Humboldt-Universität zu Berlin

Term Paper

The Trade Effects of the Euro: A Case Study of Germany's and the Netherlands' Trade Balances

Baris Sen
Matrikel number: 628530
baris.sen@student.hu-berlin.de

Vera Krämer
Matrikel number: 647831
vera.kraemer@student.hu-berlin.de

Germany's Foreign Trade 1870 - Today (SoSe: 25)

Supervisor: Prof. Nikolaus Wolf

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1 Introduction

The euro is frequently described as the peak of European Integration, embedded in a number of pre-existing measures facilitating institutional alignment leading up to it. Its ambition: Reducing the barriers to international trade, providing additional stability for the involved economies, as well as offering consumers on the markets access to a diversified range of products (European Union, 2025). The euro's initial launch as an "invisible currency" on January 1st 1999 united over 300 million people in the same monetary union. Three years later, the official bank notes were released, which today are used by over 350 million people in 20 of the 27 EU member states, as well as in some additional locations (European Central Bank, 2025). With this number of people, the euro currently stands as the second-most used currency worldwide (European Union, 2025).

Since its introduction, the Euro, or more specifically, the effects the Euro had on the involved countries have sparked significant interest in the literature. A key point of interest in this case has been quantifying the effects the Euro had in facilitating cross border trade among the Eurozone member states. Already shortly after its launch, researchers have argued that it is undeniable that the Euro led to a boost of trade among the Eurozone countries, with the body of literature and the understanding of the topic continuing to grow since then (Baldwin, 2006).

2 Literature Survey

Over the years, several unique characteristics of the effect the Euro had have been analyzed in more depth. The results of this literature diverge, with some papers noting a significant increase in trade while others conclude no notable change. With regards to our topic of interest, its trade effects, a key factor to take into consideration is potential heterogeneities in the effect size among different Eurozone member states. While several papers conclude that the Euro certainly appears to have achieved its goal of reducing barriers to trade and facilitating European integration, these papers also note that the benefits seem to be distributed unevenly among the involved countries. As a result of the introduction of the euro, current account balances of Eurozone members have widened significantly. Researchers have expressed worry that these can be interpreted as a sign of a misallocation of resources. Initial hypotheses, that stated that the mismatch of current accounts balances would even out after the introduction of the euro as countries running a deficit would experience higher rates of growth, turned out to be unjust (Barnes et al., 2010). This stark development towards an economic mismatch does not come without risks and side effects. Current account imbalances among countries in the Eurozone are frequently cited as a driver of instability. In this context, many people also believe them to be, at least partially, at fault for the Eurozone debt crisis (Brancaccio, 2014).

To deepen the understanding of the mechanisms driving these developments of the trade balances, extensive research has been conducted to gain an understanding of the relationship between the new currency and changes of trade volumes between the involved Eurozone countries. Initial papers arrived at rather high estimates, and described increases in trade of up to 25%. However, as the methodologies of estimation improved, this effect size swiftly decreased. Baldwin (2006) conducted an extensive analysis of a range of existing literature up to this date and concluded that, at the given point of time, the Euro was deemed responsible for an increase in trade ranging from 5 to 10 percent. However, he emphasized that these effects are likely to appear gradually and accumulate over time. With regards to the nature of the effect, he also noted spatial, as well as sectoral variation, meaning that certain industries and countries benefited more than others.

A country that has drawn special interest in the aforementioned body of literature is Germany, due to several unique traits it entails. These characteristics are the fact that the German economy is very large and therefore central to the Eurozone, but also its already pre-existing strong export orientation and resulting persistent trade surplus (Priewe, 2018). Berger and Nitsch (2010) conducted an analysis of bilateral trade balances among 18 European countries using a reduced-form panel OLS and found the introduction of the Euro to be responsible for a considerable widening of trade balances among Eurozone members. Germany is concretely mentioned as one of the countries that experienced a stark increase in trade balance, due to its growing trade surplus with southern Europe and therefore a key driver of imbalances across the Eurozone. Other literature exists and documents similar findings. Hohberger et al. (2019) estimate a structural DSGE model to conduct a comparison between the current German trade surplus and estimate a counterfactual, which in this case was a situation where Germany had not adopted the Euro and kept the Deutsche Mark. Through this analysis, they find the Euro to be responsible for a considerable and significant increase in Germany's trade surplus.

However, other economies also faced interesting and unique developments as a result of the introduction of the Euro. The Netherlands are frequently not specifically examined in research regarding the impact of the Euro on trade balance, presumably due to the relatively smaller size of the economy in comparison to other countries such as Germany. The Dutch economy, however, has also experienced a significant and rising current account surplus, which has been increasing steadily since the nineties (Suyker and Wagterveld, 2019). Papers such as Baldwin (2006) also identify and name the Netherlands specifically as one of the key countries that experienced a stark increase in trade after the introduction of the Euro. Figure 1 additionally highlights the fact that Germany and the Netherlands are two of the key players when it comes to intra-EU trade, underlining the motivation to study these two economies.

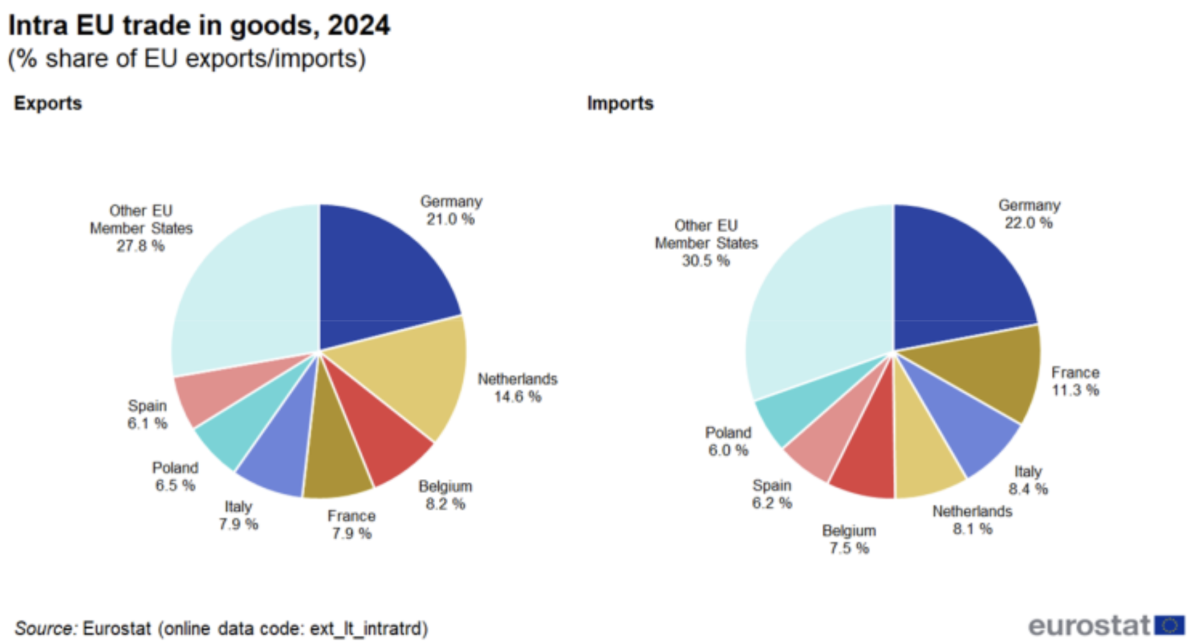

Figure 1: Intra-EU trade in goods, 2024. Source: Eurostat (2024).

The situation in the Netherlands, however, differs in comparison to the German situation with regard to the varying economic policies in place before the introduction. This is due to the fact that the Netherlands had already informally started pegging its currency to the German Deutsche Mark after 1983 (European Central Bank, 2025). This fact, combined with the distinct respective sizes of the economy as well as the different structures and characteristics, makes them suitable candidates for an insightful comparison of how the Euro affected trade in different contexts.

Nevertheless, it is also important to mention papers that arrived at different results with regard to the effects the introduction of the Euro had on trade. Mika and Zymek (2018) apply a Gravity setup using PPML and three-way fixed effects to analyze the effect the Euro had on trade in the period from 1992 to 2003. By implementing this research design they find no evidence that the Euro significantly increased trade among the members of the Eurozone. They do, however, find the growth rate of trade to be slightly higher in the EMU compared to the rest of the world in the early 2000s. Based on their findings, they believe this to be caused by European integration more generally and do not attribute this to the creation of the Euro directly.

Based on the described underlying situation, we have arrived at the following research question that we will analyze in the following paper:

> To what degree did the introduction of the Euro influence German as well as Dutch trade volumes?

To conduct the analysis, we will be working with the CEPII Gravity dataset and therefore also implementing a gravity model. This research design will allow us to examine the foundational dynamics of trade in the Eurozone, which will also deepen our understanding of the existing trade balances.

3 Data

To examine the question of interest the 202211 version of the CEPII Gravity dataset was used. Generally speaking, this dataset provides data on all pairs of countries with regards to their trade flows, geographic distances, as well as other potential variables influencing trade relationships, such as macroeconomic indicators or variables pertaining to a country's cultural background.

The unit of analysis is a directed exporter- importer- year panel. We use data on all exporter and importer pairs when one or both of these countries are part of the European monetary union, leaving out late adopters. We restricted our sample and therefore our analysis on the years 1980 to 2021.

To conduct our analysis the data was prepared in multiple steps. We used the CEPII provided country identifiers for the exporters and importers and created an ID for each unordered combination of exporter and importer, which will be later used in the fixed effects estimation. What is more, we also created numeric exporter and importer IDs based on the dataset provided country codes. These will increase efficiency during the estimation of the model, but to not provide any additional information.

For our later analysis, we restricted ourselves to using only the Euro's early adopters, meaning countries that adopted the Euro before 2002, which included 12 countries. Countries that adopted the Euro later were not included in the estimation and were also not used in the construction of the dummy variables, which will be explained in more depth in the methodology section. This additional dummy variable was created that showed whether both countries in the pair used the Euro in the respective year, to later be able to infer about the average effect the Eurozone had on trade among its member countries.

The dependent variable is defined as bilateral exports, measured as exporter-reported trade flows (`tradeflow_imf_o`) from the CEPII Gravity dataset. It is important to note that our dependent variable captures only exporter-reported flows. Accordingly, the results speak to how the export performance of member countries compared to one another, rather than to import behavior. These values originate from IMF statistics and are expressed in thousands of current US dollars. No further restrictions are imposed on the dependent variable: observations with zero or very small reported flows are retained in the sample.

	Value
Number of observations	96,546
Start year	1980
End year	2020
Number of years	41
Number of exporters	205
Number of importers	214
Number of countries total	214
Number of pairs (unordered)	2,122
Number of pairs (ordered)	3,841

Table 1: Dataset coverage and panel dimensions.

3.1 Descriptive Statistics

Descriptive statistics of bilateral trade flows are shown in Table 2. Trade data are highly skewed: while the median bilateral flow is below 100,000 USD, the maximum exceeds 170 million USD. This skewness, together with the presence of zero flows, motivates the use of the PPML estimator. The table also highlights differences between euro and non-euro country pairs, with average trade values for euro pairs an order of magnitude larger.

	mean	median	sd	p25	p75	p90	min	max
All pairs	941072.72	18674.71	5147820.23	1392.07	196319.23	1318675.04	0	173839312
Non euro	708581.64	17198.64	3673069.65	1300	170533.83	1099649.26	0	135287232
Euro pairs	12952895.24	2953562	23488537.78	628130.03	11157372.25	45375091.6	3629.44	173839312

Table 2: Descriptive statistics of bilateral trade flows (USD, thousands).

4 Methodology and Identification Strategy

To study how the European Monetary Union (EMU) affected trade, and in particular whether Germany and the Netherlands experienced different outcomes, we make use of a structural gravity model. This type of model links trade flows between countries to their economic size and to barriers such as distance or borders, and it is widely applied in the trade literature. We follow current econometric practice in specifying the model so that the results are not driven by omitted factors or other common sources of bias.

Our empirical analysis is centered on the estimation of an augmented gravity equation. The dependent variable is the value of exports from country i to country j in year t. The primary independent variables are designed to capture the average effect of the euro, as well as the specific additional effects for our countries of interest. This leads to the following specification:

$$
\begin{aligned}
E[\text{Trade}_{ijt} \mid X] = \exp\Big[& \beta_1 \, \text{EuroPair}_{ijt} \\
& + \beta_2 \, (\text{EuroPair}_{ijt} \times \text{DEU}_i) \\
& + \beta_3 \, (\text{EuroPair}_{ijt} \times \text{NLD}_i) \\
& + \alpha_{ij} + \gamma_{it} + \delta_{jt} \Big].
\end{aligned} \tag{1}
$$

The central variable, EuroPair_{ijt}, is defined as a dummy equal to one if both the exporting country i and the importing country j are members of the Eurozone in year t, and zero otherwise. In line with the argument of Baldwin (2006) that the euro's effects may vary over time, the analysis is restricted to the "early adopters" the 12 countries that joined before 2002. Focusing on this group creates a more consistent treatment set. The coefficient on this term, β_1, reflects the average percentage change in trade for a typical pair of these early members.

To examine possible heterogeneity, the model includes interaction terms such as $\text{EuroPair}_{ijt} \times \text{DEU}_i$, which capture the effect on German exports relative to the baseline. Here, the coefficient β_2 measures the additional trade impact associated with Germany. In the Emprical Results section one can observe that this country specific interaction term is extended to NLD to capture heterogeneity for Netherlands as well as Greece and Italy to further expand on our earlier research question.

The reliability of the results depends on an identification strategy that aims to separate the euro effect from other influences on trade. Building on the recommendations of Baldwin and Taglioni (2006), the model includes several layers of fixed effects. Pair fixed effects (α_{ij}) capture factors that are constant within a country pair over time, such as distance or common language. In addition, exporter-year (γ_{it}) and importer-year (δ_{jt}) effects control for influences that change over time within each country. Together, this three-way structure helps to limit the problem of omitted variable bias.

For estimation, the analysis applies the Poisson Pseudo-Maximum Likelihood (PPML) estimator, as outlined by Santos Silva and Tenreyro (2006). This estimator deals well with heteroskedasticity and allows the inclusion of observations with zero trade flows. To test robustness, additional checks are performed, including a placebo test and a dynamic event study model that examines the parallel trends assumption.

5 Empirical Results

This section reports the main outcomes of the empirical analysis. The presentation of results is organized to show how the estimated trade effects of the euro developed over time and across member states. As a first step, we replicate the so-called "Rose effect" in a historical sample that is comparable to the one used in the early literature Baldwin (2006). We then expand our analysis to the modern era to reveal the long-run, heterogeneous impacts of the monetary union.

5.1 The "Rose Effect" Revisited: A Replication for 1994-2003

To ground our analysis in the seminal literature, we first estimate our model on a sample period of 1994-2003. This timeframe is analogous to that used in Baldwin (2006)'s influential study. For this initial test, we specify a simple model focused only on the average effect of the euro. The results are presented in Table 3.

	(1) PPML Exp-Only
Dependent Var.	trade
Euro (Avg)	0.0663$^{\cdot}$ (0.0391)
Fixed-Effects	3-way PPML
Observations	23,719

Table 3: Average Effect of the Euro, 1994-2003
***p<0.001, **p<0.01, *p<0.05, $\cdot$p<0.1. Standard errors in parentheses.

In our research with the default model the PPML estimation gives a coefficient of 0.0663 for the Euro (Avg) term. In practice, this means that trade between an average pair of Eurozone countries was about 6.8% higher after the introduction of the single currency. The magnitude of this effect is close to the 5–10% range usually associated with the so-called "Rose effect" Baldwin (2006). Although the coefficient is only significant at the 10% level, it still shows that our approach reproduces the main findings of the early literature. This serves as a useful benchmark and reflects the more optimistic view of the euro's early years that shaped both academic and policy debates.

5.2 Divergence and Heterogeneity from 1980–2021

When the sample is extended to cover the full period from 1980 to 2021, the picture changes noticeably. The longer horizon makes it possible to examine the euro's legacy over several decades of shifting economic conditions.

Focusing on our preferred PPML specification, we first note that the average effect of the euro is statistically indistinguishable from zero (see Table 4). This outcome is consistent with the methodological argument of Baldwin and Taglioni (2006), who emphasize that once a sufficiently rigorous fixed-effects structure is applied, the inflated positive estimates from early studies are likely to diminish. It also aligns with the patterns found

	(1) PPML Exp-Only
Dependent Var.	trade
Euro (Avg)	-0.0287
	(0.0640)
Fixed-Effects	3-way PPML
Observations	96,546

Table 4: Average Effect of the Euro, 1980-2021
Standard errors in parentheses.

in more recent empirical work: Mika and Zymek (2018) re-estimate the euro's trade effect using PPML with three-way fixed effects and find no statistically significant average effect across member states.

It also allows us to apply the full heterogeneous model. As shown in Table 5, the results point away from a uniform positive effect and instead highlight strong differences across member states.To test our primary research question, the model is augmented with interaction terms to capture potential heterogeneity. We specifically analyze Germany (DEU) and the Netherlands (NLD) and include Greece (GRC) and Italy (ITA) as representative southern European economies for comparison. Results can be observed in Table 5.

	(1) PPML Exp-Only
Dependent Var.	trade
Euro (Avg)	0.0780
	(0.1003)
Euro x DEU	-0.2004*
	(0.0954)
Euro x NLD	0.8695***
	(0.1564)
Euro x GRC	-0.3701*
	(0.1629)
Euro x ITA	-0.1413$^{\cdot}$
	(0.0820)
Fixed-Effects	3-way PPML
Observations	96,546

Table 5: Long-Run Heterogeneous Effects of the Euro, 1980-2021
***p<0.001, **p<0.01, *p<0.05, $^{\cdot}$p<0.1. Standard errors in parentheses.

The most highlighted result is the coefficient on `Euro x NLD`, which is very large, positive, and highly statistically significant at the 0.1% level. The total effect for Dutch exports is approximately 0.95 (the sum of the insignificant average effect of 0.0780 and the additional effect of 0.8695), which corresponds to $\exp(0.95) - 1 \approx 158\%$ higher trade. This identifies the Netherlands as the primary and exceptional beneficiary of the monetary union.

In stark contrast, we find statistically significant negative interaction terms for both Germany and Greece. For Germany, the 'Euro x DEU' coefficient of -0.2004 challenges the existing knowledge and our preliminary beliefs and expectations towards this work. The total estimated effect for German exports is approximately -0.12 ($0.0780 - 0.2004$), suggesting that German exports were ultimately about 11% lower than would have been expected if they had not adopted the euro.

On top of that for Greece, the coefficient on 'Euro x GRC' is -0.3701. Combined with the average effect, this gives a total of -0.29 ($0.0780 - 0.3701$). This result indicates a decline in export performance, with trade roughly 25% lower than what would have been expected. This is in accordance with the earlier literature that southern economies have suffered with Euro due to higher cost divergence index for production.

Finally, for Italy ('Euro x ITA'), the coefficient is negative but does not meet standard thresholds for statistical significance. We interpret this as an absence of evidence for a significant effect in our demanding model.

In summary, our long-run analysis reveals a complex legacy of divergence, with a clear winner, clear losers, and a middle group for whom the trade benefits are not readily apparent.

6 Robustness Checks

To check the robustness of the main results, two additional tests are carried out. The aim is to see whether the identification strategy works as intended and whether the results could be explained by patterns that already existed before the euro.

6.1 Placebo Test for Pre-Existing Trends

One important assumption in the model is that Eurozone trade was not already moving in a different direction before the single currency was introduced. To examine this, a placebo test is implemented by assigning a pseudo treatment to the years 1996–1998. The corresponding estimates are shown in Table 6.

The coefficient on the Placebo Effect is statistically indistinguishable from zero, as indicated by its extremely large standard error. This demonstrates an absence of any significant pre-existing trend in the immediate run-up to the monetary union, giving us confidence that our model is capturing the effect of the euro itself.

	(1) Placebo Test (PPML)
Dependent Var.	trade
Actual Euro Effect	-0.0287
	(0.0640)
Placebo Effect (Pre-Euro)	0.4664
	(13,172.7)
Fixed-Effects	3-way PPML
Observations	96,546

Table 6: Placebo Test Results, 1980-2021
Standard errors in parentheses.

6.2 Event Study and the Parallel Trends Assumption

As a second, more rigorous test, we estimate a dynamic event study model. This allows us to visually inspect the year-by-year effects of the euro, providing a powerful test of the crucial "parallel trends" assumption. The model is estimated on a sample where the top 1% of trade flows have been removed to mitigate the influence of extreme outliers. The results are plotted in Figure 2.

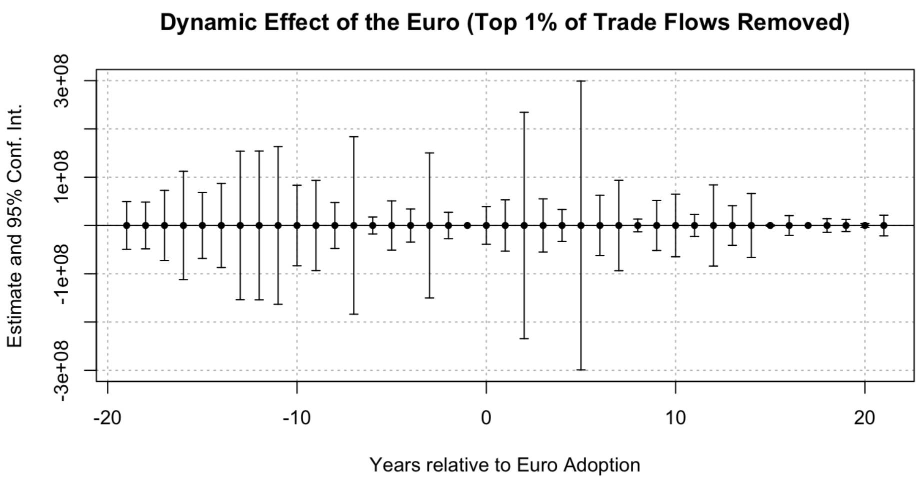

Figure 2: Dynamic Effect of the Euro (Top 1% of Trade Flows Removed)

There are 2 important insights that can be gathered from Figure 2 plot. First, it offers strong support for the parallel trends assumption. The point estimates for the coefficients in the pre-treatment period (Years < 0) are all tightly clustered around the zero line. Despite wide confidence intervals for some years, there is no evidence of a systematic upward or downward trend before the euro's implementation. Second, the plot reinforces our main conclusion about the average effect of the euro. The post-treatment coefficients remain close to zero and statistically indistinguishable from it, suggesting no evidence of an average trade effect of the euro. This visual evidence confirms that the true story of the euro's trade impact is not about the average effect, but about the profound heterogeneity among its member states.

7 Discussion

The empirical results offer a multi-layered narrative of the euro's impact on trade. Our findings both confirm the methodological critiques of the modern literature and provide new, challenging evidence regarding the distribution of benefits within the monetary union.

Our analysis first highlights the critical importance of the sample period. When the model is estimated for the period 1994–2003, in an attempt to replicated the earlier works of Baldwin (2006) the average effect of the euro is about 6.8%. This is close to the early findings reported in this paper. However, the positive effect seems to reflect conditions specific to that short time frame rather than a lasting pattern.

This simple, positive story vanishes when we extend our analysis to 2021. Our long-run model finds no statistically significant average trade benefit. This finding supports the argument of Baldwin and Taglioni (2006): as econometric techniques become more sophisticated, the once-large estimated effects of currency unions tend to diminish. As our heterogeneous results show, the positive and negative effects across different countries effectively cancelled each other out.

It strikes out here especially because it stands in direct contrast to predictions in the early literature. Influential work by authors such as Baldwin (2006) hypothesized that the initial "Rose effect" would grow over time. Our analysis finds no evidence to support this; in fact, we observe the opposite. The modest positive effect from the early 2000s disappears entirely in the long-run view. This "reversal" suggests that initial gains were likely overwhelmed by later economic shocks and the deep structural differences between member states. This reinforces our central conclusion that the story of the euro's trade impact is one of profound and persistent divergence, where any analysis focusing only on the average effect would miss the true story. More importantly, the long-run sample includes several major economic shocks (e.g., the 2008 Global Financial Crisis, the Eurozone sovereign debt crisis, COVID-19) that are absent from the early window. These crises likely overwhelmed any subtle, positive trade-creating effects of the common currency.

An important result of the analysis is the evidence of strong differences across countries, even though the overall average effect is close to zero. For the Netherlands, one explanation for the large positive coefficient is the country's starting point. Well before the euro was introduced, the Dutch guilder had already been pegged to the German Deutsche Mark (Gros and Thygesen, 1998). This meant that the Dutch economy was operating under a stable exchange rate system, which may have helped firms adjust more quickly and take advantage of the single currency.

The Dutch effect should, however, be interpreted with some caution because of the so-called "Rotterdam Effect." Earlier work (e.g., Shida (2021)) points out that many goods going to other European countries first pass through the port of Rotterdam. These flows are often logged as Dutch imports and then again as exports. Since the model cannot fully separate such re-exports from actual Dutch exports, the positive direction of the effect is clear, but its exact size remains uncertain.

Negative and statistically significant coefficient for Germany is one of the most surprising result. In the long-run model, German exports to other Eurozone members are estimated to be about 18% lower than for an average member country. This does not mean that German exports declined in absolute terms, but rather that they grew more slowly compared to the baseline. One reason may be that the usual account is too simplified. Although Germany's trade surplus increased, the gains may have been driven by factors such as tighter supply chain integration rather than by a direct rise in export volumes. This challenges the view that Germany's success was mainly the outcome of a euro-driven export boom. While our results differ from the findings of authors such as Berger and Nitsch (2010) and Hohberger et al. (2019), it is important to note that their analyses relied on different data sources and methodological approaches.

For the southern European economies, the picture looks different. In the case of Greece, the estimate is negative and statistically significant, which points to weaker export performance compared to the average. For Italy the coefficient is also negative, but the result is not statistically reliable. Taken together, the evidence shows that the common currency did not shape trade outcomes evenly: while some countries benefited, others struggled to keep pace.

Taken as a whole, the findings indicate that the euro's trade effects cannot be summarized by a single average number. Early studies suggested a modest but positive "Rose effect," yet our longer sample shows that this pattern disappears once broader time periods and stricter specifications are applied. Instead, the evidence highlights divergence: the Netherlands experienced strong trade gains, while Germany, Greece, and Italy faced weaker or even negative relative outcomes. This shows that the euro shaped European trade in an unequal rather than uniform way.

8 Limitations

In this section we will discuss the some of the limitations that should be taken into account while reading this analysis.

First one that is worth the mention is the Data itself. The study relies on the 202211 version of the CEPII Gravity dataset, which itself builds on IMF trade statistics. This is a standard source, but reporting gaps and errors are possible. A well-known example is the "Rotterdam Effect," where goods going to other European countries are first logged as Dutch imports and then appear again as exports. This can overstate Dutch trade flows and may push up the estimated effect for the Netherlands.

Another limitation worth mentioning is the second, longer period covered, from 1980 to 2021. During these four decades, there are many major events that affected global economy. We can mention such as the financial crisis of 2008, the Eurozone debt crisis, and the COVID-19 pandemic. These shocks clearly influenced trade, which makes it harder to separate the role of the euro from other forces.

Third, the country results for Germany, the Netherlands, Greece, and Italy need to be treated with care. Some of the differences we find may come from structural features of these economies like their industry mix, labor markets, or role in global value chains rather than from the euro itself. Our fixed effects absorb many confounding factors, but they cannot rule out all alternative explanations.

Finally, our analysis is restricted to exporter-reported trade flows. This means that our results capture how the export performance of member countries compared to one another. Other important economic dimensions of monetary integration, such as capital flows, investment, and intra-firm trade, are also outside the scope of this paper. As a result, our findings should not be generalized to the euro's broader economic consequences. Moreover, since the analysis is based on observational data, establishing full causal inference remains challenging. Even with high-dimensional fixed effects, unobserved factors correlated with euro adoption may still bias the estimates.

To sum up, these limitations do not undermine our main conclusion about heterogeneous trade effects. Instead, they highlight the need for further research to better understand the complex and uneven consequences of common currency once described as the greatest monetary experiment of the modern era (Centre for Economic Policy Research, 2024).

9 APPENDIX

This appendix contains the supplementary material referenced in the main text.

Table 7: Full Model Comparison for Heterogeneous Effects, 1980-2021

	(1) PPML Exp-Only	(2) PPML All-Trade	(3) OLS Surplus (3-way FE)	(4) OLS log(trade)	(5) OLS asinh(trade)
Dependent Var.:	*trade*	*trade*	*trade_surplus*	*log_trade*	*asinh_trade*
Euro (Avg)	0.0780	0.2422*	-1,438,534.7	0.1663	0.1663
	(0.1003)	(0.1087)	(1,093,548.4)	(0.1059)	(0.1059)
Euro x DEU	-0.2004*	-0.0542	2,275,958.8	-0.1811	-0.1811
	(0.0954)	(0.0450)	(9,203,652.8)	(0.1353)	(0.1353)
Euro x NLD	0.8695***	-0.0780·	19,156,091.2**	0.6169***	0.6169***
	(0.1564)	(0.0471)	(7,241,915.7)	(0.1328)	(0.1328)
Euro x GRC	-0.3701*	-0.2515·	24,608.1	-0.2627	-0.2627
	(0.1629)	(0.1311)	(1,199,063.0)	(0.1759)	(0.1759)
Euro x ITA	-0.1413·	-0.1560***	-208,923.2	-0.1789	-0.1789
	(0.0820)	(0.0467)	(2,726,235.6)	(0.1195)	(0.1195)
Fixed-Effects	3-way	3-way	3-way	3-way	3-way
Observations	96,546	96,546	114,452	96,546	96,546

***p<0.001, **p<0.01, *p<0.05, ·p<0.1. Standard errors in parentheses. All models include pair, exporter-year, and importer-year fixed effects (or their equivalent). Model descriptions: (1) Our preferred PPML specification with interactions on the exporter side only. (2) PPML where interactions apply if a country is an exporter OR importer. (3) OLS on the bilateral trade surplus. (4) OLS on log(trade), dropping zero-trade observations. (5) OLS on asinh(trade), which keeps zeros and approximates a log transformation for large values.

Pair type	N	Share (%)
EMU–ROW	91,891	95.2
EMU–EMU	4,655	4.8

Table 8: Distribution of country pairs by euro membership.

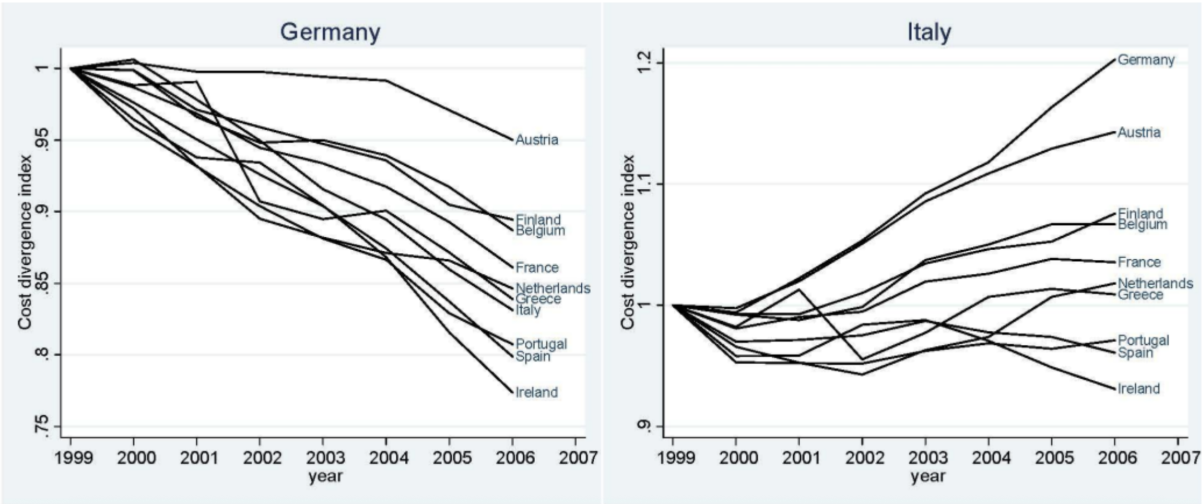

Figure 3: Cost divergence in the Eurozone. Source: De Grauwe (2012).

Year	Observations	Median Trade (USD)	Share of Euro Pairs (%)
1980	2365	16520	0.0
1981	2628	13395	0.0
1982	2617	12240	0.0
1983	2619	12068	0.0
1984	2633	12685	0.0
1985	2672	12442	0.0
1986	2651	14387	0.0
1987	2729	13920	0.0
1988	2792	14531.19	0.0
1989	2877	13505.66	0.0
1990	2887	14265.52	0.0
1991	2901	12441.28	0.0
1992	3060	12724.88	0.0
1993	3222	12536.52	0.0
1994	3257	12300	0.0
1995	3298	14621.62	0.0
1996	3274	16488.81	0.0
1997	3751	17080.71	0.0
1998	3918	15166.36	0.0
1999	3987	14555.40	28.0

Table 9: Yearly observations, median trade, and euro pair share (1980–1999).

Year	Observations	Median Trade (USD)	Share of Euro Pairs (%)
2000	4166	12275.47	4.4
2001	4188	12779.96	5.2
2002	4234	12965.21	5.1
2003	4213	14863.17	5.1
2004	4233	18086.75	4.9
2005	4223	19833.30	4.9
2006	4268	22469.50	4.7
2007	4291	27042.30	4.6
2008	4290	31033.86	4.5
2009	4316	24778.00	4.7
2010	4307	28705.00	4.6
2011	4307	33841.48	4.5
2012	4287	33719.97	4.6
2013	4361	33091.44	4.5
2014	4366	32757.29	4.5
2015	4403	28538.34	4.5
2016	4399	27063.86	4.5
2017	4381	29448.15	4.5
2018	4409	30625.34	4.5
2019	4425	30538.54	4.5
2020	4419	27244.32	4.5

Table 10: Yearly observations, median trade, and euro pair share (2000–2020).

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