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Has the European Monetary System
Led to More Exports?
Evidence from Four European Union Countries

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Abstract

We attempt to investigate whether the ERM period has coincided with an increase in intra-EU exports. We conclude that this has not been the case but it is likely that the elimination of nominal exchange rate variability arising from a single currency will boost intra-EU trade.

Keywords: exchange rate regime, exchange rate variability, EMS

JEL Classification: F31, F33
1 Introduction

Recently, the volume of research focusing on the determinants of export demand in industrial and developing countries alike, has grown significantly. The increasing interest in this topic has been sparked off by, first, developments in the econometrics of non-stationary macroeconomic time series and, second, the theoretical ambiguity that surrounds the relationship between exports and exchange rate volatility. An important issue that has been left out of the discussion of the existing literature on this topic is the impact of the creation of the Exchange Rate Mechanism (ERM) associated with the set up of the European Monetary System (EMS) on the volume of intra-European Union (EU) exports.

The launch of the EMS, a system of fixed but adjustable exchange rates, would be expected to lead to lower long-run nominal (and real, as inflation rates tend to converge) exchange rate variability and, therefore, have a direct impact on the volume of intra-EU exports. In addition, the reduction in exchange rate uncertainty brought by the ERM would lead to higher output and hence have an indirect impact on export growth as interest rates tend to converge to a lower level. More specifically, lower exchange rate uncertainty associated with a smaller exchange rate variability would increase the quality of information provided by the price mechanism of resource allocation. The fall in risk would reduce the risk premium incorporated in the expected return on investment projects and hence the real interest rate, thus, boosting output growth De Grauwe (1996a). The result of output growth would be an increase in the demand for exports in foreign countries. In summary, smaller exchange rate uncertainty would boost exports indirectly through its effect on output growth.

On the eve of the European Monetary Union (EMU), the relationship between the exchange rate regime and the volume of exports acquires increasing significance. It is for this reason that the primary objective of this study is to investigate whether the ERM period has coincided with an increase in intra-EU exports. Evidence in favour of a positive association between exchange rate stability obtained by the ERM and export volume, would provide an indication of potentially additional benefits in terms of output growth (the export-led growth hypothesis) as the EU member countries proceed to lock their currencies in a system of irrevocably fixed exchange rates and eventually a single currency. To this end, we specifically look at the

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1Gros and Thygesen (1998) report evidence of a lower nominal and real exchange rate variability in intra-ERM exchange rates following the creation of the ERM.
2Gros (1996) provides evidence that increases in the short-run variability of intra-ERM exchange rates leads to higher unemployment and less job creation in a number of large
four largest EU countries, namely, France, Germany, Italy and the UK. For each of these countries we estimate an export demand function and test for the influence of the exchange rate regime on export volume.

The paper is organised as follows: Section 2 discusses the theoretical model, Section 3 presents our econometric methodology and results, and Section 4 provides some concluding remarks.

2 Theoretical background

The empirical literature on the estimation of export functions uses the following long-run export function (see e.g., Arize, 1995; Chowdhury, 1993):

\[
\ln X_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln P_t + \beta_3 V_t + u_t
\]  

(1)

where \( X_t \) stands for real exports, \( Y_t \) for real foreign income, \( P_t \) for relative prices (a measure of competitiveness), \( V_t \) for exchange rate volatility and \( u_t \) is the error term.

Gotur (1985) shows that Equation (1) is the long-run solution to a system of behavioural demand and supply functions for exports. Economic theory suggests that the impact of real world income on real exports should be positive and the impact of relative price on real exports negative. Traditional trade theory suggests that exchange rate volatility would depress trade because exporters would view it as an increase in the uncertainty of profits on international transactions, under the assumption of risk aversion. On the other hand, a number of authors such as De Grauwe (1988), Franke (1991), Giovannini (1988), Sereu and Vanhulle (1992), and Viaene and de Vries (1992) illustrate in the context of theoretical models that exchange rate volatility might benefit trade. Hence, the sign of \( \beta_3 \) in Equation (1) is ambiguous from a theoretical point of view.


EU countries including Germany.
any significant effect of exchange rate volatility on trade. Most of the above
literature uses US dollar exchange rates and hence is not directly related
with our study that concentrates on ERM exchange rates. Exceptions are
De Grauwe (1987) and Bini-Smaghi (1991) who find a significant, although
small, relationship between exchange rate variability and intra-EMS trade.
However, these two studies have not considered the effect of the exchange
rate regime on intra-EMS exports, but only the relationship between exports
and volatility. Our study purports to close this gap in the literature.

3 Econometric methodology and results

3.1 Methodology

If the variables in Equation (1) are cointegrated, then it can be shown that
the error-correction model (ECM) will be of the following form:

\[ \Delta \ln X_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 D_t + \sum_{i=1}^{n} \gamma_i \Delta \ln X_{t-1} + \sum_{i=1}^{n} \delta_i \Delta \ln Y_{t-1} \]

\[ + \sum_{i=1}^{n} \epsilon_i \Delta \ln P_{t-1} + \sum_{i=1}^{n} \zeta_i \Delta Y_{t-1} + e_t \]  

where \( R_{t-1} \) is the error-correction term (ECT) and \( D_t \) is a dummy variable
taking the value of one when the exporting country was a member of the
ERM. \(^4\)

3.2 Data and the exchange rate volatility proxy

We use quarterly data for the period 1973–1996 and our sample includes the
four largest EU countries, France, Germany, Italy and the UK. The begin-
ing of the sample period coincides with the start of the floating exchange
rate regime following the collapse of the Bretton-Woods system.

The export variable includes each country’s exports to the other three coun-
tries. Its real value is created through division by the unit export value. Our first explanatory variable in the export function is foreign income. For
each country, this series is constructed by taking the weighted average of

\(^3\) A survey of the literature on the relation between exchange rate volatility and trade
is given in Cote (1994).

\(^4\) The dummy variable takes the value one post 1979.II for France and Germany and
the real GDP series (nominal GDP deflated by the consumer price index) of the other three countries. Each country's trade weights are calculated by determining the share of bilateral trade (exports and imports) in total trade between each country and its three trading partners. The source of the export data is the OECD Monthly Statistics of Foreign Trade. The source of the rest of the series is the International Financial Statistics (IFS) published by the IMF. The quarterly GDP data were converted to the domestic currency. For this purpose, US dollar exchange rates were taken from the IFS and were converted to exchange rates between the four EU countries.

The second right-hand side variable in Equation (1) is a measure of competitiveness. It is defined as the ratio of the exchange rate-adjusted price of domestic country exports to the price of exports of the other three countries. Hence, it is the ratio of the domestic unit export value to the weighted average of the unit export values of the other three countries, denominated in the domestic currency. The weights are identical to those used in the construction of the income variable.

Finally, as a measure of time-varying exchange rate volatility we use the moving standard deviation of the growth rate of the nominal effective exchange rate:

\[ V_t = \left( \frac{1}{m} \sum_{i=1}^{m} (\ln Z_{t+i-1} - \ln Z_{t+i-2})^2 \right)^{1/2} \]  

where \( Z \) is the nominal effective exchange rate and \( m \), the order of the moving average, is set equal to 8. The nominal effective exchange rate is calculated by the weighted average of the exchange rates where the trade weights are the ones used in creating foreign income and relative prices\(^5\). This measure of exchange rate volatility is adopted by several authors including Lastrapes and Koray (1990) and Chowdhury (1993).

3.3 Results

We first employed unit root tests to determine the integration properties of each time series. The results of these tests, available upon request from the authors, imply that all series are \( I(1) \). Then, we proceeded to test for cointegration following the Johansen maximum likelihood approach. We chose the lag length in the VAR using a likelihood ratio test. The results of the trace and maximum eigenvalue tests, also available upon request from

\(^5\)Although we use nominal exchange rates to calculate our volatility measure, Chowdhury (1993), Lastrapes and Koray (1990), and Thursby and Thursby (1987) obtain similar results using nominal and real exchange rates.
the authors, illustrate that there exists a unique cointegrating vector for France, Germany, and Italy but not for the UK.

Using the cointegration vectors normalised on exports, we estimated the ECMs and report the results in Table 1. To decide the final forms of the ECMs, we started with the maximum lag suggested by the likelihood ratio test for each variable included in the VAR and eliminated insignificant lags unless this introduced serial correlation in the error term. This allowed us to derive a parsimonious model. For the UK, the estimated regression does not include an ECT as cointegration does not apply.

Before the results are discussed, we need to determine the adequacy of the ECMs. For that reason, we performed a number of tests which are reported in the last column of Table 1. These tests indicate that the ECMs are adequate for further analysis. The adjusted $R^2$ ranges from a low 0.62 to a high 0.75. Such values compare very well with the adjusted $R^2$ values of other studies for regressions based on first differences in variables. The Breusch-Godfrey serial correlation LM test ($F$-version) indicates that there is no serial correlation in the residuals of the estimated equations at the 5 percent level. Moreover, autoregressive conditional heteroscedasticity (ARCH) does not seem to be a problem according to the ARCH LM test.

Having provided evidence supporting the adequacy of the estimated ECMs, we can make a number of observations regarding the estimates presented in Table 1. First, the ECM results show that changes in foreign income have statistically significant short-run effects on exports. Second, the dynamics of the ECM equations also indicate that exchange rate variability has a negative short-run impact on export volume. The effect appears to be significant for all countries except France. Third, the short-run dynamics show that, in agreement with other studies (e.g., Arize, 1997; Chowdhury, 1993) and the results of standard trade models, the short-run response of export volume to foreign income is larger than that to relative price changes.

Finally, and perhaps most importantly, the EMS dummy variable is not statistically significant for any of the four countries included in the study. Therefore, one can conclude that the creation of the ERM has not led to an increase in intra-EU exports either directly or indirectly. This important finding can be partially explained by a number of forces that have been widely studied in the literature (De Grauwe, 1996b). The restrictive fiscal policies followed by the major EMS countries, the supply side problems of many European countries, and the slow-down in the trade integration process within the EU since the 1960s could have been strong enough to

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6This result is in agreement with the results of Bini-Smaghi (1991) and De Grauwe (1987) obtained using classical regression analysis.
Table 1: Regression results for error-correction models

<table>
<thead>
<tr>
<th>Country</th>
<th>lag</th>
<th>$R$</th>
<th>$\Delta X$</th>
<th>$\Delta Y$</th>
<th>$\Delta P$</th>
<th>$\Delta V$</th>
<th>$D$</th>
<th>Summary statistics</th>
</tr>
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<tbody>
<tr>
<td>France</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td>$R^2$</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>-0.18</td>
<td>-0.70</td>
<td>0.87</td>
<td>-2.09</td>
<td>(2.57*)</td>
<td>(8.45**)</td>
<td>(2.59**)</td>
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<tr>
<td></td>
<td>2</td>
<td>-0.71</td>
<td>0.82</td>
<td>(9.14**)</td>
<td>(2.49*)</td>
<td></td>
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<tr>
<td></td>
<td>3</td>
<td>-0.65</td>
<td></td>
<td>-0.35</td>
<td>(9.43**)</td>
<td>(1.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>0.47</td>
<td>(1.64)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>0</td>
<td></td>
<td>-0.007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$R^2$</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.05</td>
<td>-0.45</td>
<td>-0.03</td>
<td>-4.44</td>
<td>(3.29**)</td>
<td>(5.51**)</td>
<td>(0.19)</td>
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<tr>
<td></td>
<td>2</td>
<td>-0.30</td>
<td>0.53</td>
<td>(3.58**)</td>
<td>(2.29*)</td>
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<td></td>
<td>3</td>
<td>-0.26</td>
<td>1.14</td>
<td>(3.16**)</td>
<td>(4.86**)</td>
<td></td>
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<tr>
<td></td>
<td>4</td>
<td>0.49</td>
<td>(6.21**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0</td>
<td></td>
<td></td>
<td>-4.56</td>
<td>(3.21**)</td>
<td></td>
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<tr>
<td></td>
<td>1</td>
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<td>-0.39</td>
<td>0.86</td>
<td>-0.02</td>
<td>(1.44)</td>
<td>(4.19**)</td>
<td>(2.51*)</td>
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<td>2</td>
<td></td>
<td>0.02</td>
<td>(1.77)</td>
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<tr>
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<td>3</td>
<td>-0.56</td>
<td>-0.68</td>
<td>(1.28)</td>
<td>(1.52)</td>
<td>(1.54)</td>
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<tr>
<td></td>
<td>4</td>
<td>0.5</td>
<td>(6.62**)</td>
<td></td>
<td></td>
<td>0.02</td>
<td>(1.95)</td>
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</tr>
<tr>
<td>UK</td>
<td>0</td>
<td></td>
<td></td>
<td>-0.01</td>
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<td>$R^2$</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>-0.51</td>
<td>1.15</td>
<td>0.63</td>
<td>-35.54</td>
<td>(5.05**)</td>
<td>(3.08**)</td>
<td>(1.77)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-0.30</td>
<td></td>
<td>(2.92**)</td>
<td></td>
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<tr>
<td></td>
<td>3</td>
<td>-0.27</td>
<td></td>
<td>(2.73**)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.40</td>
<td></td>
<td>(4.18**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

Figures in parentheses are the absolute t-statistics.
* and ** denote significance at the 5% and 1% levels, respectively.
The F-statistic versions of the LM(4) test statistic for autocorrelation (AR) and the LM(4) test statistic for autoregressive conditional heteroscedasticity (ARCH) are reported.
swamp the possible beneficial effects of exchange rate stability resulting from the implementation of EMS.

4 Concluding remarks

This paper attempted to primarily investigate whether the ERM period has coincided with an increase in intra-EU exports using the techniques of multivariate cointegration and error-correction models. The models were estimated using quarterly data for the four largest EU member countries, Germany, France, Italy, and the UK for the sample period 1973.I-1996.IV. Our empirical estimates support two main conclusions.

First, growth in intra-EU trade seems to be relatively independent of the exchange rate regime. Put differently, growth in intra-EU trade is influenced by a number of factors, exchange rate regime being a relatively unimportant one. Second, the finding that changes in exchange rate volatility affects export volume negatively could be interpreted as suggesting that the reduction in exchange rate volatility that could result from the further monetary union within the EU would likely boost intra-EU trade. This interpretation represents an argument in support of the proponents of monetary union in Europe.
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