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The Currency Union Effect on Trade: Early Evidence from EMU

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Abstract[*]

In this paper we estimate the early effect of the European Monetary Union (EMU) on trade. We use a panel data set that includes the most recent information on bilateral trade for 22 developed countries from 1992 through 2002. During this period 12 European countries formally entered into a currency union. This is a unique event that allows us to study the effect of currency union among a relatively homogeneous group of industrial countries. Controlling for a host of other factors, we find that the effect of EMU on bilateral trade between member countries ranges between 5 and 10 percent, when compared to trade between all other pairs of countries, and between 9 and 20 percent, when compared to trade among non-EMU countries. In addition, we find no evidence of trade diversion. If anything, our results suggest that monetary union increases trade not just with EMU countries, but also with the rest of the world.

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1. Introduction

In the last couple of years there has been a growing literature on the impact of common currencies on trade. Much of the interest in this question was sparked by the creation of the Economic and Monetary Union in Europe (EMU). As a result of the EMU, 12 countries in the European Union have abandoned their own national currencies,and adopted a new single currency, the Euro. One of the main hopes, as Europe advanced toward monetary integration, was that the single currency would contribute to further integrating these countries' markets, and thus allow for a more efficient allocation of resources. This increased market integration, it was hoped, would be reflected in increased trade and investment flows. Yet at the time, there was no empirical evidence on the direct impact of common currencies on trade.

The channels through which monetary unification may potentially affect trade are numerous.[1] A common currency eliminates bilateral nominal exchange rate volatility, and thus substantially reduces the uncertainty and risk involved in trade transactions. While there are ways to hedge against this risk, doing so may be costly. Furthermore, as Kenen (2003) points out, it is not always possible to fully hedge against large, long-lasting changes in exchange rates, since producers are uncertain not only about the price they will receive for their exports, but also about the demand for their products.[2] Exchange rate volatility, in turn, complicates cost calculations and pricing decisions of firms.

The argument that lower exchange rate volatility will reduce transactions costs and increase trade and investment flows has a great deal of intuitive appeal. Yet the evidence regarding the impact of exchange rate volatility on trade has not yielded conclusive results. While there is some empirical evidence suggesting that exchange rate volatility has a negative effect, these effects are generally quite small, have decreased over time, and vary widely in significance depending on the study in question.[3]

[1] For a detailed discussion, see Emerson, Gros, Italanier et al. (1992), which corresponds to a European Commission Report.

[2] Thus, the producer does not know how much foreign currency she will earn, and how much she should sell in the forward market.

[3] For an early survey of this literature, see Edison and Melvin (1990). Of 12 studies examined by these authors, six find negative and significant effects, five have inconclusive results, and one finds effects that are positive and significant. IDB (2002) refers to a number of studies suggesting that the impact is larger in the case of developing countries, for which hedging mechanisms might not exist.

The effects of joining a currency union, however, go beyond the reduction of exchange rate volatility. Currency unions eliminate the transaction costs arising from the need to operate with multiple currencies, when trading across countries with different monies. These costs are independent of the volatility channel, and may discourage trade even in cases in which bilateral exchange rates are perfectly stable.[4] Emerson, Gros, Italanier et al. (1992) estimated these costs to be as high as 0.5 percent of GDP, for the European Union as a whole, and as much as 1 percent of GDP for the case of the smaller, more open member countries, whose currencies are not used much internationally. Furthermore, sharing a common currency has an additional effect: it results in irrevocably fixed exchange rates, thus eliminating exchange rate volatility among currency union partners for the foreseeable future.[5] Finally, in giving up their national monies and adopting a much more liquid currency, the monetary union may also provide its member countries with a vehicle to hedge exchange rate risk in their trade transactions with non-member countries. None of these factors is captured by the empirical literature on exchange rate volatility and trade.

Until very recently, there were no studies measuring the direct impact of common currencies on trade. The only hint that the effect might be substantial came from the "border effect" literature. This literature, based mostly on the application of a gravity model to trade data for Canadian provinces and US states, pointed to a huge home market bias. In particular, the work of McCallum (1995) and Helliwell (1998) suggested that trade between two Canadian provinces was on average between 10 and 20 times greater than that between Canadian provinces and US states, other things equal. This huge border effect, particularly among countries that share the same language, similar cultural values, and a free trade agreement that minimizes trade barriers, suggested that the need to transact in multiple currencies, in the case of trade between provinces and states, might be playing an important role. While recent theoretical developments associated with the gravity model have explained away part of this home bias, the border effect remains substantial.[6]

[4] De Grawe (1994) reports the buying and selling spreads between the Belgian Franc and various industrial country currencies. The cost of exchanging Belgian francs for guilders or deutsche marks is similar to the cost of exchanging them for French francs, pounds sterling or US dollars (approximately 0.5 percent), despite the low volatility of the Belgian franc vis-à-vis the guilder or the mark.

[5] This, in turn, may increase market transparency, and foster competition among firms in different countries.

[6] See Anderson and van Wincoop (2001) and Head and Mayer (2002).

It was only recently, with the work of Rose (2000), that economists began to study directly the impact of common currencies on trade. Rose found that, other things equal, two countries that share a common currency trade three times more than two similar countries with different currencies. Yet while the rapidly expanding literature on this issue, which we will review in the next section, has generally found large and significant common currency effects, it is not clear whether the existing empirical evidence, drawn mostly from the experience of very small economies joining (or leaving) currency unions or adopting the currency of larger ones, is relevant for the case of the EMU.

The issue is of fundamental importance. EMU members need to know whether or not the promise of deeper market integration is becoming a reality. Increased trade can lead to a more efficient use of the available resources and, ultimately, to higher growth. But the significance of the issue far exceeds the realm of trade. Monetary unions can have important benefits, but they also impose important costs. In particular, by adopting a common currency, countries sacrifice their monetary independence. Unless the cycles of the member countries are highly correlated, this sacrifice may prove to be too costly. This cost is at the center of the literature on Optimal Currency Areas (OCA), which began in the early 1960s with the work of Mundell (1961) and McKinnon (1963). The OCA literature suggested that, unless certain conditions of price flexibility or labor mobility were met, countries subject to asymmetric shocks and cycles should stay away from forming currency unions.

Recent studies by Frankel (1997) and Frankel and Rose (1998), however, suggest that the symmetry of cycles can be endogenous. These authors provide evidence, drawn from the experience of industrial countries, suggesting that increased trade integration leads to increased cycle correlation. If monetary unions lead to increased trade, and increased trade intensity leads to higher correlation, then countries could meet the OCA criteria ex-post, even if they do not meet it ex-ante. Higher cycle correlation, in turn, would lessen the value of an independent monetary policy. The whole endogenous OCA argument, however, hinges on the impact of the currency union on trade. Without a positive impact, the argument falls apart, whether increased trade leads to cycle correlation or not.

The impact of EMU on trade is also of great importance for the UK, Denmark and Sweden, the members of the EU that have not joined the Euro. What are they missing? Should they join the monetary union? The debate on whether or not to join the Euro is raging in the UK,

where it has been polarized to an extraordinary degree. This debate is in desperate need of economic analysis, in order to help clarify the potential impact of the Euro on a number of dimensions, one of which is trade. This paper, we hope, will contribute to the debate, by providing estimates of the currency union effect on trade, for the specific case of the countries in the European Union.

1.1 The Currency Union Effect on Trade: A Survey of the Literature

The first paper to study the impact of common currencies on trade was Rose (2000), who added a common currency dummy to a gravity model of bilateral trade. In order to have enough country pairs with common currencies to allow an estimation of the effect, he included in his sample not only countries, but also all the dependencies, territories, colonies and overseas departments for which the United Nations collects international trade data. In this way, he put together a sample of 186 countries.[7] To his own surprise, and that of the rest of the profession, Rose found that two countries that share a common currency trade over three times as much as do otherwise similar countries with different currencies. Rose performed extensive sensitivity analysis and found the result to be very robust. In terms of the relevance of his findings for EMU, however, one important shortcoming is that most country pairs with common currencies in his sample are either currency unions formed by very small or very poor countries (such as those in the Eastern Caribbean Currency Area) or very small or poor countries adopting the currency of larger ones (such as Tonga adopting the Australian dollar, or Reunion adopting the French franc).

Rose's first study was based on cross-section analysis. Therefore, the question it answers is whether countries that share a common currency trade more than others that do not. As Glick and Rose (2001) argue, this is not exactly the right question from a policy perspective. What one would want to know, as a policymaker, is the impact of a currency union on those countries that adopt it. In order to respond this question, Glick and Rose (2001) study the impact of currency union using panel data from 1948 through 1997. This extended period of time is crucial, since it allows the authors to have enough country pairs with periods in which they shared currencies, as well as periods in which they did not. These are actually the country pairs that provide the information from which the currency union effect is estimated. Glick and Rose's answer to the

[7] Within this sample, there are over 300 country pairs for which two countries trade and share a common currency, which allows for the estimation of the currency union effect.

"right" policy question is that adopting currency unions nearly doubles bilateral trade among member countries.[8] Notice, however, that the sample ends in 1997, before the creation of the EMU. Thus, while Glick and Rose answer the right policy question, their answer is relevant mostly for the case of very small and/or poor countries, which are primarily the ones that have had currency unions, or adopted the currency of others, in their sample.

These important and controversial findings by Rose and his co-authors were followed by a large number of studies, some of them criticizing their work on methodological grounds and seeking to "shrink" the currency union effect.[9] Two papers worth mentioning, among Rose's critics, are those of Persson (2001) and Tenreyro (2001).

Persson (2001) argues that the results in Rose (2000) may be biased due to the combination of two factors. First, the effects of some of the explanatory variables may be non-linear. While size, for example, may affect bilateral trade, it is possible that the effect of size on bilateral trade is different at different sizes. Second, the likelihood that two countries will adopt a common currency is not random, and may depend on some of the explanatory variables. For example, the likelihood of forming currency unions may be larger for small countries. Persson argues that this combination of non-random selection into currency unions and non-linearities can result in biased estimates of the currency union effect.

He proposes a different methodology, based on matching techniques borrowed from the labor literature: he first looks at the determinants of currency unions, and produces a currency union "propensity score" for each country pair. Then, for each "treatment" observation with currency union, he chooses a "control" observation, which is the closest to the "treated" observation according to the propensity score. Finally, he estimates the treatment effects, that is, the effect of currency union on trade, using exclusively these treated observations and their controls. Using this methodology, he finds the effect of currency union on trade to be 65 percent.[10] But, while Persson's methodology solves the problem of non-random selection into currency unions, it does not solve the problem that concerns us: his treatment effect is still only

[8] Actually, the sample used by Glick and Rose includes mostly countries that exited currency unions, rather than countries that joined them. In addition, these authors do not differentiate countries that formed currency unions from others that simply adopted the currency of another, such as Panama. For a discussion of these issues, as well as an analysis of the difference between the impact of currency unions and the unilateral adoption of the currency of other countries, see Levy Yeyati (2003).

[9] The prize for best title among Rose's critics goes to Nitsch (2001), for his paper "Honey, I Shrunk the Currency Union Effect on Trade."

[10] A different but related methodology used by Persson (2001) yields an effect of 13 percent.

relevant for the type of countries that, in his sample, tend to form currency unions: the very small and poor ones.

Tenreyro (2001) also stresses the problem of endogenous selection into a currency union, but places the emphasis on the problem of omitted variables. In particular, she argues that omitted factors, which may at the same time strengthen trade links and increase the propensity to join currency unions, may lead to a positive bias in the OLS estimates.[11] In addition, she is concerned with Rose's treatment of the observations with zero trade, which in Rose's papers are eliminated by the use of log (trade) as the dependent variable. In order to solve the problems of zero-trade observations, she works with trade flows aggregated over five years.[12] To deal with the endogeneity issue, she estimates the trade equation jointly with the decision to participate in a currency union. She finds that the currency union effect increases trade by 50 percent, although the effect is not statistically different from zero. As in the case of Persson, nothing in this paper addresses the issue that concerns us: all the results are derived from currency unions formed primarily by small and/or poor countries.

Two papers that provide some hints about the currency union effect on trade in large countries using historical data are Estevadeordal, Frantz and Taylor (2002) and López-Cordova and Meissner (2002). Both of these papers look at the experience of countries during the gold standard, using smaller samples that consist primarily of industrial countries and a small group of large developing countries.[13] Estevadeordal, Frantz and Taylor, using data from 1870 through 1939, find that common participation in the gold standard increased trade between 34 and 72 percent, depending on the specification used. López-Córdova and Meissner, using data from 1870 through 1910, find the gold standard effect to be 60 percent. In addition, they find that currency unions double trade, a result that is very similar to that found by Glick and Rose (2001).

[11] As an example that goes the other way, two countries might have a history of conflict, a variable that is difficult to observe in the data. This history may reduce bilateral trade flows, and at the same time make it unlikely that they will form a currency union. Thus, while Persson focuses on the problem of selection on observables, Tenreyro emphasizes the problem of selection on unobservables.

[12] While this solves the problem of the countries that trade some years but do not trade in others, it does not address the problem of countries that do not trade throughout the sample, which we believe is a more important one. In particular, if country pairs that do not share a common currency are more likely to have zero trade, the elimination of these observations would produce biased estimates. However, the effect would be to underestimate the currency union effect, rather than overestimate it.

[13] López-Córdova and Meissner (2002) include the following developing countries in their 29-country baseline sample: Argentina, Brazil, Chile, China, Egypt, India, Indonesia, Mexico and the Philippines.

Another recent paper that has addressed this problem is Rose and van Wincoop (2001). This paper, which is in turn based on a model of bilateral trade developed by Anderson and van Wincoop (2001), estimates the *potential* EMU effect on trade, using data on pre-EMU currency unions. According to the theory, bilateral trade between a pair of countries depends on their bilateral trade barrier *relative* to average trade barriers with all trade partners (i.e., their multilateral trade barrier or "multilateral resistance.") Since reducing barriers vis-à-vis an important trading partner also reduces multilateral resistance considerably, the impact of the currency union on trade should be smaller in the case of countries that are large and proximate.[14] The methodology allows the authors to estimate the trade effect of different potential currency unions, even those that have not yet been created. For the case of the EMU, Rose and van Wincoop find that the increase in trade would be on the order of 60 percent.

While the methodology used by Rose and van Wincoop to calculate the implied trade effects of currency unions is appealing, the estimated effects depend crucially on assumptions made regarding the elasticity of substitution between different goods. Moreover, it is now possible to estimate the effects of EMU on trade among its members in a direct way, since data on trade are already available for 1999 through most of 2002

1.2 What This Paper Does

In what follows, we will present our own results on the trade effect of currency unions, which are drawn directly from the early experience of the countries in the European Monetary Union. By focusing on the time series dimension, and by working with countries that joined, rather than exited, currency unions, we answer the "right policy question": the effect of currency unions on those countries that join them. By focusing on the experience of the EU countries, we provide evidence that is much more relevant for the countries that are faced with the decision of whether or not to join EMU.

Our results suggest that EMU has already had a noticeable impact on trade, even at this early stage. The estimates we obtain for the currency union effect, using different samples and different methodologies, range between 5 percent and 20 percent. While this effect is much smaller than that in the previous literature, it is still statistically significant, and economically

[14] In contrast, reducing bilateral barriers vis-à-vis a small trade partner barely affects the multilateral trade barrier, so the impact on the *relative* trade barrier is larger in this case.

important. Furthermore, we find no evidence that EMU has diverted trade of member countries away from non-members. In fact, EMU countries seem to have increased their trade with non-EMU countries, as well as with fellow EMU members. These findings should be particularly important for countries such as the UK, which are considering whether or not to join EMU, or for countries that are in line for EU accession. They should also be relevant as a reference for other middle-income countries considering a currency union, or seeking to adopt the currency of another country.

2. Methodology and Data

2.1 Our Methodology

Our methodology is based on the gravity model, that is a standard specification in the empirical literature on the determinants of bilateral trade. Since the early work of Linnemmann (1966), the gravity model has been extremely successful in predicting bilateral trade flows. In its simplest formulation, it states that bilateral trade flows depend positively on the product of the GDPs of both economies and negatively on the distance between them, in analogy to Newton's gravitational attraction between two bodies. The dependence on the product of the GDPs was derived most naturally from models of trade with increasing returns to scale and product differentiation, such as that in Helpman (1987) and Helpman and Krugman (1985).[15] In these models with imperfect substitutes, the number of varieties produced in each country increases with size and, as a result, the quantity of goods imported from each country is proportional to its GDP. Within this framework, trade barriers (such as transportation and other transaction costs) increase the relative price of imported goods, and therefore reduce trade.[16] More recently, Deardorff (1998) showed that, under certain assumptions, the gravity equation can also be derived from the classical Hecksher-Ohlin model, which emphasizes differences in factor endowments across trading countries.[17]

[15] There are, however, earlier theoretical foundations for the gravity model, such as Anderson (1979). Deardorff (1984) surveys the early work on this subject. For a brief discussion of the origins and theoretical foundations of the gravity model, see Frankel (1997).
[16] For an early paper that introduced shipping costs into the imperfect substitutes model, see Bergstrand (1985).
[17] Evenett and Keller (2002) discuss the different implications of these theories, and test them using bilateral data on intra-industry and inter-industry trade.

Typical variables added to the simplest gravity specification in the empirical trade literature include GDP per capita or population, as well as dummy variables indicating whether the two countries share a common border or a common language, among others. In line with our focus on the "right policy question" discussed in the previous section, in most of our regressions we will use a modified version of the standard gravity model, which relies on panel data and includes country pair fixed effects (as in Glick and Rose, 2001) in order to isolate the time series dimension of the EMU effect on trade, and leave out the cross-sectional variation. Thus, time-invariant pair-specific variables such as distance, borders, common language, or colonial links will be subsumed in these country pair fixed effects. We believe that the use of country pair fixed effects provides the cleanest benchmark against which to assess the impact of EMU on trade. Against this benchmark, then, we study the impact of EMU on bilateral trade by introducing an additional dummy variable, which takes a value of 1 when the two countries in the pair belong to the EMU. We call this variable EMU 2, indicating that both countries in the pair are part of EMU.

To a certain extent, the inclusion of the country pair dummies addresses potential endogeneity problems that would arise if countries, following the Optimal Currency Area criteria, tend to form currency unions with partners with which they trade a great deal. Indeed, as will be shown below, comparison of our results with those obtained when we replace the country-pair fixed effects with the traditional gravity variables suggests that the latter in fact overstate the impact of EMU on trade.[18]

In isolating the impact of the EMU on trade, it is important to control for other factors that may be affecting bilateral trade among the countries in the sample. For example, if around the time at which EMU was created, two countries join a free trade area and as a result their bilateral trade rises sharply, we want to make sure not to attribute this jump to the formation of the currency union. For this reason, we add to the specification a dummy variable, FTA, which takes a value of 1 when both countries in the pair belong to the same FTA. We also include a dummy for the European Union, recognizing that the impact on trade of common membership in the EU may be larger than that of other more shallow FTAs. The EU, however, has evolved over

[18] This does not completely eliminate the potential for endogeneity, however. It is possible for countries to join currency unions following a substantial increase in their bilateral trade links. If this were the case, one would expect to see the increase in trade occurring before the formation of the currency union. These concerns will be addressed in Section 3.3, when we look at the impact of the currency union over time.

time and become a deeper agreement. We want to make sure that we do not attribute to EMU increases in trade that may be explained by the increase in the depth of the EU over time. For this reason, we add to our baseline specification an EU Trend variable, which captures the impact of the EU on trade, as it evolves through time. Finally, the model also includes year fixed effects, in order to control for the increase in trade flows over time. Thus, the baseline model we estimate is the following:

$$LnT_{ijt} = \alpha_{ij} + \beta_1 \ln Y_{it}Y_{jt} + \beta_2 Lny_{it}y_{jt} + \beta_3 FTA_{ijt} + \beta_4 EU_{ijt} + \beta_5 EUTrend_{ijt} + \\ + \beta_6 EMU2_{ijt} + \gamma_t + \varepsilon_{ijt} \qquad \textbf{(1),}$$

where the α's represent the country pair fixed effects, the γ's represent the year fixed effects, Y is GDP, y is GDP per capita, and ε_{ijt} is the error term. The coefficient of interest is β_6, which, if EMU in fact stimulates trade among its members, should be positive and significant. In order to compare the results using country pair fixed effects to those of the more traditional gravity model, in some specifications we will leave out these fixed effects and replace them with distance, with dummies for common border and common language, as well as variables capturing the number of islands in the pair, the number of landlocked countries in the pair, and the log of the product of the countries' areas.[19]

An important methodological question is whether we should use nominal (in US dollars) or real GDP and GDP per capita as controls in the model, particularly since large shifts in real exchange rates around the time of the creation of EMU may cause the results to be sensitive to changes in the definition of these variables. The answer to this question, in our view, is not obvious, and may depend on the way prices are set. Consider, for example, the impact of the depreciation of the Euro following the creation of EMU. Let us assume that this depreciation had no effects on real GDPs. If all prices are set in dollars, the depreciation should have no effect on the value of bilateral trade among country pairs. In this case, real GDP seems to be the way to go. The use of nominal GDP in dollars would reduce the value of GDP for the Euro countries following the depreciation. Since trade flows do not change, the Euro countries would appear to

[19] In a recent article, Head and Mayer (2002) have argued that the measurement of distance in the gravity model has been misspecified. These authors propose a "theoretically correct" measure, which takes into account the fact that trade between countries is the result of an aggregation of trade between regions. Among other things, they argue that the effect of common border typically found in the empirical literature can be in part attributed to this

be trading more among themselves, after controlling for GDP, and thus the impact of the Euro on trade would be overestimated.

Consider instead the case in which prices are set in the currency of the producer. In this case, bilateral flows between two EMU countries, measured in dollars, would decline following the depreciation, even if the volume of trade were unchanged.[20] Bilateral trade between an EMU country and a non-EMU country will also decline, although to a lesser extent. The use of real GDP, in this case, would underestimate the Euro effect on trade, since the decline in the dollar value of bilateral trade would be erroneously attributed to the Euro. In this case, using nominal GDP may be more appropriate, since the decline in trade flows is accompanied by corresponding declines in nominal GDP in the Euro countries.[21] Similar considerations would apply to the case in which there is "pricing to market," i.e., where prices are set in the currency of the buyer.

In the end, which is the ideal variable to use may depend on the way in which prices are set. In a sample dominated by developing countries, which tend to be price takers, it may be more appropriate to consider that prices are set in dollars, in which case using real GDPs appears to be more appropriate. In contrast, for a sample of industrial countries such as the one we use here, in which a larger portion of trade is associated with activities with increasing returns to scale and in which firms have market power, it may be more appropriate to use nominal GDP.[22] Rather than choosing one or the other, here we start by using both, with the idea that, due to the depreciation of the Euro following the creation of EMU, the results using nominal GDP may be an upper bound, and the result using real GDP a lower bound, of the impact of EMU on trade.[23] As a way to improve on the nominal/real GDP choice discussed above, we attempt to control for the movements in the real exchange rate explicitly, by including in the model an index of the real exchange rate for each of the countries in the pair (in logs).[24]

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misspecification. In this paper we will abstract from this issues, since our focus is on the specifications that include the pair dummies, and thus exclude both distance and common border.

[20] We are abstracting here from substitution effects, and concentrating only on valuation issues.

[21] On the other hand, the use of nominal GDP in dollars may overestimate the EMU effect, depending on the elasticity of trade with respect to the GDP product.

[22] We find it difficult to believe that German exporters would set the price of their exports to France, for example, in dollars.

[23] This problem would go away if we had data on the *volume* of bilateral trade, instead of on its *value*. The use of bilateral *volume* of trade, would have saved us from these valuation problems, and would have required the use of real control variables, matching the real character of the volume of trade. But this would require data on bilateral unit prices on exports and imports, which are not available.

[24] We construct this index as the ratio between the real GDP and the nominal GDP in dollars. As we show in the Data Appendix, this is equivalent to the ratio between the nominal exchange rate vis-à-vis the dollar, and the GDP

While the model discussed above has the advantage of producing a single estimate for the EMU effect, it does not provide information on whether the jump in trade was abrupt or smooth, whether the trade increased in anticipation of the EMU, or whether the impact is only obvious after a lag. In order to analyze these issues in more detail, we will also work with an alternative specification, which allows us to follow the countries that eventually became part of the EMU over time, and see whether trade in these countries increased significantly around the time of the creation of the EMU.[25]

In the empirical exercises discussed so far, the evolution of trade among country pairs that become members of EMU (captured by the dummy EMU 2) is measured against a benchmark provided by the evolution of bilateral trade among all other country pairs. However, this leaves out the question of trade diversion. As pointed out by Frankel and Rose (2000), it is important to check whether the currency union generates net trade for the member countries, or if increases in trade with other members come at the expense of trade with non-members. We will check whether this is the case by adding a dummy that takes the value 1 when just one of the countries in the pair belongs to EMU. As an example, this variable, which we call EMU 1, would take a value of one in the case of the US and Spain, for the year 2000, but would take a value of 0 for France-Germany, regardless of the year. If there were trade diversion, we would expect the coefficient for EMU 1 to be negative and significant.[26] Once we include this additional dummy, the benchmark against which we are comparing bilateral trade performance is that of the evolution of bilateral trade between non-EMU members.

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deflator. Since time dummies are included in the model, this in turn would be equivalent to multiplying this index by the US GDP deflator (to get bilateral real exchange rates vis-à-vis the US). Once we introduce this variable constructed in this way, using either nominal or real GDP variables yields identical results.

[25] The details of this alternative methodology will be discussed below.

[26] The use of the term "trade diversion" here requires some clarification, since it does not correspond exactly to the concept of trade diversion developed by Viner (1950). In Viner's work, trade diversion involves a geographical shift in the origin of imports for the country that is considering a trade agreement as a result of the preferential treatment, in favor of the partners in the trading bloc, and away from the most efficient producers of the goods in question. Here, a currency union could also potentially shift trade away from non-members and in favor of members, but unlike the traditional trade diversion case, here there is no distortion involved. In fact, it is useful to think about the reduction in transaction costs as akin to a reduction in transportation costs between the currency union members. In spite of this, in the rest of the paper we will use the term trade diversion understood as a shift in trade away from non-members, since other papers in this literature have used the term in this way (see, for example, Frankel and Rose, 2000).

2.2 Data

Our dependent variable is the log of total merchandise trade (exports plus imports) between pairs of countries, in a given year. We work with trade data from the IMF Direction of Trade Statistics (DOTS) between 1992 and 2002.[27] We use in our analysis two different samples of countries. The first includes all 22 industrial countries included in the DOTS dataset (see Data Appendix for list of countries). The second is restricted to the 15 countries that are members of the European Union (we actually have 14 countries, since Belgium and Luxembourg are considered together in the dataset). While the first sample has the advantage of the larger size, the second has the advantage of including countries that are more homogeneous, geographically proximate, and all members of the same single market. The EU sample results in a total of 91 (14x13/2) country pairs. Out of these, 11 of them (counting Belgium and Luxembourg as one) have become members of the European Monetary Union during the period under study. Thus there are 55 country pairs (11x10/2) that have adopted a common currency, and 36 country pairs that have not. We exploit this variation to estimate the effect of EMU on trade. It is worth mentioning that neither of our samples contains observations with zero trade, which saves us the trouble of dealing with this aspect of the gravity model.

Our explanatory variables are taken from different sources. Population and GDP data come from the World Bank's World Development Indicators. Most country-specific variables (coordinates for the calculation of distances, language, borders, etc) are taken from the United States Central Intelligence Agency's *World Factbook*. The information on the composition of free trade agreements was taken from Frankel (1997) and complemented with data provided by the integration department of the IDB. More details on the definitions of the variables used are provided in the Data Appendix.

3. Empirical Results

3.1 A First Look at the Impact of EMU on Trade

Tables 1a and 1b present the results of the regressions in which we exclude EMU 1, that is, in which we leave aside the question of trade diversion, for the developed country and EU samples,

[27] In this version of the paper, we only have trade data until July 2002. Given the small number of years since the formation of the EMU, we chose to annualize the trade data for 2002, in a manner detailed in the Data Appendix,

respectively. The first two columns of each table report the results using nominal GDP and GDP per capita in US dollars, while columns 3 and 4 use real control variables. The even-numbered columns present our preferred specification, using country pair fixed effects, while the odd-numbered columns present the results when the fixed effects are excluded, and replaced by the more traditional gravity variables.

Consider first the results in columns 1 and 3. All the traditional gravity variables have the expected sign, and their coefficients are similar to those typically found in the gravity literature. For example, the elasticity of trade with respect to distance is around –0.67 in the developed country sample, and around –0.75 in the EU sample regardless of whether we use nominal or real controls. The coefficients for GDP and GDP per capita add up to around one, another typical gravity result. Other free trade areas increase bilateral trade by around 5 percent (in Table 1a, column 1) while, not surprisingly, the impact of the EU is a much larger 34 percent.[28]

The results reported in columns 1 and 3 suggest that the impact of EMU is very large. For example, using the developed country sample, two countries that share membership in the EMU trade between 18 and 32 percent more than other country pairs, other things equal, depending on the nominal or real nature of the controls. Within the EU sample, the corresponding figures are 21 and 37 percent, respectively. Thus, according to these regressions, the impact of EMU appears to be comparable to that of the European Union itself.

The problem with these regressions, as we argued in the section on methodology, is that they may suffer from problems of endogeneity, which may lead to an overestimation of the EMU effect. In fact, one of the traditional criteria for currency union formation identified in the Optimal Currency Area literature suggests that currency areas are more beneficial the greater the extent of trade between the countries considering a monetary union. Thus, if countries choose their monetary union partners on the basis of the OCA criteria, it would not be surprising to find that country pairs with common currencies trade more than others. One way to (at least partially) overcome this problem is to include country pair fixed effects in the regression, instead of time-invariant, country-pair specific variables such as distance, common border, common language,

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rather than throw away these valuable observations. In any case, the results are very similar when we exclude the year 2002 from the sample.

[28] Since trade is in logs, the impact of FTAs in Table 1a, column 1 is computed as exp(0.051)-1 = 0.052. To compute the impact of the EU, we have to add the coefficient of FTA to that of the EU, and that of the EU Trend multiplied by the mean of the sample year, which is 6 (since there are 11 years in the sample). Thus, the impact is calculated as exp(0.051+0.252+6*0.006)-1 = 0.34.

etc. The inclusion of the country pair dummies allows us to focus on the time series effect of EMU. If two countries have traditionally traded a great deal, and suddenly they adopt the EMU, the fact that they trade a great deal throughout the period will not be reflected in the EMU 2 coefficient, but rather in the country pair dummy. Only changes in trade before and after the adoption of the EMU will be reflected. Thus, the beauty of the country pair fixed effects is that they absorb all other unobservable characteristics of the country pairs (and of the individual countries) that are invariant over time and may have an impact on bilateral trade.[29]

Columns 2 and 4 in each of the tables present the results, including country pair fixed effects, as described in equation (1). The impact of the EMU, in this case, appears to be much smaller, ranging from 4.1 to 9.5 percent, using the developed country sample, and from 6.1 to 9.4 percent, using the EU sample, depending on whether we use nominal or real controls.[30] This confirms the presumption that failure to include country pair fixed effects leads to an overestimation of the EMU effect on trade. Notice that, in both columns, the coefficient for the EU Trend is positive and significant. This suggests that trade among EU members increased as the European Union grew deeper.[31] It also suggests that failure to account for this would have resulted in an overestimation of the EMU effect.[32]

In line with the expectations discussed in the section on methodology, associated with the depreciation of the Euro following its creation, the EMU effect using nominal controls—which we view as an upper bound of the EMU impact on trade—is always larger than that using real controls, which may be seen as a lower bound. In column 6 of Tables 1a and 1b, we control for the movements in real exchange rates as a way to address the issues discussed in the methodological section regarding the potential problems associated with the use of both real and

[29] This captures factors such as openness to trade, a history of conflict among a country pair, etc. Including country fixed effects instead of country pair fixed effects, while accounting for country-specific time invariant factors that may help explain bilateral trade flows, do not help address the endogeneity problem discussed above. In any case, we run similar regressions using country fixed effects (not reported here), and the results were close to those in which only year fixed effects were used.

[30] These effects are calculated as exp(coeff)-1. For example, the EMU effect using the developed country sample and nominal controls is exp(0.091)-1=0.095.

[31] The interpretation of the other parameters of the model is not as straightforward. The impact of variables such as GDP, same FTA or EU are for the most part already captured in the fixed effects. The coefficients in the table represent changes in trade as a result of changes in these variables.

[32] In fact, if we exclude the EU Trend variable, the impact of EMU on the developed country sample increases to 7.2 and 14.7, depending on the controls used.

nominal GDP controls.[33] Reassuringly, the coefficient for EMU 2 lies in between those obtained with the nominal or the real versions of the model. Specifically, trade between two countries that share membership in the EMU increased by 5.2 percent (in the developed country sample) and by 7.3 percent (in the EU sample), above and beyond the increase in trade among other country pairs.[34] The regressions reported in column 6 of each of the tables, including country pair fixed effects and controlling for movements in real exchange rates, represent our preferred regressions for each of the samples used.

[33] In the regressions, we use real GDP controls, but given the construction of the real exchange rate variables, the use of real and nominal GDP yields identical results.
[34] exp (0.051)-1 = 0.052

Table 1a. The EMU2 Effect, Developed Country Sample

Dependent variable: *Ln of Bilateral Trade*	1992-2002					
	Developed Countries					
	Nominal GDP		*Real GDP*			
EMU 2	**0.281**	**0.091**	**0.165**	**0.040**	**0.200**	**0.051**
	(0.044)* **	**(0.014)*** **	**(0.045)*** **	**(0.013)*** **	**(0.046)*** **	**(0.014)*** **
GDP	0.763	2.798	0.753	2.568	0.761	2.220
	(0.008)***	(0.313)***	(0.008)***	(0.294)***	(0.008)***	(0.306)***
GDP per capita	0.319	-2.360	0.304	-1.746	0.328	-1.381
	(0.034)***	(0.329)***	(0.031)***	(0.329)***	(0.033)***	(0.337)***
Free Trade Agreement	0.051	0.030	0.070	0.000	0.055	0.007
	(0.048)	(0.022)	(0.048)	(0.021)	(0.048)	(0.021)
EU	0.252	-0.019	0.238	0.003	0.246	0.001
	(0.065)***	(0.023)	(0.064)***	(0.022)	(0.065)***	(0.022)
EU Trend	0.006	0.016	0.004	0.012	0.006	0.010
	(0.008)	(0.003)***	(0.008)	(0.003)***	(0.008)	(0.003)***
Landlocked	-0.215		-0.278		-0.259	
	(0.034)***		(0.034)***		(0.033)***	
Island	-0.063		-0.118		-0.094	
	(0.040)		(0.038)***		(0.039)**	
Distance	-0.668		-0.689		-0.676	
	(0.022)***		(0.021)***		(0.022)***	
Area	-0.002		0.026		0.011	
	(0.009)		(0.008)***		(0.009)	
Contiguity	0.476		0.404		0.440	
	(0.044)***		(0.046)***		(0.046)***	
Common Language	1.075		1.127		1.115	
	(0.049)***		(0.050)***		(0.051)***	
Real Exchange Rate of Country 1					-0.353	-0.136
					(0.117)***	(0.047)***
Real Exchange Rate of Country 2					-0.825	-0.366
					(0.147)***	(0.056)***
Observations	2541	2541	2541	2541	2541	2541
Pair Country Dummies	No	Yes	No	Yes	No	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1b. The EMU2 Effect, European Union Sample

Dependent variable: Ln of Bilateral Trade	1992-2002					
	European Union Countries					
	Nominal GDP		*Real GDP*			
EMU 2	**0.318**	**0.090**	**0.191**	**0.059**	**0.258**	**0.070**
	(0.046)***	**(0.015)*****	**(0.048)*****	**(0.014)*****	**(0.051)*****	**(0.015)*****
GDP	0.758	4.222	0.775	2.979	0.766	3.067
	(0.014)***	(0.672)***	(0.014)***	(0.552)***	(0.014)***	(0.600)***
GDP per capita	0.297	-3.945	0.201	-2.357	0.274	-2.450
	(0.040)***	(0.691)***	(0.037)***	(0.595)***	(0.041)***	(0.628)***
Free Trade Agreement	-0.084	0.011	-0.026	0.030	-0.070	0.029
	(0.115)	(0.036)	(0.132)	(0.035)	(0.122)	(0.037)
EU	0.140	0.063	-0.029	0.017	0.101	0.019
	(0.213)	(0.077)	(0.240)	(0.072)	(0.224)	(0.074)
EU Trend	-0.105	-0.027	-0.047	-0.014	-0.097	-0.013
	(0.076)	(0.027)	(0.084)	(0.026)	(0.080)	(0.026)
Landlocked	-0.002		-0.012		0.002	
	(0.055)		(0.057)		(0.057)	
Distance	-0.732		-0.760		-0.752	
	(0.037)***		(0.037)***		(0.038)***	
Area	-0.019		-0.015		-0.016	
	(0.015)		(0.016)		(0.016)	
Contiguity	0.471		0.413		0.440	
	(0.056)***		(0.063)***		(0.061)***	
Common Language	0.817		0.779		0.825	
	(0.104)***		(0.108)***		(0.107)***	
Real Exchange Rate of Country 1					-0.571	-0.136
					(0.164)***	(0.065)**
Real Exchange Rate of Country 2					-1.205	0.139
					(0.211)***	(0.111)
Observations	1001	1001	1001	1001	1001	1001
Pair Country Dummies	No	Yes	No	Yes	No	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

3.2 The EMU Effect Over Time

The results discussed so far suggest that the EMU has had a moderate, but statistically significant, impact on trade. While it is nice to be able to capture the effect of EMU in a single estimate, the models discussed above do not provide information regarding the timing of the effect. Is the jump in trade abrupt or gradual? Does trade increase in anticipation of the formal creation of EMU, or is the impact obvious only after a lag? Is trade among EMU members still increasing vis-à-vis other country pairs, or has the increase slowed down?

In order to answer these questions, in this section we will use a different empirical model, one which allows us to follow the bilateral trade performance of the EMU country pairs through time, even before the formal creation of EMU, in comparison to other country pairs. The main difference with the previous model is that we now replace the EMU 2 term by interactions of the EMU 2 dummy with the year dummies (captured in the summation term in the model given by equation 2). The model is as follows:

$$LnT_{ijt} = \beta_{ij} + \beta_1 \ln Y_{it} Y_{jt} + \beta_2 \ln y_{it} y_{jt} + \beta_3 FTA_{ijt} + \beta_4 EU_{ijt} + \beta_5 EUTrend_{ijt} + \beta_6 RER_{it} + \beta_7 RER_{jt} + \sum_{\tau \in (1992, 2001]} \beta_{8t} I(\tau = t) EMU2_{ij} + \gamma_t + \varepsilon_{ijt} \quad \textbf{(2)}$$

where I(τ=t) is an indicator function that is 1 if τ is equal to t and 0 otherwise, and the rest of the variables are defined as before. But there is another important difference with the model of the previous section. We now keep EMU 2 constant through time.[35] In other words, the dummy EMU 2 takes a value of 1 for the EMU country-pairs throughout the whole sample, *even before the formal creation of the European Monetary Union*. As an example, we assign a value of 1 to the Spain-Germany country pair for the year 1993, even though the EMU did not exist at the time. Thus, the estimated year-coefficients ($\beta_{8\tau}$) for EMU 2 show the excess trade of EMU-bound country pairs as it varies across time. If the EMU has an effect on trade, we should observe an increase in the coefficient corresponding to our EMU 2 dummy around the time of its creation. In order to have meaningful comparisons across time, it is important to keep the EMU pairs constant throughout the sample. For this reason, and given its late arrival into EMU, in the results reported here we exclude Greece from the EMU group of countries.[36]

Table 2 presents the results of our regressions. The first column corresponds to the developed country sample, while the second one reports the results for the EU sample. The key, for our purposes, is not the statistical significance of the EMU dummy coefficient, but rather its evolution through time, particularly around the creation of the EMU in 1999. The excess trade of EMU country pairs over time, as captured by the yearly EMU 2 coefficients, is presented in Figures 1a and 1b. The effect increases in 1999 in both samples, but the real jump seems to occur

[35] This is the reason why the EMU 2 dummy appears in equation (2) with a subscript *ij*, rather than *ijt*, as in equation (1).
[36] The regressions including Greece in the group are reported in the Data Appendix.

in 1998.[37] While in the developed country sample the impact of EMU continues to increase gradually after that, in the case of the EU sample there is another noticeable jump in 2001.[38]

Table 2. EMU Effect Over Time

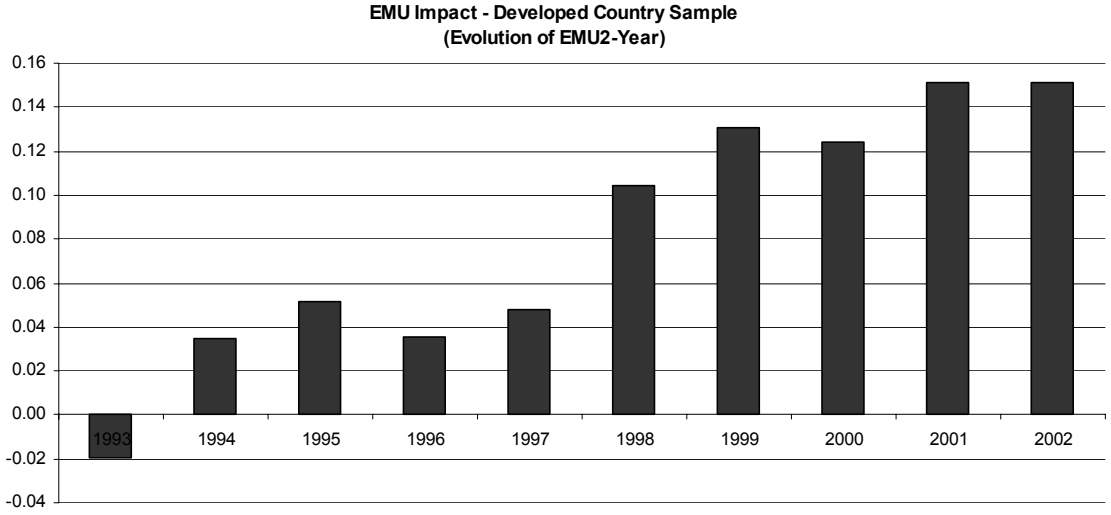
	Developed Sample		*EU Sample*	
	Coef	***S.D.***	***Coef***	***S.D.***
Real GDP	2.185	(0.307)***	2.661	(0.588)***
Real GDP per capita	-1.349	(0.339)***	-2.022	(0.616)***
Free Trade Agreement	0.004	(0.021)	0.023	(0.036)
EU	0.007	(0.022)	0.034	(0.072)
EU Trend	0.006	(0.003)*	-0.018	(0.026)
Real Exchange Rate of Country 1	-0.154	(0.048)***	-0.213	(0.066)***
Real Exchange Rate of Country 2	-0.363	(0.056)***	0.123	(0.110)
EMU2 - 1993	-0.020	(0.032)	-0.005	(0.037)
EMU2 - 1994	0.034	(0.032)	0.024	(0.034)
EMU2 - 1995	0.050	(0.032)	0.022	(0.035)
EMU2 - 1996	0.035	(0.031)	0.011	(0.034)
EMU2 - 1997	0.047	(0.030)	0.033	(0.032)
EMU2 - 1998	**0.099**	**(0.031)****	**0.078**	**(0.034)****
EMU2 - 1999	**0.123**	**(0.031)****	**0.088**	**(0.034)****
EMU2 - 2000	**0.117**	**(0.034)****	**0.097**	**(0.037)****
EMU2 - 2001	**0.141**	**(0.035)****	**0.176**	**(0.036)****
EMU2 - 2002	**0.141**	**(0.044)****	**0.153**	**(0.047)****
Observations	2541	2541	1001	1001
Year Dummies	Yes	Yes	Yes	Yes
Country Pair Dummies	Yes	Yes	Yes	Yes

Robust Standard Error in parentheses.
* significant at 10%, ** significant at 5%, significant at 1%

[37] The fact that trade among EMU countries did not increase substantially before 1998 dispels the remaining endogeneity concern: that countries might have decided to join the monetary union following a significant increase in their bilateral trade.

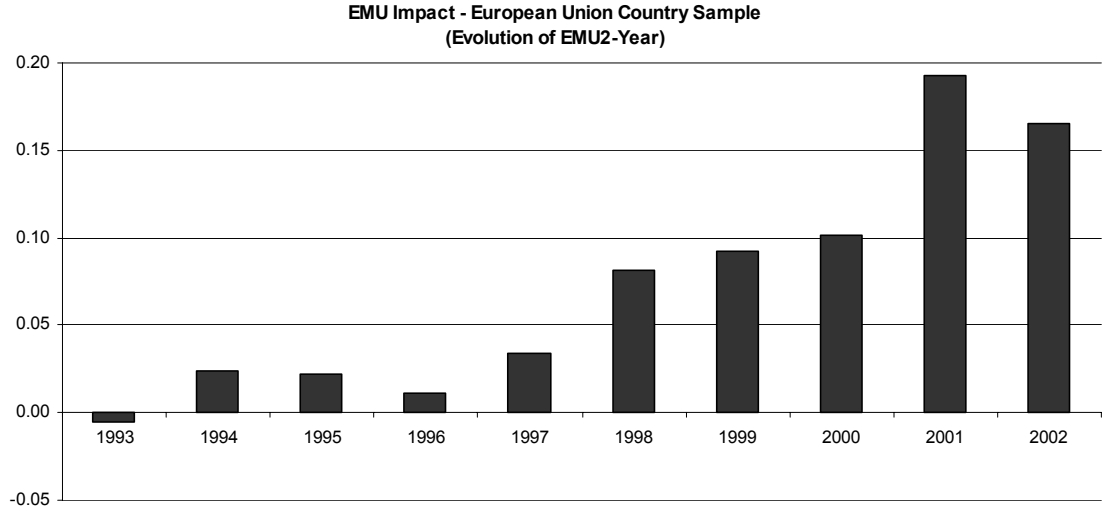
[38] We compared trade in 2000 and 2001 for each of the country pairs in the EU sample, to check whether the jump is due to outliers. It is not. In fact, out of only 23 country pairs whose trade increased in 2001, 18 were pairs formed by two EMU countries. Meanwhile, out of the 23 country pairs whose trade fell by more than 10 percent, only four were formed by two EMU countries.

Figure 1a. EMU Effect Over Time, Developed Country Sample



Results come from Table 2, column (1). These are calculated as exp(EMU2-year)-1.

Figure 1b. EMU Effect Over Time, European Union Sample



Results come from Table 2, column 3. These are calculated as exp(EMU2-year)-1.

The obvious question is why did the jump occur in 1998, given that EMU was formally created in 1999. While the road to the EMU started with the elimination of capital controls, and intensification of policy and central bank coordination in 1990 (Stage 1 of the EMU), the year 1998 was a pivotal year in the process of monetary unification. In fact, whether or not the EMU

would become a reality was still in doubt as late as 1997. Italy and Belgium had levels of debt that exceeded the convergence criteria by a wide margin, while in France a socialist government had come into power amid campaign promises to focus more on the lingering unemployment problem, and less on meeting the convergence criteria.[39] Even Germany had trouble meeting the convergence criteria, as deficits increased as a result of unification efforts.[40] In 1998, though, any lingering concerns regarding the future of EMU were put to rest. On March 25, 1998, the European Commission and the European Monetary Institute published their convergence reports, recommending that 11 countries—Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain—be admitted into the EMU. At the beginning of May, the decision was formally announced during a meeting of the Heads of State in Brussels, during which the bilateral irrevocable conversion rates were set among the member currencies. This was followed on June 1, 1998, with the official creation of the European Central Bank.

In addition to providing a sense of the evolution of the EMU effect over time, the model discussed in this section can also be used to measure the size of the impact of EMU. In fact, it may have an advantage over the estimates obtained in the previous section. Those estimates may potentially be more tainted by changes in bilateral trade that occurred at the beginning of the sample period, which probably have very little to do with monetary unification. In contrast, the model presented in Table 2 can be used to compare the "effect" before the EMU (say, in 1996 and 1997) with that after the EMU (say, 1999 and 2000). The more compact period in which the yearly coefficients are compared reduces the chances of having the results contaminated by developments that happened several years before. In Table 3, we present four other estimates of the currency union effect on trade, which are drawn from the regressions presented in Table 2, and result from the comparison of the before and after coefficients of the yearly EMU 2 variables, leaving out the year 1998.[41]

[39] Once in office, however, the Jospin government commited itself to monetary unification.
[40] These difficulties were reflected in Franco Modigliani's *Financial Times* article, March 14, 1997: "The news that Germany risks failing the exam for admission to economic and monetary union (EMU) has shaken Europe."
[41] For example, the first of the four estimates is calculated averaging the yearly EMU 2 coefficients corresponding to 1996 and 1997 in regression 1, Table 2, and doing the same for the years 1999-2000. The estimate is simply calculated as *exp (avg coef 96-97 - avg coef 99-00) – 1.*

Table 3. Alternative Measures of the EMU Effect on Trade

	Developed country sample	EU sample
1999-2000 vs. 1996-97	8.2***	7.3***
1999-2001 vs. 1995-97	8.7***	10.5***

*** Significant at 1 percent.

Thus, this exercise suggests that the impact of EMU on trade among its members ranges between 7 and 10 percent, depending on the sample, and the years used for the before/after comparison, and that this impact is highly significant. Tables 4a and 4b provide additional support regarding the significance of the EMU effect. The tables test the equality of each pair of yearly EMU 2 coefficients in Table 2, for the developed country and the EU sample, respectively. The story that emerges clearly from both tables is that each and every one of the years that follow the creation of the EMU is significantly different from each of the pre-EMU years, with the sole exception of 1998.

Table 4a. Developed Country Sample: Testing Coefficients Differences

	1993	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
1993										
1994	4.42**									
1995	7.44***	0.41								
1996	4.99**	0.00	0.41							
1997	7.82***	0.32	0.02	0.33						
1998	23.13***	7.65***	4.57**	9.01***	6.91***					
1999	33.79***	14.78***	10.43***	17.84***	16.19***	1.61				
2000	23.41***	9.55***	6.33**	10.72***	9.19***	0.61	0.07			
2001	28.70***	13.94***	10.26***	15.53***	14.27***	2.84*	0.58	0.82		
2002	15.74***	7.38***	5.42**	7.76***	6.48**	1.3	0.25	0.38	0.00	

* significant at 10%, ** significant at 5%, significant at 1%
The tests are made based on the coefficients presented in Table 2, column 1. In the table we report the difference F test between each one of the EMU2-year coefficients.

Table 4b. European Union Country Sample: Testing Coefficients Differences

	1993	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
1993										
1994	1.02									
1995	0.86	0.01								
1996	0.31	0.27	0.19							
1997	1.97	0.15	0.21	0.96						
1998	8.35***	4.69**	4.87**	7.43***	4.63**					
1999	10.20***	6.40**	6.56***	9.53***	6.87***	0.18				
2000	9.67***	6.17**	6.27**	8.77***	6.59***	0.48	0.11			
2001	32.86***	29.39***	29.10***	35.01***	34.55***	13.48***	10.84***	7.18***		
2002	13.43***	10.25***	10.61***	12.16***	9.38***	3.36*	2.48	1.65	0.80	

* significant at 10%, ** significant at 5%, significant at 1%
The tests are made based on the coefficients presented in Table 2, column 3. In the table we report the difference F test between each one of the EMU2-year coefficients.

There is one additional issue that we need to address in order to get a more precise view of the EMU effect on trade. That is the issue of trade diversion. Before we get to this issue, however, it is worth asking whether the effect of EMU on trade discussed in this and the previous section is already obvious to the naked eye, by focusing exclusively on trade data.

3.3 Does the EMU Effect Show by Looking at the Trade Data?

The first question that comes to mind when thinking about the impact of EMU discussed above is that such an effect should be visible by looking at the trade data. In particular, if trade among EMU pairs is boosted by around 8 percent as a result of the monetary union, one would expect to see that EMU countries gain importance as a share of other EMU countries' trade. To check this, in Table 5a we report, for each of the countries in EMU, the share of trade with EMU, with other EU countries, with other countries in Europe (Iceland, Norway and Switzerland), and with other countries in the sample (Australia, Canada, Japan, New Zealand and US), both before and after the formal creation of EMU.[42]

[42] These shares are expressed in the table as a percentage of total trade within the sample. We use the average of 1996 and 1997 for the before EMU shares, and the average of 2000 and 2001 for the after EMU shares.

Table 5a. Shares Considering All Developed Countries

	Austria	*Bel-Lux*	*Finland*	*France*	*Germany*	*Ireland*	*Italy*	*Nether.*	*Portugal*	*Spain*	**EMU**
EMU											
96-97	**77.7**	**72.4**	**44.3**	**67.0**	**59.6**	**37.3**	**66.0**	**66.1**	**76.9**	**74.1**	**64.1**
00-01	**77.3**	**71.4**	**48.1**	**66.4**	**59.1**	**37.3**	**65.7**	**65.3**	**78.9**	**75.3**	**64.5**
Change	**-0.378**	**-1.005**	**3.726**	**-0.560**	**-0.451**	**0.010**	**-0.249**	**-0.808**	**1.992**	**1.231**	**0.351**
Other EU											
96-97	7.3	14.4	32.5	14.8	16.4	37.4	13.7	17.4	13.2	13.5	18.1
00-01	7.0	14.2	30.7	14.2	15.7	32.5	12.6	17.1	10.9	13.2	16.8
Change	-0.299	-0.204	-1.833	-0.646	-0.736	-4.901	-1.144	-0.252	-2.297	-0.325	-1.264
Other Europe											
96-97	6.3	2.5	6.4	5.1	7.6	3.2	5.8	3.9	3.0	2.6	4.6
00-01	6.7	2.4	6.3	5.2	7.1	3.7	5.3	3.7	3.0	2.4	4.6
Change	0.346	-0.082	-0.108	0.092	-0.518	0.451	-0.419	-0.252	0.038	-0.119	-0.057
Rest											
96-97	8.7	10.7	16.8	13.1	16.4	22.0	14.5	12.6	6.9	9.9	13.2
00-01	9.0	11.9	15.0	14.2	18.1	26.5	16.4	13.9	7.2	9.1	14.1
Change	0.332	1.291	-1.785	1.114	1.705	4.440	1.812	1.311	0.267	-0.787	0.970

Source: Authors' calculations.

Table 5b. Shares Considering European Union Countries

	Austria	*Bel-Lux*	*Finland*	*France*	*Germany*	*Ireland*	*Italy*	*Nether.*	*Portugal*	*Spain*	**EMU**
EMU											
96-97	**91.4**	**83.4**	**57.7**	**81.9**	**78.4**	**50.0**	**82.8**	**79.2**	**85.3**	**84.6**	**77.5**
00-01	**91.7**	**83.4**	**61.1**	**82.4**	**79.1**	**53.5**	**83.9**	**79.2**	**87.8**	**85.1**	**78.7**
Change	**0.285**	**0.004**	**3.345**	**0.530**	**0.642**	**3.514**	**1.154**	**0.038**	**2.508**	**0.525**	**1.254**
other EU											
96-97	8.6	16.6	42.3	18.1	21.6	50.0	17.2	20.8	14.7	15.4	22.5
00-01	8.3	16.6	38.9	17.6	20.9	46.5	16.1	20.8	12.2	14.9	21.3
Change	-0.285	-0.004	-3.345	-0.530	-0.642	-3.514	-1.154	-0.038	-2.508	-0.525	-1.254

Source: Authors' calculations.

The first thing that jumps out from this comparison is that the share corresponding to EMU countries is practically unchanged. There is, on average, a very small increase of 0.35 percentage points. Only Finland, Portugal and Spain experience noticeable increases in the EMU share (of 3.7, 2 and 1.2 percentage points, respectively). Meanwhile, Belgium experiences a decline in the EMU share of 1 percentage point. In all other countries, the share of EMU remains the same, or changes less than one percentage point.

The picture is a little different if we just concentrate on intra-EU trade, in order to compare these trends to the results using the EU sample (see Table 5b). In this case, the share corresponding to EMU partners in trade of EMU countries increases for each of the EMU countries, particularly in Ireland (3.5 percentage points), Finland (3.3), Portugal (2.5) and Italy (1.2). On average, the increase in the share of EMU is of 1.25 percentage points. While this may seem like a negligible increase, it is important to keep in mind that, for EMU countries, the share corresponding to other EMU countries within their total EU trade was around 77.5 percent even

before EMU. It is easy to calculate that this increase in share would be consistent with an EMU effect on trade of 7.6 percent.[43] Thus, most of the impact of EMU on trade we estimated using the EU sample is reflected in changes in the composition of EMU countries' trade. In contrast, a similar calculation for the case of the developed country sample suggests that the change in the shares reflects an impact of EMU of just 1.5 percent, much smaller than the impact estimated in the regression analysis.

The discrepancy between the regression results and the small impact reflected in trade shares, in the case of the larger sample, could potentially have two very different explanations. The first one is that, by focusing on trade data alone, we are failing to keep all else equal, as we do in the regression analysis. In other words, the difference could be associated with differing patterns, regarding all or some of the control variables, in EMU countries vis-à-vis the rest of the developed world.[44] Alternatively, the discrepancy could be linked to something more fundamental: if the monetary union acts just as a "trade booster," in the sense that it increases trade of its members not only with other members, but also with the rest of the world, then the impact of EMU would not be fully reflected in the trade shares.[45] In this sense, the most important differences should be found with respect to trade between two non-EMU countries, and not with respect to trade between an EMU and a non-EMU country, which is the benchmark we were using in Table 5a. In Figure 2, we address this issue by comparing trade performance among pairs of EMU countries to that among pairs of non-EMU countries. We also look at the case of trade performance in pairs in which just one of the countries is part of EMU.[46]

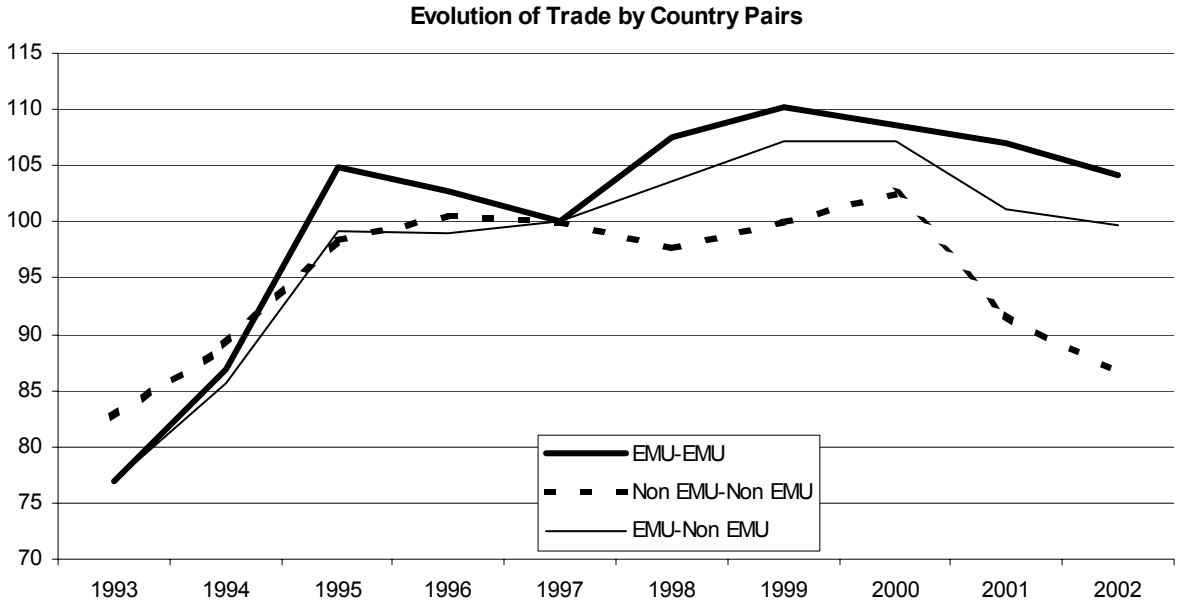
[43] If trade with EMU is 77.5 percent, then an increase of 7.6 percent will imply a new share of 77.5*1.076 / (77.5*1.076 + 22.5) = 78.75, consistent with the increase in 1.25 percentage points discussed above.

[44] Good candidates for differing patterns are growth performance, and the behavior of real exchange rates, discussed above in the section on methodology.

[45] We are grateful to Richard Baldwin for proposing the "trade booster" interpretation.

[46] Each of the series in Figure 3 is constructed as follows: For every country in the sample, we compute two trade indices, one for trade with EMU countries, and the other for trade with non-EMU countries, using 1997 (=100) as the base year. The EMU-EMU series is the unweighted average of the indices of each EMU country's trade with the rest of EMU. The nonEMU-nonEMU series is the unweighted average of the indices of each non-EMU country's trade with their non-EMU partners. Finally, in the EMU-nonEMU series, we average both the indices of EMU countries' trade with non-EMU partners and the indices of non-EMU countries' trade with EMU partners.

Figure 2.



Source: Authors' calculations.

The figure shows clearly that there is a jump in trade performance for pairs of EMU countries around the creation of the single currency, in comparison to that between non-EMU countries. At the same time, it shows that trade among EMU–non-EMU pairs also increased as a result of monetary union with respect to trade among non-EMU pairs, albeit not as much as EMU pairs. The trade share comparison discussed above was focused on the comparison between EMU-EMU and EMU–non-EMU pairs, so it is not surprising that the impact on the shares was very small. These results provide some support to the "trade booster" hypothesis, and suggests that trade diversion does not seem to take place. On the contrary, membership in EMU seems to increase trade with EMU members and non-members alike. In order to look at this issue in more detail, in the next section we test for the existence of trade diversion more formally.

3.4 Is There Any Trade Diversion?

In order to check for trade diversion, we add to the model of equation (1) an extra dummy variable, EMU 1, which takes a value of 1 whenever just one of the countries in the pair is a member of EMU. The model is as follows:

$$LnT_{ijt} = \alpha_{ij} + \beta_1 \ln Y_{it} Y_{jt} + \beta_2 Lny_{it} y_{jt} + \beta_3 FTA_{ijt} + \beta_4 EU_{ijt} + \beta_5 EU\,Trend_{ijt} + \\ + \beta_6 RER_{it} + \beta_7 RER_{jt} + \beta_8 EMU2_{ijt} + \beta_9 EMU1_{ijt} + \gamma_t + \varepsilon_{ijt} \quad \textbf{(3)}$$

Notice that once again the dummies EMU 2 and EMU 1 have the subscript *ijt*, which means that they both take values of zero before 1999, regardless of the pair. If there is trade diversion, we should expect the coefficient β_9 to be negative and significant. Conversely, if joining the Euro acts as a trade booster, β_9 should be positive and significant, although likely smaller than β_8, since pairs of EMU countries would be benefiting from a double boost. Table 6 presents the regression results, both for the developed country and the EU sample. The coefficient for EMU 2 is now larger than that obtained in Table 1, under both samples. The impact of EMU 2, using as a benchmark trade performance among non-EMU countries, leads to an increase in bilateral trade of 16.5 percent, in the case of the developed country sample, or 8.7 percent, in the case of the EU sample.

The impact of EMU 1, however, varies depending on the sample. The developed country sample results suggest that membership in EMU increases trade vis-à-vis all partners. Compared to trade among non-EMU countries, trade between an EMU country and a non-member increases by 12.3 percent. In contrast, the EU sample results suggest that there is no trade boost with nonmembers, and all the action happens between EMU partners.[47] While the exercise does not provide definitive answers, we believe that the results using the developed country sample may be more reliable once we include the EMU 1 dummy. The reason is that in the EU sample, there are very few country pairs formed by non-EMU countries left, and these are the pairs that are used as the benchmark for comparison.

Matching the exercises discussed in Section 3.2 regarding the evolution of the EMU effect over time, Table 7 and Figures 4a and 4b present the evolution of the EMU 2 and EMU 1 effects over time for both samples, using a specification similar to that of equation (2), but adding yearly EMU 1 dummies. As Figure 4a shows, in the developed country sample the temporal pattern of EMU 1 is similar to that of EMU 2. In contrast, in the EU sample there is no discernible EMU 1 effect until 2001 and 2002.

[47] This is actually consistent with the discrepancies discussed in Section 3.3, between the results for the developed country and the EU samples.

Table 6. Trade Diversion

	1992-2002	
	Dev. Sample	***EU***
EMU 2	**0.153**	**0.083**
	(0.020)***	**(0.030)*****
EMU 1	**0.116**	**0.014**
	(0.016)***	**(0.030)**
Real GDP	2.656	3.066
	(0.305)***	(0.601)***
Real GDP per capita	-1.902	-2.450
	(0.337)***	(0.629)***
Free Trade Agreement	0.007	0.029
	(0.021)	(0.037)
EU	0.011	0.019
	(0.022)	(0.074)
EU Trend	0.009	-0.013
	(0.003)***	(0.026)
Real Exchange Rate of Country 1	-0.197	-0.140
	(0.047)***	(0.066)**
Real Exchange Rate of Country 2	-0.369	0.139
	(0.055)***	(0.111)
Observations	2541	1001
Pair Country Dummies	Yes	Yes
Year Dummies	Yes	Yes

Robust standard errors in parentheses

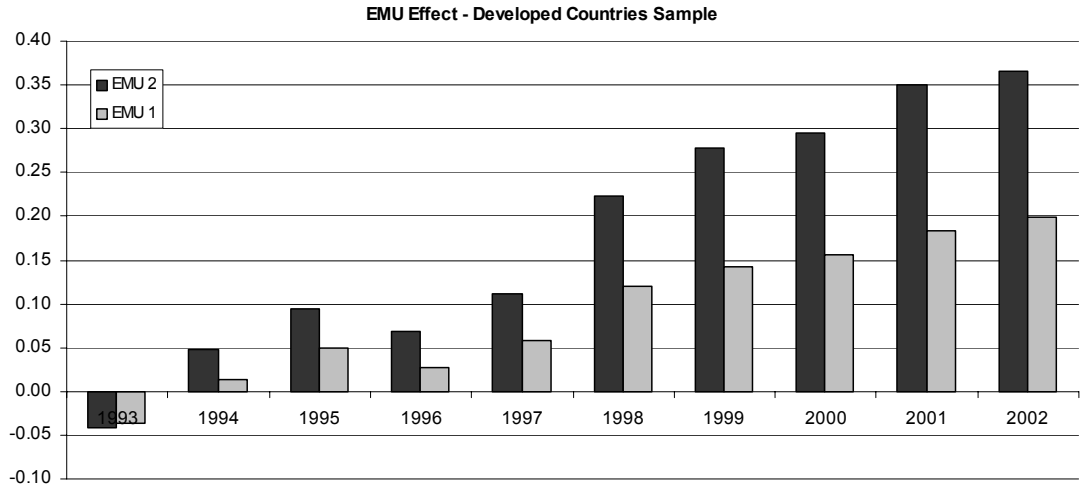
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Trade Diversion Over Time

	Developed Sample		*EU Sample*	
	Coef	***S.D.***	***Coef***	***S.D.***
Real GDP	2.758	(0.300)***	2.598	(0.584)***
Real GDP per capita	-2.029	(0.332)***	-1.959	(0.609)***
Free Trade Agreement	-0.000	(0.020)	0.027	(0.036)
EU	0.021	(0.022)	0.030	(0.073)
EU Trend	0.003	(0.003)	-0.017	(0.026)
Deflator Country 1	-0.228	(0.048)***	-0.236	(0.067)***
Deflator Country 2	-0.353	(0.056)***	0.120	(0.111)
EMU2 - 1993	-0.042	(0.041)	-0.021	(0.056)
EMU2 - 1994	0.047	(0.040)	0.034	(0.052)
EMU2 - 1995	0.090	(0.042)**	0.065	(0.053)
EMU2 - 1996	0.066	(0.040)*	0.053	(0.056)
EMU2 - 1997	0.106	(0.040)***	0.039	(0.051)
EMU2 - 1998	**0.202**	**(0.041)*** **	**0.111**	**(0.061)***
EMU2 - 1999	**0.245**	**(0.039)*** **	**0.139**	**(0.061)****
EMU2 - 2000	**0.258**	**(0.045)*** **	**0.138**	**(0.066)****
EMU2 - 2001	**0.300**	**(0.045)*** **	**0.264**	**(0.060)*** **
EMU2 - 2002	**0.311**	**(0.056)*** **	**0.304**	**(0.075)*** **
EMU1 - 1993	-0.037	(0.039)	-0.018	(0.057)
EMU1 - 1994	0.013	(0.037)	0.013	(0.053)
EMU1 - 1995	0.049	(0.040)	0.051	(0.054)
EMU1 - 1996	0.026	(0.037)	0.049	(0.057)
EMU1 - 1997	0.056	(0.038)	0.007	(0.051)
EMU1 - 1998	**0.114**	**(0.038)*** **	**0.036**	**(0.062)**
EMU1 - 1999	**0.133**	**(0.035)*** **	**0.056**	**(0.062)**
EMU1 - 2000	**0.145**	**(0.040)*** **	**0.045**	**(0.066)**
EMU1 - 2001	**0.169**	**(0.039)*** **	**0.100**	**(0.059)***
EMU1 - 2002	**0.181**	**(0.046)*** **	**0.172**	**(0.075)****
Observations	2541	2541	1001	1001
Year Dummies	Yes	Yes	Yes	Yes
Country Pair Dummies	Yes	Yes	Yes	Yes

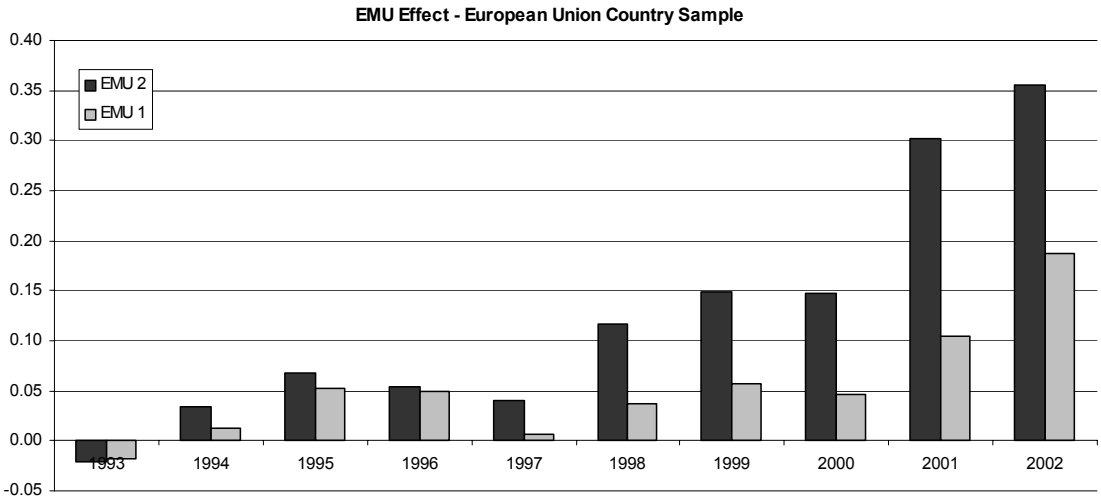
Robust Standard Error in parentheses
* significant at 10%, ** significant at 5%, significant at 1%

Figure 3a.



Results come from Table 7, column 1. These are calculated as exp(EMU2-year)-1.

Figure 3b.



Results come from Table 7, column 2. These are calculated as exp(EMU2-year)-1

Table 8 presents alternative estimates of the EMU 2 and EMU 1 effects, based on the regressions shown in Table 7. The trade booster effect of EMU is confirmed for the developed country sample, where the impact of EMU 2 is approximately twice that of EMU 1. In the EU sample, the impact of EMU 1 is positive, but not significant. What is clear, in any case, is that EMU does not lead to trade diversion, a result that is consistent with what Frankel and Rose (2002) found for a much larger sample of countries.

Table 8. Alternative Measures of the EMU 2 and EMU 1 Impact

	Developed country sample		**EU sample**	
	EMU 2	*EMU 1*	*EMU 2*	*EMU 1*
1999-2000 vs. 1996-97	18.0***	10.3***	9.7***	2.3
1999-2001 vs. 1995-97	19.8***	11.1***	13.7***	3.2

*** Significant at 1 percent.

3.5 Are the Results Robust?

In this section, we check whether the impact of EMU is fairly widespread among its member countries, or whether our results are driven by the experiences of just a few of them. As a baseline for these robustness checks, we will use the regressions in column 6 of Tables 1a and 1b (without trade diversion), and the regressions in Table 6 (with trade diversion).

The first check we perform is to exclude from the sample one EMU country at a time. The results are presented in Table 9, which only reports the estimated coefficients corresponding to EMU 2 and EMU 1. We can see that the results are very robust to the exclusion of one country at a time. To give just one example, while the coefficient for EMU 2 without introducing trade diversion, in the developing country sample, was 0.51, the range of the coefficients excluding one country at a time goes from 0.43 (excluding Netherlands) to 0.63 (excluding Greece), and is always highly significant. The only country that seems to be an outlier in this table is Greece, whose exclusion from the sample tends to inflate all the EMU coefficients.[48]

[48] This may explain why the estimated effects obtained using the yearly EMU 2 and EMU 1 coefficients (as in Tables 3 and 8), in which Greece was excluded from EMU, were systematically larger than those reported in Tables 1 and 6.

Table 9. Dropping One Country at a Time

Country Dropped		**DEV**	**EU**	**DEV**	**EU**
NONE	***EMU2***	***0.051***	***0.070***	***0.153***	***0.083***
Original Sample		***(0.014)******	***(0.015)******	***(0.020)******	***(0.030)******
	EMU1			***0.116***	***0.014***
				(0.016)***	***(0.030)***
Observations		***2541***	***1001***	***2541***	***1001***
Austria	*EMU2*	0.045	0.067	0.145	0.082
		(0.015)***	(0.016)***	(0.021)***	(0.030)***
	EMU1			0.114	0.017
				(0.017)***	(0.030)
Belgium-Luxembourg	*EMU2*	0.052	0.073	0.153	0.092
		(0.015)***	(0.017)***	(0.021)***	(0.030)***
	EMU1			0.115	0.021
				(0.017)***	(0.029)
Finland	*EMU2*	0.058	0.081	0.164	0.089
		(0.015)***	(0.016)***	(0.021)***	(0.031)***
	EMU1			0.121	0.008
				(0.017)***	(0.031)
France	*EMU2*	0.053	0.076	0.153	0.084
		(0.016)***	(0.017)***	(0.021)***	(0.031)***
	EMU1			0.115	0.008
				(0.017)***	(0.030)
Germany	*EMU2*	0.045	0.070	0.144	0.086
		(0.016)***	(0.016)***	(0.021)***	(0.031)***
	EMU1			0.112	0.017
				(0.017)***	(0.031)
Greece	*EMU2*	0.063	0.083	0.175	0.134
		(0.014)***	(0.016)***	(0.020)***	(0.029)***
	EMU1			0.127	0.055
				(0.016)***	(0.028)*
Ireland	*EMU2*	0.056	0.078	0.152	0.093
		(0.014)***	(0.016)***	(0.020)***	(0.030)***
	EMU1			0.110	0.016
				(0.016)***	(0.029)
Italy	*EMU2*	0.049	0.070	0.153	0.084
		(0.016)***	(0.017)***	(0.022)***	(0.032)***
	EMU1			0.117	0.015
				(0.017)***	(0.031)
Netherlands	*EMU2*	0.043	0.063	0.130	0.067
		(0.016)***	(0.017)***	(0.021)***	(0.031)**
	EMU1			0.099	0.005
				(0.017)***	(0.030)
Portugal	*EMU2*	0.054	0.069	0.164	0.098
		(0.014)***	(0.015)***	(0.020)***	(0.030)***
	EMU1			0.124	0.031
				(0.017)***	(0.031)
Spain	*EMU2*	0.047	0.054	0.154	0.053
		(0.015)***	(0.016)***	(0.021)***	(0.030)*
	EMU1			0.123	-0.001
				(0.017)***	(0.029)
Observations		*2310*	*858*	*2310*	*858*

Minimum EMU2	0.043***	0.054***	0.13***	0.053*
Maximum EMU2	0.063***	0.083***	0.175***	0.134***
Minimum EMU1			0.099***	-0.001
Maximum EMU1			0.127***	0.055*

In Table 10, we repeat the exercise, but excluding from the sample groups of countries, some of them non-EMU members, instead of individual ones. We exclude, in turn, the relatively less developed EMU countries (Greece, Ireland, Portugal and Spain), the Original EU core countries (Belgium and Luxembourg, France, Germany, Netherlands and Italy), the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) and the DM Bloc countries (Austria, Belgium and Luxembourg, Denmark, Germany, France and Netherlands). Two things are worth noting. First, when we exclude the relatively less developed EMU members, the trade booster effect that we found for the developed country sample is replicated in the case of the EU sample. Second, the exclusion of the EU core countries, and especially of the DM bloc countries, weakens some of the results. Overall, the results are quite robust to these changes although, as a general rule, the impact of EMU seems to be somewhat higher in the more advanced EMU countries.

Table 10. Dropping Groups of Countries

		DEV	***EU***	***DEV***	***EU***
All Countries	***EMU2***	***0.051***	***0.070***	***0.153***	***0.083***
		(0.014)***	***(0.015)******	***(0.020)******	***(0.030)******
	EMU1			***0.116***	***0.014***
				(0.016)***	***(0.030)***
Observations		***2541***	***1001***	***2541***	***1001***
Without Relatively Less Dev.	*EMU2*	0.075	0.076	0.194	0.143
Spain, Portugal		(0.014)***	(0.014)***	(0.020)***	(0.027)***
Ireland and Greece	*EMU1*			0.139	0.073
				(0.016)***	(0.026)***
Observations		*1683*	*495*	*1683*	*495*
Without Original EU Core	*EMU2*	0.037	0.063	0.120	0.081
Belgium-Lux, France		(0.024)	(0.025)**	(0.028)***	(0.035)**
Germany, Netherlands	*EMU1*			0.097	0.020
Italy				(0.019)***	(0.031)
Observations		*1705*	*550*	*1705*	*550*
Without Nordics	*EMU2*	0.050	0.082	0.132	0.107
Finland, Norway, Denmark		(0.016)***	(0.018)***	(0.022)***	(0.032)***
Sweden and Iceland	*EMU1*			0.089	0.026
				(0.019)***	(0.031)
Observations		*1683*	*726*	*1683*	*726*
Without DM Block	*EMU2*	0.011	0.058	0.093	0.055
Germany, Netherlands		(0.028)	(0.028)**	(0.033)***	(0.051)
Belgium-Lux, France	*EMU1*			0.091	-0.003
Austria and Denmark				(0.022)***	(0.047)
Observations		*1320*	*308*	*1320*	*308*

Robust Standard Error in parentheses.
* significant at 10%, ** significant at 5%, significant at 1%

Finally, in Table 11 we isolate the EMU effect in each of the individual EMU countries. It is best to explain the procedure with an example. In the regressions for Germany, we split the dummy EMU 2 into two different dummies. The first one is a dummy "Germany EMU 2" that takes a value of 1 for pairs formed by Germany and other EMU countries, 0 otherwise. The second is a dummy called "Other EMU 2", which takes a value of 1 for all other pairs of EMU countries. Similarly, we create a dummy "Germany EMU 1", which takes a value of 1 for pairs formed by Germany and non-EMU countries, as well as a dummy for "Other EMU 1". One advantage of this procedure is that we can test whether the individual country EMU 2 effect is significantly different from the effect in the rest of EMU.

The table suggests that there are indeed a few countries that are different from the rest. Spain and Netherlands are the two countries in which the EMU seems to have had the largest effect. In both countries, their individual EMU 2 coefficients are statistically different from those of other EMU countries, in each of the specifications used. At the other end of the spectrum, the impact of EMU on Greece is significant, but with the wrong sign. Portugal also has the wrong sign in some of the specifications, but the effect is not statistically significant.

In summary, while there are important differences across countries regarding the impact of EMU on trade, the impact reported in the previous sections is generally widespread, and the overall result does not seem to be explained by the experience of one or two particular countries.

Table 11. Effects by Individual Country

		DEV	*EU*	*DEV*	*EU*
Benchmark	***EMU2***	***0.051****	***0.070****	***0.153****	***0.083****
	EMU1			***0.116****	***0.014***
Austria	Other EMU2 (1)	0.048***	0.069***	0.151***	0.083***
	Austria EMU2 (2)	0.062**	0.075***	0.160***	0.087**
	Other EMU1			0.119***	0.016
	Austria EMU1			-0.033	-0.022
	Difference EMU2 (1)-(2)	0.014	0.005	0.009	0.004
Belgium-Luxembourg	Other EMU2 (1)	0.039***	0.062***	0.142***	0.075**
	Belgium-Lux. EMU2 (2)	0.102***	0.109***	0.203***	0.122***
	Other EMU1			0.112***	0.013
	Belgium-Lux. EMU1			0.042*	0.011
	Difference EMU2 (1)-(2)	0.063*	0.047	0.062*	0.048
Finland	Other EMU2 (1)	0.063***	0.078***	0.166***	0.092***
	Finland EMU2 (2)	-0.000	0.036	0.101***	0.052
	Other EMU1			0.122***	0.010
	Finland EMU1			-0.071***	0.053
	Difference EMU2 (1)-(2)	-0.064**	-0.043	-0.065**	-0.040
France	Other EMU2 (1)	0.048***	0.072***	0.151***	0.085***
	France EMU2 (2)	0.064***	0.062***	0.162***	0.077***
	Other EMU1			0.114***	0.009
	France EMU1			0.013	0.059***
	Difference EMU2 (1)-(2)	0.016	-0.010	0.012	-0.008
Germany	Other EMU2 (1)	0.047***	0.070***	0.149***	0.083***
	Germany EMU2 (2)	0.070***	0.071***	0.172***	0.084**
	Other EMU1			0.114***	0.016
	Germany EMU1			0.020	-0.020
	Difference EMU2 (1)-(2)	0.023	0.001	0.023	0.000
Greece	Other EMU2 (1)	0.074***	0.094***	0.174***	0.117***
	Greece EMU2 (2)	-0.103***	-0.068**	0.009	-0.049
	Other EMU1			0.119***	0.035
	Greece EMU1			-0.084	-0.215***
	Difference EMU2 (1)-(2)	-0.177***	-0.162***	-0.165***	-0.166***
Ireland	Other EMU2 (1)	0.055***	0.062***	0.155***	0.078**
	Ireland EMU2 (2)	0.028	0.123***	0.163***	0.180***
	Other EMU1			0.110***	0.009
	Ireland EMU1			0.080**	0.115**
	Difference EMU2 (1)-(2)	-0.027	0.061	0.007	0.102***
Italy	Other EMU2 (1)	0.049***	0.070***	0.151***	0.084***
	Italy EMU2 (2)	0.058***	0.071***	0.160***	0.083**
	Other EMU1			0.116***	0.015
	Italy EMU1			0.001	-0.013
	Difference EMU2 (1)-(2)	0.009	0.000	0.009	-0.000
Netherlands	Other EMU2 (1)	0.038**	0.060***	0.138***	0.071**
	Netherlands EMU2 (2)	0.107***	0.115***	0.203***	0.133***
	Other EMU1			0.101***	0.007
	Netherlands EMU1			0.121***	0.075***
	Difference EMU2 (1)-(2)	0.069***	0.055**	0.065***	0.062**
Portugal	Other EMU2 (1)	0.072***	0.092***	0.178***	0.106***
	Portugal EMU2 (2)	-0.042	-0.015	0.059*	-0.005
	Other EMU1			0.130***	0.035
	Portugal EMU1			-0.139***	-0.211***
	Difference EMU2 (1)-(2)	-0.114***	-0.106***	-0.119***	-0.111***
Spain	Other EMU2 (1)	0.026*	0.043***	0.128***	0.053*
	Spain EMU2 (2)	0.157***	0.185***	0.267***	0.206***
	Other EMU1			0.114***	-0.002
	Spain EMU1			0.045*	0.163***
	Difference EMU2 (1)-(2)	0.131***	0.142***	0.139***	0.153***

* significant at 10%, ** significant at 5%, significant at 1%

4. Conclusions

The promise of greater market integration was probably the single most important reason for the move toward monetary union in Europe. Four years after the creation of EMU, however, we still know very little about the impact of the monetary union on its member countries. Is the promise being fulfilled? The question is of great importance, not only for the current EMU members, but also for the rest of the EU, as well as the countries that are in line for accession. What are they missing? Should they join the club? The debate is raging today in countries such as Sweden and, particularly, in the UK. Good economic analysis on the impact of EMU on trade, as well as on other dimensions, is of fundamental importance if these countries are going to make sound decisions. Yet four years into the EMU, we still have more questions than answers, and little empirical analysis that could inform the debate.

In this paper, we attempt to provide some answers regarding the impact of EMU on trade, using a panel data set that includes the most recent information on bilateral trade, and two different samples of industrial countries. Controlling for a host of other factors, we find that common membership in EMU has positive and significant effects on bilateral trade. Specifically, the impact of shared membership in EMU ranges from 5 to 10 percent, when compared to all other country pairs, and from 9 to 20 percent, when compared to trade between two non-EMU countries. Consistent with these results, we find no evidence of trade diversion. On the contrary, some of our results suggest that EMU leads to higher trade not just with other EMU members, but also with the rest of the world.

Our estimates are much smaller than those that were obtained by Glick and Rose (2001), using similar techniques, but on a much larger sample dominated by the experience of very small and poor countries. They are also smaller than Rose and van Wincoop's (2001) out of sample estimates of the effects of EMU. However, the effect of EMU on trade is significant, and economically important, particularly if we consider that our sample only covers the first four years of the monetary union.

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Data Appendix

This appendix describes the data used in our estimations.

Trade: Bilateral trade is measured in millions dollars and are taken from the DOTS (Direction of Trade Statistics) published by the IMF. We use the simple average of the bilateral imports and exports declared by both countries (average of 4 data). For those cases in which just one of the countries reports bilateral trade, we just take the average of the two available measures. In all cases we use FOB exports and CIF imports. Bilateral trade for year 2002 is the annualized trade until July.[49]

Nominal GDP in US dollars: This variable is taken from the World Development Indicators (WDI-WB). The WDI converts figures for GDP from domestic currencies into US dollars using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, the World Bank uses an alternative conversion factor. This information is available only until 2001 in the WDI. We compute the nominal GDP in 2002 using nominal GDP growth reported by the OECD. To calculate the Nominal GDP per capita we divide by the total population, also taken from WDI.

Real GDP: This variable is also taken from the WDI. The WDI converts figures for GDP from constant domestic currencies into US dollars using 1995 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, the World Bank use an alternative conversion factor. This information is available only until 2001 in the WDI. We compute the real GDP in 2002 using real GDP growth reported by the OECD. To calculate the Real GDP per capita we divide by the total population in the WDI.

Gravity Variables: Data on Distance, Common Borders, Island Condition, Landlocked Condition, Common Language and Area were obtained from the CIA World Factbook (http://www.cia.gov).

FTA's (Free Trade Agreements): This dummy takes the value 1 when a country pair belongs to a same Free Trade Area. The data is taken from Frankel (1997) and complemented with data provided by the IDB Integration Department.

EU (European Union): This is a dummy that takes the value 1 when both countries in a country-pair belong to the European Union.

EU Trend (European Union Trend): This variable is equal to the EU dummy multiply by the year since the beginning of the sample.

Real Exchange Rate: This variable is the ratio between the Real GDP and the Nominal GDP in dollars. Since Real GDP = Nom GDP (in domestic currency) / GDP deflator, and Nominal GDP in dollars = Nominal GDP (in domestic currency) / Nominal exchange rate, the ratio between the two is the nominal exchange rate / GDP deflator, which we use as our index of the real exchange rate. If we multiplied this index by the US GDP deflator we would obtain the bilateral Real Exchange Rate vis-à-vis the US.

[49] For each country pair, we compute the average fraction of annual bilateral trade corresponding to the first seven months of the year, for 2000 and 2001. We use these proportions and the actual data on bilateral trade until July to estimate the annualized bilateral trade in 2002.

Appendix Table A. List of Countries in the Sample

Country	EU Country (Year of Affiliation)	EMU Country (Year of Euro Adoption)
Australia		
Austria	1995	1999
Belgium-Luxembourg	1952	1999
Canada		
Denmark	1973	
Finland	1995	1999
France	1952	1999
Germany	1952	1999
Greece	1981	2001
Iceland		
Ireland	1973	1999
Italy	1952	1999
Japan		
New Zealand		
Netherlands	1952	1999
Norway		
Portugal	1986	1999
Spain	1986	1999
Sweden	1995	
Switzerland		
United Kingdom	1973	
United States		

Source: European Union Commission.

Notes: Countries that appear as affiliated in 1952 in fact created that year the European Coal and Steel Community (ECSC) that was extended to all economic sectors in 1958, creating the European Community (EC). Formally, the European Union (EU) was created in 1992 when the countries that were part of the EC ratified the Treaty on European Union (Maastricht).

On 1 January 1999 eleven European Union Member States adopted the euro as their national currency, being selected by the European Council to participate in the European Monetary Union (EMU) since they had fulfilled the convergence criteria laid down in the Maastricht Treaty.

On 19 June 2000, the EU Council assessed that Greece fulfills the requirements of the Treaty and approved its accession to the Euro area as a twelfth member as January, 2001.

Appendix Table B. Results Over Time with Greece as an EMU Member

	Developed Sample		*EU Sample*		*Developed Sample*		*EU Sample*	
	Coef	***S.D.***	***Coef***	***S.D.***	***Coef***	***S.D.***	***Coef***	***S.D.***
Real GDP	2.268	(0.307)***	3.218	(0.603)***	2.961	(0.303)***	3.273	(0.605)***
Real GDP per capita	-1.431	(0.339)***	-2.610	(0.630)***	-2.246	(0.335)***	-2.672	(0.633)***
Free Trade Agreement	0.006	(0.021)	0.027	(0.037)	0.003	(0.021)	0.032	(0.038)
EU	0.000	(0.022)	0.027	(0.074)	0.017	(0.022)	0.023	(0.075)
EU Trend	0.009	(0.003)***	-0.014	(0.026)	0.006	(0.003)**	-0.012	(0.027)
Real Exchange Rate of Country 1	-0.126	(0.048)***	-0.141	(0.069)**	-0.199	(0.048)***	-0.158	(0.070)**
Real Exchange Rate of Country 2	-0.351	(0.056)***	0.190	(0.111)*	-0.323	(0.056)***	0.208	(0.112)*
EMU2 - 1993	-0.024	(0.033)	0.005	(0.036)	-0.056	(0.041)	0.022	(0.055)
EMU2 - 1994	0.017	(0.031)	0.019	(0.034)	0.004	(0.038)	0.083	(0.059)
EMU2 - 1995	0.043	(0.032)	0.034	(0.034)	0.038	(0.042)	0.145	(0.055)***
EMU2 - 1996	0.030	(0.032)	0.033	(0.033)	0.023	(0.041)	0.112	(0.059)*
EMU2 - 1997	0.011	(0.030)	0.008	(0.031)	0.035	(0.042)	0.082	(0.053)
EMU2 - 1998	**0.062**	**(0.032)***	**0.058**	**(0.034)***	**0.148**	**(0.041)*****	**0.199**	**(0.052)*****
EMU2 - 1999	**0.082**	**(0.031)*****	**0.070**	**(0.034)****	**0.190**	**(0.039)*****	**0.219**	**(0.054)*****
EMU2 - 2000	**0.071**	**(0.035)****	**0.072**	**(0.036)****	**0.196**	**(0.047)*****	**0.158**	**(0.053)*****
EMU2 - 2001	**0.077**	**(0.036)****	**0.139**	**(0.036)*****	**0.234**	**(0.047)*****	**0.267**	**(0.066)*****
EMU2 - 2002	**0.069**	**(0.044)**	**0.096**	**(0.047)****	**0.232**	**(0.054)*****	**0.208**	**(0.075)*****
EMU1 - 1993					-0.047	(0.039)	0.019	(0.055)
EMU1 - 1994					-0.024	(0.036)	0.070	(0.059)
EMU1 - 1995					-0.017	(0.040)	0.122	(0.054)**
EMU1 - 1996					-0.030	(0.037)	0.087	(0.058)
EMU1 - 1997					0.003	(0.039)	0.080	(0.052)
EMU1 - 1998					**0.081**	**(0.038)****	**0.153**	**(0.052)*****
EMU1 - 1999					**0.100**	**(0.035)*****	**0.161**	**(0.054)*****
EMU1 - 2000					**0.111**	**(0.041)*****	**0.092**	**(0.050)***
EMU1 - 2001					**0.151**	**(0.040)*****	**0.137**	**(0.065)****
EMU1 - 2002					**0.153**	**(0.045)*****	**0.119**	**(0.075)**
Observations	2541	2541	1001	1001	2541	2541	1001	1001
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Pair Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%