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Make or Break:
The Varying Trade Effects of the Euro*

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Abstract
It has long been argued that the criteria for optimum currency areas, such as the intensity of trade, are (partly) endogenous; the adoption of a common currency is expected to further intensify trade relationships. Early results from the euro area indeed seemed to provide supportive evidence for this hypothesis. A number of studies find an economically sizable and statistically significant increase in trade among member countries. In the meantime, however, it has become increasingly obvious that the common currency has also been associated with less favorable developments, such as the emergence of trade imbalances. In this paper, I review evidence on the trade effects of the euro, focusing in particular on differences across country pairs.

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1. Introduction

In the 1990s, the revival of monetary unions as a real world policy option was accompanied by controversial debates about economic preconditions for successful integration. In Europe, a sizable literature examined empirically the level of economic integration among countries, aiming to determine potential candidates ready for the Economic and Monetary Union (EMU); the definition of convergence criteria, along with the establishment of the stability and growth pact, provide further evidence for the view that real convergence of member countries was widely considered to be of relevance for the success of the common currency. In the Western Hemisphere, in similar fashion, Ecuador's (emergency) plans to adopt the US dollar as its national currency were greeted with great skepticism; Stanley Fischer (2001), then Vice President of the International Monetary Fund, notes: "The decision to dollarize was taken in desperation. The authorities did not consult with us [...] If they had asked us, we would have said that the preconditions for making a success of dollarization were not in place."

Since these early times, however, policy-making, especially in Europe, seems to have been increasingly dominated by the Nike ("Just Do It") approach to monetary integration; see Barry Eichengreen (2002) for a more extensive discussion of the possible sequencing of policy measures. This policy shift may have been initially due to the early success of EMU: institutions, most notably the newly established European Central Bank, were working well; also, the internal and external value of the new currency proved to be stable. With EMU in smooth operation, a (partial) departure from previously agreed principles seemed affordable. Later, in times of crisis, policy-makers agreed on a wide range of (unconventional and ad hoc) measures, desperately trying to signal that they were prepared to do whatever it takes to save the euro.

In this short note, I further examine the effects of monetary integration on trade. Specifically, it has been argued that the adoption of a common currency is likely to foster economic integration among member countries; Frankel and Rose (1998), for instance, convincingly argue that the optimum currency area criteria are endogenous.[1, 2] Berger and

[1] Frankel and Rose (1997, p. 754) even argue: "Countries which join EMU, *no matter what their motivation*, may satisfy optimum currency area criteria ex post even if they do not ex ante!" (emphasis added).

[2] A sizable number of studies indeed document an increase in trade intensity among EMU member countries after the adoption of the euro; see Baldwin (2006) for an extensive summary and Berger and Nitsch (2008) for an alternative view.

Nitsch (2013a,b), in contrast, emphasize in a series of papers the possible emergence of asymmetries such as bilateral trade imbalances after the elimination of nominal exchange rate flexibility.[3] Nitsch (2005) further highlights the costs of monetary integration by analyzing the extensive evidence on currency union break-ups in the post-WWII period. Here, I explore the possible disintegration effects of monetary integration.

To analyze this issue, I follow the empirical literature on the real effects of EMU. A sizable body of previous work interprets the (free) decision of eleven European countries to adopt the euro (as founding members) as a natural experiment to examine the effects of monetary integration. In contrast to most of this work, however, my main focus is not on the overall effect; I am particularly interested in the variation of the effect across member countries.

Previewing the results, I find that, although trade among EMU member countries seems to be, on average, particularly intense, the trade effects have spread more unevenly over time. These results add to previous findings of growing trade imbalances in the euro area.

The remainder of the note is structured as follows. Section 2 briefly describes the methodology and the data. The main part of the paper is section 3 which presents the empirical results. Finally, a short summary concludes.

2. Methodology and Data

As is standard in the literature, I use a gravity model to identify the effects of monetary integration on trade. Whenever possible, however, I replace structural variables (such as measures of the economic size of trading partners or the geographic distance between them) with a comprehensive set of country-specific and pair-specific fixed effects Specifically, I estimate (gravity-type) regressions of the following (very general) form:

(1) $\ln(Exports_{rpt}) =$

$\alpha + \beta\ EMU_{rpt} + \gamma\ X_{rpt}\ \{+ \Sigma_t\ \phi_t\ T_t\}\ \{+ \Sigma_{rp}\ \phi_{rp}\ RP_{rp}\}\ \{+ \Sigma_{rt}\ \phi_{rt}\ R_{rt}\}\ \{+ \Sigma_{pt}\ \phi_{pt}\ P_{pt}\} + \varepsilon_{rpt}$,

[3] An earlier literature was particularly concerned about possible industry location effects after a decline in transaction costs due to monetary integration; see, for instance, Krugman (1993).

where the regressand is the log of exports from reporter country r to partner country p at time t, EMU is a dummy variable that takes the value of one if both trade partners are members of the euro area at time t and zero otherwise, X is a vector of structural (gravity) variables, and ε is the disturbance term. As noted above, whenever possible, I also include various combinations of fixed effects. For instance, for panel analyses, I use common time fixed effects {T} to control for joint variations in trade over time. I also allow pair-wise trade to consistently deviate from the sample average by adding pair-specific fixed effects {RP}. Finally, I replace the common time effects by country-time fixed effects for both reporter {R} and partner {P} countries to capture any dynamic country-specific features that could affect the countries' overall trade position, including changes in the institutional environment, trends in country-specific competitiveness, or changes in the ease with which exports can be financed.[4] Given the comprehensiveness of the set of fixed effects, I consider these demanding specifications a fairly strong test of the hypothesis that euro area membership will influence trade.

Following Berger and Nitsch (2008, 2013a,b), the analysis focuses on a homogeneous set of 18 European countries. The approach has the advantage of including countries which either share the European Union's (EU) institutional framework or are closely associated with it. The sample comprises the 15 countries which were member of the EU at the time of the introduction of the euro (eleven of which adopted the currency from the beginning, followed by Greece in 2001) plus Iceland, Norway and Switzerland. In total, my sample covers the period from 1948 to 2011, but I often analyze much shorter time periods, typically only cross-section data for individual years, mainly for computational and interpretational convenience.

The data are taken from standard sources. I use trade data from the International Monetary Fund's Direction of Trade Statistics (in US dollars). Other variables are constructed based on information taken from the CIA World Factbook.

[4] Examples for changing institutional arrangements captured by time fixed effects include the country-specific effects of the "Single Market" initiative but also pre-EMU exchange rate arrangements. Arguably, the introduction of the euro has eased the financing of trade deficits through tighter financial integration and, for some countries, through the decline of real interest rates. Time fixed effects will also capture any systematic decline in (real) exchange rate volatility.

3. Empirical Results

I begin by updating the results in Berger and Nitsch (2013a,b). Instead of analyzing overall trade, Berger and Nitsch examine pair-wise trade relationships between European countries, focusing in particular on (the evolution of) bilateral imbalances under different exchange rate regimes. Specifically, they ask: "When does trade become a one-way relationship?". To account for differences in the importance of a trade relationship both across partners and over time, they normalize the trade surplus or deficit by the total value of bilateral trade; the measure of interest is defined as:[5]

$$(2) \qquad TradeBalance_{rpt} = (Exports_{rpt} - Imports_{rpt}) / (Exports_{rpt} + Imports_{rpt}) .$$

Figure 1 illustrates average absolute trade imbalances by groups of country pairs, distinguishing between pairs of countries in which both partners are members of the euro area and pairs which include at least one country that is not member of the euro area.[6] In line with Berger and Nitsch (2013a,b), it is shown that trade imbalances among euro area members widened considerably with the introduction of the euro (and during the 'phase-in' period), with a partial adjustment of imbalances (or rebalancing) during the times of crisis.

Table 1 provides accompanying regression results. The first three columns on the left of the table replicate the results in Berger and Nitsch (2013a,b) (with an updated set of trade data); the remaining three columns present analogous estimates for an extended sample, covering data until 2011. As in Berger and Nitsch, I begin with the most parsimonious specification of equation (1), a regression of the absolute value of bilateral trade imbalances on an EMU membership dummy and a comprehensive set of year fixed effects. Next, I add a comprehensive set of pair-wise fixed effects so that the EMU coefficient captures only the time variation in the trade imbalance for EMU member countries after the adoption of the

[5] Given the interest in the symmetry of trade relations, normalizing by total trade is the natural choice (rather than, for instance, normalizing by country size). Larger magnitudes of the variable of interest indicate greater imbalances in bilateral trade.

[6] Using the median instead of the mean leaves the results qualitatively unchanged. The differences between country groups become even more pronounced when the Non-EMU group is additionally split into EMU-Non-EMU and Non-EMU-Non-EMU pairs; see Berger and Nitsch (2013a,b).

euro. Finally, I control for time-variant country-specific features in the reporter and partner country.

As shown, the additional coverage of the crisis episode in Europe leaves the main results essentially unchanged. If anything, the estimated coefficients turn out to be even stronger, both economically and statistically. In sum, there is consistent evidence that imbalances in trade among euro area member countries widened markedly after the introduction of the common currency.

One issue related to the emergence of trade imbalances (with potentially growing frictions between partners) is whether all member countries benefit equally from the adoption of a common currency. While the overwhelming majority of studies finds a statistically significant positive effect of the euro on trade, with Baldwin, DiNino, Fontagné, De Santis and Taglioni (2008) providing an excellent survey, the distribution of these benefits across countries (and pair-wise trade relationships) is much less clear.

To explore this issue, I analyze the distribution of the residuals from a gravity regression. Specifically, I estimate year-specific variants of equation (1) in which all country-specific features are summarized in comprehensive sets of exporter and importer fixed effects and (the log of) geographic distance, a common language dummy and a common border dummy are intended to capture (the most relevant) pair-specific features for the value of exports.[7] I then analyze the residuals separately for trade pairs where both partners are members of the euro area ('EMU') and pairs which include at least one partner with national currency ('Non-EMU').

For illustration, Table 2 presents the accompanying estimation results when an EMU dummy is added to the specification, with each line in the table reporting the result of a separate estimation. Generally, I do not intend to interpret the results literally; the precise estimates are likely to suffer from endogeneity and omitted variables bias. Still, it seems interesting to note that trade between EMU member countries is particularly intense over the full EMU period from 1999 through 2011, with no clear trend towards further integration, but a strong increase in intensity in 2008 at the time of the 'Great Trade Collapse'.

To analyze differences in trade intensities across country pairs, Figure 2 plots the Epanechnikov kernel densities of residuals of a gravity regression (without an EMU dummy),

[7] Note that joint membership in the EMU is a country pair-specific characteristic which prevents the use of pair-wise (dyadic) fixed effects.

split by groups of country pairs. Reviewing the results, two findings appear particularly noteworthy. First, there is indeed evidence of a particularly strong trade intensity among euro area member countries; residuals of EMU pairs are, on average, considerably larger than residuals of non-EMU pairs, suggesting that the specification of the gravity model tends to fall systematically short in explaining the actual value of trade between euro area member countries. The difference between EMU and non-EMU trade is typically picked up by the EMU dummy variable. Second, and more importantly, the range of the distribution of residuals for euro area member countries has increased over time, indicating that for trade between some EMU country pairs the specification of the gravity model has gradually become a more appropriate description. The distributions become increasingly skewed to the right, with more negative residuals; there is even a slight tendency towards a bi-modal twin peaks distribution in the most recent years.

Figure 3 reinforces these observations, plotting the evolution of cross-sectional kernel densities for EMU member countries over time. The distributions of the gravity residuals shift to the left over the years, with the mode moving closer to zero; the distributions have also become flatter.

In Table 3, I provide some additional statistics on the distribution of the gravity residuals. Each column of the table presents the results for a single year. For each year, I compute averages of the gravity residual for intra-EMU trade and for the control group of country pairs which includes at least one non-EMU member; these averages are presented in the top rows of the table. As illustrated before, the mean values for EMU pairs are consistently larger than for non-EMU pairs. However, the differences seem to be generally of borderline statistical significance, with p-values of a t-test for the equality of means often close to 0.1.

Still, I am mainly interested in the dispersion of the gravity residuals. Therefore, I report the results of non-parametric Kolmogorov-Smirnov tests for the equality of distributions; the p-values are tabulated in the bottom row. As shown, the hypothesis of equal distributions is always strongly rejected at the 1% level. However, since there is no statistically identifiable variation across years, the results provide only limited insights on the effects of the euro.

For completeness, I also make use of the full sample of available trade data, reaching back to 1948. The appendix provides analogues to Figure 2 and Table 3 for selected years,

illustrating the decades-long process of European integration that had already taken place before EMU.

Overall, the results indicate that estimates of the average effect of the euro on trade mask considerable variation in the effect of the common currency on bilateral trade patterns. With the formation of EMU, some pair-wise trade relationships became increasingly dominated by one of the partners; other pairs have experienced a relative decline in trade intensity. As a result, the introduction of a common currency does not necessarily imply future trade integration; it may also lead to greater disintegration.

4. Conclusion

It has long been argued that the criteria for optimum currency areas, such as the intensity of trade, are (partly) endogenous; the adoption of a common currency is expected to further intensify trade relationships. Taking this view to an extreme, economic and institutional preconditions for monetary integration seem to be irrelevant, since the formation of a monetary union will promote further integration, thereby putting all the necessary elements in place.

Early results from the euro area indeed seemed to provide supportive evidence for this hypothesis. A number of studies find an economically sizable and statistically significant increase in trade among member countries.

In the meantime, however, it has become increasingly obvious that the common currency has also been associated with less favorable developments, such as the emergence of trade imbalances or the growing dispersion of the trade-promotion effects across country pairs. In view of the possible disintegration effects of a monetary union, economic and institutional preconditions (and not just political will) become a key element for successful monetary integration.

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Table 1: Trade Imbalances under Fixed Exchange Rate Regimes

Period	**1948-2007**			**1948-2011**		
EMU	0.018* (0.009)	0.033** (0.007)	0.035* (0.015)	0.023** (0.007)	0.034** (0.006)	0.045** (0.013)
Common time fixed effects?	Yes	Yes	No	Yes	Yes	No
Pair-wise fixed effects?	No	Yes	Yes	No	Yes	Yes
Country time fixed effects?	No	No	Yes	No	No	Yes
Number of observations	16,491	16,491	16,491	17,579	17,579	17,579
Adj. R^2	0.02	0.53	0.63	0.01	0.52	0.63

Notes: OLS regression. Dependent variable is the absolute trade imbalance as a fraction of total bilateral trade. Robust standard errors are reported in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively.

Table 2: Gravity Regression

	EMU
1999	0.343* (0.138)
2000	0.317* (0.139)
2001	0.548** (0.167)
2002	0.530** (0.161)
2003	0.510** (0.112)
2004	0.501** (0.167)
2005	0.475** (0.166)
2006	0.476** (0.170)
2007	0.472** (0.168)
2008	0.626** (0.175)
2009	0.600** (0.169)
2010	0.555** (0.181)
2011	0.570** (0.186)

Notes: OLS regression. Dependent variable is the log of exports. Additional regressors for which estimated coefficients are unreported: the log of distance, common border and common language. All regressions include exporter-specific and importer-specific fixed effects. Robust standard errors are reported in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Number of observations: 272.

Table 3: Analysis of Gravity Residuals

Averages	**1989**	**1999**	**2007**	**2011**
EMU	0.079	0.065	0.055	0.067
Non-EMU	-0.053	-0.044	-0.038	-0.045
t-test (p-value)	0.02*	0.05	0.11	0.07
Kolmogorov-Smirnov (p-value)	0.00*	0.00*	0.00*	0.00*

Notes: Residuals from a gravity model (as tabulated in Table 2; without an EMU dummy) are used. t-test denotes the absolute value of a t-test for the null hypothesis of equal means of residuals between EMU and Non-EMU countries. Kolmogorov-Smirnov denotes the probability for the Kolmogorov-Smirnov test for the null hypothesis of equality of distributions between EMU and Non-EMU countries.. * denotes significant at the 5% level.

Figure 1: Trade Imbalances

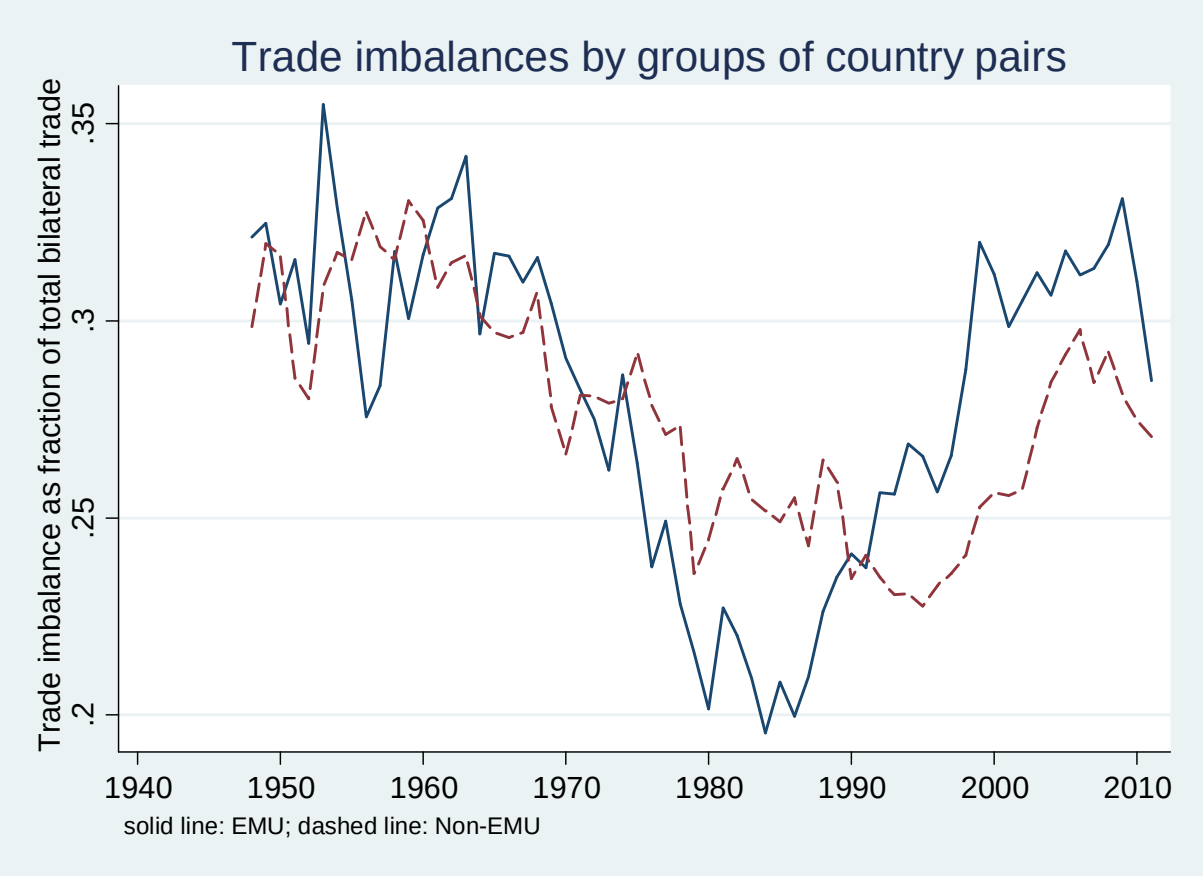


Figure 2: Kernel Densities of Gravity Residuals

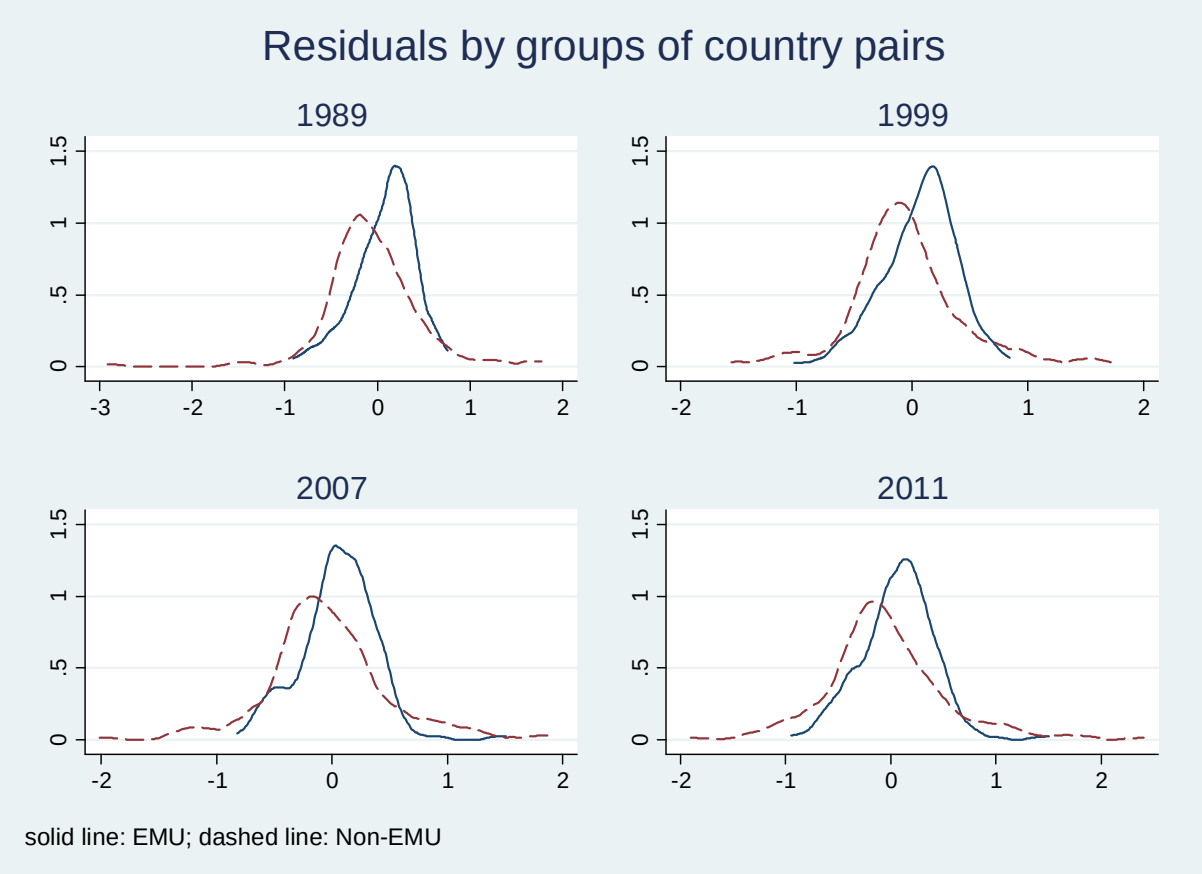
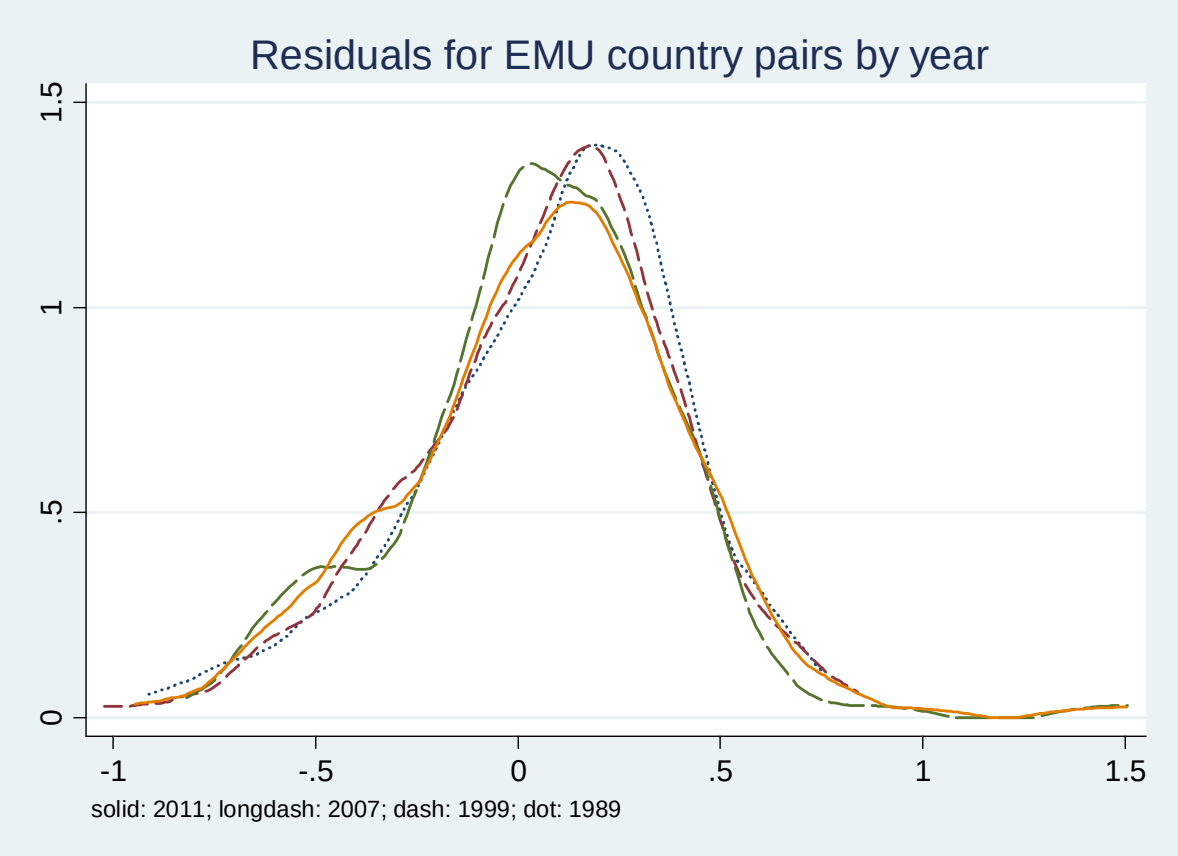
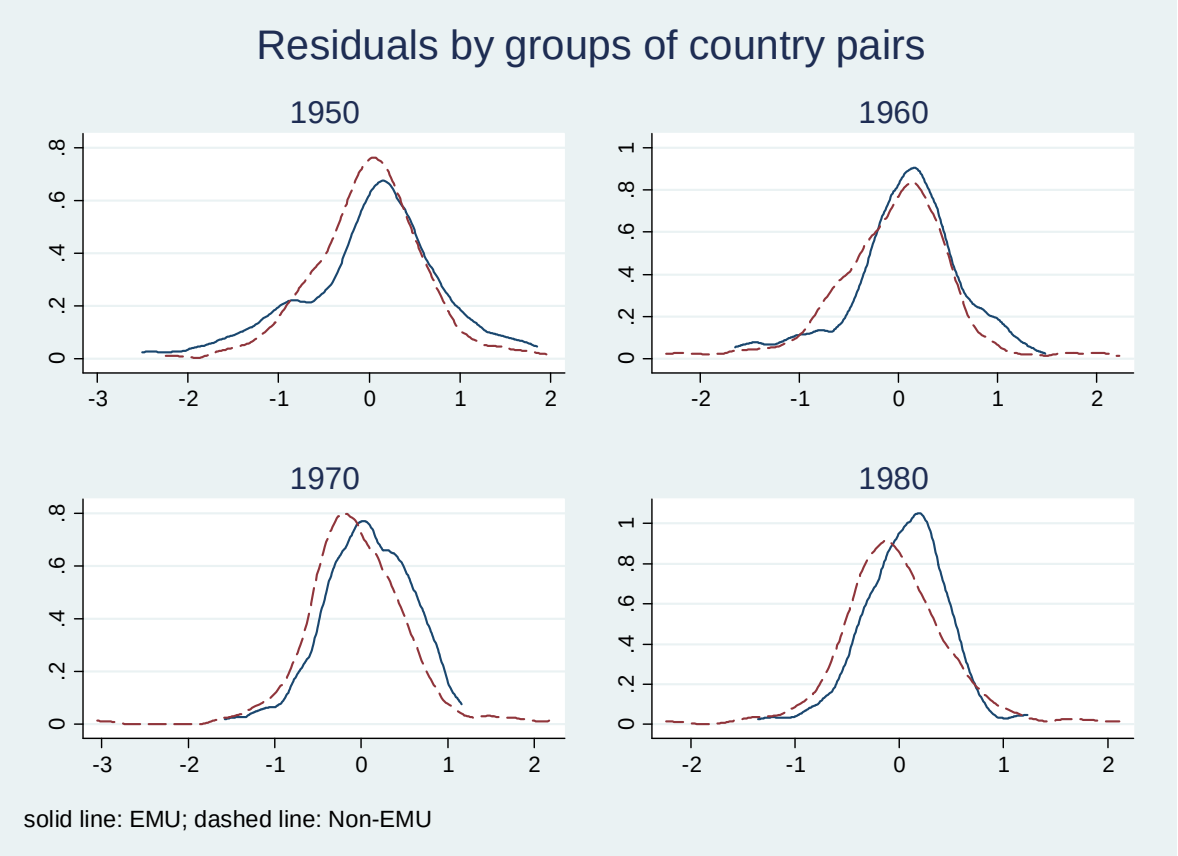


Figure 3: Kernel Densities of Gravity Residuals for EMU Pairs over Time



Appendix Figure: Kernel Densities of Gravity Residuals for Earlier Years



Appendix Table: Analysis of Gravity Residuals

Averages	**1950**	**1960**	**1970**	**1980**
EMU	0.008	0.068	0.085	0.058
Non-EMU	-0.005	-0.048	-0.058	-0.040
t-test (p-value)	0.88	0.13	0.04*	0.11
Kolmogorov-Smirnov (p-value)	0.40	0.24	0.02*	0.02*

Notes: Residuals from a gravity model (as tabulated in Table 2; without an EMU dummy) are used. t-test denotes the absolute value of a t-test for the null hypothesis of equal means of residuals between EMU and Non-EMU countries. Kolmogorov-Smirnov denotes the probability for the Kolmogorov-Smirnov test for the null hypothesis of equality of distributions between EMU and Non-EMU countries.. * denotes significant at the 5% level.