Analysis

The effects of the Economic and Monetary Union on export

Oscar Soons and Fons van Overbeek

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Authors: Oscar Soons and Fons van Overbeek

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De Nederlandsche Bank n.v.
P.O. Box 98 1000 AB
Amsterdam
Internet: www.dnb.nl
Email: info@dnb.nl

Executive summary

How large are the economic benefits of the Economic and Monetary Union (EMU)? One consideration when evaluating the success of the EMU is a comparison between its economic benefits and costs. However, these are not directly measurable and difficult to quantify. In this analysis we contribute to the debate on the benefits of EMU membership by quantifying its impact on exports of goods, an important component of economic activity.

We present evidence that the EMU has significantly boosted exports of goods and that some countries benefitted more than others. We use an empirical gravity model to estimate the impact of joining the EMU on exports, beyond the impact of EU membership. We find that the EMU has boosted export values of its member states, not only to other EMU member states (by 7.2%), but also to non-euro EU countries (by 15.7%) and to the rest of the world (by 12.0%). Interestingly, our country-specific estimates suggest that not all member states benefit equally. For instance, among the twelve founding euro area countries, we find that Ireland, Belgium, Luxembourg and The Netherlands benefitted the most in terms of increased exports from their EMU membership. France, Germany and Austria benefitted to a lesser extent. On the contrary, our estimates suggest that exports from Finland, Spain and Portugal did not significantly rise due to their EMU membership, while exports from Greece and Italy even declined.

Why did exports from some countries benefit from EMU membership while exports from other countries did not? We highlight two possible reasons for the heterogenous effect of EMU membership on exports. First, countries export different goods and EMU membership may benefit the exports of certain goods more than others. Second, in a monetary union with a single nominal exchange rate it can take a long time for real exchange rates to reflect productivity differentials. This means that that countries with relatively high productivity growth may benefit from a prolonged competitive edge while it is more difficult for countries with lower productivity growth to remain competitive. Further research could clarify the empirically relevant mechanisms underlying the heterogenous effects on exports.

Methodology and data

We estimate the effect of EMU membership on export by employing an empirical gravity model. Gravity equations are the workhorse models for studying bilateral trade. These models have a solid theoretical foundation, as pioneered by Anderson (1979), and tend to perform well in empirical applications. Our panel data gravity model is similar to Larch et al. (2018) and Esteve-Pérez et al. (2020) which means that we include exporter-time and importer-time fixed effects (instead of specific macroeconomic control variables), domestic trade (to be consistent with theory and to allow for the identification of the effect of EMU membership on exports to non-EMU countries), and a globalization dummy (to control for global trends in trade). Since the reference group includes domestic trade flows, we capture empirically important trade creation effects that arise from the replacement of domestic sales. Compared to Larch et al. (2018) and Esteve-Pérez et al. (2020), we include both contemporaneous and lagged explanatory variables (to allow for phase-in effects) and a country-pair specific time trend (to control for heterogeneous trends in trade flows). Our estimates represent a lower-bound on the effects of EMU membership on exports due to the restrictive country-pair time trends, which are expected to pick up some of the change in export that could be attributed to ongoing monetary integration. The Technical Appendix contains a detailed description of our empirical gravity model and estimates excluding the restrictive country-pair time trends.

Our analysis uses yearly export data for 42 countries from 1970 to 2019. The sample includes all OECD countries as of January 2019, the BRICS countries, and Cyprus and Malta, resulting in 1764 country-pairs. Due to data availability, Belgium and Luxembourg are taken together. We use the current dollar value of exports from each origin country i to each destination country j in year t. The data is taken from IMF's DOTS database and obtained from CEPII (Conte and Mayer, 2022). It covers all goods trade flows but does not cover services. Approximately 80% of world trade is trade in goods. We approximate domestic trade flows as the difference between GDP and total goods export, where total goods export includes export to 244 countries when data is available. Following Silva and Tenreyro (2006, 2011), we use Poisson Pseudo-maximum Likelihood (PPML) to estimate our econometric models. We report robust standard errors, clustered by country-pair.

Results

Table 1 presents the estimated effect of EMU membership on the export from EMU countries. To ease exposition, Table 1 only presents the total effect on export, which includes phase-in effects captured by our inclusion of lagged independent variables. We distinguish between the effect of EMU membership on "$Intra - EMU$", "$Extra - EMU^{EU}$" and "$Extra - EMU^{ROW}$" export flows, which represent exports to other EMU countries, to non-euro EU countries and to the rest of the world, respectively. Our estimates on the impact of EMU membership on exports are interpreted as the change in exports compared to the counterfactual of no EMU-membership but equal EU-integration. However, it is conceptually impossible to be sure how European integration would have evolved without a common currency. Econometrically, our methodology separates their partial equilibrium effects on trade as well as possible.

The positive effects of EMU membership on intra-trade flows are in line with the existing literature. We find that, on average, export to other EMU member states is significantly boosted by 7.2% due to EMU membership. This coefficient has the following interpretation: on average, joining the EMU permanently increased export values to other EMU member states by 7.2%. Our estimate is on the lower end of recent estimates in the literature. For example, Larch et al. (2018), Esteve-Pérez et al. (2020) and Freeman et al. (2022) find an intra-EMU effect of 23.9%, 9.2% and 12%, respectively. On the other hand, Mayer et al. (2019) find an insignificant effect.

EMU membership also significantly boosted extra-EMU trade flows. We find that EMU membership increased exports to non-euro EU countries by 15.7% and exports to the rest of the word by 12.0%. These results have the following interpretation: on average, joining the EMU permanently increased export values to non-euro EU countries (the rest of the world) by 15.7% (12.0%). One reason that exports to non-euro countries may increases due to EMU-membership is that the euro is a stable global reserve currency, which leads to lower transaction costs for trade with non-euro countries. These estimates are similar to those of Larch et al. (2018) and Esteve-Pérez et al. (2020), who find an extra-EMU effect of 15.5% and 31.8%, respectively.

These estimated effects of EMU membership come on top of the large effect of EU membership on exports. We find that export to other EU members is boosted by 83.7% due to EU membership. In recent literature, the estimated effect of EU membership on intra-EU goods trade varies from 46% in Felbermayr et al. (2023), to 109% in Mayer et al. (2019) and 161% in Freeman et al. (2022). Furthermore, EU membership is estimated to have increased exports to the rest of the world by 28.5% on average. As expected due to the development of the internal market, exports to other EU countries increased by more compared to exports to the rest of the world. However, the extra-EU effect remains material. This could be because a country that joins the EU imports common trade agreements with non-EU countries. An alternative explanation is that joining the EU and importing its regulatory framework decreases uncertainty and increases policy predictability, benefiting intra- as well as extra-EU trade flows. This average effect may hide trade diversion effects away from specific trade partners.

Table 1: The estimated FTA, EU and EMU impact on export values (in %)

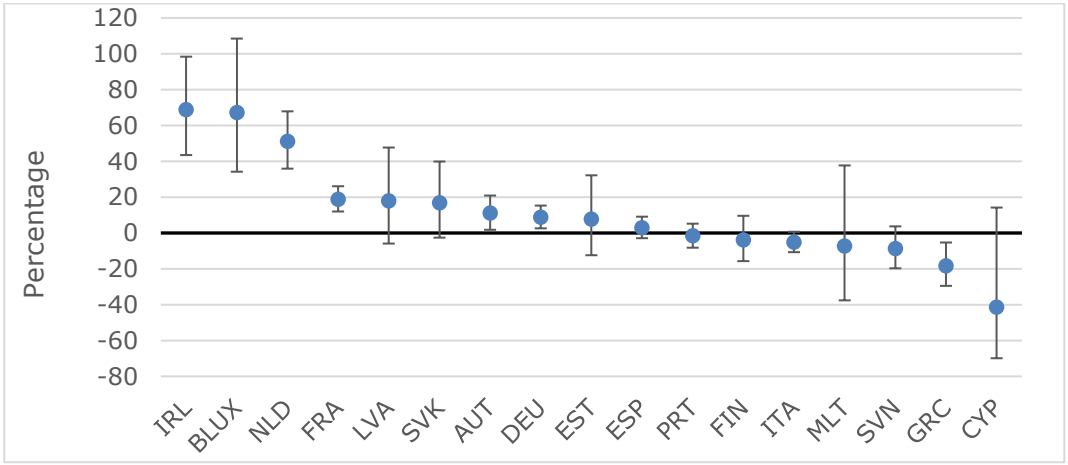
$Intra - FTA_{ij,t}$	11.4^{***}
	[3.5 - 20.0]
$Intra - EU_{ij,t}$	83.7^{***}
	[64.0 - 105.9]
$Intra - EMU_{ij,t}$	7.2^{**}
	[0.1 - 14.3]
$Extra - EU_{ij,t}$	28.5^{***}
	[12.7 - 46.5]
$Extra - EMU_{ij,t}^{EU}$	15.7^{***}
	[8.3 - 23.5]
$Extra - EMU_{ij,t}^{ROW}$	12.0^{**}
	[1.5 - 23.6]
Importer-time FE	Yes
Exporter-time FE	Yes
Country-pair FE	Yes
Country-pair trend	Yes
Globalization dummies	Yes
Country-pair trend	Yes
N	73062

Notes: The dependent variable measures bilateral trade flows, measured in current dollar values. 95% confidence intervals calculated using robust standard errors (clustered by country-pair) are in brackets. *p<.10,**p<0.5,*** <0.1. The presented total effect is a percent change and resembles the total effect based on the various individual coefficients of the estimated dynamic specification.

Country-specific results

In some countries, exports have increased more due to EMU membership than in other countries. Figure 1 presents point estimates and 95% confidence intervals of the impact of EMU membership on total exports when we use our gravity model to estimate the impact for each EMU member state separately. Interestingly, despite the loss of statistical power when estimating country-level effects, our estimates suggest statistically significant differences in the effect of EMU membership on exports across member states. The exports from Ireland, Belgium, Luxembourg and The Netherlands are estimated to have increased more than 50% due to their EMU-membership. Exports from France increased by almost 20% and exports from Austria and Germany by 11% and 9% respectively. On the other hand, exports from Greece are estimated to have declined by almost 20% and exports from Italy declined by 5% (significant at the 90% confidence level).

Figure 1: Country-specific estimated impact of EMU membership on total export values (in %)



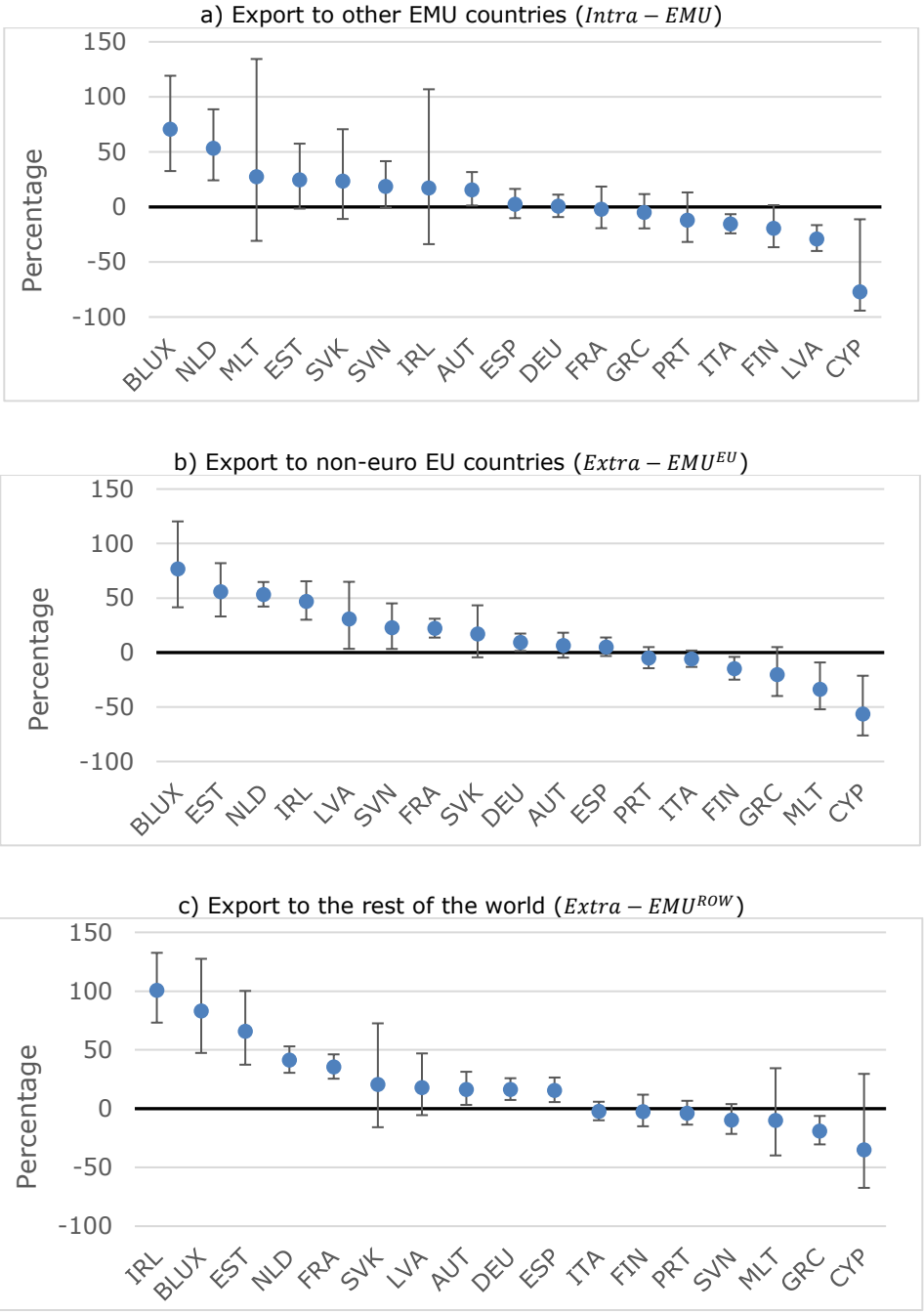
Notes: The figure report the country-specific impact of EMU membership on the current dollar value of exports. The presented effect is a percent change compared to the counterfactual of not joining EMU and resembles the total effect based on the various individual coefficients of the estimated dynamic specification. Error bars represent 95% confidence intervals which are calculated using robust standard errors (clustered by country-pair). Lithuania is excluded and Belgium and Luxembourg are combined (BLUX) due to data availability.

These results beg the question why exports from some countries benefit more from EMU membership than exports from other countries. A common currency has far-reaching implications for its member states. Foremostly, it implies a common nominal exchange rate, and thus the absence of currency conversion costs and bilateral nominal exchange rate fluctuations. But why would this lead to heterogeneous effects on exports across countries? We believe two explanations to be particularly plausible. First, countries export different goods and EMU membership may benefit the exports of certain goods more than others. This could be because some goods are more likely to be subject to trade diversion effects than others, for instance because of differing price elasticities, because for some goods global competitors and/or importers are within the euro area while for others they are outside the euro area, or because goods enter global supply chains at different stages. Second, EMU membership may have persistent heterogenous effects on member states their competitiveness. Before adopting the euro, countries with lower productivity growth and higher inflation were able to remain competitive through a depreciation of their nominal exchange rate. The EMU fixed nominal exchange rates at a particular conversion

rate, resulting in a common nominal exchange rate vis-à-vis the rest of the world. As a result, a member state's real exchange rate, and thus its international competitiveness, can only respond to productivity differentials by changes in relative wages and prices. Because of nominal rigidities and frictions in labor and capital markets it can take a long time for real exchange rates to reflect productivity differentials. This means that countries with relatively high productivity growth may benefit from a prolonged competitive edge while it is more difficult for countries with lower productivity growth to remain competitive. In addition, a reduction in borrowing costs in countries with lower productivity growth due to monetary unification could fuel a debt-funded boom in the non-tradable sector, leading to higher wages and a further loss of international competitiveness.

To shed light on the reasons for the heterogenous effects of EMU membership on exports, we use our gravity model to separately estimate the impact on exports to other EMU countries, to non-euro EU countries and to the rest of the world, for each EMU member state. While Figure 2 provides no conclusive evidence for the main reasons behind the heterogenous effects of EMU membership on exports, two results stand out. First, the country-specific impact on exports to each destination is highly correlated. In other words, when EMU membership increases exports to other EMU countries, exports to other EU countries and to the rest of the world also increases. An exception is France, whose exports to non-euro EU countries and to the rest of the world significantly increased following its EMU membership, while exports to other EMU countries did not. Second, for many countries, exports to non-euro EU countries and to the rest of the world rose by more due to EMU membership than exports to other EMU countries. Additionally, the more productive EMU countries are among those countries with the largest increase in exports to the rest of the world. These latter results suggest that indeed the slow adjustment of real exchange rates to relative productivity growth could potentially be an empirically relevant explanation for the heterogeneous effects of EMU membership on exports. A smaller benefit for less productive countries, especially for exports to the rest of the world, is consistent with a slow adjustment of their real exchange rates due to the absence of nominal exchange rate adjustments. Further research could provide more conclusive evidence, for instance by using more granular export data.

Figure 2: Country-specific estimated impact of EMU membership on various export values (in %)



Notes: The figures report the country-specific impact of EMU membership on the current dollar value of exports. The presented effect is a percent change compared to the counterfactual of not joining EMU and resembles the total effect based on the various individual coefficients of the estimated dynamic specification. Error bars represent 95% confidence intervals which are calculated using robust standard errors (clustered by country-pair). Lithuania is excluded and Belgium and Luxembourg are combined (BLUX) due to data availability.

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Technical Appendix

We estimate the effect of EMU membership on trade by employing an empirical gravity model. Gravity equations are the workhorse models for studying bilateral trade. These models have a solid theoretical foundation, as pioneered by Anderson (1979), and tend to perform well in empirical applications. Our gravity model, closely in line with Larch et al. (2018), Esteve-Pérez et al. (2020), Baier et al. (2019) and Freeman et al. (2022), is the following:

$$X_{ij,t} = \exp(\eta_{i,t} + \psi_{j,t} + \gamma_{i,j} + \gamma_{\bar{ij},t} + \sum_{t} b_t + \beta_1 FTA_{ij,t} + \sum_{L} \beta_{2,L} \Delta FTA_{ij,t-L} + \beta_3 EU_{ij,t}$$
$$+ \sum_{L} \beta_{4,L} \Delta EU_{ij,t-L} + \beta_5 \widetilde{EU}_{ij,t} + \sum_{L} \beta_{6,L} \Delta \widetilde{EU}_{ij,t-L} + \beta_7 EMU_{ij,t} + \sum_{L} \beta_{8,L} \Delta EMU_{ij,t-L}$$
$$+ \beta_9 \widetilde{EMU}^{EU}_{ij,t} + \sum_{L} \beta_{10,L} \Delta \widetilde{EMU}^{EU}_{ij,t-L} + \beta_{11} \widetilde{EMU}^{ROW}_{ij,t} + \sum_{L} \beta_{12,L} \Delta EMU^{ROW}_{ij,t-L}) \epsilon_{ij,t}$$

where $X_{ij,t}$ denotes the dollar value of export from an origin country *i* to a destination country *j* in period *t*. We include domestic trade flows, where $i = j$, in line with theory and as suggested in Yotov (2022). $\eta_{i,t}$ and $\psi_{j,t}$ are, respectively, time-varying exporter- and importer-fixed effects that control for all country-level factors that vary over time. As proposed in Bun and Klaassen (2007), we not only include country-pair fixed effects, $\gamma_{i,j}$, but we also account for country-pair specific time trends by introducing time-varying pair-wise fixed effects $\gamma_{\bar{ij},t}$. To decrease the number of variables, we estimate these country-pair specific time trends over 5-year intervals. To capture the effects of globalization on trade, we include $\sum_t b_t$, a set of year specific dummies that is equal to 1 for cross-border trade observations at each time *t*, as proposed by Bergstrand et al. (2015).

The dummy variable $FTA_{ij,t}$ equals 1 when country *i* and *j* belong to a common FTA excluding the EU. Similarly, $EU_{ij,t}$ equals 1 if both *i* and *j* are part of the EU in year *t*. The EMU variable is likewise defined. These variables capture the "intra-trade flows". We add additional variables to simultaneously estimate the impact on "*extra-E(M)U trade flows"*, which represent trade flows between a country with EU or EMU membership and the rest of the world. The dummy variables $\widetilde{EU}$ equal 1 when country *i* belongs to the EU but country *j* does not (the rest of the world). The dummy variables $\widetilde{EMU}^{EU}$ equal 1 when country *i* belongs to the EMU and country *j* does not belong to the EMU but is part of the EU and $\widetilde{EMU}^{ROW}$ equal 1 when country *i* belongs to the EMU and country *j* does not belong to the EMU nor the EU. Thus, for EMU countries we separate the effect on trade with EU and non-EU countries.

To account for the possibility that FTA, EU and EMU effects phase-in over time or are anticipated, we include a distributed lag structure. For instance, for the FTA dummy the L-year lag is denoted as $FTA_{ij,t-L}$. We add lagged (and lead) variables year by year and use a simple rule: if two subsequent lags are insignificant we include up to the last significant lag. Since we include the lags in first difference, the parameters on the contemporary dummy variables represent the total effects.

Table 2 presents robustness results on the estimated effects of EMU membership on export when excluding the country-pair specific time trend (column 1). All point estimates are significantly larger, except for the estimated impact of EMU membership on trade with non-euro EU countries, which becomes insignificant. Other robustness results are available upon request.

Table 2: Robustness of the estimated FTA, EU and EMU impact on export values (in %)

	(1)	(2)
$Intra - FTA_{ij,t}$	32.8***	11.4***
	[16.9 - 51.0]	[3.5 - 20.0]
$Intra - EU_{ij,t}$	94.6***	83.7***
	[54.0 - 146.2]	[64.0 - 105.9]
$Intra - EMU_{ij,t}$	26.1**	7.2**
	[3.2 - 54.0]	[0.1 - 14.3]
$Extra - EU_{ij,t}$	40.9***	28.5***
	[8.6 - 82.8]	[12.7 - 46.5]
$Extra - EMU^{EU}_{ij,t}$	17.2	15.7***
	[-12.7 - 57.6]	[8.3 - 23.5]
$Extra - EMU^{ROW}_{ij,t}$	46.8***	12.0**
	[12.2 - 92.1]	[1.5 - 23.6]
Importer-time FE	Yes	Yes
Exporter-time FE	Yes	Yes
Country-pair FE	Yes	Yes
Country-pair trend	Yes	Yes
Globalization dummies	Yes	Yes
Country-pair trend	No	Yes
N	73174	73062

Notes: The dependent variable measures bilateral trade flows, measured in current dollar values. 95% confidence intervals calculated using robust standard errors (clustered by country-pair) are in brackets. *p<.10,**p<0.5,*** <0.1. The presented total effect is a percent change and resembles the total effect based on the various individual coefficients of the estimated dynamic specification.