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**Black Tie Required?
How to Enter a Currency Union***

Volker Nitsch
Free University Berlin

Abstract

Recent transitions to monetary union have been extremely diverse. Some countries, such as the member countries of the European Monetary Union, first had to undergo a year-long process of convergence before the monetary union was established. Other countries (such as Ecuador) have abandoned their national currency in a rather spontaneous and unplanned step. In this paper, I explore the (few) different experiences in monetary union formation in the post-war period in more detail. I find that the transition approach had no measurable effect on the subsequent macroeconomic performance of the country that has entered a monetary union. This issue seems to be of particular interest for EU accession countries which currently face the option of convergence (to the Maastricht criteria) or unilateral adoption of the euro (“euroization”).

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Address:
Volker Nitsch
Free University Berlin
Department of Economics
Boltzmannstrasse 20
14195 Berlin
Germany
Tel.: (030) 838-56280
Fax: (030) 838-54142
E-mail: vnitsch@wiwiss.fu-berlin.de

I. Introduction

One of the most dramatic changes in the international monetary system is the recent revival of monetary integration. For most of the post-war period, countries strongly preferred to have their own national currencies. When a territory gained political independence, the currency union link with the former colonizer was often quickly dissolved. More importantly, between 1950 and 1995, only two sovereign countries were willing to abandon their independent monies: Mali became again a member of the CFA franc zone in 1984 after it had left the arrangement in 1962, and Equatorial Guinea joined the CFA franc zone in 1984.

Since the mid-1990s, however, currency unions have become increasingly attractive again. In Europe, twelve nations have formed the European Monetary Union (EMU) and almost the same number of countries is expected to join EMU within the next few years. Ecuador and El Salvador have unilaterally adopted the US dollar as legal tender, possibly providing a blueprint for other Latin American countries.

Given this growing interest in common currencies, it is striking to note that the recent transitions to monetary union have been extremely diverse. The twelve EMU member countries, for instance, first had to undergo a year-long process of convergence before the monetary union was established. Ecuador, in contrast, has abandoned its national currency in a rather spontaneous and unplanned step.¹

In this paper, I examine whether the entry strategy matters for monetary unification. Most of the previous work on currency union formation discusses the costs and benefits of adopting another currency and then aims to identify potential candidates (partner or anchor countries) for successful monetary integration; see, for instance, the contributions in HM Treasury (2003) for an extensive discussion on whether the UK should join EMU and Alberto Alesina, Robert Barro and Silvana Tenreyro (2002) for a recent application of the cost-benefit-analysis to a much larger set of countries. Here, I ask a different question: Given that a country has already decided to join a monetary union, how should the new currency be implemented?

To analyze this issue, I explore the (few) different experiences in monetary union formation in the post-war period in more detail. More specifically, I analyze whether the transition approach has had a measurable effect on the subsequent macroeconomic

¹ Barry Eichengreen (2002) refers to these schemes as the “coronation” approach and the “just do it” approach, respectively.

performance of the country that has entered a monetary union. This issue seems to be of particular interest for EU accession countries which currently face the option of convergence (to the Maastricht criteria) or unilateral adoption of the euro (“euroization”).

Previewing the main results, I find that there is no systematic association between the degree of pre-entry convergence and a country’s later economic performance within a currency union; there is little evidence that a long period of preparations significantly improves economic growth. Based on these results, the economic rationale for requiring an extensive transition period (including participation in the exchange rate mechanism ERM II for a minimum period of two years) before recent EU entrants are allowed to join the euro appears to be weak.

The remainder of the paper is organized as follows. The next section presents two recent country cases of currency union entry. In section 3, I discuss some theoretical background. Section 4 describes the empirical set-up and the data. Section 5 presents the results, followed by a discussion of some robustness checks. Section 7 provides a brief conclusion.

II. Implementing a Monetary Union: Two Case Studies

To illustrate the possible variation in the adoption of a foreign currency, I discuss two recent country cases in more detail: the accession of Greece to EMU in 2001 and official dollarization in Ecuador in 2000.

2.1 Greece

On 7 February 1992, the member countries of the European Union signed the Maastricht Treaty. Having eliminated all restrictions to the internal movement of capital, goods and people and sharing a strong desire for further economic integration, the countries agreed to establish a monetary union. With the treaty, the countries installed an institutional framework (including a detailed timetable) for the introduction of a common currency and set in motion a gradual process of convergence. More directly, based on the idea that a monetary union is only sustainable if the member countries share some common macroeconomic characteristics, the treaty stipulated a number of convergence criteria that needed to be fulfilled before a country could join the monetary union.²

² An excellent early assessment of the process towards EMU is provided in Charles Wyplosz (1997).

At the time the treaty was signed, Greece was in serious divergence from the other member countries of the European Union. Unlike Portugal and Spain (which both joined the EU in 1986), Greece had experienced no improvement in its macroeconomic performance after its accession to the EU (in 1981); for more than a decade, weak growth and high inflation continued.³ As a result, when it was decided in May 1998 that eleven countries will adopt a single currency, Greece was not able to participate in the European Monetary Union; it failed to meet any of the criteria.

Beginning in 1994, however, Greece had implemented a convergence program. Adjustment measures included structural reforms (e.g., the abolishment of wage indexation), a “hard drachma” policy (in which the drachma was allowed to depreciate only by less than the inflation differential) and fiscal consolidation (which was achieved, among others, through a widening of the tax base). Due to these policies, Greece’s economic performance improved markedly in the late 1990s; real GDP growth, for instance, jumped to an average rate of 3.2 percent between 1995 and 2000, about 0.6 percent above the EU average. By the year 2000, the fiscal deficit was reduced to 0.8 percent of GDP (from about 13.5 percent in 1993); the debt-to-GDP ratio had declined from a peak of 111.3 percent in 1996 to 103.9 percent; and inflation fell to 3.3 percent so that (in June 2000) Greece was finally admitted into the euro area.

On 1 January 2001, almost nine years after signing the Maastricht Treaty and two years after the formation of the monetary union, Greece became the twelfth country to adopt the euro.

2.2 Ecuador

In remarkable contrast to this experience, Ecuador’s decision to dollarize was taken in haste and without any preparations when the country was in the midst of a serious economic and political crisis. The decision was announced by President Jamil Mahuad on 9 January 2000. A few days later, on 21 January, the President was ousted in a civilian-military coup, but his successor, former vice president Gustavo Noboa, opted to stick with dollarization. On 13 March 2000, the sucre was abandoned as national currency and Ecuador adopted the US dollar as legal tender.

³ For the period 1980-94, real GDP growth in Greece averaged 0.8 percent (compared with an average rate of 2.0 percent in the EU) and inflation was on average 18.3 percent (compared with 6.4 percent in the EU). More details are documented in Ralph Bryant, Nicholas Garganas and George Tavlas (2001).

Economic conditions in Ecuador already gradually began to deteriorate in the mid-1990s when the country was hit by a series of external shocks: the El Niño floods in 1997 caused crop losses and destroyed infrastructure at a total cost of about 13 percent of GDP; the fall in world oil prices in 1998 cut public sector revenues by about 3.5 percent of GDP; and due to the spillover of the Russian financial crisis into Latin America, external credit lines for the banking system were substantially reduced. Domestic policies, instead to counter these shocks, further weakened the Ecuadoran economy. Problems included political instability (with frequent changes of government and accusations of corruption and cronyism), chronic inflation and social discontent.

In 1999, the situation worsened dramatically when problems in an already fragile banking sector escalated. The closure of a bank in April 1998 triggered deposit runs on other banks and, after a series of ad hoc actions by the government (including a deposit freeze, bank holidays, and government bailouts), the banking system collapsed. At the same time, Ecuador's fiscal position, which was already weak with a deficit of about 5 percent of GDP, rapidly deteriorated, thereby aggravating the financial crisis. Finally, as the demand for dollars gained momentum, the sucre depreciated dramatically, pushing up inflation. By the end of the year, output had dropped by about 7.5 percent; the annual inflation rate had accelerated to 60 percent; the sucre had lost about 80 percent of its dollar value; and the ratio of total public debt to GDP was at 130 percent.⁴

Against this background, Ecuador adopted the US dollar as legal tender as a substitute to the sucre. Stanley Fischer (2001, p. 7), then the First Deputy Managing Director of the IMF, notes: "The decision to dollarize was taken in desperation. ... If they had asked us, we would have said that the preconditions for making a success of dollarization were not in place." Nonetheless, the economy stabilized after dollarization and the financial system in Ecuador recovered.

III. Background and Literature

Despite these large differences in regime transitions, it is a priori unclear which entry approach to monetary union is preferable. Theory appears to provide no conclusive answer.

According to the standard literature on optimum currency areas (OCAs), as developed by Robert Mundell (1961), Peter Kenen (1969) and Ronald McKinnon (1963), a monetary union is desirable when territories display a high degree of economic integration. More

⁴ A more detailed account of the Ecuadoran crisis is given in Luis Jacome (2004).

specifically, it is argued that a common currency is suitable if the members of a potential OCA satisfy the following criteria: a high degree of bilateral trade integration; a strong correlation of domestic business cycles; free mobility of labor; and a system of fiscal transfers. Accordingly, there should have been substantial convergence between potential member countries before a monetary union is entered.

Alternatively, it is possible to emphasize the integration effects of a common currency. While the OCA literature focuses mainly on (minimizing) the costs of monetary integration, this approach concentrates on the potential benefits of a common currency. Currency unions may then become more attractive for country pairs with some dissimilarities. For instance, given that the adoption of a new currency cannot be easily reversed, entry into a monetary union appears to be a serious and credible commitment device that is particularly useful for countries that lack the internal discipline for monetary policy. Alesina, Barro and Tenreyro (2002) argue that “the countries that stand to gain the most from giving up their currencies are those that have a history of high and volatile inflation.” Moreover, as Jeffrey Frankel and Andrew Rose (1998) have shown, the OCA criteria for whether a country should join a monetary union are largely endogenous; sharing a common currency increases trade integration and business cycle correlation. In summary, convergence before entry into a monetary union may be of less importance.

Finally, it is possible that some other criteria may affect the success of monetary integration.⁵ Potential candidates include the Maastricht criteria that must be legally met by countries willing to join EMU. As is well known, the economic rationale for these conditions, which are price stability, exchange rate stability, convergence of nominal long-term interest rates, and fiscal discipline, is weak. Frankel (2004, p. 15), for instance, notes: “The four Maastricht conditions, particularly the fiscal criterion, are not very closely based on international monetary theory.” Other potentially important macroeconomic variables can be borrowed from the currency crises literature. In these studies, typically money growth and the current account, among others, feature prominently for identifying changes in the exchange rate regime.

⁵ I focus here exclusively on economic criteria. In recent years, there has also been a growing discussion on the potential relevance of non-economic criteria, such as public support for the adoption of another currency (Ricardo Hausmann and Andrew Powell [1999]) or the existing degree of currency substitution (Guillermo Calvo [1999]). William Gruben, Mark Wynne and Carlos Zarazaga (2003) provide detailed implementation guidelines for the introduction of a monetary union.

Given these general ambiguities, finding conditions for successful monetary integration appears to be ultimately an empirical issue. I now turn to that task.

IV. Data

Until recently, only few economies used currencies other than their own.⁶ For more than a half century, no new currency union was created, and although some currency unions remained in existence, many more common currency links were dissolved. Reuven Glick and Rose (2002), for instance, compile regime transitions for the period from 1948 through 1997 and find that 130 of the 146 switches (for which they have data) were currency union exits. Nonetheless, some countries and territories have adopted a foreign currency in the post-war period; these experiences provide the basis for the empirical analysis in this paper. Table 1 lists the currency union entries.⁷

Given the small number of episodes and their considerable heterogeneity (covering different time periods and countries of different sizes and income levels), the choice of an appropriate benchmark is potentially important. I use as control group the member countries of the monetary union whose currency is being adopted. That is, I construct country pairs of joining or client countries, on the one hand, and the respective currency union member or anchor countries, on the other, thereby excluding all countries that are not members of a currency union and the member countries of other currency unions.⁸ This approach offers at least two advantages. First, the countries in the control group are geographically close and often share the same economic characteristics with the entering country so that the empirical results should not be affected by non-linearities. Second, the approach allows to explore the degree of convergence that has been achieved by the country that adopts the foreign currency shortly before monetary union entry.

In total then, my sample consists of 7 currency union entries and 58 bilateral country pairs. If I additionally include the formation of the European Monetary Union (which appears

⁶ Alesina and Barro (2001, p. 381) note that roughly 60 territories have for some time been members of a currency union. Most of these territories, however, are extremely small (e.g., Andorra, Liechtenstein, Monaco) so that the group of countries is much smaller economically (e.g., in terms of GDP) than the plain number of countries suggests. Rose and Charles Engel (2002) provide a list of member countries of monetary unions.

⁷ I do not include monetary unifications between territories that also form a political union (e.g., German unification in 1990).

⁸ For a comparison of countries in currency unions to countries with sovereign monies, see Rose and Engel (2002).

to be reasonable), the sample increases to 17 entries and 68 country pairs.⁹ Due to missing observations, however, the actual sample is often somewhat (but not much) smaller.

The data are compiled from a number of different sources. Since for some countries in my sample data are often not available or, when they are, they are of poor quality, I collected data from various standard data files and then either cross-checked the information or filled in missing observations. The main source of data is the World Bank's World Development Indicators. This database provides information on several country-specific variables, including population, land area and inflation as well as on exports and imports, gross foreign direct investment, gross private capital inflows, the current account balance, the monetary aggregate M2, the overall budget deficit and the central government debt (all as shares of GDP). Additional variables such as real GDP growth, the nominal exchange rate, and exports and imports (in US dollars) were obtained from the IMF's International Financial Statistics. Wherever possible, I also add information from the Penn World Table 6.1 and the United Nations's statistical databases. The bilateral trade data are taken from the IMF's Direction of Trade Statistics.

V. Empirical Results

I begin with a simple characterization of countries that have entered a currency union. In table 2, I report for a number of variables means (and standard deviations) for currency union entrants and existing currency union members; the last column provides the p-value of a t-test for equality.

As shown, countries that have entered a currency union are typically significantly smaller and poorer than existing currency union members; this result, which is robust to the exclusion of the US as an anchor country, confirms previous findings about countries without sovereign monies (Zeljko Bogetic [2000], Sebastian Edwards [2001], Rose and Engel [2002]). Entering countries also have higher inflation. They are less open to international trade (despite of their small size) and experience much lower growth rates in international trade.¹⁰ Fiscal conditions in entering countries are in significantly worse shape, as measured by both the budget deficit and the overall government debt (as percentages of GDP). Somewhat

⁹ Substituting the EMU-average (minus the country in question) for Germany as pre-EMU anchor does not change any of the results.

¹⁰ The finding of no significant differences in financial openness may be due to limited data availability.

surprisingly, output growth rates appear to be similar for entering countries and currency union members.

In a next step, I analyze whether the differences in the macroeconomic conditions have become smaller over time; that is, I ask: Do countries converge before they join a monetary union? To analyze this issue, I estimate a simple time-series regression of the (absolute) pairwise difference of the variable of interest on a linear time trend (with country-pair fixed effects); a negative slope coefficient would then imply that the countries have on average become more similar before they have adopted the same currency. The results are reported in table 3; I tabulate separate values for the three-year period before entry and the five years before entry.

Reviewing the results, there is little evidence of convergence before joining a monetary union. For most variables, the differences are statistically unchanged in the run-up to the adoption of a common currency. In two cases, however, the coefficient on the time trend variable is consistently negative and statistically significant: the differences in export growth rates tend to decline over time (possibly reflecting some trade liberalization before currency union entry), and the differential in fiscal debt seems to become smaller (which may be mostly the result of the convergence process in Europe for which fiscal data are readily available). Interestingly, the inflation differential first appears to get smaller when the five-year period is analyzed, but then gets on average larger in the three-year period before accession. This divergent pattern probably reflects the different motives for currency union entry; some countries have abolished their national currency when they faced accelerating inflation.

My main interest, however, is to identify possible determinants for the success of monetary integration. A natural starting point for this analysis is to assess the sustainability of a currency union. In currency unions that have been dissolved, the pre-conditions for successful monetary integration were obviously not in place; the benefits of sharing the same currency were smaller than the costs. All currency unions, however, that have been either created or extended in the post-war period are still in existence today.¹¹

Therefore, I define two alternative measures for the macroeconomic performance of a currency union. First, I compute the change in the GDP growth rate of the accession country. This measure, which is the average difference in real output growth for the five years before and the five years after entry, captures the direct impact of currency union entry on the

¹¹ Nitsch (2004) provides a characterization of currency union exits.

accession country.¹² As a second measure, I relate the performance of the entering country to the macroeconomic performance of the existing currency union members by computing the average pair-wise difference in GDP growth rates for the five years after currency union entry. Both performance measures are positively related, but far away from being close substitutes; the correlation is 0.59.

To provide more intuition, table 4 lists the five best and the five worst performing currency union entrants, according to our performance measures. Three observations appear to be particularly noteworthy. First, there is considerable variation in the relative growth performance of countries that have entered a currency union. Second, there are some notable outliers, possibly amplified by poor quality of the data. Third, the two measures provide in general a quite consistent picture; they indicate that Ecuador and Mali have been the most successful entrants, while Guinea-Bissau showed the worst performance.

In the following, I analyze whether the level of (pre-entry) convergence had a measurable impact on the subsequent performance of the country that has entered a monetary union. In particular, I estimate equations of the form:

$$PERFORM_{i,t} = \alpha + \beta CONV_{ij,t-1} + \varepsilon_{ij,t} ,$$

where $PERFORM_{i,t}$ is the macroeconomic performance measure of entering country i as explained above and $CONV_{ij,t-1}$ is the measure of convergence before entry (with variables often suggested by theory); β is the coefficient of interest to me.¹³

In a first exercise, I explore whether the standard OCA criteria help to explain the differences in the relative growth performance of countries that have entered a monetary union. I begin with a simple measure of bilateral trade integration: the share of trade with the prospective partner country in the joining country's total trade. In my sample, this measure ranges from 0 to 67 percent (for the pair Bahamas-US), with a mean value of 7.3 percent. As shown in the first column of table 5, the effect on the relative growth performance is essentially zero. The estimated coefficient on this trade variable is statistically insignificant so that there is basically no evidence for the OCA hypothesis that entering countries benefit from particularly close trade ties with the anchor country. Moreover, the results remain practically unchanged when I additionally control for the entering country's level of trade openness by using the share of bilateral trade in the joining country's GDP. In summary, bilateral trade

¹² The approach is close in style to Hausmann, Lant Pritchett and Dani Rodrik's (2004) method to identify growth accelerations.

¹³ In view of the small sample size, I usually do not include additional control variables.

intensity prior to monetary unification appears to be no important precondition for successful monetary integration.

The results are somewhat stronger for the measures of business cycle synchronization. Following the literature (Rose and Engel [2002]), I experiment with two different measures of business cycle similarity, the pair-wise correlation of deviations from the country's mean output growth rate (before entry into monetary union) and the pair-wise correlation of deviations from the country's trend output growth rate; the correlation coefficient for the two alternative measures is 0.62. For both measures, the estimated coefficients are consistently positive and, in some specifications, statistically significant at conventional levels of confidence. Moreover, the estimates slightly improve when (to check robustness) the outliers in the performance measures are dropped (results are not reported).

Taken together, the empirical findings are not very encouraging for the OCA hypotheses.¹⁴ Based on the experience of currency union entries in the post-war period, I find that trade intensity with the anchor/currency union partner country is largely irrelevant for the subsequent growth performance of the country that abandons its national currency while there is at best only weak evidence that the commonality of shocks improves macroeconomic performance.

In a next step, I test the stabilization or nominal anchor hypothesis of currency union formation. Do countries with high inflation benefit most strongly from the adoption of another (stable) currency? The estimation results, presented in table 6, suggest the opposite: the relative growth performance of a currency union entrant clearly seems to improve with lower inflation, a smaller inflation differential and less inflation variability. A closer examination of the underlying raw data, however, shows that the sample includes two countries with particularly high rates of inflation; Guinea-Bissau and Ecuador experienced inflation rates in excess of 45 percent before they entered a currency union. For all other countries in the sample, inflation is lower by almost an order of magnitude, as illustrated in figure 1.¹⁵ Therefore, to explore the sensitivity of the estimates, I reestimated the regressions when the high-inflation countries are dropped. For this perturbation, as shown in the bottom half of table 6, the estimated coefficients generally lose significance and sometimes even change sign. More generally then, I find no convincing evidence that inflation rates affect the success of monetary integration. [Parenthetically, I note that the relative growth performance of the

¹⁴ I have no data on labor market flexibility.

¹⁵ Figure 1 also nicely illustrates the striking pattern of inflation convergence across European countries before the decision on membership in EMU was made and inflation divergence afterwards; see Patrick Honohan and Philipp Lane (2003) for a discussion.

high-inflation countries varies sizably, with Ecuador being a highly successful dollarizer while Guinea-Bissau showed the by far worst macroeconomic performance of all currency union entrants (as noted above; see table 4). However, since Guinea-Bissau joined a multilateral monetary union with 13 member countries, this experience entered with a much larger weight in my regressions.]

Given the generally negative results for convergence in the variables suggested by theory, perhaps other factors affect the outcome of monetary unification. A first set of potential candidates are the Maastricht criteria which have to be formally met by countries that are willing to join EMU. Apart from price stability (for which I already found no measurable effect on the performance of the entering country), these conditions include exchange rate stability and fiscal prudence.

Table 7 suggests that the evidence on these variables is mixed. On the one hand, exchange rate stability appears to be completely irrelevant for the success of monetary integration; the coefficient on various measures of exchange rate volatility is, if anything, positive, suggesting that countries that face large exchange rate fluctuations tend to benefit most strongly from currency union entry. As shown in figure 2, Ecuador, one of the best performing entrants, experienced a large devaluation before currency union entry.

On the other hand, the results seem to be more supportive for fiscal conditions. The coefficients take on the expected sign and are often statistically different from zero: a positive budget balance and lower debt levels seem to be associated with improved macroeconomic performance. There are two caveats, however, to these results. First, the threshold levels that are defined in the Treaty of Maastricht (i.e., that countries are required to keep the deficit below 3 percent of GDP and to maintain a debt level below 60 percent of GDP) are of no measurable importance for monetary integration; the coefficient on a dummy variable for compliance with these criteria is highly insignificant. Second, the results appear to be affected by an outlier; Guinea-Bissau entered the CFA franc zone in serious fiscal disorder with a budget deficit of -12.2 percent of GDP and a debt-to-GDP ratio of 319.1 percent. When Guinea-Bissau is dropped from the sample, the coefficients generally lose significance and often change sign.

Finally, I explore a diverse set of other variables that are occasionally found to be important for the sustainability of exchange rate regimes. For most of these variables, the estimated effect on the entering country is close to zero, with one exception: the coefficient on the import growth differential is significantly negative. This finding, however, which suggests

that large pair-wise differences in the import growth rate are typically associated with a worse macroeconomic performance of the entering country, is probably due to simultaneity.

VI. Robustness

To check the robustness of the (generally negative) results, I perform extensive sensitivity analyses. None of the perturbations, however, sizably affects the main findings.

For instance, I have increased sample size by additionally including currency boards, thereby also covering moves to another (very) hard exchange rate regime. Table 9 lists the episodes in which countries have introduced a currency board arrangement in the sample period. Not surprisingly, the results are basically unchanged; the number of additional observations is rather small. Moreover, the estimates (unreported here to save space) are, if anything, even somewhat weaker for the benefits of pre-entry convergence hypothesis since most of the (unilateral) moves to a currency board are exercises of (successful) stabilization. I have also experimented with extending the sample by making better use of the time series dimension of the data, but without much success.

Another potential issue is the large heterogeneity in the sample. In principle, it could be argued that convergence is more important for multilateral currency unions, in which all member countries have a say, than for unilateral dollarization. Seeking to avoid negative consequences for themselves, incumbents in multilateral unions typically have a much stronger incentive to impose entry criteria on candidates than anchor countries. However, if I control for this difference in the type of monetary union, the results remain largely unaffected (mainly because of non-convergence of entrants to the CFA franc zone).

Finally, I substitute inflation for economic growth as performance measure. However, given the large positive correlation between the two measures (of 0.79 and 0.45 for the change in the entrants' performance and the difference in performance to existing members/anchor countries, respectively), the effect on the results is again negligible.

VII. Conclusions

In this paper, I analyze post-war experiences of currency union formation to identify possible factors that affect the feasibility of sharing a common currency. The economic performance of countries that have entered a monetary union differs widely, both relative to the period before they have abandoned their national currency and to the experience of the

anchor country. I am unable, however, to find evidence that there are useful pre-requisites for monetary integration. Neither conditions suggested by theory (OCA) nor those implemented by policy-makers (Treaty of Maastricht) appear to affect the success of monetary unification. This result generally supports the claim by Hausmann and Powell (1999) that there are almost no pre-conditions for monetary integration, noting (p. 5) that “minimum technical requirements [for dollarization] are few.”

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Figure 1: Inflation Rates

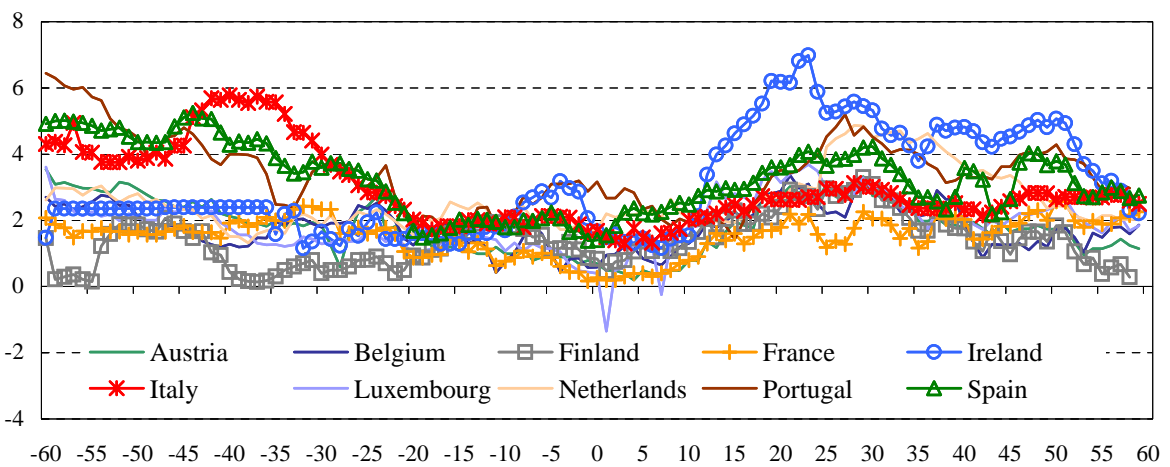
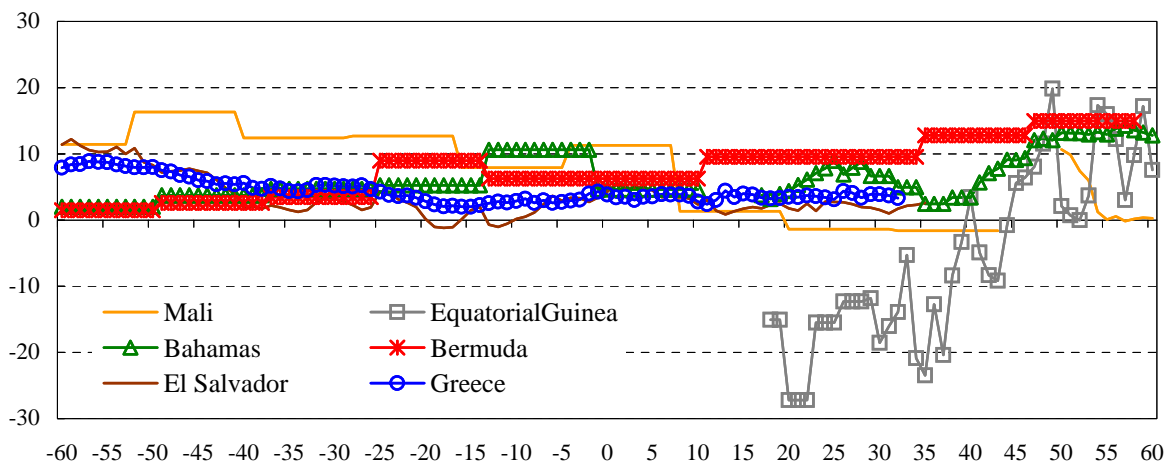
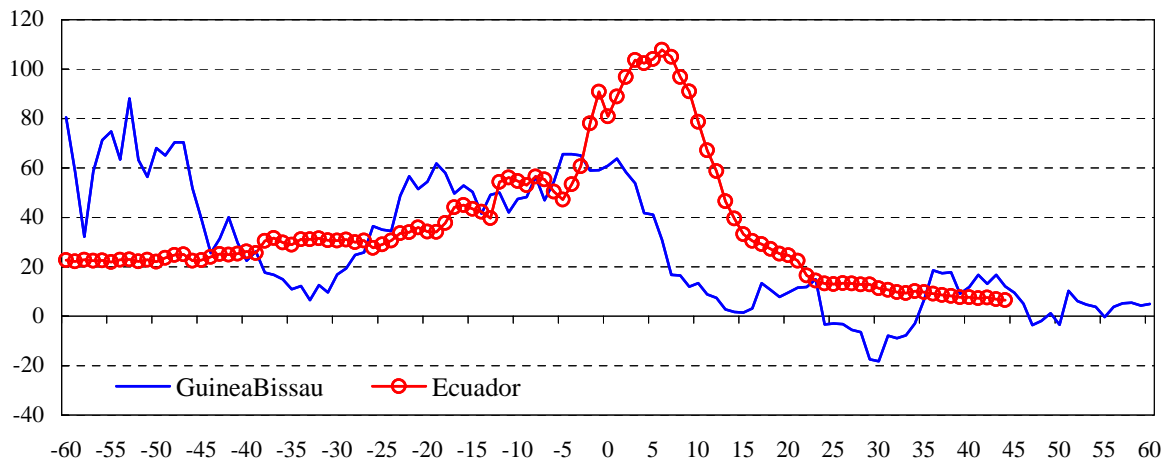
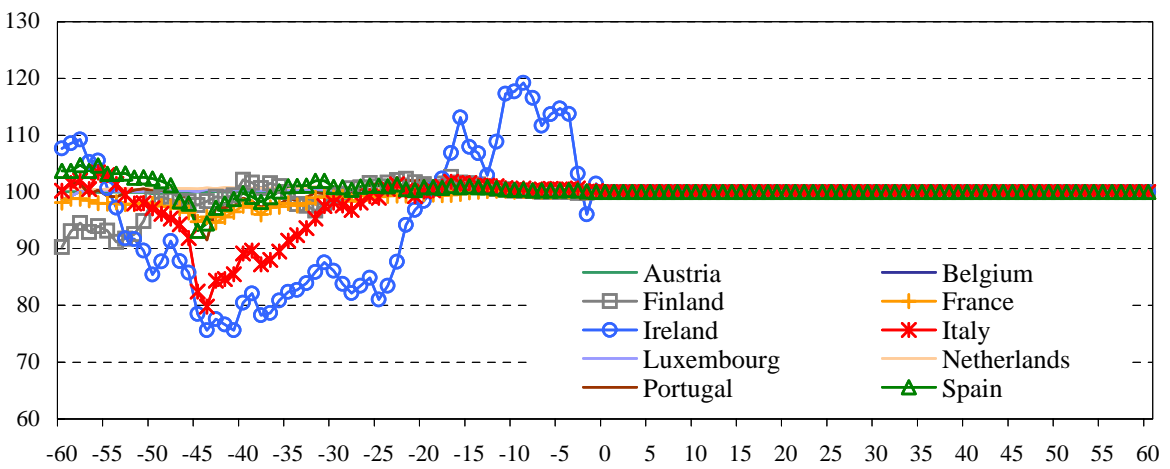
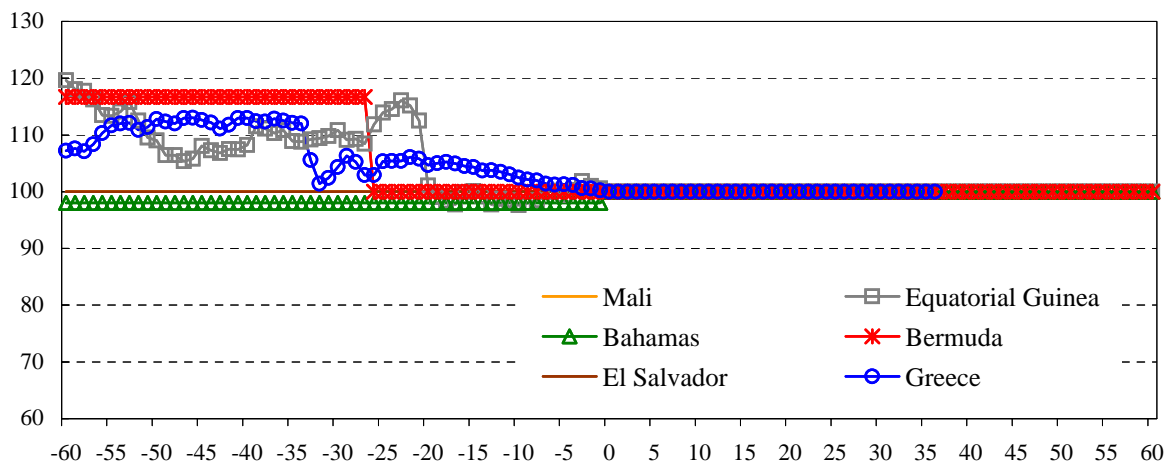
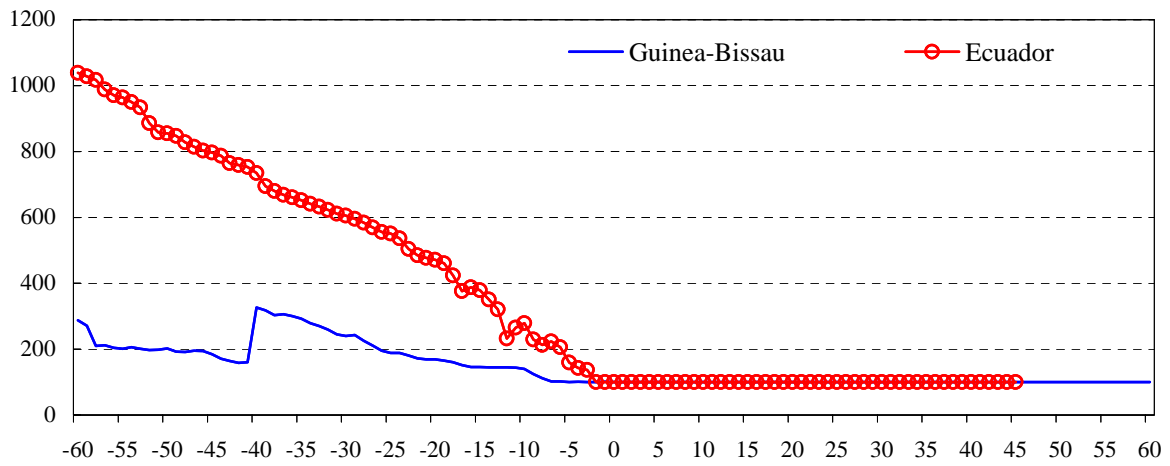


Figure 2: Nominal Exchange Rates



Note: The base of the index is 100 for the month prior to currency union entry.

Table 1: Currency Union Entries in Sample

Countries that have entered a currency union after 1945 (date of entry):	Existing currency union members / Anchor countries
Equatorial Guinea (August 27, 1984) Guinea-Bissau (May 2, 1997) Mali (June 1, 1984)	Benin Burkina Faso Cote d'Ivoire Niger Senegal Togo Cameroon Central African Republic Chad Congo, Rep. Gabon
The Bahamas (February, 1970) Bermuda (February 6, 1970) Ecuador (March 13, 2000) El Salvador (January 1, 2001)	United States Panama
Greece (January 1, 2001)	Austria Belgium Finland France Germany Ireland Italy Luxembourg Netherlands Portugal Spain
Austria (January 1, 1999) Belgium (January 1, 1999) Finland (January 1, 1999) France (January 1, 1999) Ireland (January 1, 1999) Italy (January 1, 1999) Luxembourg (January 1, 1999) Netherlands (January 1, 1999) Portugal (January 1, 1999) Spain (January 1, 1999)	Germany

Table 2: Characterizing Currency Union Entrants

Variable:	CU entrant			Existing CU member			Test of equality (p-value)
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	
Population (thousands)	68	7,280.7	10,873.2	68	33,439.9	59,842.7	0.00
Land area (sqkm)	68	274,759.5	432,069.7	68	874,895.1	2,115,092	0.03
Real GDP per capita (\$)	60	7,112.4	8,522.8	60	10,258.3	10,936.2	0.00
Real GDP growth (%)	64	3.80	3.17	64	3.69	6.90	0.91
Inflation (%)	55	13.25	20.98	55	4.30	4.99	0.00
M2/GDP (%)	32	29.96	27.43	32	31.00	21.26	0.61
Exports/GDP (%)	48	24.01	19.40	48	35.41	23.79	0.02
Imports/GDP (%)	49	34.22	12.45	49	38.85	26.30	0.30
Export growth (%)	59	0.09	16.37	59	16.90	63.99	0.07
Import growth (%)	59	-11.01	24.26	59	12.11	85.59	0.06
Current account/GDP (%)	49	-6.36	8.02	49	-6.52	20.32	0.96
FDI/GDP (%)	19	1.91	2.79	19	1.40	1.06	0.37
Private capital flows/GDP (%)	19	15.82	30.98	19	13.16	11.16	0.66
Budget deficit/GDP (%)	43	-5.02	4.33	43	-1.14	2.35	0.00
Government debt/GDP (%)	35	137.05	104.15	35	68.99	28.25	0.00

Maximum sample size = 68

Table 3: Is There Convergence Before Currency Union Entry?

Dependent variable:	Five-year period before entry				Three-year period before entry			
	Coeff.	Std. Err.	Obs.	R ²	Coeff.	Std. Err.	Obs.	R ²
Real GDP growth	0.05	0.19	318	0.31	0.17	0.45	192	0.27
Inflation	-1.96**	0.37	275	0.72	2.94**	0.88	165	0.64
M2/GDP	-0.27#	0.16	200	0.95	0.23	0.31	102	0.94
Exports/GDP	-0.22	0.44	240	0.85	0.98	0.46	142	0.97
Imports/GDP	-0.38	0.61	243	0.69	0.68	0.74	145	0.91
Export growth	-12.03*	4.85	314	0.28	-9.35*	4.01	190	0.43
Import growth	0.73	1.80	318	0.27	-7.08#	4.26	192	0.39
Export duties	-0.32	0.10	87	0.67	-0.69**	0.12	37	0.88
Import duties	-0.90**	0.29	86	0.87	-0.31	0.46	37	0.94
Current account/GDP	-0.37	0.47	236	0.50	0.58	0.98	136	0.51
FDI/GDP	0.08	0.05	134	0.85	0.06	0.17	68	0.84
Private capital flows/GDP	1.72*	0.83	134	0.97	0.95	1.83	68	0.81
Budget deficit/GDP	-0.33*	0.14	194	0.29	0.44	0.33	128	0.25
Government debt/GDP	-1.87**	0.58	147	0.99	-3.55**	1.14	100	0.99
Bilateral exchange rate	6.98	5.28	340	0.01	17.51	12.87	204	0.01

Notes:

The table reports country-pair fixed effects OLS estimates of ϕ_1 from

$$\text{DepVar}_{i,j,t} = \phi_0 + \phi_1 \text{ Time trend} + \varepsilon$$

where $\text{DepVar}_{i,j,t}$ is the absolute difference in the variable of interest between currency union entrant i and existing member country j at time t . For bilateral exchange rate, $\text{DepVar}_{i,j,t}$ is the absolute percentage change in the nominal bilateral exchange rate.

Intercepts are not reported. **, * and # denote significant at the 1, 5 and 10 percent level, respectively.

Table 4: Performance Measures**Growth differential between CU entrant and CU member**

(difference in average real GDP growth rate five years after CU entry)

Five best performing entrants

CU entrant	Anchor/CU member country	GDP growth entrant	GDP growth member	Growth differential
Ireland	Germany	8.75	1.46	7.29
Ecuador	Bermuda	4.27	-0.43	4.70
Mali	Congo, Rep.	4.58	1.17	3.41
Luxembourg	Germany	4.85	1.46	3.39
Greece	Belgium	3.97	0.68	3.29

Five worst performing entrants

CU entrant	Anchor/CU member country	GDP growth entrant	GDP growth member	Growth differential
Guinea-Bissau	Equatorial Guinea	-1.27	33.43	-34.70
The Bahamas	Panama	-5.17	3.53	-8.70
The Bahamas	United States	-5.17	2.34	-7.51
Guinea-Bissau	Mali	-1.27	4.48	-5.75
Guinea-Bissau	Cote d'Ivoire/Chad	-1.27	4.10	-5.38

Change in average growth rate of CU entrant

(difference between average real GDP growth rate five years after and five years before CU entry)

Five best performing entrants

	GDP growth before entry	GDP growth after enter	Change in growth rate
Ecuador	0.17	4.27	4.10
Mali	0.54	4.58	4.04
Belgium	1.93	3.86	1.93
Spain	1.95	3.50	1.55
Portugal	2.13	3.55	1.42

Five worst performing entrants

CU entrant	GDP growth before entry	GDP growth after enter	Change in growth rate
Guinea-Bissau	4.36	-1.27	-5.63
El Salvador	3.91	1.97	-1.94
Netherlands	3.45	2.55	-0.90
Equatorial Guinea	2.56	1.99	-0.58
Finland	3.38	2.93	-0.45

Table 5: Do OCA Criteria Matter?

	Growth differential after entry							
Share of bilateral trade in entrant's total trade	-0.003 (0.051)				0.06 (0.06)	0.03 (0.04)		
Share of bilateral trade in entrant's GDP		0.003 (0.002)					0.002 (0.002)	0.001 (0.001)
Correlation of de-measured GDP growth rates			2.42 (2.18)		0.95 (2.08)		0.49 (2.51)	
Correlation of de-trended GDP growth rates				3.48# (1.93)		2.42* (1.05)		2.70 (1.75)
Obs.	60	47	64	58	58	58	47	47
R ²	0.00	0.10	0.02	0.12	0.07	0.22	0.10	0.24

	Change in entrant's GDP growth rate							
Share of bilateral trade in entrant's total trade	0.04 (0.07)				0.06 (0.07)	0.02 (0.05)		
Share of bilateral trade in entrant's GDP		0.001 (0.003)					0.002 (0.003)	0.001 (0.002)
Correlation of de-measured GDP growth rates			-0.37 (1.61)		-1.66 (1.70)		-2.03 (2.01)	
Correlation of de-trended GDP growth rates				1.65 (1.37)		1.48 (1.15)		1.87 (2.21)
Obs.	58	47	64	58	58	58	47	47
R ²	0.02	0.02	0.00	0.02	0.04	0.06	0.04	0.07

Table 6: Do High Inflation Countries Benefit from Currency Union Entry?Full sample

	Growth differential after entry			Change in entrant's GDP growth rate		
	Coeff.	Obs.	R ²	Coeff.	Obs.	R ²
Inflation in entering country	-0.13* (0.06)	57	0.22	-0.09 (0.07)	53	0.31
Inflation differential	-0.12** (0.04)	55	0.16	-0.11 (0.07)	51	0.37
Inflation variability in entering country	-0.25** (0.04)	57	0.29	-0.24** (0.04)	53	0.64
Difference in inflation variability	-0.25** (0.04)	57	0.20	-0.27** (0.05)	53	0.62

Drop high inflation countries (inflation >40%)

	Growth differential after entry			Change in entrant's GDP growth rate		
	Coeff.	Obs.	R ²	Coeff.	Obs.	R ²
Inflation in entering country	-0.24 (0.31)	40	0.07	0.62** (0.07)	36	0.85
Inflation differential	-0.30 (0.30)	39	0.09	0.002 (0.10)	35	0.00
Inflation variability in entering country	0.60 (0.58)	40	0.12	-0.46 (0.46)	36	0.09
Difference in inflation variability	-0.04 (0.11)	40	0.00	-0.36** (0.08)	36	0.35

Notes: In the second sample, the two high-inflation countries (inflation >40%) Guinea-Bissau and Ecuador are dropped.

Table 7: Do the Maastricht Criteria Matter for the Success of Monetary Integration?

Full Sample

		Growth differential after entry			Change in entrant's GDP growth rate		
		Coeff.	Obs.	R ²	Coeff.	Obs.	R ²
Exchange rate conditions	Average yearly percentage change in bilateral exchange rate (2 years before entry)	0.04* (0.02)	68	0.01	0.01 (0.02)	64	0.00
	Standard deviation of bilateral exchange rate (2 years before entry)	0.68# (0.35)	68	0.02	1.05* (0.37)	64	0.12
	Dummy for yearly percentage change in bilateral exchange rate <15%	2.21 (3.12)	68	0.04	2.79 (2.64)	64	0.17
Fiscal conditions	Deficit/GDP in entering country	0.74** (0.16)	53	0.33	0.48# (0.25)	53	0.32
	Deficit/GDP (difference)	0.49** (0.08)	43	0.47	0.38 (0.23)	43	0.23
	Dummy for entrant's deficit/GDP ratio <3%	3.83 (2.65)	53	0.11	0.76 (3.04)	53	0.01
	Debt/GDP in entering country	-0.03** (0.004)	53	0.37	-0.03** (0.005)	53	0.67
	Debt/GDP (difference)	-0.03** (0.004)	35	0.61	-0.03** (0.005)	35	0.64
	Dummy for entrant's debt/GDP ratio <3%	1.29 (2.21)	53	0.01	-0.70 (2.20)	53	0.00

Drop Guinea-Bissau, a country in extreme fiscal disorder

		Growth differential after entry			Change in entrant's GDP growth rate		
		Coeff.	Obs.	R ²	Coeff.	Obs.	R ²
Fiscal conditions	Deficit/GDP in entering country	0.10 (0.12)	40	0.02	-0.57** (0.08)	40	0.56
	Deficit/GDP (difference)	0.23# (0.12)	34	0.12	-0.38** (0.10)	34	0.30
	Dummy for entrant's deficit/GDP ratio <3%	0.24 (0.53)	40	0.00	-3.28** (0.65)	40	0.67
	Debt/GDP in entering country	0.01 (0.01)	40	0.04	0.02 (0.02)	40	0.11
	Debt/GDP (difference)	0.0004 (0.01)	27	0.00	0.01 (0.01)	27	0.05
	Dummy for entrant's debt/GDP ratio <3%	-1.21 (0.78)	40	0.07	-3.02 (1.15)	40	0.37

Table 8: Do Other Criteria Affect the Success of Monetary Integration?

	Growth differential after entry			Change in entrant's GDP growth rate		
	Coeff.	Obs.	R ²	Coeff.	Obs.	R ²
Log of real GDP per capita (difference)	-0.12 (0.61)	60	0.00	-0.31 (0.69)	60	0.00
M2/GDP (difference)	0.06 (0.05)	32	0.01	0.08 (0.08)	32	0.04
Exports/GDP (difference)	0.06 (0.05)	48	0.10	0.02 (0.02)	48	0.02
Imports/GDP (difference)	0.10 (0.06)	49	0.29	0.02 (0.01)	49	0.02
Exports growth (difference)	0.06 (0.04)	64	0.22	0.03 (0.02)	62	0.15
Imports growth (difference)	0.06** (0.01)	64	0.63	0.02** (0.01)	62	0.19
Current account/GDP (difference)	-0.19** (0.02)	49	0.44	-0.003 (0.011)	49	0.00
FDI/GDP (difference)	0.005 (0.151)	19	0.00	-0.55** (0.06)	19	0.54
Private capital flows/GDP (difference)	0.04** (0.01)	19	0.50	-0.02 (0.01)	19	0.08

Table 9: Currency Board Entries

Countries that have adopted a currency board after 1945 (date of entry): Anchor countries

Argentina (April 1, 1991)	United States
Bosnia (August 12, 1997)	Germany
Bulgaria (July 1, 1997)	Germany
Cayman Islands (May 1, 1972)	United States
Estonia (June 20, 1992)	Germany
Hong Kong (October 17, 1983)	United States
Lithuania (April 1, 1994)	United States
Lithuania (February 2, 2002)	Germany
