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IS THERE A DIFFERENCE? EXCHANGE RATE NONLINEARITIES IN EUROPEAN AGRI-FOOD (VERSUS TOTAL) EXPORTS TO THE US

by

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IS THERE A DIFFERENCE? EXCHANGE RATE NONLINEARITIES IN EUROPEAN AGRI-FOOD (VERSUS TOTAL) EXPORTS TO THE US

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Abstract: *Each time the Euro starts appreciating, a discussion on how painful this might hit European exporters arises in media, making politician and economists work out the ways to mitigate possible shocks. Still, in his recent study, Verheyen (2013a) using aggregated European exports to the US as an example, showed, that in the long run exports react on exchange rate changes in a nonlinear way. Particularly his analysis revealed, that a positive impact on trade during the Euro depreciation seem to outweigh the losses caused by its appreciations. In this paper, I test whether this holds true for agri-food exports as well. To address this question, I apply a partial sum decomposition approach and the NARDL framework of Shin et al. (2013) to aggregated agri-food exports as well as to total exports of eleven European countries to the US, which is currently the major partner of the EU in agri-food trade. The outcomes suggest, that the exchange rate nonlinearities are even more pronounced in agri-food than in total exports. Despite the ongoing discussion regarding the nocent effect of a strong national currency on exports, the estimation results suggest that European agri-food exporters have found their way to cope with such negative effects. European exporters seem to benefit more from Euro depreciation, than its appreciation harm them. I interpret this finding as a sign of pricing strategies application (e.g., pricing-to-market) to the European agri-food exports.*

Keywords: *agri-food exports, asymmetry, exchange rate nonlinearity, export demand, NARDL*

JEL-Codes: *C22, F14, L66*

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Introduction

Although the investigation of trade determinants and trade elasticities has been playing an important role in international economic studies for many decades now, the question of possible nonlinearities in international trade stayed unaddressed till the end of 80s, when the sunk costs and hysteresis literature emerged (e.g., Baldwin, 1990). According to hysteresis literature, nonlinearities in export demand might be driven by strategic behavior of the exporters, who invest an amount of sunk costs into entering the market and try to gain or keep the market share in the destination country. Though these studies showed evidence in favor of nonlinearities, they were basically conducted using relatively simple models, which did not allow to take time-series properties of data into account or to address nonlinearities and asymmetries of the underlying long-run relation between exports and exchange rates.

The only exception from this pattern I am aware of is the study of Verheyen (2013a), who adopted a nonlinear autoregressive distributed lag approach (NARDL) of Shin et al. (2011) to model nonlinearities not only in the short, but also in the long run in order to address the issue of the exchange rate nonlinearities in the exports of twelve EMU countries to the US. That study focused on total exports, and nonlinearities in the export demand reactions to the Euro appreciations and depreciations were found for many countries.

In this study, besides addressing total exports, I focus on agri-food exports. Excessive demand for EU agri-food products put European countries on the second position among the world top exporters. The US is the largest export market of the EU with an export share of 13 % in total agricultural exports (European Commission, 2013). As around 80 percent of all agricultural EU exports are final goods (mainly spirits and liqueurs, wine and vermouth, beer, waters, dairy products, cereal, fruit and vegetable preparations and confectionery) I suppose to find a more pronounced evidence of exchange rate nonlinearities in the European agri-food exports than it was recorded for total exports. This is expected due to pricing-to-market strategies (as e.g. in Knetter, 1989), which might be used by exporters in order to hinder the pass-through of the Euro fluctuations to the domestic US prices and to protect the market shares. In total exports the effect of pricing-to-market strategies might be hindered by a higher aggregation of data.

To test whether the evidence of exchange rate nonlinearities is indeed more pronounced in agri-food trade, I analyze agricultural exports of eleven European countries to the US over the last 25 years. As my model specification is somewhat different from the existing studies (with regard to definition of variables, choice of thresholds, etc.) I also re-estimate the export demand equations for total exports. This is done in order to compare the outcomes with the only empirical study available (Verheyen, 2013a) and to check whether the results are robust to different model specifications and to have a reference for conclusions regarding nonlinearities in agri-food exports. In order to allow for nonlinearities in the short and in the long run and to address the time-series properties of data (possible hidden cointegration) I apply the partial sum decomposition combined with the NARDL approach of Shin et al. (2013) and the bounds testing approach by Pesaran et al. (2001).

The remainder of the paper is structured as follows: Section 2 describes the methodology in more detail, Section 3 introduces the data, Section 4 presents the results and the last section provides a summary.

1. Methodology

I assume that the European exports to the US can be described by a conventional demand function[1], which can be written, depending on the way of including of the real exchange rate in it, as:

(1) $X_t = A * R_t^{\alpha} * Y_t^{\beta}$, or

(2) $X_t = B * E_t^{\gamma} * P_t^{\delta} * Y_t^{\zeta}$,

where the European exports to the US at the time t (X_t) are determined by some constant parameter (A or B), the US demand Y, and the real exchange rate (R), which is included in the second specification as a nominal exchange rate (E) and a relative price (P), in order to separate the exchange rate and the price effect. The exponents refer to the elasticities of exports with respect to the foreign demand and the real exchange rate (or to the nominal exchange rate and the relative price in the second case).

Taking logs of the Equations 1 and 2 results in the following Equations 3 and 4, which represent the long-run relationship between the exports and its determinants (the lower case letters denote logs):

(3) $x_t = a + \alpha r_t + \beta y_t$

(4) $x_t = b + \gamma e_t + \delta p_t + \zeta y_t$.

To address the nonlinearity of the US export demand with respect to the exchange rate, I apply a partial sum decomposition approach by Shin et al. (2013). Here I stick to a two-threshold decomposition case, which let me not only distinguish between appreciations and depreciations of the exchange rate, but also separate small from large exchange rate changes, as it was often suggested empirically that exporters behavior might be a subject to hysteresis and the exporter might not react the same way on exchange rate changes of different magnitudes (e.g., Baldwin, 1988; Belke et al., 2013). The exchange rate decomposition takes the following form for the real exchange rate:

(5) $r_t = r_0 + r_t^{-} + r_t^{\pm} + r_t^{+}$,

and analogously for the nominal exchange rate:

(6) $e_t = e_0 + e_t^{-} + e_t^{\pm} + e_t^{+}$.

[1] Similar demand functions were specified in e.g. Bahmani-Oskooee and Kara (2003) or Verheyen (2013b).

Unlike Verheyen (2013a) I decompose not the original series, but the log of the exchange rate here, which allows me to avoid problems related to taking logs of negative numbers (exchange rate depreciations) and interpret the exchange rate coefficients as elasticities. Instead of using various quantiles I fix the threshold levels at the level of one positive and negative standard deviation, as it lets me show how the export reaction changes within the range of standard fluctuations of exchange rates and outside of it. The real exchange rate series can be decomposed as:

(7) $r_t^- = \sum_{j=1}^{t} \Delta r_j^- = \sum_{j=1}^{t} \Delta r_j I\{\Delta r_j \leq -STD\}$;

(8) $r_t^{\pm} = \sum_{j=1}^{t} \Delta r_j^{\pm} = \sum_{j=1}^{t} \Delta r_j I\{-STD < \Delta r_j < +STD\}$;

(9) $r_t^+ = \sum_{j=1}^{t} \Delta r_j^+ = \sum_{j=1}^{t} \Delta r_j I\{+STD \leq \Delta r_j\}$.

The decomposition of the nominal exchange rate can be done analogously. Then the export Equations 3-4 take the following form:

(10) $x_t = a + \alpha_1 r_t^- + \alpha_2 r_t^{\pm} + \alpha_3 r_t^+ + \beta y_t$,

(11) $x_t = b + \gamma_1 e_t^- + \gamma_2 e_t^{\pm} + \gamma_3 e_t^+ + \delta p_t + \zeta y_t$.

In this representation I still have (the log of) original exchange rate series, which is now substituted by three partial sums. This allows me to test the long-run relation between the positive, negative and small changes of the exchange rate and the export demand in the long run. The only observation that I lose due to such an exchange rate decomposition will be captured by the constant. The same holds true for the nominal exchange rate partial sum decomposition.

As I deal with variables, which are often nonstationary, such long-run representation might be spurious, once time-series properties of data are not taken into account. On the other hand, all the standard methods of a unit-root and cointegration testing might be not applicable, as the original variable is decomposed. Using NARDL allows me to take into account the possible hidden cointegration between positive and negative components of the underlying variables (Granger and Yoon, 2002) and test for a presence of a long-run relationship between the level variables irrespective of their order of integration (I(0), I(1) or mixed) by means of a bound testing approach by Pesaran et al. (2001)[2].

The NARDL model for the export demand Equation (10) can be written as:

(12) $\Delta x_t = a_0 + a_1\left(x_{t-1} - a_2 r_{t-1}^- - a_3 r_{t-1}^{\pm} - a_4 r_{t-1}^+ - a_5 y_{t-1}\right) + \sum_{\tau=0} \eta_\tau \Delta r_{t-\tau}^- +$
$+ \sum_{\tau=0} \theta_\tau \Delta r_{t-\tau}^{\pm} + \sum_{\tau=0} \iota_\tau \Delta r_{t-\tau}^+ + \sum_{\tau=0} \kappa_\tau \Delta y_{t-\tau} + \sum_{\omega=1} \lambda_\omega \Delta x_{t-\omega} + u_t$

[2] There are no variables integrated of order two in my sample. The results of pre-testing are available upon request.

The NARDL representation of the model with nominal exchange rate is constructed analogously:

$$(13)\Delta x_t = b_0 + b_1\left(x_{t-1} - b_2 e^{-}_{t-1} - b_3 e^{\pm}_{t-1} - b_4 e^{+}_{t-1} - b_5 y_{t-1} - b_6 p_{t-1}\right) + \sum_{\tau=0} \mu_\tau \Delta e^{-}_{t-\tau} + \\ + \sum_{\tau=0} \nu_\tau \Delta e^{\pm}_{t-\tau} + \sum_{\tau=0} \xi_\tau \Delta e^{+}_{t-\tau} + \sum_{\tau=0} o_\tau \Delta y_{t-\tau} + \sum_{\tau=0} \pi_\tau \Delta p_{t-\tau} + \sum_{\omega=1} \rho_\omega \Delta x_{t-\omega} + u_t$$

The appropriate lag structure is chosen according to Schwarz criterion. When the autocorrelation is still present in the chosen specification I add the lags of the first difference of the dependent variable in order to overcome the problem. In any case, a maximum lag length of 12 is considered as the monthly data is used.

As the estimation of NARDL with ordinary least squares (OLS) delivers only a product of the exchange rate coefficient and the coefficient of the lagged export demand, I recalculate the long-run elasticities as follows:

$$(14) rer^{-} = -\frac{a_2}{a_1};\ rer^{\pm} = -\frac{a_3}{a_1};\ rer^{+} = -\frac{a_4}{a_1};$$

$$(15) er^{-} = -\frac{b_2}{b_1};\ er^{\pm} = -\frac{b_3}{b_1};\ er^{+} = -\frac{b_4}{b_1}.$$

The standard errors and significance levels of the recalculated long-run elasticities are obtained using the Delta method. To test for a long-run level relationship between the variables, I conduct the Bounds testing by Pesaran et al. (2001). This is done by testing the H_0 of $a_1 = a_2 = a_3 = a_4 = a_5 = 0$ in the Equation 12 and the H_0 of $b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = 0$ in the Equation 13 and comparing the test statistics with the critical values tabulated by Pesaran et al. (2001).

The symmetry is tested by means of a Wald test. The rejection of the H_0 of symmetry will be considered as a proof of a nonlinear export demand reaction towards appreciations and depreciations. As there might be not much variation within the inner regime I suppose to face some certain difficulties in proving hysteresis in the sense of Verheyen (2013a), who stated that hysteresis can be indicated by a stronger reaction to large than to small exchange rate changes. Still, I suppose to see nonlinearity in the response of the export demand to exchange rate changes of different magnitudes. Furthermore, positive values for the estimates of the foreign demand (y) and negative coefficients at the relative prices (p) are expected. As exports and exchange rates are typically inversely related, I also await negative signs at the exchange rate coefficients.

2. Data

My export data are taken from the Eurostat and consist of bilateral nominal total and agricultural exports from 11 EMU countries[3] to the US measured in Euro. The sample includes monthly data from January 1988 to August 2013. For two countries in the sample (Austria and Finland) the export series are only available from January 1995 on. For aggregated exports I use total exports according to the Standard International Trade Classification (SITC) classification. The analyzed

[3] Those countries are: Austria (AT), Belgium (BE), Germany (DE), Spain (ES), Finland (FI), France (FR), Greece (GR), Ireland (IE), Italy (IT), Netherlands (NL), and Portugal (PT).

agricultural exports are limited to SITC group 0 "Food and live animals", which includes, e.g. meat and preparations, dairy products, cereals and preparations, fruits and vegetables, coffee, sugar and confectionery. In order to deseasonalise nominal exports I apply the Census-12 procedure. Relative prices are calculated as consumer price index (CPI) of a corresponding European country divided by the US CPI series. The US demand is approximated by the index of industrial production (IIP), as it is available on a monthly basis. The IIP and the CPI are collected from the OECD Main Economic Indicators database and are already seasonally adjusted.

Nominal exchange rates are measured as units of the American Dollar (USD) per 1 Euro and are taken from Eurostat. In order to adjust the exchange rates for the period before the introduction of the Euro, I use the official conversion rates to calculate the bilateral exchange rate series. In order to obtain real exchange rates, bilateral nominal exchange rate series are multiplied with the relative price measures. Thus, an increase in the exchange rate corresponds to a Euro appreciation. The descriptive statistics of nominal and real exchange rate series in levels as well as of the first differences of the exchange rates in logs are reported in Appendix A.

The US is one of the most relevant trade partners of the European countries and the main importer of European agricultural products in recent years. For many EMU countries the US is the major export destination outside of the Eurozone (Verheyen, 2013a). Figure 1 provides some overview of the relevance of the US market for the exports of the considered European countries.

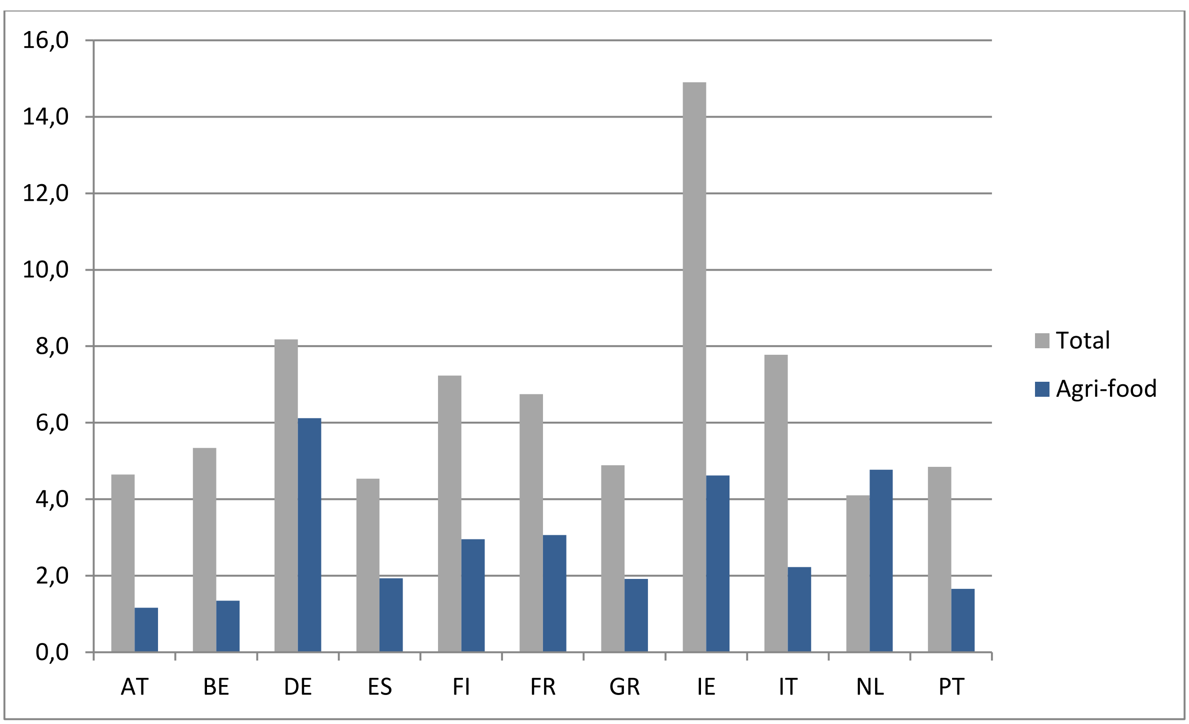

Figure 1. Exports to the US relative to all country's exports (average of values 1988-2012, %)

3. Results

In this section I proceed with the outcomes of the estimated models. As nonlinearities in the export reactions to exchange rate changes were mostly neglected in empirical literature, I compare the outcomes for total exports with those of Verheyen (2013a), and then collate these results with the outcomes received for agri-food exports to see whether some differences/similarities can be found there.

Total exports

The outcomes obtained for total exports (Appendix B) are very much in line with those by Verheyen (2013a), despite the fact that my sample is somewhat larger, the exchange rates enter the equations in logs and the threshold levels are not similar. The chosen lag structure and the explanatory power of the models are compatible in most of the cases. The average adjusted coefficient of determination in my sample takes the value of 0.391, ranging from 0.286 to 0.529 between the models.

The evidence in favor of a long-run level relationship is quite strong. Results of bounds testing are reported in the bottom part of the corresponding NARDL tables (Appendix B). The only models for which I could not reject the H_0 of no cointegration were the ones for Austria, Netherlands and Ireland (only for the model with a nominal exchange rate). Estimated coefficients carry mostly expected signs and show that the US income, approximated by the industrial production index, positively and over proportionally affects European exports to the US, while inflation has a negative impact.

In order to save space, Table 1 reports only the recalculated long-run export demand elasticities with respect to exchange rates. The outcomes suggest that exchange rates do affect European exports. The values of coefficients of nominal and real exchange rates are quite close in absolute terms and are mostly significant. For most of the models irrespective of the specification coefficients related to Euro depreciations are larger in absolute terms than those related to Euro appreciations. This supports the idea, that the EU countries benefit more from the Euro depreciations than they suffer from the reduction in the US export demand, once the Euro appreciates. As for hysteresis, I was not able to find any robust evidence in favor of hysteresis, apart from France, Greece, Italy and Spain, for which the coefficients at the inner regime of exchange rate are smaller in absolute terms, than those at large appreciations and depreciations.

Table 2 provides an overview of a symmetry testing. Symmetry between all the exchange rate coefficients is rejected for seven (eight) out of eleven cases for the models with real (nominal) exchange rates as explanatory variables. The most pronounced and robust evidence in favor of nonlinearities is found for Austria and Belgium, where the hypothesis of equality of long-run

Table 1. Summary of the long-run exchange rate coefficients (total exports)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					A. Real exchange rates						
$\boldsymbol{rer^{-}}$	-0.658**	-0.715***	-0.812***	-0.654***	-0.423*	-0.960***	-1.300***	-2.234***	-0.691***	-0.215	-0.918***
	(0.305)	(0.253)	(0.151)	(0.208)	(0.250)	(0.090)	(0.248)	(0.839)	(0.116)	(0.318)	(0.348)
$\boldsymbol{rer^{\pm}}$	-2.130***	-2.602***	-0.770***	-0.087	-1.214***	-0.765***	-0.028	-1.879*	-0.231	-1.330**	-0.961*
	(0.551)	(0.452)	(0.231)	(0.387)	(0.348)	(0.141)	(0.608)	(1.127)	(0.165)	(0.577)	(0.498)
$\boldsymbol{rer^{+}}$	0.083	-0.198	-0.509***	-0.290*	-0.309	-0.926***	-0.273**	-1.699	-0.614***	0.440	-0.698***
	(0.273)	(0.194)	(0.130)	(0.159)	(0.231)	(0.076)	(0.121)	(1.065)	(0.086)	(0.283)	(0.258)
					B. Nominal exchange rates						
$\boldsymbol{er^{-}}$	-0.524**	-0.727**	-0.770***	-0.548***	-0.457	-0.959***	-0.813***	-1.914***	-0.710***	-0.405	-0.815***
	(0.211)	(0.301)	(0.121)	(0.144)	(0.286)	(0.097)	(0.296)	(0.697)	(0.091)	(0.351)	(0.291)
$\boldsymbol{er^{\pm}}$	-1.698***	-2.087***	-0.778***	-0.393*	-1.047***	-0.900***	-0.153	-2.003*	-0.467***	-1.211**	-1.290***
	(0.348)	(0.423)	(0.170)	(0.207)	(0.349)	(0.141)	(0.400)	(1.020)	(0.127)	(0.585)	(0.384)
$\boldsymbol{er^{+}}$	0.172	-0.040	-0.590***	0.046	-0.371	-0.838***	0.084	-1.074*	-0.627***	0.168	-0.590***
	(0.205)	(0.261)	(0.131)	(0.113)	(0.316)	(0.101)	(0.233)	(0.636)	(0.072)	(0.316)	(0.213)

Notes: Delta method standard errors are in parentheses. ***, ** and * refer to significance at the 1, 5 and 10 percent level.

Table 2. Symmetry testing summary (total exports)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					A. Real exchange rates						
$\boldsymbol{a_2 = a_3 = a_4}$	0.020	0.000	0.001	0.006	0.133	0.243	0.000	0.367	0.000	0.033	0.199
$\boldsymbol{a_2 = a_3}$	0.047	0.004	0.865	0.146	0.064	0.155	0.113	0.807	0.000	0.092	0.949
$\boldsymbol{a_3 = a_4}$	0.018	0.001	0.358	0.625	0.049	0.267	0.721	0.926	0.232	0.029	0.949
$\boldsymbol{a_2 = a_4}$	0.005	0.000	0.000	0.005	0.226	0.399	0.000	0.402	0.000	0.011	0.093
					B. Nominal exchange rates						
$\boldsymbol{b_2 = b_3 = b_4}$	0.004	0.003	0.051	0.000	0.329	0.477	0.000	0.280	0.044	0.047	0.070
$\boldsymbol{b_2 = b_3}$	0.039	0.015	0.966	0.460	0.171	0.669	0.105	0.949	0.066	0.178	0.257
$\boldsymbol{b_3 = b_4}$	0.010	0.003	0.408	0.053	0.139	0.710	0.569	0.546	0.264	0.040	0.092
$\boldsymbol{b_2 = b_4}$	0.001	0.001	0.019	0.000	0.512	0.241	0.000	0.111	0.107	0.031	0.076

Notes: Wald test results of equality of the coefficients are reported (p-values).

coefficients of the exchange rates is rejected for both models and for all of the exchange rate coefficients' combinations. Symmetry between the two outer regimes – appreciations and depreciations – was rejected for all the countries but Finland[4], France and Ireland, for which I conclude, that the magnitude of the reaction of the exports does not depend on direction or magnitude of the exchange rate change.

Food exports

The overall fit of the models, which focus on the US export demand for agri-food products, is somewhat higher than for total exports. Adjusted R-squared takes the value of around 0.405 on average, with the values on a country level ranging from 0.291 to 0.471. The evidence in favor of cointegration in equations for agri-food exports is even more pronounced than in the models with total exports as dependent variable (results are reported in Appendix C). The bound testing suggests that there is a long-run relationship between the level variables in all models.

Most of the coefficients of the estimated NARDL models have expected signs. The export demand for food products, when significant, mostly enters equations with a positive sign. Relative prices are of less importance for the exports determination of agri-food than of the total exports. More than 50 percent of the coefficients are not statistically significant even at the 10 percent level.

Similarly to the case of total exports, the nominal exchange rate itself seems to be more important than inflation, as the coefficients of the nominal and real exchange rate in the different model specifications do not differ much. For agri-food exports the exchange rate seems also to be more important than the US income: while only half of the industrial production indices are statistically significant, exchange rate coefficients (especially the ones capturing depreciations) are often highly statistically significant. The only robust exclusion is Austria, where neither for the nominal nor for real exchange rate specifications any of the exchange rate coefficients are significant. Finland, France, Greece, Netherlands, Portugal and Spain seem to benefit the most from the Euro depreciations. In a meantime, those are in general also the countries who suffer the most of the Euro appreciations. Still, Euro appreciations do not seem to harm the export demand much. The coefficients for Euro depreciations are often considerably higher in absolute terms than the ones for appreciations. Table 3 reports long-run elasticities of food exports with respect to exchange rate changes.

There might be some plausible reasons for such asymmetric reactions of exports: as European countries export a lot of processed goods to the US, some of those products might have gained certain reputation on the American market, so that the US consumers do not switch away from European goods as their local price in US Dollars rise, and consume more, once the Dollar price falls. It could also be the case that the European food exporters, who perceive the US market as

[4] The outcomes for Finland should be treated with caution. The equation seem to be misspecified, as the speed of adjustment is higher than one in absolute terms, which implies some overshooting. This might be due to a shorter time span, as in case of Finland the data is only available from 1995, and a poorer performance of NARDL in short samples.

strategically important, apply some pricing strategies (e.g., pricing-to-market) in order to partially offset the currency volatility and smooth fluctuations in shipped quantities, by reducing the markup they set on marginal costs. Then the total agri-food imports of European products by the US do not change much, as the Euro appreciates, which results in a modest number of significant coefficients referring to a Euro appreciation. Asymmetric strategic pricing might be a plausible explanation behind the nonlinearity and asymmetry of the export volumes' reactions towards Euro appreciations and depreciations, as empirical literature often found evidence of pricing-to-market of European exporters, especially in their trade with the US (e.g., Knetter 1989, 1997; Falk and Falk, 2000; Glauben and Loy, 2003; Stahn, 2007).

The evidence in favor of hysteresis is also more pronounced for agri-food than for total exports which supports the sunk costs hypothesis and suggests that strategic pricing might really take place on some markets. For agri-food exports hysteresis is found for Belgium, France, Greece, Italy, Portugal and Spain.

Table 4 provides the outcomes of the symmetry testing for the food export demand. The equality of all the long-run exchange rate coefficients is rejected in ten out of eleven cases in both model specifications. Thus, Ireland is the only country, for which the symmetry of the export's reaction on exchange rate changes of different direction and magnitude could not be rejected. In general, asymmetry between the appreciations and depreciations is more pronounced, than between those and the inner regime. The evidence in favor of nonlinearities is larger for food exports equations compared to the equations with total exports as dependent variable. This suggests that assuming linearity and symmetry in export demand functions, as it has been often done in the literature, might well lack a rationale, once one assumes imperfectly competitive segmented markets.

4. Summary

In this paper I concentrated on the relationship between the exported volumes of food and agricultural products and exchange rates and tested if this relationship is linear, using a newly developed methodology of Shin et al (2013), which allowed me to model exchange rate nonlinearities in export demand equations not only in the short, but also in the long run. Furthermore, I compared the outcomes for agri-food products with the results for aggregated total exports, and showed that assuming linearity of the export's reaction on the exchange rates is very restrictive in both cases.

The results of the analysis, which was carried out using monthly data on nominal exports from eleven European countries to the US during the period 1988-2013, show, that exports react differently on appreciations and depreciations of the Euro. The same holds true for small and large exchange rate changes.

Table 3. Summary of the long-run exchange rate coefficients (food exports)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					A. Real exchange rates						
$\boldsymbol{rer^{-}}$	-0.332	-0.771***	-0.600*	-1.146***	-0.900**	-0.839***	-1.094***	-0.849***	-0.710***	-1.146***	-1.360***
	(0.468)	(0.258)	(0.330)	(0.158)	(0.414)	(0.229)	(0.299)	(0.265)	(0.089)	(0.216)	(0.518)
$\boldsymbol{rer^{\pm}}$	1.108	-0.011	0.779	-0.779***	-3.649***	-0.771**	-0.598	-0.898**	-0.103	-1.647***	-1.174
	(0.820)	(0.487)	(0.517)	(0.288)	(0.578)	(0.357)	(0.744)	(0.450)	(0.124)	(0.390)	(0.855)
$\boldsymbol{rer^{+}}$	-0.042	-0.312	0.16	-0.790***	-0.879**	-0.269	-0.168	-0.608***	-0.028	-0.388**	-0.392
	(0.414)	(0.191)	(0.279)	(0.121)	(0.383)	(0.190)	(0.145)	(0.230)	(0.065)	(0.185)	(0.388)
					B. Nominal exchange rates						
$\boldsymbol{er^{-}}$	-0.127	-0.626***	-0.704**	-1.093***	-1.083**	-1.917***	-0.713***	-0.585	-0.684***	-1.168***	-0.879***
	(0.410)	(0.107)	(0.342)	(0.156)	(0.538)	(0.285)	(0.249)	(0.391)	(0.085)	(0.217)	(0.329)
$\boldsymbol{er^{\pm}}$	0.836	-0.468***	0.835*	-1.017***	-3.653***	-0.579	-0.650*	-1.200**	-0.189	-1.248***	-0.176
	(0.707)	(0.163)	(0.486)	(0.224)	(0.656)	(0.356)	(0.337)	(0.600)	(0.119)	(0.364)	(0.473)
$\boldsymbol{er^{+}}$	0.607	-0.083	-0.160	-0.605***	-1.396**	-0.249	0.269	-0.418	-0.025	-0.335*	0.102
	(0.407)	(0.092)	(0.382)	(0.121)	(0.595)	(0.271)	(0.196)	(0.304)	(0.066)	(0.188)	(0.243)

Notes: Delta method standard errors are in parentheses. ***, ** and * denote significance at the 1, 5 and 10 percent levels respectively.

Table 4. Symmetry testing summary (food exports)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					A. Real exchange rates						
$\boldsymbol{a_2 = a_3 = a_4}$	0.087	0.006	0.000	0.000	0.001	0.000	0.000	0.224	0.000	0.000	0.001
$\boldsymbol{a_2 = a_3}$	0.140	0.114	0.018	0.201	0.000	0.845	0.113	0.917	0.000	0.227	0.864
$\boldsymbol{a_3 = a_4}$	0.260	0.512	0.225	0.971	0.000	0.182	0.721	0.585	0.596	0.008	0.450
$\boldsymbol{a_2 = a_4}$	0.148	0.002	0.000	0.000	0.897	0.000	0.000	0.094	0.000	0.000	0.001
					B. Nominal exchange rates						
$\boldsymbol{b_2 = b_3 = b_4}$	0.010	0.000	0.004	0.000	0.005	0.003	0.000	0.298	0.000	0.000	0.000
$\boldsymbol{b_2 = b_3}$	0.240	0.333	0.021	0.740	0.002	0.078	0.849	0.430	0.000	0.817	0.154
$\boldsymbol{b_3 = b_4}$	0.788	0.027	0.153	0.084	0.010	0.446	0.011	0.293	0.232	0.011	0.557
$\boldsymbol{b_2 = b_4}$	0.005	0.000	0.013	0.000	0.216	0.002	0.000	0.305	0.000	0.000	0.000

Notes: Wald test results of equality of the coefficients are reported (p-values)

Even though the outcomes differ a lot between countries[5], they suggest that European exports benefit more from Euro depreciations, than the Euro appreciations harm them. This result is even more pronounced when agri-food exports are considered. I was able to reject the symmetry hypotheses between all the exchange rates regimes in 91 percent of cases for agricultural exports and found support in favor of hysteresis in half of the cases.

As European countries export a lot of final goods to the US, which is their most important trade partner outside of the Eurozone, it seems like European exporters apply pricing-to-market strategies in order to stay competitive on the US market and protect their market shares by partially offsetting Euro appreciations. Euro depreciations might be used in order to gain competitiveness and expand exports. Numerous empirical pricing-to-market studies support this hypothesis for the case of agri-food exports, chemical products and manufactured goods, especially vehicles. The outcomes obtained for agri-food exports suggest that pricing-to-market might play an important role in European exporters' trade decisions (and that pricing-to-market might be well asymmetric as well). The outcomes obtained for total exports might then reflect a higher degree of aggregation, as heterogeneous final goods, for which pricing-to-market strategies in export pricing are expected, and homogeneous commodities, which are often traded at the world prices, are mixed together. As shares of different products in the structure of total exports are unknown, one cannot distinguish between the export demands reactions to the exchange rate changes within different groups of goods, which would require more disaggregated data. Also, in order to better explain the cross-countries differences, one should focus on a more disaggregated agri-food product groups (e.g. milk and milk products, fruits and vegetables and their preparations). As European markets are highly integrated, one might also think of some way of nesting of the NARDL approach into a panel setting in order to address possible third-country effects[6]. As implementing these ideas requires an independent large-scale study, at this point these suggestions are left for a future research.

[5] This might well be due to a difference in the composition of exports across exporting countries or a whole lot of other related factors. More detailed data is required to formally test this hypothesis.

[6] I am thankful to two anonymous referees at the 54th Gewisola-Tagung for these last two comments.

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Appendix 1. Descriptive statistics

A. Exchange rates (levels)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					Real exchange rate						
Mean	1.247	1.276	1.316	1.108	1.268	1.330	0.944	1.226	1.168	1.271	1.140
Median	1.278	1.308	1.329	1.111	1.291	1.338	0.961	1.241	1.200	1.289	1.166
Maximum	1.559	1.594	1.673	1.575	1.572	1.728	1.513	1.684	1.618	1.561	1.594
Minimum	0.889	0.877	0.917	0.703	0.928	0.901	0.215	0.856	0.748	0.889	0.646
Std. Dev.	0.155	0.161	0.156	0.211	0.148	0.179	0.348	0.167	0.200	0.148	0.214
Skewness	-0.681	-0.636	-0.652	0.007	-0.590	-0.414	-0.524	-0.075	-0.182	-0.661	-0.380
Kurtosis	2.794	3.170	3.332	1.954	2.783	3.049	2.365	2.950	2.085	3.250	2.479
Jarque-Bera	17.721	21.139	23.244	14.048	13.420	8.815	19.277	0.319	12.442	23.250	10.879
Probability	0.000	0.000	0.000	0.001	0.001	0.012	0.000	0.853	0.002	0.000	0.004
Sum	279.413	392.989	405.259	341.397	284.136	409.524	290.734	377.556	359.656	391.339	351.212
Sum Sq. Dev.	5.378	7.925	7.457	13.727	4.858	9.812	37.106	8.604	12.263	6.693	14.011
					Nominal exchange rate						
Mean	1.210	1.222	1.220	1.153	1.209	1.227	1.083	1.208	1.167	1.219	1.177
Median	1.240	1.237	1.240	1.161	1.238	1.252	1.094	1.223	1.168	1.234	1.191
Maximum	1.577	1.577	1.577	1.577	1.577	1.577	1.577	1.577	1.591	1.577	1.577
Minimum	0.853	0.853	0.853	0.830	0.853	0.853	0.541	0.853	0.812	0.853	0.853
Std. Dev.	0.168	0.152	0.152	0.178	0.169	0.154	0.245	0.154	0.186	0.152	0.161
Skewness	-0.363	-0.473	-0.441	0.079	-0.353	-0.531	-0.338	-0.299	0.034	-0.424	0.008
Kurtosis	2.607	3.110	3.060	2.124	2.569	3.089	2.465	2.783	2.097	3.051	2.458
Jarque-Bera	6.360	11.648	10.029	10.167	6.390	14.577	9.536	5.205	10.520	9.243	3.769
Probability	0.042	0.003	0.007	0.006	0.041	0.001	0.008	0.074	0.005	0.010	0.152
Sum	270.973	376.251	375.721	355.112	270.854	377.920	333.415	371.942	359.314	375.422	362.417
Sum Sq. Dev.	6.297	7.084	7.124	9.727	6.343	7.237	18.448	7.285	10.611	7.123	7.962
Observations	224	308	308	308	224	308	308	308	308	308	308

B. Exchange rates (log, first difference)

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
					Real exchange rate						
Mean	0.000	0.000	-0.001	0.001	0.000	-0.001	0.006	0.000	0.001	0.000	0.002
Median	0.000	-0.001	0.000	0.000	0.000	0.000	0.004	0.001	0.002	0.000	0.001
Maximum	0.067	0.063	0.069	0.077	0.066	0.066	0.081	0.066	0.139	0.067	0.072
Minimum	-0.067	-0.081	-0.077	-0.080	-0.067	-0.075	-0.066	-0.079	-0.087	-0.071	-0.080
Std. Dev.	0.024	0.024	0.024	0.026	0.023	0.025	0.030	0.026	0.028	0.024	0.026
Skewness	0.193	-0.109	-0.070	0.051	0.131	-0.087	0.191	-0.058	0.249	-0.096	0.069
Kurtosis	3.071	3.226	3.242	3.073	3.090	3.077	2.759	2.882	4.607	3.119	3.119
Jarque-Bera	1.426	1.272	1.007	0.205	0.709	0.469	2.646	0.356	36.557	0.654	0.427
Probability	0.490	0.529	0.605	0.903	0.702	0.791	0.266	0.837	0.000	0.721	0.808
Sum	0.001	-0.131	-0.165	0.432	-0.059	-0.214	1.721	0.011	0.415	-0.119	0.640
Sum Sq. Dev.	0.123	0.182	0.184	0.203	0.122	0.187	0.272	0.210	0.235	0.182	0.205
					Nominal exchange rate						
Mean	0.000	0.000	0.000	0.001	0.000	0.000	0.003	0.000	0.001	0.000	0.001
Median	0.001	0.000	0.000	0.001	0.001	0.001	0.003	0.001	0.002	0.001	0.001
Maximum	0.065	0.065	0.065	0.076	0.065	0.065	0.065	0.068	0.134	0.065	0.065
Minimum	-0.076	-0.076	-0.076	-0.082	-0.076	-0.076	-0.076	-0.077	-0.092	-0.076	-0.084
Std. Dev.	0.023	0.025	0.024	0.025	0.024	0.025	0.027	0.026	0.028	0.024	0.025
Skewness	0.043	-0.154	-0.167	-0.053	0.023	-0.169	0.016	-0.111	0.108	-0.159	-0.079
Kurtosis	3.201	3.141	3.144	3.254	3.089	3.119	2.758	2.939	4.436	3.150	3.150
Jarque-Bera	0.445	1.494	1.713	0.984	0.094	1.661	0.771	0.684	27.322	1.607	0.611
Probability	0.801	0.474	0.425	0.611	0.954	0.436	0.680	0.710	0.000	0.448	0.737
Sum	0.098	0.024	0.037	0.263	0.082	0.031	0.819	0.105	0.335	0.040	0.264
Sum Sq. Dev.	0.122	0.187	0.185	0.199	0.127	0.191	0.221	0.211	0.237	0.185	0.200
Observations	223	307	307	307	223	307	307	307	307	307	307

Appendix 2. NARDL models (nominal total exports)

A. Real exchange rate as explanatory variable

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
Const.	1.926***	4.357***	4.539***	3.577***	14.998***	7.374***	11.324***	0.326	4.460***	2.638***	2.590***
x_{t-1}	-0.223***	-0.297***	-0.341***	-0.331***	-1.065***	-0.517***	-0.811***	-0.134**	-0.418***	-0.192***	-0.319***
r_{t-1}^{-}	-0.146**	-0.212***	-0.277***	-0.217***	-0.451*	-0.496***	-1.054***	-0.300***	-0.289***	-0.041	-0.293***
$r_{t-1}^{\pm}$	-0.474***	-0.772***	-0.262**	-0.029	-1.293***	-0.396***	-0.023	-0.252	-0.096	-0.255**	-0.307*
r_{t-1}^{+}	0.019	-0.059	-0.173***	-0.096*	-0.329	-0.478***	-0.222**	-0.228***	-0.257***	0.084	-0.223***
y_{t-1}	0.509**	0.338**	0.638***	0.651***	1.203***	0.777***	0.589**	0.520***	0.995***	0.265***	0.747***
Δr_{t}^{-}	-0.781*	-0.554	-0.185	0.014	1.866	-0.949***	-2.904**	-1.696***	-0.587**	-0.943**	1.476**
$\Delta r_{t}^{\pm}$	-1.053**	-0.998*	-0.489	0.142	1.230	-0.410	-0.459	-0.480	-0.549	0.833*	-0.202
Δr_{t}^{+}	-0.507	-1.266***	-0.037	0.296	2.197	-0.608*	0.207	0.688	-0.260	0.135	-0.970*
Δy_{t}	1.585*	0.905	0.791	-1.447	2.134	-0.523	-3.118	-1.180	0.545	1.002	1.415
Δx_{t-1}	-0.573***	-0.342***	-0.523	-0.430***		-0.363***		-0.675***	-0.359***	-0.443***	-0.426***
Δx_{t-2}	-0.305***	-0.181***	-0.370***	-0.206***		-0.206***		-0.501***	-0.230***	-0.277***	-0.289***
Δx_{t-3}			-0.137*					-0.429***			-0.108*
Δx_{t-4}			-0.205***					-0.330***			
Δx_{t-5}			-0.151***					-0.245***			
Δx_{t-6}								-0.207**			
Δx_{t-7}								-0.187**			
Δx_{t-8}								-0.118**			
Δr_{t-1}^{-}	-0.120		-0.397	-0.813*				-0.379			
$\Delta r_{t-1}^{\pm}$	0.262		-0.505	-0.437				0.632			
Δr_{t-1}^{+}	-0.645		0.289	-0.657*				1.382			
Δy_{t-1}	1.716*		-0.434	0.123				0.704			
Δr_{t-2}^{-}	-0.856*		0.375								
$\Delta r_{t-2}^{\pm}$	0.237		-0.425								
Δr_{t-2}^{+}	0.316		0.063								
Δy_{t-2}	2.039*		2.627***								
Adj. R^2	0.395	0.293	0.482	0.382	0.529	0.453	0.396	0.404	0.381	0.308	0.345
Bounds t.	2.327	5.049	5.475[a]	6.316[a]	48.849[a]	11.713[a]	39.960[a]	4.618[a]	9.310[a]	3.278	6.568[a]

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent levels respectively. [a], [b], [c] denote significance at the 1, 5 and 10 percent level respectively and refer to the outcomes of the bounds testing according to Pesaran et al. (2001).

B. Nominal exchange rate as explanatory variable

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
Const.	1.814**	3.394***	6.128***	4.794***	14.353***	7.148***	6.924***	1.040	6.128***	2.508***	3.242***
x_{t-1}	-0.316***	-0.259***	-0.432***	-0.499***	-1.050***	-0.508***	-0.688***	-0.168***	-0.514***	-0.182***	-0.358***
e^{-}_{t-1}	-0.165**	-0.189***	-0.333***	-0.273***	-0.480	-0.487***	-0.559**	-0.322**	-0.365***	-0.073	-0.292***
$e^{\pm}_{t-1}$	-0.536***	-0.541***	-0.336***	-0.196*	-1.100***	-0.457***	-0.105	-0.337	-0.240***	-0.220	-0.462***
e^{+}_{t-1}	0.054	-0.010	-0.255	0.023	-0.398	-0.426***	0.058	-0.181*	-0.322***	0.031	-0.211***
y_{t-1}	0.925***	0.382**	0.760***	1.055***	1.281**	0.794***	1.006***	0.497***	1.065***	0.245**	0.731***
p_{t-1}	0.526	0.332	-0.920***	-2.012***	0.242	-0.059	-0.706***	-0.057	0.368**	-0.077	-0.218
Δe^{-}_{t}	-0.628	-0.715	-0.353***	-0.155	0.719	-0.847***	-2.854**	-1.626***	-0.579**	-0.973**	0.891
$\Delta e^{\pm}_{t}$	-1.211**	-0.845	-0.365	0.501	3.425*	-0.659*	-0.245	-0.729	-0.375	0.341	0.060
Δe^{+}_{t}	-0.246	-1.222***	0.118	0.235	1.989	-0.674**	0.527	0.626	-0.378	0.263	-0.856
Δy_{t}	2.096**	0.305	0.816	-1.225	1.566	-0.478	-0.373	-0.927	0.032	1.054	1.213
Δp_{t}	-0.684	-2.052	-1.533	-0.276	-0.704	-0.090	-0.564	-0.420	0.447	-1.591	-0.981
Δx_{t-1}	-0.497***	-0.361***	-0.428	-0.317***		-0.363***	-0.153**	-0.648***	-0.301***	-0.450***	-0.364***
Δx_{t-2}	-0.252***	-0.182***	-0.291***	-0.146***		-0.207***	-0.099*	-0.467***	-0.202***	-0.278***	-0.216***
Δx_{t-3}	-0.010		-0.019					-0.358***			
Δx_{t-4}			-0.065					-0.250***			
Δx_{t-5}								-0.152			
Δx_{t-6}								-0.081			
Δx_{t-7}								-0.038			
Δx_{t-8}								0.064			
Δx_{t-9}								0.230***			
Δx_{t-10}								0.137*			
Δx_{t-11}								0.108*			
Δe^{-}_{t-1}			-0.375					-0.430			
$\Delta e^{\pm}_{t-1}$			-0.600*					0.523			
Δe^{+}_{t-1}			0.300					-0.828			
Δy_{t-1}			-0.925					0.740			
Δp_{t-1}			0.325					-0.305			
Δe^{-}_{t-2}			0.695**								
$\Delta e^{\pm}_{t-2}$			-0.427								
Δe^{+}_{t-2}			0.143								
Δy_{t-2}			2.766***								
Δp_{t-2}			-1.266								
Adj. R^2	0.382	0.286	0.486	0.397	0.526	0.446	0.404	0.404	0.400	0.294	0.331
Bounds t.	2.943	3.852[c]	5.502[b]	8.633[a]	39.820[a]	9.280[a]	10.720[a]	4.618[c]	9.761[a]	2.648	6.152[a]

Notes: As in Appendix 2.A.

Appendix 3. NARDL models (nominal agri-food exports)

A. Real exchange rate as explanatory variable

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
Const.	7.253***	3.902***	3.976***	5.117***	9.743***	5.148***	3.998***	4.653***	6.632***	6.682***	8.590***
x_{t-1}	-0.447***	-0.373***	-0.270***	-0.493***	-0.794***	-0.373***	-0.499***	-0.631***	-0.652***	-0.397***	-0.392***
r^{-}_{t-1}	-0.149	-0.288***	-0.162*	-0.565***	-0.715**	-0.313***	-0.546***	-0.536***	-0.463***	-0.455***	-0.532**
$r^{\pm}_{t-1}$	0.495	-0.004	0.211	-0.384**	-2.898***	-0.288**	-0.298	-0.567*	-0.067	-0.654***	-0.460
r^{+}_{t-1}	-0.019	-0.116	0.034	-0.390***	-0.699**	-0.101	-0.084	-0.383**	-0.018	-0.154**	-0.154
y_{t-1}	-0.173	0.445**	0.132	0.752***	0.431	0.209	0.800***	1.095***	0.979***	-0.036	-0.713**
Δr^{-}_{t}	-1.187	-1.181*	-0.115	-0.150	-1.904	0.178	-0.535	-0.794	0.024	-0.929*	1.231
$\Delta r^{\pm}_{t}$	1.839	-1.392*	-0.148	-0.197	2.954	0.548	-1.384	-1.036	-0.245	0.322	-1.716
Δr^{+}_{t}	-1.070	-0.918	-0.063	-0.662	-3.942**	0.096	0.611	-0.921	0.235	0.664	-0.830
Δy_{t}	1.051	2.705**	0.087	-1.182	-2.623	2.091	0.332	-1.815	1.377*	2.822**	0.728
Δx_{t-1}	-0.387***	-0.443***	-0.479***	-0.146**		-0.534***	-0.156***	-0.203*	-0.216***	-0.316***	-0.427***
Δx_{t-2}	-0.278***	-0.354***	-0.224***	-0.093		-0.391***		-0.048		-0.282***	-0.186***
Δx_{t-3}		-0.226**				-0.093		0.011			
Δx_{t-4}		-0.263***						0.046			
Δx_{t-5}		-0.139*						0.118			
Δx_{t-6}		-0.059						0.116			
Δx_{t-7}								0.018			
Δx_{t-8}								0.055			
Δx_{t-9}								0.114*			
Δr^{-}_{t-1}			-0.946*			-0.131	1.219				-2.387
$\Delta r^{\pm}_{t-1}$			-2.107**			-0.316	-1.223				-0.655
Δr^{+}_{t-1}			-0.144			-0.484	1.308*				-2.191**
Δy_{t-1}			-0.829			0.430	2.121				-2.759
Δr^{-}_{t-2}						0.066					
$\Delta r^{\pm}_{t-2}$						-1.717**					
Δr^{+}_{t-2}						0.465					
Δy_{t-2}						2.744**					
Adj. R^2	0.426	0.390	0.369	0.299	0.422	0.464	0.304	0.405	0.427	0.376	0.413
Bounds t.	5.587[b]	3.222	4.917[b]	10.698[a]	32.523[a]	6.000[b]	13.517[a]	5.799[b]	17.287[a]	8.046[a]	6.282[a]

Notes: As in Appendix 2.A.

B. Nominal exchange rate as explanatory variable

	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
Const.	5.679**	5.601***	4.349***	5.692***	11.769***	3.592***	4.516***	4.338***	6.911***	6.332***	9.253***
x_{t-1}	-0.512***	-0.853***	-0.283***	-0.534***	-0.687***	-0.342***	-0.599***	-0.573***	-0.667***	-0.405***	-0.580***
e^{-}_{t-1}	-0.065	-0.534***	-0.199*	-0.583**	-0.745*	-0.409***	-0.427***	-0.336	-0.456***	-0.473***	-0.510**
$e^{\pm}_{t-1}$	0.428	-0.399***	0.237	-0.543***	-2.511***	-0.198	-0.389*	-0.688**	-0.126	-0.505***	-0.102
e^{+}_{t-1}	0.311	-0.070	-0.045	-0.323***	-0.960**	-0.085	0.161	-0.239	-0.017	-0.136*	0.059
y_{t-1}	0.324	1.709***	0.126***	0.731***	-0.326	0.406**	0.905***	0.982***	0.972***	0.061	-0.335
p_{t-1}	4.153**	4.112***	-0.828	-1.387***	-2.001	1.080	-0.589***	-1.534	0.217	0.723	-1.815***
Δe^{-}_{t}	-1.679	-1.455**	-0.252	-0.261	-3.149	-0.039	-1.239	-0.906	0.055	-1.095**	0.619
$\Delta e^{\pm}_{t}$	0.547	-1.289*	-0.517	-0.458	3.136	0.824	-0.461	-0.962	-0.261	-0.120	-1.382
Δe^{+}_{t}	-0.463	-0.788	0.340	-0.705	-2.863	0.300	1.209	-1.019	0.195	0.849	-1.537
Δy_{t}	1.016	3.117**	0.515	-1.027	-3.124	2.512**	1.618	-2.832	1.146	2.647**	0.976
Δp_{t}	2.530	1.216	-1.693	-0.035	-0.079	-0.709	0.735	-1.224	1.294	-0.024	-0.737
Δx_{t-1}	-0.347***		-0.469***	-0.125*	-0.150**	-0.604***		-0.263***	-0.209***	-0.311***	-0.300***
Δx_{t-2}	-0.253***		-0.219***	-0.081		-0.520***		-0.120		-0.281***	-0.146**
Δx_{t-3}						-0.302***		-0.039			
Δx_{t-4}						-0.249***					
Δx_{t-5}						-0.115***					
Δe^{-}_{t-1}			-0.643								
$\Delta e^{\pm}_{t-1}$			-2.167***								
Δe^{+}_{t-1}			-0.266								
Δy_{t-1}			-0.334								
Δp_{t-1}			-0.425								
Adj. R^2	0.429	0.411	0.367	0.307	0.424	0.471	0.291	0.397	0.427	0.370	0.429
Bounds t.	5.489[b]	35.787[a]	3.917[c]	9.202[a]	15.051[a]	4.550[b]	21.487[a]	7.011[a]	14.648[a]	6.601[a]	8.333[a]

Notes: As in Appendix 2.A.

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