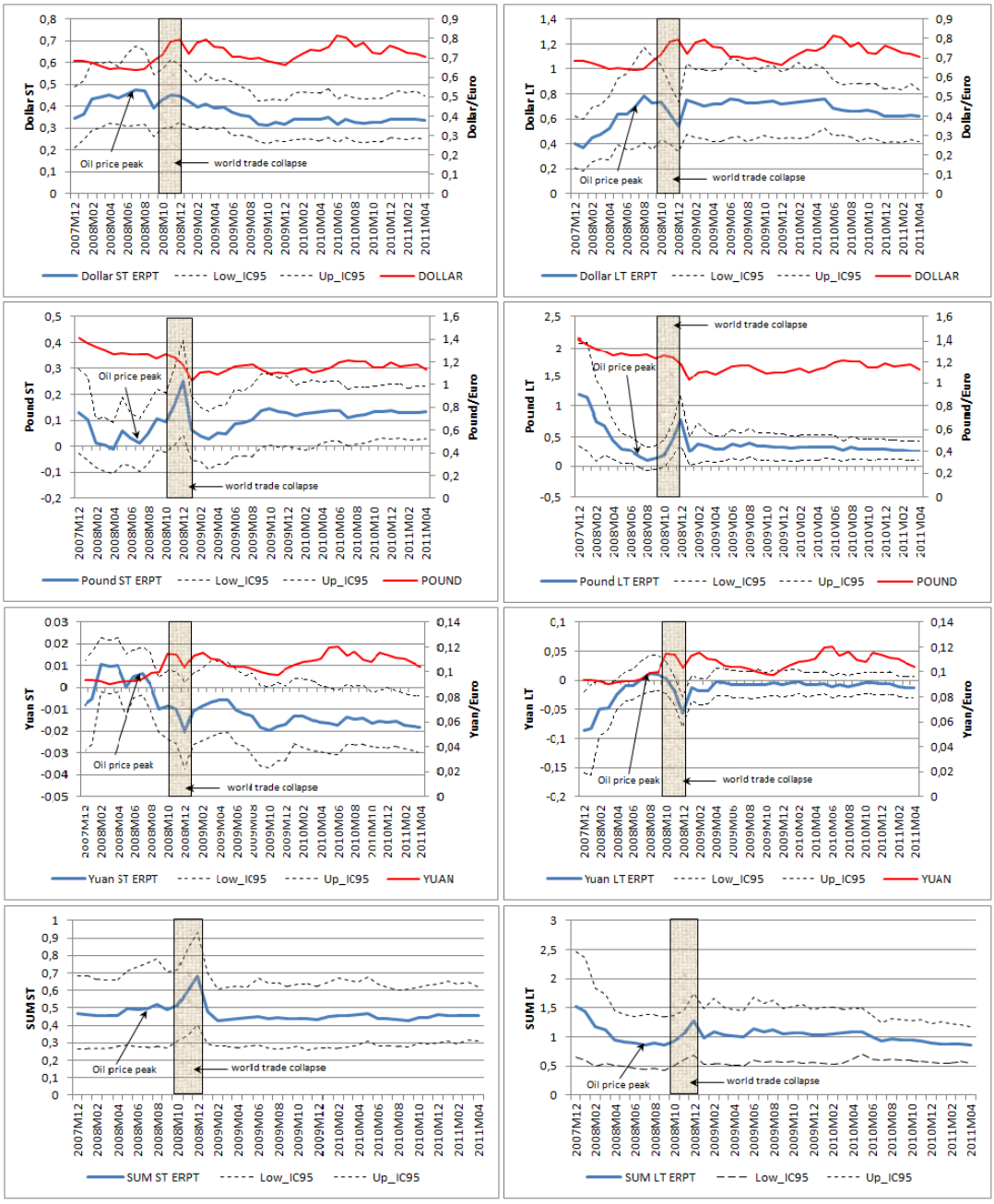
Appendix C: Graphics

Figure 1: Exchange rate



The exchange rate used in this study is defined as the number of units of domestic currency, the Euro, per unit of foreign currency. That is, a decrease of the exchange rate is interpreted as an appreciation of the Euro or a depreciation of the foreign currency considered.

Figure 2: Time varying ERPT for cross-country and industry analysis



Appendix D: Tables

Table 3: Weight

MANUFACTURING	SITC
FOOD	SITC0: Food and live animals
PETRO	SITC3-3: Petroleum, petroleum products
CHEM, PHAR	SITC5: Chemicals and related products
TEXT, LEATH, WOOD, PAPE, RUUB, NMMP, METAL, FMET	SITC6: Manufactured goods classified by materials
COMP, ELEC, MACH, VEHI, OTRA	SITC7: Machinery and transport equipment
WEAP, FURN, OMAN	SITC8: Miscellaneous manufactured articles
Table of correspondence between the EU Classification of Product and Activity (CPA) at 2-digit level and the Standard International Trade Classification (SITC) Rev.2 for time-varying weights computation.	

The time-varying weight is computed, following the Standard International Trade Classification (SITC), from the value of Euro-area import in million Ecu/Euro from United States (M_t^{us}), United Kingdom (M_t^{uk}) and China (M_t^{ch}) published by Eurostat. STIC classification corresponding to each category of manufacturing products is summarized in table 3. Formally we have:

$$\pi_t^x = \frac{M_t^x}{M_t^{us} + M_t^{uk} + M_t^{ch}}$$

Note that sections of SITC and CPA classification are the same until 2-digit level.

Table 4: ERPT elasticities individual estimation

		EA16		Germany		Greece		Spain		France		Netherlands	
		ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
Food	**Dollar**	0.219^{+}	**0.507**	0.197^{+}	0.034^{+}	0.351^{+}	0.119^{+}	0.621^{++}	0.807^{++}	0.232^{+}	0.367^{+}	0.128^{+}	0.252^{+}
	Pound	0.021^{+}	0.020^{+}	0.008^{+}	0.055^{+}	-0.244^{+}	-0.234^{+}	0.167^{+}	0.537^{++}	0.030^{+}	-0.012^{+}	**0.298**	**0.512**
	Yuan	-0.071^{+}	-0.215^{+}	-0.045^{+}	**-0.319**	-0.009^{+}	-0.237^{+}	-0.044^{+}	-0.182^{+}	-0.051^{+}	-0.127^{+}	**-0.228**	**-0.476**
	SUM	0.169^{+}	0.312^{+}	0.160^{+}	-0.230^{+}	0.098^{+}	-0.353^{+}	0.743^{++}	1.162^{++}	0.212^{+}	0.228^{+}	0.198^{+}	0.288^{+}
Text	**Dollar**	0.183^{+}	0.816^{++}	0.192^{+}	0.404^{+}	0.235^{+}	0.442^{+}	1.097^{++}	1.493^{++}	-0.051^{+}	-0.290^{+}	0.131^{+}	**0.450**
	Pound	-0.043^{+}	-0.077^{+}	-0.083^{+}	-0.118^{+}	-0.099^{+}	-0.157^{+}	-0.124^{+}	0.066^{+}	0.059^{+}	0.258^{+}	0.003^{+}	**-0.312**
	Yuan	-0.019^{+}	-0.043^{+}	0.000^{+}	-0.025^{+}	0.013^{+}	0.032^{+}	0.053^{+}	0.007^{+}	0.001^{+}	-0.078^{+}	**-0.035**	-0.034^{+}
	SUM	0.122^{+}	0.696^{++}	0.110^{+}	0.261^{+}	0.149^{+}	0.318^{+}	1.027^{++}	1.565^{++}	0.009^{+}	-0.110^{+}	0.099^{+}	0.105^{+}
Weap	**Dollar**	**0.490**	0.871^{++}	**0.500**	0.699^{++}	0.099^{+}	0.067^{+}	0.905^{++}	**1.787**	-0.021^{+}	**0.467**	1.134^{++}	**1.638**
	Pound	-0.027^{+}	-0.183^{+}	-0.072^{+}	-0.112^{+}	-0.001^{+}	-0.054^{+}	-0.117^{+}	-0.133^{+}	0.189^{+}	-0.275^{+}	-0.329^{+}	-0.563^{+}
	Yuan	0.018^{+}	0.035^{+}	0.032^{+}	0.060^{+}	0.003^{+}	0.002^{+}	0.047^{+}	**0.115**	-0.040^{+}	-0.078^{+}	**0.068**	**0.106**
	SUM	**0.481**	0.723^{++}	**0.461**	0.647^{++}	0.102^{+}	0.014^{+}	0.835^{++}	1.769^{++}	0.127^{+}	0.113^{+}	0.874^{++}	1.181^{++}
Leath	**Dollar**	0.357^{+}	1.317^{++}	0.870^{++}	0.858^{++}	0.706^{++}	0.617^{++}	**1.820**	**2.477**	0.326^{+}	0.083^{+}	0.675^{++}	0.547^{++}
	Pound	**0.545**	0.221^{+}	-0.010^{+}	-0.302^{+}	0.089^{+}	0.105^{+}	0.029^{+}	-0.190^{+}	0.101^{+}	-0.161^{+}	-0.129^{+}	-0.483^{+}
	Yuan	-0.085^{+}	-0.058^{+}	0.033^{+}	0.018^{+}	0.031^{+}	0.011^{+}	0.042^{+}	-0.022^{+}	0.023^{+}	-0.230^{+}	-0.001^{+}	-0.076^{+}
	SUM	0.817^{++}	1.479^{++}	0.894^{++}	0.574^{++}	0.826^{++}	0.723^{++}	**1.891**	2.265^{++}	**0.450**	-0.308^{+}	**0.545**	-0.011^{+}
Wood	**Dollar**	**0.336**	0.423^{+}	0.290^{+}	0.700^{++}	-0.188^{+}	-0.455^{+}	1.294^{++}	1.641^{++}	-0.056^{+}	-0.122^{+}	0.010^{+}	-0.293^{+}
	Pound	0.063^{+}	0.361^{+}	0.116^{+}	0.964^{++}	0.212^{+}	0.036^{+}	-0.060^{+}	-0.243^{+}	0.192^{+}	**0.487**	0.046^{+}	0.316^{+}
	Yuan	-0.035^{+}	**-0.186**	-0.045^{+}	**-0.225**	-0.035^{+}	-0.083^{+}	0.050^{+}	-0.037^{+}	-0.020^{+}	-0.109^{+}	-0.055^{+}	**-0.209**
	SUM	**0.364**	0.598^{++}	**0.361**	1.439^{++}	-0.011^{+}	-0.502^{+}	1.284^{++}	1.361^{++}	0.116^{+}	0.257^{+}	0.001^{+}	-0.186^{+}
Pape	**Dollar**	**0.360**	0.649^{++}	**0.307**	**0.496**	-0.024^{+}	-0.376^{+}	**0.417**	0.697^{++}	0.633^{++}	0.992^{++}	0.253^{+}	0.669^{++}
	Pound	0.061^{+}	**0.504**	0.074^{+}	**0.477**	-0.016^{+}	0.014^{+}	0.240^{+}	0.863^{++}	-0.135^{+}	0.591^{++}	0.126^{+}	0.626^{++}
	Yuan	-0.018^{+}	-0.002^{+}	-0.020^{+}	0.000^{+}	-0.012^{+}	**-0.103**	-0.034^{+}	-0.051^{+}	0.000^{+}	0.065^{+}	-0.029^{+}	-0.040^{+}
	SUM	**0.403**	1.151^{++}	**0.361**	0.973^{++}	-0.051^{+}	-0.464^{+}	**0.622**	1.509^{++}	**0.498**	1.648^{++}	**0.350**	1.255^{++}
Petro	**Dollar**	-	-	**2.400**	2.190^{++}	**1.942**	2.824^{++}	**2.410**	**5.211**	**3.182**	3.988^{++}	**1.982**	1.183^{++}
	Pound	-	-	-0.063^{+}	0.130^{+}	0.291^{+}	0.583^{++}	0.198^{+}	**0.476**	**0.466**	1.180^{++}	0.178^{+}	0.143^{+}
	Yuan	-	-	0.135^{+}	-0.064^{+}	-0.485^{+}	-2.778^{+}	0.574^{++}	-1.655^{+}	-0.446^{+}	-3.372^{+}	0.627^{++}	2.449^{++}
	SUM	-	-	**2.472**	2.255^{++}	1.747^{++}	0.629^{++}	**3.182**	4.042^{++}	**3.202**	1.796^{++}	**2.787**	3.775^{++}
Chem	**Dollar**	0.164^{+}	0.033^{+}	0.072^{+}	-0.041^{+}	0.022^{+}	-0.073^{+}	**0.508**	0.369^{+}	0.140^{+}	0.003^{+}	-0.018^{+}	-0.466^{+}
	Pound	0.156^{+}	0.181^{+}	**0.241**	**0.443**	-0.058^{+}	-0.230^{+}	0.012^{+}	**0.497**	0.146^{+}	**0.419**	**0.340**	0.676^{++}
	Yuan	-0.144^{+}	-0.605^{+}	**-0.119**	**-0.482**	0.078^{+}	0.054^{+}	-0.140^{+}	-0.617^{+}	-0.127^{+}	**-1.315**	**-0.280**	-0.466^{+}
	SUM	0.176^{+}	-0.391^{+}	**0.193**	-0.080^{+}	0.043^{+}	-0.249^{+}	**0.380**	0.249^{+}	0.160^{+}	-0.894^{+}	0.042^{+}	-0.255^{+}
Phar	**Dollar**	**0.257**	0.120^{+}	**0.378**	0.225^{+}	0.023^{+}	**0.301**	**0.324**	0.306^{+}	0.276^{+}	-0.164^{+}	0.124^{+}	0.314^{+}
	Pound	0.112^{+}	-0.098^{+}	-0.016^{+}	-0.319^{+}	**-0.205**	-0.193^{+}	-0.158^{+}	-0.038^{+}	0.178^{+}	0.136^{+}	0.775^{++}	**0.448**
	Yuan	-0.058^{+}	-0.177^{+}	-0.080^{+}	-0.485^{+}	-0.002^{+}	0.608^{++}	0.051^{+}	-0.402^{+}	0.045^{+}	0.209^{+}	**-0.410**	**-0.807**
	SUM	**0.312**	-0.154^{+}	**0.282**	-0.579^{+}	**-0.184**	0.716^{++}	0.217^{+}	-0.134^{+}	**0.499**	0.182^{+}	**0.489**	-0.045^{+}
Rubb	**Dollar**	0.221^{+}	0.672^{++}	0.159^{+}	0.707^{++}	-0.022^{+}	-0.331^{+}	0.861^{++}	1.600^{++}	0.228^{+}	**0.440**	0.064^{+}	**0.536**
	Pound	-0.134^{+}	-0.153^{+}	-0.064^{+}	0.029^{+}	-0.115^{+}	0.007^{+}	-0.153^{+}	**-0.629**	-0.040^{+}	0.211^{+}	-0.053^{+}	-0.079^{+}
	Yuan	-0.011^{+}	0.028^{+}	0.007^{+}	0.020^{+}	0.031^{+}	**-0.086**	0.041^{+}	0.011^{+}	-0.036^{+}	0.032^{+}	-0.026^{+}	-0.028^{+}
	SUM	0.076^{+}	0.547^{++}	0.102^{+}	0.756^{++}	-0.105^{+}	-0.410^{+}	0.749^{++}	0.981^{++}	0.152^{+}	0.683^{++}	-0.015^{+}	0.429^{+}
Nmmp	**Dollar**	0.158^{+}	0.190^{+}	0.099^{+}	0.156^{+}	0.044^{+}	-0.171^{+}	1.002^{++}	0.765^{++}	0.100^{+}	0.533^{++}	0.154^{+}	0.352^{+}
	Pound	-0.104^{+}	-0.119^{+}	**-0.112**	-0.252^{+}	-0.004^{+}	0.144^{+}	-0.134^{+}	0.431^{+}	0.037^{+}	-0.155^{+}	-0.151^{+}	-0.125^{+}
	Yuan	0.005^{+}	-0.043^{+}	0.002^{+}	0.003^{+}	0.023^{+}	-0.038^{+}	**0.080**	-0.151^{+}	-0.020^{+}	-0.011^{+}	0.006^{+}	-0.003^{+}
	SUM	0.059^{+}	0.028^{+}	-0.010^{+}	-0.094^{+}	0.063^{+}	-0.065^{+}	0.948^{++}	1.046^{++}	0.117^{+}	0.366^{+}	0.009^{+}	0.224^{+}
Metal	**Dollar**	0.789^{++}	1.276^{++}	1.123^{++}	1.035^{++}	-0.155^{+}	**0.404**	0.781^{++}	1.378^{++}	0.331^{+}	1.714^{++}	0.523^{++}	0.612^{++}
	Pound	0.142^{+}	1.047^{++}	0.313^{+}	1.350^{++}	0.086^{+}	-0.013^{+}	-0.030^{+}	0.390^{+}	0.169^{+}	2.100^{++}	0.261^{+}	1.700^{++}
	Yuan	-0.034^{+}	0.152^{+}	-0.042^{+}	0.178^{+}	-0.032^{+}	0.057^{+}	-0.014^{+}	0.200^{+}	-0.084^{+}	0.008^{+}	-0.048^{+}	0.175^{+}
	SUM	0.897^{++}	2.474^{++}	1.394^{++}	2.562^{++}	-0.101^{+}	**0.449**	0.738^{++}	1.968^{++}	**0.416**	3.822^{++}	0.737^{++}	2.487^{++}

Fmet	**Dollar**	0.209^{+}	0.713^{++}	0.194^{+}	0.818^{++}	**0.471**	0.965^{++}	1.303^{++}	1.576^{++}	0.131^{+}	1.166^{++}	0.113^{+}	0.270^{+}
	Pound	**0.154**	0.283^{+}	0.126^{+}	0.029^{+}	-0.098^{+}	-0.305^{+}	**-0.335**	-0.254^{+}	0.108^{+}	0.352^{+}	-0.065^{+}	-0.138^{+}
	Yuan	-0.027^{+}	-0.033^{+}	-0.033^{+}	-0.029^{+}	0.029^{+}	0.037^{+}	**0.072**	0.013^{+}	-0.004^{+}	-0.044^{+}	-0.021^{+}	-0.020^{+}
	SUM	**0.336**	0.963^{++}	**0.287**	0.819^{++}	**0.402**	0.697^{++}	1.040^{++}	1.335^{++}	0.236^{+}	1.473^{++}	0.028^{+}	0.112^{+}
Comp	**Dollar**	**0.365**	0.823^{++}	**0.262**	0.780^{++}	0.014^{+}	-0.008^{+}	**0.400**	0.875^{++}	0.361^{+}	0.231^{+}	**0.476**	0.676^{++}
	Pound	-0.058^{+}	**-0.698**	0.053^{+}	**-0.750**	-0.003^{+}	0.001^{+}	-0.116^{+}	-0.505^{+}	-0.066^{+}	0.117^{+}	-0.210^{+}	-0.692^{+}
	Yuan	0.035^{+}	0.054^{+}	0.019^{+}	0.007^{+}	0.003^{+}	0.004^{+}	0.019^{+}	0.052^{+}	0.011^{+}	0.030^{+}	0.023^{+}	0.026^{+}
	SUM	**0.342**	0.179^{+}	**0.334**	0.037^{+}	0.014^{+}	-0.003^{+}	0.304^{+}	**0.422**	0.306^{+}	0.379^{+}	0.289^{+}	0.010^{+}
Elec	**Dollar**	**0.385**	**0.530**	**0.424**	**0.551**	**0.188**	-0.128^{+}	0.826^{++}	0.946^{++}	0.172^{+}	0.476^{+}	**0.199**	0.142^{+}
	Pound	-0.152^{+}	-0.314^{+}	-0.103^{+}	-0.198^{+}	0.050^{+}	0.184^{+}	**-0.364**	**-0.905**	-0.024^{+}	-0.019^{+}	**-0.161**	-0.175^{+}
	Yuan	**0.043**	0.030^{+}	**0.044**	0.028^{+}	0.008^{+}	-0.005^{+}	**0.071**	0.039^{+}	0.004^{+}	-0.020^{+}	**0.037**	0.020^{+}
	SUM	**0.276**	0.246^{+}	**0.364**	0.380^{+}	**0.246**	0.051^{+}	**0.532**	0.080^{+}	0.152^{+}	**0.437**	0.075^{+}	-0.013^{+}
Mach	**Dollar**	0.135^{+}	0.128^{+}	**0.218**	**0.252**	-0.013^{+}	-0.086^{+}	**0.434**	**0.517**	-0.034^{+}	-0.213^{+}	**0.196**	**0.205**
	Pound	-0.076^{+}	-0.025^{+}	-0.091^{+}	-0.133^{+}	0.093^{+}	**0.264**	-0.092^{+}	-0.301^{+}	0.071^{+}	-0.158^{+}	**-0.202**	**-0.297**
	Yuan	0.029^{+}	0.020^{+}	**0.030**	0.024^{+}	0.002^{+}	0.041^{+}	**0.055**	0.084^{+}	0.036^{+}	-0.048^{+}	**0.049**	0.032^{+}
	SUM	0.088^{+}	0.124^{+}	**0.156**	0.143^{+}	0.083^{+}	0.220^{+}	**0.397**	0.299^{+}	0.074^{+}	-0.419^{+}	0.043^{+}	-0.060^{+}
Vehi	**Dollar**	0.223^{+}	0.467^{+}	0.054^{+}	0.003^{+}	**0.158**	0.160^{+}	0.099^{+}	0.167^{+}	0.250^{+}	0.080^{+}	0.041^{+}	-0.074^{+}
	Pound	-0.271^{+}	**-0.785**	0.052^{+}	0.168^{+}	-0.029^{+}	0.171^{+}	-0.036^{+}	0.074^{+}	-0.245^{+}	0.248^{+}	-0.070^{+}	-0.055^{+}
	Yuan	0.033^{+}	0.054^{+}	0.007^{+}	0.011^{+}	0.017^{+}	0.038^{+}	0.007^{+}	0.027^{+}	0.016^{+}	0.013^{+}	0.004^{+}	-0.002^{+}
	SUM	-0.015^{+}	-0.263^{+}	**0.113**	0.183^{+}	**0.147**	**0.370**	0.071^{+}	0.268^{+}	0.021^{+}	0.341^{+}	-0.026^{+}	-0.132^{+}
Otra	**Dollar**	**0.381**	0.763^{++}	**0.268**	0.194^{+}	0.051^{+}	-0.057^{+}	**0.469**	0.774^{++}	0.102^{+}	1.092^{++}	**0.339**	0.917^{++}
	Pound	-0.082^{+}	-0.403^{+}	0.006^{+}	-0.057^{+}	0.022^{+}	0.027^{+}	-0.239^{+}	-0.485^{+}	0.678^{++}	1.276^{++}	-0.205^{+}	**-0.987**
	Yuan	0.037^{+}	0.045^{+}	0.027^{+}	0.013^{+}	0.022^{+}	0.007^{+}	0.050^{+}	0.073^{+}	-0.029^{+}	-0.142^{+}	0.021^{+}	0.003^{+}
	SUM	**0.336**	**0.406**	**0.301**	0.149^{+}	0.095^{+}	-0.023^{+}	**0.279**	0.362^{+}	0.750^{++}	2.226^{++}	0.155^{+}	-0.066^{+}
Furn	**Dollar**	0.131^{+}	0.381^{+}	**0.324**	0.290^{+}	-0.026^{+}	-0.023^{+}	1.182^{++}	1.513^{++}	**-0.402**	-0.086^{+}	**0.499**	**0.482**
	Pound	**-0.364**	-0.287^{+}	**-0.395**	**-0.503**	-0.031^{+}	0.077^{+}	**-0.709**	-0.414^{+}	0.236^{+}	-0.083^{+}	**-0.351**	-0.017^{+}
	Yuan	**0.074**	0.027^{+}	**0.082**	0.033^{+}	0.017^{+}	0.036^{+}	**0.223**	0.132^{+}	-0.047^{+}	-0.088^{+}	**0.062**	-0.027^{+}
	SUM	-0.160^{+}	0.121^{+}	0.010^{+}	-0.179^{+}	-0.040^{+}	0.091^{+}	0.696^{++}	1.231^{++}	-0.214^{+}	-0.257^{+}	0.210^{+}	**0.438**
Oman	**Dollar**	0.902^{++}	1.059^{++}	**0.641**	0.842^{++}	0.168^{+}	0.559^{++}	1.342^{++}	**1.959**	1.104^{++}	0.689^{++}	**0.457**	0.684^{++}
	Pound	**-0.477**	**-0.609**	**-0.456**	**-0.573**	0.004^{+}	**-0.886**	**-0.504**	-0.476^{+}	**-0.830**	-0.918^{+}	-0.198^{+}	**-0.727**
	Yuan	**0.100**	**0.123**	**0.087**	**0.033**	0.012^{+}	0.060^{+}	**0.137**	**0.189**	**0.122**	0.131^{+}	**0.043**	**0.072**
	SUM	**0.525**	0.573^{++}	**0.272**	0.376^{+}	0.184^{+}	-0.267^{+}	0.975^{++}	1.673^{++}	0.396^{+}	-0.098^{+}	0.302^{+}	0.029^{+}

Test of ERPT elasticity equal to 0 and 1 :

- short term : **(1)** $H_0 : \alpha_0 = 0$ or **(2)** $H_0 : \alpha_0 = 1$

- long term : **(3)** $H_0 : \sum_{i=0}^{4} \alpha_i = 0$ or **(4)** $H_0 : \sum_{i=0}^{4} \alpha_i = 1$

$^{(+)}$ null hypothesis **(1)** and **(3)** is not rejected at 95% level, ERPT is not statistically different from **0**

$^{(++)}$ null hypothesis **(2)** and **(4)** is not rejected at 95% level, ERPT is not statistically different from **1**

Figures in bold type indicate that ERPT is incomplete when its estimate value lies between 0 and 1, statistically smaller than 0 when it is negative and statistically greater than 1 when it is greater than 1.

Table 4 reports estimated coefficients of the ERPT for the currencies of the three main trade partners' of Euro-area using equation (3). Interpretation of these estimated coefficients is as the following. Let us for instance take the case of the Euro area (EA16). The US Dollar BERPT into the import price of manufacture of paper and paper products

(Pape) is estimated to be equal to 0.360 in the short run and 0.649 in the long run. That is, one percent change in the bilateral Euro-Dollar exchange rate leads to 0.360% (respectively, 0.649%) change in the import price of manufacture of paper and paper products (Pape) for the Euro area (EA16) in the short run (respectively, in the long run), everything else being equal. Moreover, the short run US Dollar BERPT in this case is incomplete (expressed with bold character) whereas that of the long run is complete (marked with double plus sign). The Pound and the Yuan do not have any statistically significant effects, zero pass-through, at the short run (respectively estimated to be equal to 0.061 and -0.018, and marked with plus sign). The long run BERPT in turn is incomplete (0.504) for the Pound and is statistically not different from zero (-0.002) for the Yuan.

Concerning the MERPT, $\alpha_0^{SUM} = 0.403$ (respectively, $\sum_{i=0}^{4} \alpha_i^{SUM} = 1.151$) is interpreted as short (respectively, long) term manufacture of paper and paper products' (Pape) import price reponse, a rise of 0.403% (respectively, 1.151%), following one percent rise (depreciation) of the Euro. As for the short term US Dollar BERPT, the short run MERPT is incomplete whereas the long run MERPT is complete.

Table 5: Cross-industry fixed effect estimation

	EA16		Germany		Greece		Spain		France		Netherlands	
	ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
Dollar	**0.260** (0.035) [0.038]	**0.419** (0.119) [0.121]	**0.347** (0.120) [0.117]	**0.509** (0.167) [0.177]	0.112^{+} (0.091) [0.092]	**0.358** (0.182) [0.206]	**0.624** (0.109) [0.114]	1.174^{++} (0.314) [0.330]	**0.245** (0.106) [0.110]	**0.517** (0.222) [0.230]	**0.295** (0.110) [0.109]	**0.400** (0.184) [0.194]
Pound	0.034^{+} (0.041) [0.045]	0.084^{+} (0.087) [0.092]	**0.109** (0.050) [0.055]	**0.260** (0.101) [0.111]	0.129^{+} (0.115) [0.110]	0.119^{+} (0.158) [0.145]	0.137^{+} (0.141) [0.138]	**0.365** (0.232) [0.227]	**0.268** (0.160) [0.153]	**0.572** (0.248) [0.236]	0.110^{+} (0.080) [0.079]	**0.184** (0.112) [0.117]
Yuan	-0.005^{+} (0.009) [0.010]	-0.009^{+} (0.017) [0.017]	**-0.014** (0.010) [0.013]	-0.007^{+} (0.020) [0.019]	**-0.018** (0.012) [0.015]	-0.009^{+} (0.011) [0.012]	0.006^{+} (0.013) [0.016]	0.020^{+} (0.022) [0.022]	**-0.047** (0.019) [0.022]	**-0.066** (0.026) [0.026]	**-0.027** (0.014) [0.015]	-0.020^{+} (0.020) [0.020]
SUM	**0.289** (0.039) [0.042]	**0.494** (0.124) [0.132]	**0.442** (0.154) [0.146]	0.763^{++} (0.234) [0.251]	0.223^{+} (0.179) [0.168]	**0.469** (0.325) [0.334]	0.767^{++} (0.201) [0.199]	1.559^{++} (0.491) [0.504]	**0.466** (0.240) [0.222]	**1.023**$^{++}$ (0.428) [0.422]	**0.379** (0.148) [0.140]	**0.564** (0.174) [0.187]

Test of ERPT elasticity equal to 0 and 1 :

- short term : **(1)** $H_0 : \alpha_0 = 0$ or **(2)** $H_0 : \alpha_0 = 1$

- long term : **(3)** $H_0 : \sum_{i=0}^{4} \alpha_i = 0$ or **(4)** $H_0 : \sum_{i=0}^{4} \alpha_i = 1$

$^{(+)}$ null hypothesis **(1)** and **(3)** is not rejected at 95% level, ERPT is not statistically different from **0**
$^{(++)}$ null hypothesis **(2)** and **(4)** is not rejected at 95% level, ERPT is not statistically different from **1**
Figures in bold type indicate that ERPT is incomplete.
Figures in parentheses and brackets are respectively standard errors for the slope coefficients from panel robust (Arellano (1987)) and panel bootstrap.

Table 6: Cross-country fixed effect estimation

MANUF	ERPT							
	Dollar		Pound		Yuan		SUM	
	ST	LT	ST	LT	ST	LT	ST	LT
Food	**0.286** (0.083) [0.081]	**0.285** (0.124) [0.123]	0.052^{+} (0.079) [0.078]	0.174^{+} (0.131) [0.129]	**-0.074** (0.034) [0.033]	**-0.262** (0.054) [0.054]	**0.264** (0.106) [0.105]	0.196^{+} (0.239) [0.236]
Text	**0.353** (0.173) [0.179]	**0.546** (0.255) [0.260]	**-0.059** (0.028) [0.029]	-0.097^{+} (0.072) [0.077]	0.007^{+} (0.013) [0.013]	-0.016^{+} (0.016) [0.017]	**0.301** (0.166) [0.170]	**0.432** (0.267) [0.265]
Weap	**0.525** (0.193) [0.200]	0.942^{++} (0.289) [0.301]	-0.085^{+} (0.066) [0.071]	**-0.297** (0.065) [0.069]	**0.024** (0.016) [0.017]	**0.044** (0.031) [0.033]	**0.464** (0.149) [0.151]	0.689^{++} (0.290) [0.295]
Leath	0.863^{++} (0.236) [0.232]	0.921^{++} (0.393) [0.388]	0.025^{+} (0.045) [0.043]	**-0.197** (0.101) [0.101]	**0.024** (0.007) [0.007]	-0.060^{+} (0.042) [0.041]	0.912^{++} (0.234) [0.229]	0.664^{++} (0.406) [0.393]
Wood	0.310^{+} (0.235) [0.239]	0.385^{+} (0.367) [0.365]	**0.087** (0.039) [0.040]	**0.243** (0.146) [0.160]	-0.022^{+} (0.015) [0.016]	**-0.129** (0.031) [0.032]	**0.375** (0.216) [0.219]	**0.499** (0.341) [0.341]
Pape	**0.326** (0.095) [0.092]	**0.507** (0.198) [0.192]	0.049^{+} (0.056) [0.056]	**0.492** (0.128) [0.126]	**-0.017** (0.005) [0.005]	-0.024^{+} (0.025) [0.024]	**0.358** (0.098) [0.095]	0.974^{++} (0.330) [0.321]
Petro	**2.398** (0.204) [0.202]	**3.115** (0.636) [0.636]	**0.222** (0.080) [0.081]	**0.503** (0.148) [0.155]	0.070^{+} (0.225) [0.224]	-1.152^{+} (0.960) [0.946]	**2.689** (0.242) [0.243]	**2.466** (0.578) [0.574]
Chem	**0.140** (0.0708) [0.0713]	-0.046^{+} (0.1154) [0.1298]	**0.160** (0.0708) [0.0713]	**0.394** (0.1154) [0.1298]	**-0.127** (0.0708) [0.0713]	**-0.578** (0.1154) [0.1298]	**0.173** (0.0708) [0.0713]	**-0.230** (0.1154) [0.1298]
Phar	**0.221** (0.065) [0.062]	**0.194** (0.072) [0.075]	0.098^{+} (0.153) [0.147]	-0.005^{+} (0.108) [0.104]	-0.070^{+} (0.070) [0.068]	-0.164^{+} (0.219) [0.212]	**0.249** (0.106) [0.103]	0.024^{+} (0.185) [0.180]
Rubb	**0.282** (0.142) [0.150]	**0.619** (0.284) [0.291]	**-0.099** (0.018) [0.021]	-0.150^{+} (0.124) [0.132]	0.004^{+} (0.014) [0.013]	-0.009^{+} (0.020) [0.020]	0.186^{+} (0.135) [0.141]	**0.460** (0.210) [0.215]
Nmmp	**0.282** (0.168) [0.170]	**0.340** (0.150) [0.151]	**-0.069** (0.039) [0.038]	-0.006^{+} (0.112) [0.109]	0.016^{+} (0.016) [0.016]	**-0.041** (0.025) [0.025]	0.229^{+} (0.165) [0.167]	**0.292** (0.191) [0.189]
Metal	**0.524** (0.184) [0.179]	1.029^{++} (0.213) [0.212]	**0.146** (0.050) [0.051]	1.057^{++} (0.350) [0.365]	**-0.042** (0.010) [0.010]	**0.126** (0.034) [0.034]	**0.629** (0.204) [0.202]	**2.212** (0.480) [0.494]

Fmet	**0.472** (0.198) [0.204]	0.997^{++} (0.196) [0.207]	-0.059^{+} (0.074) [0.076]	-0.071^{+} (0.094) [0.101]	0.009^{+} (0.017) [0.018]	-0.007^{+} (0.014) [0.014]	**0.422** (0.151) [0.156]	0.920^{++} (0.206) [0.221]
Comp	**0.321** (0.076) [0.077]	**0.524** (0.157) [0.161]	**-0.083** (0.051) [0.053]	**-0.376** (0.160) [0.169]	**0.015** (0.003) [0.004]	**0.025** (0.010) [0.010]	**0.252** (0.052) [0.051]	**0.173** (0.074) [0.073]
Elec	**0.365** (0.111) [0.116]	**0.420** (0.167) [0.173]	**-0.135** (0.066) [0.069]	**-0.263** (0.181) [0.189]	**0.033** (0.011) [0.012]	**0.015** (0.010) [0.011]	**0.263** (0.069) [0.072]	**0.172** (0.070) [0.079]
Mach	**0.163** (0.075) [0.075]	0.145^{+} (0.114) [0.116]	-0.057^{+} (0.047) [0.047]	**-0.156** (0.098) [0.099]	**0.036** (0.008) [0.009]	**0.029** (0.018) [0.019]	**0.142** (0.056) [0.057]	0.018^{+} (0.117) [0.120]
Vehi	**0.126** (0.038) [0.039]	**0.069** (0.042) [0.042]	**-0.076** (0.048) [0.047]	**0.097** (0.039) [0.045]	**0.012** (0.003) [0.003]	**0.018** (0.006) [0.006]	**0.061** (0.027) [0.027]	**0.185** (0.077) [0.080]
Otra	**0.348** (0.088) [0.086]	0.691^{++} (0.265) [0.250]	-0.075^{+} (0.073) [0.098]	**-0.300** (0.200) [0.250]	**0.036** (0.005) [0.007]	**0.031** (0.017) [0.024]	**0.308** (0.102) [0.104]	**0.422** (0.318) [0.333]
Furn	**0.337** (0.233) [0.237]	**0.488** (0.267) [0.272]	**-0.266** (0.133) [0.140]	**-0.271** (0.114) [0.121]	**0.065** (0.037) [0.038]	0.025^{+} (0.032) [0.033]	0.136^{+} (0.145) [0.142]	0.241^{+} (0.253) [0.242]
Oman	**0.720** (0.181) [0.177]	0.938^{++} (0.236) [0.231]	**-0.369** (0.113) [0.118]	**-0.653** (0.067) [0.068]	**0.076** (0.020) [0.020]	**0.108** (0.020) [0.020]	**0.428** (0.125) [0.121]	0.393^{+} (0.309) [0.305]

Test of ERPT elasticity equal to 0 and 1 :

- short term : **(1)** $H_0 : \alpha_0 = 0$ or **(2)** $H_0 : \alpha_0 = 1$

- long term : **(3)** $H_0 : \sum_{i=0}^{4} \alpha_i = 0$ or **(4)** $H_0 : \sum_{i=0}^{4} \alpha_i = 1$

$^{(+)}$ null hypothesis **(1)** and **(3)** is not rejected at 95% level, ERPT is not statistically different from **0**

$^{(++)}$ null hypothesis **(2)** and **(4)** is not rejected at 95% level, ERPT is not statistically different from **1**

Figures in bold type indicate that ERPT is incomplete.

Figures in parentheses and brackets are respectively standard errors for the slope coefficients from panel robust (Arellano (1987)) and panel bootstrap.

Table 7: Cross-country and industry fixed effect estimation

Country and industry fixed effect	ERPT							
	Dollar		**Pound**		**Yuan**		**SUM**	
	ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
MANUF	**0.337** (0.052) [0.051]	**0.623** (0.105) [0.107]	**0.135** (0.054) [0.052]	**0.257** (0.088) [0.084]	**-0.018** (0.006) [0.007]	-0.012^{+} (0.010) [0.009]	**0.453** (0.086) [0.081]	0.867^{++} (0.168) [0.164]

Test of ERPT elasticity equal to 0 and 1 :

- short term : **(1)** $H_0 : \alpha_0 = 0$ or **(2)** $H_0 : \alpha_0 = 1$

- long term : **(3)** $H_0 : \sum_{i=0}^{4} \alpha_i = 0$ or **(4)** $H_0 : \sum_{i=0}^{4} \alpha_i = 1$

$^{(+)}$ null hypothesis **(1)** and **(3)** is not rejected at 95% level, ERPT is not statistically different from **0**
$^{(++)}$ null hypothesis **(2)** and **(4)** is not rejected at 95% level, ERPT is not statistically different from **1**
Figures in bold type indicate that ERPT is incomplete.
Figures in parentheses and brackets are respectively standard errors for the slope coefficients from panel robust (Arellano (1987)) and panel bootstrap.

Table 8: ERPT mean deviation across goods by country

MANUF		EA16		Germany		Greece		Spain		France		Netherlands	
		ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
MEAN		**0.330***	**0.618***	**0.449***	**0.560***	**0.202***	**0.238***	**0.905***	**1.343***	**0.350***	**0.572***	**0.374***	**0.455***
Dollar	**Food**	-0.110	-0.111	-0.252	-0.525	0.149	-0.119	-0.284	-0.537	-0.118	-0.205	-0.246	-0.202
	Text	-0.147	0.198	-0.256	-0.155	0.032	0.205	0.193	0.149	-0.401	-0.862	-0.243	-0.005
	Weap	0.160	0.253	0.052	0.139	-0.103	-0.170	0.000	0.443	-0.371	-0.106	**0.760***	**1.183***
	Leath	0.027	**0.699****	0.422	0.298	**0.504****	0.379	**0.915***	**1.133***	-0.024	-0.489	0.301	0.093
	Wood	0.006	-0.195	-0.159	0.140	-0.390	-0.693	0.390	0.297	-0.406	-0.694	-0.364	-0.747
	Pape	0.031	0.031	-0.141	-0.064	-0.226	-0.613	**-0.488****	-0.647	0.283	0.420	-0.121	0.214
	Petro	-	-	**1.951***	**1.630***	**1.739***	**2.586***	**1.505***	**3.878***	**2.832***	**3.415***	**1.608***	**0.728****
	Chem	**-0.166****	**-0.585***	**-0.377***	**-0.600***	-0.180	-0.311	**-0.396***	**-0.974***	-0.210	-0.570	**-0.392***	**-0.921***
	Phar	-0.073	**-0.497***	-0.071	-0.335	-0.180	0.063	**-0.580***	**-1.037***	-0.074	**-0.736****	**-0.250***	-0.141
	Rubb	-0.109	0.054	-0.290	0.148	-0.224	-0.569	-0.044	0.256	-0.122	-0.132	-0.310	0.081
	Nmmp	-0.171	-0.428	-0.349	-0.404	-0.158	-0.408	0.097	-0.578	-0.251	-0.040	-0.220	-0.103
	Metal	**0.460***	0.658	**0.675***	0.475	-0.357	0.167	-0.123	0.035	-0.019	1.142	0.150	0.157
	Fmet	-0.120	0.095	-0.255	0.259	0.269	0.727	0.399	0.232	-0.219	0.594	-0.261	-0.185
	Comp	0.035	0.206	-0.186	0.220	-0.188	-0.246	**-0.504***	-0.468	0.011	-0.341	0.102	0.221
	Elec	0.055	-0.088	-0.025	-0.009	-0.014	-0.366	-0.079	-0.397	-0.178	-0.096	-0.175	-0.312
	Mach	-0.195	**-0.490***	-0.231	-0.308	-0.215	-0.323	**-0.471***	**-0.827***	-0.384	-0.785	-0.178	-0.250
	Vehi	-0.107	-0.151	**-0.395***	**-0.556****	-0.044	-0.077	**-0.805***	**-1.176***	-0.100	-0.492	**-0.333****	**-0.529****
	Otra	0.051	0.146	-0.181	-0.366	-0.152	-0.294	**-0.436***	**-0.569****	-0.248	0.519	-0.035	0.462
	Furn	-0.199	-0.237	-0.125	-0.270	-0.228	-0.260	0.277	0.170	**-0.753****	-0.659	0.125	0.027
	Oman	**0.572***	0.441	0.193	0.282	-0.034	0.322	**0.437****	0.616	**0.754****	0.117	0.083	0.229

H_0 : mean is equal to 0, **H_0 :** mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

MANUF		EA16		Germany		Greece		Spain		France		Netherlands	
		ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
MEAN		**-0.028**	**-0.060**	**-0.024**	**0.016**	**-0.003**	**-0.023**	**-0.126***	**-0.062**	**0.066**	**0.280**	**-0.005**	**-0.011**
Pound	**Food**	0.049	0.080	0.032	0.039	**-0.241***	-0.211	**0.293***	**0.599***	-0.036	-0.292	**0.303***	**0.523***
	Text	-0.015	-0.017	-0.059	-0.134	-0.096	-0.134	0.003	0.127	-0.007	-0.022	0.008	-0.300
	Weap	0.001	-0.124	-0.048	-0.128	0.002	-0.032	0.010	-0.071	0.123	-0.555	-0.324	-0.551
	Leath	**0.574***	0.280	0.014	-0.319	0.092	0.128	0.155	-0.128	0.035	-0.441	-0.124	-0.471
	Wood	0.091	0.421	0.140	**0.948***	0.214	0.059	0.066	-0.181	0.126	0.208	0.051	0.327
	Pape	0.089	**0.563****	0.098	0.461	-0.013	0.037	**0.366****	**0.925***	-0.201	0.312	0.131	0.637
	Petro	-	-	-0.039	0.113	**0.293***	**0.606***	**0.324***	**0.538***	**0.400***	**0.901***	**0.183****	0.155
	Chem	0.184	0.240	**0.264****	0.426	-0.055	-0.207	0.138	**0.558****	0.080	0.139	**0.345***	**0.687***
	Phar	0.141	-0.038	0.008	-0.335	-0.202	-0.170	-0.032	0.024	0.112	-0.143	**0.780***	0.459
	Rubb	-0.106	-0.093	-0.040	0.012	-0.112	0.030	-0.026	-0.567	-0.106	-0.069	-0.048	-0.067
	Nmmp	-0.076	-0.060	-0.088	-0.268	-0.001	0.167	-0.007	0.493	-0.029	-0.435	-0.146	-0.114
	Metal	0.170	**1.106***	**0.337****	**1.333***	0.089	0.010	0.096	0.452	0.103	**1.820***	0.266	**1.711***
	Fmet	0.182	0.343	0.150	0.013	-0.095	-0.282	-0.209	-0.192	0.043	0.072	-0.060	-0.127
	Comp	-0.030	**-0.638****	0.076	-0.766	0.000	0.024	0.010	-0.443	-0.132	-0.163	-0.205	-0.681
	Elec	-0.124	-0.254	-0.079	-0.215	0.053	0.207	-0.238	**-0.843****	-0.090	-0.299	-0.156	-0.163
	Mach	-0.048	0.035	-0.067	-0.149	0.096	0.287	0.034	-0.239	0.005	-0.438	-0.198	-0.285
	Vehi	**-0.243****	**-0.725****	0.076	0.152	-0.026	0.194	0.091	0.136	-0.311	-0.031	-0.066	-0.044
	Otra	-0.054	-0.343	0.030	-0.073	0.025	0.049	-0.113	-0.423	**0.612****	0.996	-0.200	**-0.975***
	Furn	-0.336	-0.227	-0.371	-0.519	-0.028	0.100	-0.583	-0.352	0.170	-0.363	-0.346	-0.005
	Oman	**-0.449****	-0.549	-0.432	-0.590	0.006	-0.863	-0.378	-0.414	-0.896	-1.197	-0.193	-0.716

H_0 : mean is equal to 0, **H_0 :** mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

MANUF		EA16		Germany		Greece		Spain		France		Netherlands	
		ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
MEAN		**-0.007**	**-0.042****	**0.006**	**-0.056**	**-0.014**	**-0.117***	**0.067***	**-0.109***	**-0.032**	**-0.259***	**-0.010**	**0.035**
Yuan	**Food**	**-0.064****	-0.173	-0.051	-0.263	0.005	-0.120	**-0.111****	-0.073	-0.018	0.132	**-0.218***	**-0.511***
	Text	-0.012	-0.002	-0.006	0.031	0.028	**0.149****	-0.014	0.115	0.033	0.181	-0.025	-0.069
	Weap	0.025	0.077	0.026	0.116	0.017	**0.119****	-0.020	**0.224***	-0.008	0.181	**0.078***	0.071
	Leath	**-0.079***	-0.017	0.027	0.075	0.045	0.128	-0.025	0.087	0.056	0.029	0.009	-0.110
	Wood	-0.028	**-0.144***	-0.051	**-0.169****	-0.021	0.034	-0.017	0.072	0.013	0.150	-0.045	**-0.244***
	Pape	-0.011	0.040	-0.026	0.056	0.003	0.015	**-0.101***	0.058	0.032	**0.323***	-0.020	-0.075
	Petro	-	-	0.129	-0.008	**-0.471***	**-2.661***	**0.507***	**-1.547***	-0.414	**-3.113***	**0.636***	**2.415***
	Chem	**-0.138***	**-0.563***	-0.125	-0.426	0.093	0.171	**-0.207***	-0.508	-0.094	-1.056	**-0.270***	-0.500
	Phar	-0.051	-0.135	-0.086	-0.428	0.013	**0.725***	-0.016	-0.294	0.077	0.468	**-0.400***	**-0.842***
	Rubb	-0.004	0.070	0.001	0.076	0.046	0.031	-0.026	0.120	-0.004	**0.291****	-0.017	-0.063
	Nmmp	0.012	-0.001	-0.004	0.059	0.037	0.079	0.013	-0.042	0.012	0.247	0.016	-0.038
	Metal	-0.028	**0.193***	-0.048	**0.234***	-0.018	0.174	**-0.081****	**0.308***	-0.052	0.267	-0.038	0.140
	Fmet	-0.020	0.009	-0.039	0.028	0.043	**0.154****	0.005	0.122	0.029	0.214	-0.011	-0.055
	Comp	**0.042****	**0.095****	0.013	0.063	0.017	**0.121****	-0.048	**0.160****	0.043	0.289	0.033	-0.008
	Elec	**0.049****	0.072	0.037	0.084	0.022	0.112	0.004	**0.148****	0.036	**0.239****	0.047	-0.015
	Mach	0.036	0.062	0.024	0.080	0.017	**0.158****	-0.012	**0.192****	0.068	0.210	0.059	-0.003
	Vehi	0.040	0.096	0.001	0.067	0.031	**0.155****	-0.060	0.136	0.048	**0.271****	0.013	-0.037
	Otra	0.043	0.087	0.021	0.069	0.036	0.124	-0.017	**0.182****	0.003	0.117	0.031	-0.031
	Furn	**0.081***	0.069	0.076	0.090	0.031	0.153	**0.156***	**0.240****	-0.015	0.171	0.071	-0.062
	Oman	**0.107***	**0.165***	**0.081***	**0.164***	0.026	**0.177***	**0.070****	**0.298***	**0.155***	**0.390***	0.053	0.037

H_0 : mean is equal to 0, **H_0 :** mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

MANUF		EA16		Germany		Greece		Spain		France		Netherlands	
		ST	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
MEAN		**0.295***	**0.516***	**0.431***	**0.520***	**0.185***	**0.098**	**0.845***	**1.173***	**0.384***	**0.593***	**0.360***	**0.478***
SUM	**Food**	-0.126	-0.204	-0.271	**-0.750****	-0.087	-0.451	-0.102	-0.011	-0.172	-0.365	-0.161	-0.190
	Text	-0.173	0.179	-0.321	-0.258	-0.036	0.220	0.181	0.392	-0.375	-0.703	-0.260	-0.373
	Weap	0.186	0.206	0.030	0.127	-0.083	-0.083	-0.011	0.596	-0.257	-0.480	**0.514****	0.703
	Leath	**0.522***	**0.963***	**0.463****	0.054	**0.641***	0.635	**1.045***	1.092	0.066	-0.902	0.186	-0.489
	Wood	0.069	0.082	-0.070	0.919	-0.196	-0.599	0.438	0.188	-0.268	-0.336	-0.359	-0.664
	Pape	0.108	0.634	-0.070	0.454	-0.237	-0.562	-0.223	0.337	0.114	1.055	-0.010	0.776
	Petro	-	-	**2.041***	**1.736***	**1.562***	0.532	**2.337***	**2.869***	**2.818***	1.203	**2.428***	**3.297***
	Chem	-0.119	**-0.908***	-0.238	-0.600	-0.142	-0.347	**-0.465***	-0.924	-0.224	-1.487	**-0.317***	-0.734
	Phar	0.017	**-0.671****	-0.149	**-1.098***	**-0.369***	0.618	**-0.629***	**-1.307***	0.115	-0.412	0.129	-0.523
	Rubb	-0.219	0.030	-0.329	0.236	-0.291	-0.508	-0.096	-0.191	-0.232	0.090	-0.374	-0.049
	Nmmp	-0.236	-0.488	**-0.441****	-0.613	-0.122	-0.162	0.102	-0.127	-0.267	-0.227	-0.351	-0.254
	Metal	**0.602***	**1.957***	**0.964***	**2.042***	-0.286	0.351	-0.108	0.795	0.032	**3.229***	0.377	**2.009***
	Fmet	0.041	0.447	-0.144	0.300	0.216	0.599	0.195	0.163	-0.148	0.880	-0.332	-0.366
	Comp	0.048	-0.337	-0.097	-0.483	-0.171	-0.101	**-0.542***	-0.750	-0.078	-0.215	-0.071	-0.468
	Elec	-0.019	-0.270	-0.067	-0.140	0.061	-0.047	**-0.313****	**-1.092***	-0.232	-0.156	-0.284	-0.491
	Mach	-0.207	-0.392	-0.274	-0.376	-0.103	0.122	**-0.448***	-0.873	-0.310	-1.012	**-0.317***	-0.538
	Vehi	**-0.310***	**-0.780***	**-0.318****	-0.337	-0.039	0.272	**-0.775***	-0.904	-0.363	-0.252	**-0.386****	-0.610
	Otra	0.041	-0.110	-0.130	-0.370	-0.091	-0.121	**-0.567***	-0.811	0.366	1.632	-0.204	-0.544
	Furn	**-0.455***	-0.396	-0.420	-0.699	-0.225	-0.007	-0.150	0.059	-0.598	-0.850	-0.150	-0.040
	Oman	0.230	0.057	-0.159	-0.144	-0.002	-0.364	0.130	0.500	0.012	-0.691	-0.057	-0.450

H_0 : mean is equal to 0, **H_0 :** mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

Interpretation of Table 8 is given as the following. Short term and long term mean of the ERPT for each importer's country are reported in the third row of each sub-panel that is labeled "MEAN". For example, short term variations of the import prices in Germany are in mean equal to 0.449%, −0.024%, 0.006% and 0.431% in response to a, respectively, 1% change of the Euro-Dollar, the Pound, the Chinese-Yuan, and the Euro. Long term ERPT cross-industry means in turn are equal to 0.560 for the US Dollar, 0.016 for the Pound, −0.056 for the Yuan and 0.520 for the Euro. Below the row of the MEAN are presented the deviations of pass-through from its mean for each category of manufactured products.

Table 9: ERPT mean deviation across countries by good

MANUF			Germany	Greece	Spain	France	Netherlands
			Mean Deviation				
Dollar (mandev.)	Food	ST: 0.306*	-0.109	0.045	0.315	-0.074	-0.177
		LT: 0.316	-0.282	-0.197	0.491	0.051	-0.063
	Text	ST: 0.321*	-0.129	-0.086	0.777*	-0.372*	-0.190
		LT: 0.500*	-0.096	-0.058	0.993*	-0.790*	-0.050
	Weap	ST: 0.524*	-0.023	-0.425*	0.381*	-0.545*	0.611*
		LT: 0.931*	-0.232	-0.864*	0.855*	-0.465**	0.706*
	Leath	ST: 0.879*	-0.009	-0.173	0.940*	-0.553**	-0.204
		LT: 0.916*	-0.059	-0.300	1.560*	-0.833	-0.369
	Wood	ST: 0.270*	0.020	-0.458*	1.024*	-0.326	-0.260
		LT: 0.294	0.406	-0.749**	1.346*	-0.416	-0.587
	Pape	ST: 0.317*	-0.010	-0.341**	0.100	0.316	-0.065
		LT: 0.496*	0.000	-0.872*	0.201	0.496	0.173
	Petro	ST: 2.383*	0.016	-0.441	0.027	0.799	-0.401
		LT: 3.081*	-0.891	-0.257	2.140**	0.907	-1.898
	Chem	ST: 0.145*	-0.073	-0.123	0.364*	-0.005	-0.163**
		LT: -0.042	0.001	-0.032	0.411*	0.044	-0.424*
	Phar	ST: 0.225*	0.153	-0.202*	0.099	0.051	-0.101
		LT: 0.196**	0.028	0.105	0.110	-0.361**	0.118
	Rubb	ST: 0.258*	-0.099	-0.280**	0.603*	-0.030	-0.194
		LT: 0.590*	0.117	-0.922*	1.009*	-0.150	-0.054
	Nmmp	ST: 0.280*	-0.180	-0.235	0.722*	-0.180	-0.126
		LT: 0.327*	-0.171	-0.498**	0.438	0.206	0.025
	Metal	ST: 0.521*	0.603	-0.676	0.260	-0.190	0.003
		LT: 1.029**	0.006	-0.624	0.350	0.685	-0.416
	Fmet	ST: 0.443*	-0.249	0.028	0.861*	-0.311	-0.329
		LT: 0.959*	-0.141	0.006	0.616	0.207	-0.689
	Comp	ST: 0.303*	-0.040	-0.289*	0.098	0.059	0.173
		LT: 0.511*	0.269	-0.519*	0.365**	-0.280	0.165
	Elec	ST: 0.362*	0.062	-0.174**	0.464*	-0.190**	-0.163
		LT: 0.397*	0.153	-0.526*	0.548*	0.079	-0.255
	Mach	ST: 0.160*	0.057	-0.173*	0.274*	-0.194*	0.036
		LT: 0.135**	0.117	-0.221	0.382*	-0.348*	0.070
	Vehi	ST: 0.120*	-0.067	0.038	-0.021	0.130	-0.080
		LT: 0.067**	-0.064	0.093	0.100	0.013	-0.141
	Otra	ST: 0.245**	0.022	-0.195	0.223	-0.144	0.093
		LT: 0.584*	-0.390	-0.641	0.190	0.508	0.333
	Furn	ST: 0.315*	0.009	-0.341*	0.866*	-0.718*	0.184**
		LT: 0.435*	-0.145	-0.458*	1.078*	-0.521*	0.047
	Oman	ST: 0.743*	-0.101	-0.574*	0.600*	0.361*	-0.286**
		LT: 0.947*	-0.105	-0.387	1.013*	-0.257	-0.263

$\mathbf{H_0}$: mean is equal to 0, $\mathbf{H_0}$: mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

MANUF			Germany	Greece	Spain	France	Netherlands
			Mean Deviation				
Pond (mandev.)	Food	ST: 0.052	-0.044	**-0.296***	0.115	-0.022	0.246
		LT: 0.171	-0.116	**-0.406****	0.366	-0.184	0.340
	Text	ST: -0.049	-0.034	-0.051	-0.075	0.108	0.052
		LT: -0.053	-0.065	-0.105	0.118	0.311	-0.259
	Weap	ST: -0.066	-0.006	0.065	-0.051	0.254	-0.263
		LT: -0.227	0.116	0.173	0.094	-0.048	-0.335
	Leath	ST: 0.016	-0.026	0.073	0.013	0.085	-0.145
		LT: -0.206	-0.096	0.311	0.016	0.045	-0.276
	Wood	ST: 0.101	0.015	0.111	-0.161	0.090	-0.055
		LT: 0.312*	**0.652***	-0.276	**-0.555****	0.175	0.003
	Pape	ST: 0.058	0.016	-0.074	0.182	-0.193	0.068
		LT: 0.514*	-0.037	**-0.500****	0.349	0.077	0.112
	Petro	ST: 0.214	-0.277	0.077	-0.016	0.252	-0.036
		LT: 0.503**	-0.373	0.081	-0.026	0.678	-0.359
	Chem	ST: 0.136*	0.105	-0.194	-0.125	0.010	0.204
		LT: 0.361*	0.082	**-0.591***	0.136	0.058	0.315
	Phar	ST: 0.115	-0.131	**-0.320***	**-0.273***	0.063	**0.660***
		LT: 0.007	-0.325	-0.200	-0.045	0.130	**0.441****
	Rubb	ST: -0.085**	0.021	-0.030	-0.068	0.045	0.032
		LT: -0.092	0.121	0.099	**-0.537***	0.303	0.014
	Nmmp	ST: -0.073	-0.039	0.068	-0.061	0.110	-0.078
		LT: 0.009	-0.260	0.135	**0.422***	-0.163	-0.134
	Metal	ST: 0.160	0.153	-0.073	-0.190	0.009	0.101
		LT: 1.105*	0.245	**-1.118****	-0.716	0.995	0.594
	Fmet	ST: -0.053	0.179	-0.045	**-0.283***	0.161	-0.012
		LT: -0.063	0.093	-0.242	-0.190	0.415	-0.075
	Comp	ST: -0.068	0.121	0.066	-0.047	0.002	-0.141
		LT: -0.366*	-0.384	0.367	-0.139	0.483	-0.326
	Elec	ST: -0.120*	0.017	**0.170****	**-0.244***	0.096	-0.040
		LT: -0.223**	0.024	**0.407****	**-0.682***	0.203	0.048
	Mach	ST: -0.044	-0.047	0.137	-0.048	0.115	**-0.158****
		LT: -0.125	-0.008	**0.389****	-0.176	-0.033	-0.172
	Vehi	ST: -0.066	0.118	0.037	0.030	**-0.179****	-0.005
		LT: 0.121	0.047	0.050	-0.047	0.127	-0.177
	Otra	ST: 0.052	-0.047	-0.030	-0.292	**0.625***	-0.257
		LT: -0.045	-0.012	0.072	-0.440	**1.321****	-0.942
	Furn	ST: -0.250*	-0.145	0.219	**-0.459***	**0.486***	-0.101
		LT: -0.188	-0.315	0.265	-0.226	0.105	0.171
	Oman	ST: -0.397*	-0.059	**0.401****	-0.107	**-0.433****	0.199
		LT: -0.716*	0.142	-0.170	0.240	-0.202	-0.011

$\mathbf{H_0}$: mean is equal to 0, $\mathbf{H_0}$: mean deviation of ERPT elasticity is equal to 0.
* (**) null hypothesis is rejected at 5% (10%) level.

MANUF			Germany	Greece	Spain	France	Netherlands
			Mean Deviation				
Yuan(mandev.)	Food	ST: -0.075*	0.031	0.066	0.031	0.025	-0.153*
		LT: -0.268*	-0.051	0.031	0.086	0.142	-0.208
	Text	ST: 0.006	-0.006	0.007	0.047*	-0.006	-0.042*
		LT: -0.020	-0.006	0.052	0.026	-0.058	-0.014
	Weap	ST: 0.022**	0.010	-0.019	0.025	-0.062*	0.046*
		LT: 0.041*	0.019	-0.039	0.075**	-0.119*	0.065
	Leath	ST: 0.026	0.007	0.005	0.017	-0.003	-0.026
		LT: -0.060	0.078	0.070	0.038	-0.171**	-0.016
	Wood	ST: -0.021	-0.024	-0.014	0.071*	0.001	-0.034
		LT: -0.133*	-0.093	0.050	0.096	0.024	-0.077
	Pape	ST: -0.019	-0.001	0.007	-0.015	0.019	-0.010
		LT: -0.026	0.026	-0.077	-0.025	0.090	-0.015
	Petro	ST: 0.081	0.054	-0.566	0.493	-0.527	0.546
		LT: -1.084	1.020	-1.694	-0.571	-2.288	3.533
	Chem	ST: -0.117*	-0.002	0.196*	-0.022	-0.009	-0.162*
		LT: -0.565*	0.083	0.619**	-0.052	-0.750*	0.099
	Phar	ST: -0.079*	-0.001	0.078	0.130**	0.124	-0.331*
		LT: -0.175	-0.310	0.784*	-0.227	0.385	-0.632*
	Rubb	ST: 0.003	0.004	0.028	0.037**	-0.039**	-0.030
		LT: -0.010	0.030	-0.075**	0.021	0.042	-0.018
	Nmmp	ST: 0.018**	-0.016	0.005	0.062*	-0.038**	-0.012
		LT: -0.040**	0.043	0.002	-0.111*	0.029	0.037
	Metal	ST: -0.044	0.002	0.011	0.030	-0.040	-0.004
		LT: 0.123**	0.054	-0.066	0.076	-0.115	0.051
	Fmet	ST: 0.009	-0.042	0.020	0.063*	-0.012	-0.030
		LT: -0.009	-0.020	0.046	0.022	-0.036	-0.012
	Comp	ST: 0.015	0.004	-0.012	0.004	-0.004	0.008
		LT: 0.024	-0.017	-0.019	0.028	0.006	0.002
	Elec	ST: 0.033*	0.011	-0.025	0.038**	-0.029	0.004
		LT: 0.012	0.015	-0.018	0.027	-0.032	0.007
	Mach	ST: 0.035*	-0.005	-0.032	0.021	0.002	0.015
		LT: 0.026	-0.002	0.015	0.057	-0.075**	0.005
	Vehi	ST: 0.010	-0.003	0.007	-0.003	0.006	-0.007
		LT: 0.017	-0.006	0.021	0.010	-0.005	-0.020
	Otra	ST: 0.018	0.009	0.003	0.031	-0.048	0.003
		LT: -0.009	0.022	0.016	0.082	-0.133	0.012
	Furn	ST: 0.067*	0.014	-0.050*	0.156*	-0.114*	-0.006
		LT: 0.017	0.016	0.019	0.114*	-0.105**	-0.044
	Oman	ST: 0.080*	0.007	-0.069*	0.057*	0.042**	-0.037
		LT: 0.112*	-0.004	-0.052	0.078**	0.019	-0.040

$\mathbf{H_0}$: mean is equal to 0, $\mathbf{H_0}$: mean deviation of ERPT elasticity is equal to 0.
* (**) null hypothesis is rejected at 5% (10%) level.

MANUF			Germany	Greece	Spain	France	Netherlands
			Mean Deviation				
SUM(mean dev.)	Food	ST: 0.282*	-0.122	-0.184	**0.461***	-0.070	-0.084
		LT: 0.219	-0.449	-0.572	**0.943***	0.009	0.069
	Text	ST: 0.279*	-0.169	-0.130	**0.748***	**-0.270****	-0.180
		LT: 0.428*	-0.167	-0.110	**1.137***	-0.537	-0.323
	Weap	ST: 0.480*	-0.019	**-0.378***	**0.355****	**-0.352****	**0.394***
		LT: 0.745*	-0.098	-0.731	**1.024***	-0.632	0.436
	Leath	ST: 0.921*	-0.027	-0.095	**0.970***	**-0.471****	-0.376
		LT: 0.650**	-0.076	0.082	**1.614***	-0.959	-0.661
	Wood	ST: 0.350*	0.011	**-0.361****	**0.934***	-0.234	**-0.349****
		LT: 0.474**	**0.965***	**-0.975***	**0.887****	-0.217	-0.660
	Pape	ST: 0.356*	0.005	**-0.407***	0.267	0.142	-0.006
		LT: 0.984*	-0.011	**-1.448***	0.525	0.664	0.270
	Petro	ST: 2.678*	-0.206	-0.931	0.504	0.524	0.109
		LT: 2.500*	-0.244	-1.870	1.542	-0.703	1.276
	Chem	ST: 0.164*	0.030	-0.121	**0.217****	-0.004	-0.121
		LT: -0.246	0.166	-0.003	0.495	-0.648	-0.010
	Phar	ST: 0.261*	0.021	**-0.444***	-0.044	**0.239***	**0.228***
		LT: 0.028	-0.607	0.688	-0.162	0.154	-0.073
	Rubb	ST: 0.177*	-0.075	**-0.282***	**0.573***	-0.024	-0.191
		LT: 0.488*	0.268	**-0.898***	0.493	0.195	-0.059
	Nmmp	ST: 0.225*	**-0.236****	-0.162	**0.723***	-0.108	-0.216
		LT: 0.296**	-0.389	-0.360	**0.750***	0.071	-0.071
	Metal	ST: 0.637*	**0.758****	**-0.738****	0.101	-0.221	0.100
		LT: 2.257*	0.305	-1.809	-0.290	1.564	0.229
	Fmet	ST: 0.398*	-0.112	0.003	**0.642***	-0.162	-0.371
		LT: 0.887*	-0.068	-0.191	0.448	0.586	-0.775
	Comp	ST: 0.249*	0.085	**-0.235****	0.054	0.057	0.040
		LT: 0.169	-0.132	-0.172	0.253	0.210	-0.159
	Elec	ST: 0.274*	0.090	-0.028	**0.258***	-0.122	**-0.199***
		LT: 0.187	0.193	-0.136	-0.107	0.250	-0.200
	Mach	ST: 0.151*	0.006	-0.068	**0.246***	-0.077	-0.108
		LT: 0.037	0.107	0.183	0.263	**-0.456****	-0.097
	Vehi	ST: 0.065**	0.048	0.082	0.006	-0.044	-0.091
		LT: 0.206**	-0.023	0.164	0.062	0.135	-0.338
	Otra	ST: 0.316*	-0.015	-0.221	-0.037	0.434	-0.161
		LT: 0.529	-0.380	-0.553	-0.167	**1.696***	-0.596
	Furn	ST: 0.132**	-0.122	-0.172	**0.563***	**-0.346***	0.077
		LT: 0.265	-0.444	-0.174	**0.967***	-0.522	0.173
	Oman	ST: 0.426*	-0.154	-0.242	**0.550***	-0.030	-0.123
		LT: 0.343	0.033	-0.609	**1.330***	-0.440	-0.314

$\mathbf{H_0}$ **:** mean is equal to 0, $\mathbf{H_0}$ **:** mean deviation of ERPT elasticity is equal to 0.
*(**) null hypothesis is rejected at 5% (10%) level.

Interpretation of Table 9 is given as the following. Cross-country mean in the short and the long run ERPT are reported in the third column for each category of goods. Let us take the case of the Euro-Dollar BERPT. The short and long run mean of the pass-through for the manufacture of food products (Food) are respectively equal to 0.306

and 0.316, and all the mean deviations are not statistically different from zero. That is, Euro-Dollar fluctuations have an homogeneous impact of 0.306 in the short run and 0.316 in the long run on the import price of food products. Concerning the manufacture of textiles (Text), the short and long run mean deviation of the US-Dollar BERPT for Spain (0.777 and 0.993) and for France (-0.372 and -0.790) show that United-States exporters of textiles tend to price in its own currency in Spain (complete pass-through of 1.098 in the short run and of 1.493 in the long run) whereas they tend to price in local currency of sale in France (pass-through of -0.051 in the short run and of -0.29 in the long run). The argument goes for the exporters of textiles that use the US-Dollar as a vehicle currency.