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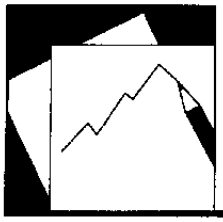

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Determinants of the Choice of Exchange Rate Regimes in Six Central American Countries: An Empirical Analysis

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Determinants of the Choice of Exchange Rate Regimes in Six Central American Countries: An Empirical Analysis

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Abstract

This paper examines whether decisions about the appropriate exchange rate regime in six Central American countries were based on longer-run economic fundamentals or on the confluence of historical and political circumstances. To uncover any actual relationship both across countries and across time, we estimate several probit and multinomial logit models of exchange rate regime choice with data spanning the period 1974–2001. We find that theoretical long-run determinants, such as trade openness, export share with the major trading partner, economic size, and per capita income, are adequate, but not robust, predictors of exchange rate regime choice. However, we were not able to establish a statistically significant association between the terms of trade fluctuations or capital account openness and a particular regime in any specification using our sample.

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I. INTRODUCTION

The question of why some developing countries adopt fixed exchange rate regimes while others opt for more flexible systems has long been debated in international economics (Dreyer, 1978; Melvin, 1985; Bosco, 1987; Aghevli and others, 1991; Collins, 1996; and Edwards and Savastano, 1999). The optimum currency area (OCA) theory first tried to answer this question by theoretically analyzing possible long-term economic fundamental determinants in the choice of an exchange rate regime, like trade openness and economic size (Mundell, 1961; McKinnon, 1963). In this vein, financial market considerations, like the openness of the capital account and the structure of the foreign exchange and capital markets, subsequently gained some prominence (Frankel, 1995; Edwards, 1996; and Hausmann and others, 2001). Then, several hypotheses stressing various institutional, historical, and political characteristics, like the independence of the central bank and political stability, were developed as fresh views in identifying long-run determinants of exchange rate regime choice (Tornell and Velasco, 1995; Cukierman and others, 1992; Berger, Sturm, and de Haan, 2000).

Meanwhile, many empirical studies employed additional macroeconomic variables, such as the level of a country's indebtedness and reserves, in an attempt to validate these theories without, however, being able to present conclusive evidence on any universally dominant set of determinants (Honkapohja and Pikkarainen, 1994; and Juhn and Mauro, 2002). Drawing on a large dataset of countries and utilizing many potential explanatory variables and a variety of exchange rate regime classifications, Juhn and Mauro summarize their findings by noting that "no robust empirical regularities" can emerge on how countries choose their exchange rate regimes. Nevertheless, a few studies have discovered some meaningful relationships, often based on a social-welfare-function maximization framework (Berger, Sturm, and de Haan, 2000).

The issue of exchange rate regime choice has also been analyzed from the point of view of their economic consequences and policy requirements to maintain a regime (Edison and Melvin, 1990; Ghosh and others, 1997). Many recent studies have argued that the possible economic advantages are increasing with the switch to more flexible systems. For example, Collins (1996) states that "countries which experience large foreign real shocks should choose flexible exchange rates." Other studies have emphasized the trade-off between credibility and flexibility (Milesi-Ferretti, 1995; Frankel, 1996; Edwards, 1996; and Berger, Jensen, and Schjelderup, 2001).[2] According to this argument, a flexible regime allows a country to have an independent monetary policy, providing the flexibility to accommodate domestic and foreign shocks, while a fixed exchange rate regime reduces the degree of flexibility to accommodate such shocks but imparts a higher degree of credibility (Giavazzi and Pagano, 1988; Mendoza, 2001). Furthermore, other researchers argue that a flexible

[2] Moreover, Tornell and Velasco (1995) argue that an exchange rate regime can be thought of as a mechanism to allocate intertemporally the burden of the inflation tax.

exchange rate system has advantages from a political-economy point of view, as flexible rates lower the political costs of exchange rate changes (Edwards and Savastano, 1999).[3]

The wide range of exchange rate regimes adopted by Central American countries has intrigued many researchers (Collins, 1996; Dornbusch, 2001; Corbo, 2001; Papaioannou, 2002; and Mercer-Blackman, Offerdal, and Rennhack, 2002). These countries are small in economic size, have a low level of export diversification, and exhibit strong trade integration with the U.S. economy. In 2001, the United States was their largest export partner, with the share of their exports going to the United States ranging from about 45 percent for Costa Rica to 70 percent for Honduras. These common structural characteristics would lend support to the hypothesis that these countries should peg to the U.S. dollar (Dornbusch, 2001; and Corbo, 2001). However, only El Salvador and Panama are currently dollarized economies, while Costa Rica, Honduras, and Nicaragua have crawling peg regimes in place and Guatemala has adopted a floating rate. Nevertheless, the choice of exchange rate regime in the latter four countries has been found to be generally consistent with their long-term macroeconomic fundamentals at the time they adopted the corresponding regime and in line with the practice of a large number of developing countries (Papaioannou, 2002; and Mercer-Blackman, Offerdal, and Rennhack, 2002).

This study attempts to uncover possible systematic relationships between the choice of an exchange rate regime by the six Central American countries and some traditional determinants proposed in the existing literature. By utilizing the IMF's exchange rate regime classification as declared by countries,[4] we estimate several probit and multinominal logit models of various specifications of the traditional OCA theory and of newer hypotheses of exchange rate regime choice for the 1974–2001 period. Our results indicate that many theoretical long-run determinants proposed by the OCA theory seem to adequately determine the exchange rate regime choice of these countries, in broad conformity with the results of Mercer-Blackman, Offerdal, and Rennhack (2002) but in contrast to the findings of some other recent studies (Juhn and Mauro, 2002). Although not robust in all specifications, high trade openness, export share with the major trading partner, and economic size are found to be less likely to be associated with pegs and more likely to be associated with floating rates or crawling pegs. However, other traditional explanatory variables, like terms of trade fluctuations and capital account openness, cannot adequately explain the choice of the exchange rate regime by these countries. Moreover, the unexplained portion of the dependent variable variance in some specifications suggests that characteristics besides to those considered here, like the specific institutional and political conditions prevailing at the time of entering in to a particular exchange rate arrangement, may have played an important role in determining these countries' exchange rate regime choices during this period.

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[3] See also, Aghevli and others, 1991; Collins, 1996; Edwards, 1996; Blomberg and Hess; 1997; and Klein and Marion, 1997.

[4] The de jure exchange rate classification may of course, differ from the de facto classification (IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*, 2001; Levy-Yeyati and Sturzenegger, 2001; Bubula and Otker-Robe, 2002; Reinhart and Rogoff, 2002).

The remainder of the paper is organized as follows: Section II briefly reviews the main theories of exchange rate choice and presents some of the available empirical evidence. Section III discusses the sources, definitions, and basic diagnostics of the data used in our analysis and outlines the methodology. Section IV provides a discussion of the results, and Section V offers a summary and some concluding comments.

II. Exchange Rate Regime Choice: Theory and Evidence

The three main hypotheses of exchange rate regime choice that have been proposed in the literarure are the optimum currency area theory, the capital account openness hypothesis and the institutional and historical characteristics hypothesis.

A. Optimum Currency Area Theory

The OCA theory, which originates in Mundell (1961), has been presented in several forms in the literature (Ricci, 1997). In essence, it relates the choice of an exchange rate regime to some long-run determinants that are relatively stable over time. The original form of the optimum currency area theory argues that low openness and large size of an economy should favor floating exchange rates (Mundell, 1961; McKinnon, 1963). Subsequent versions of this theory emphasized the size and nature of economic shocks as potential determinants of exchange rate regime choice (Fischer, 1977; Marston, 1981). The potential impact of some of these variables has been actively debated in the literature on, mostly, theoretical grounds. For example, while some authors argue that openness may provide an incentive to maintain fixed rates (Edwards, 1996; Corden, 2002), others point out that foreign shocks are more important in countries that are more open, increasing the appeal of floating rates as a shock absorber Eichengreen and Masson, 1998; Mussa and others, 2000). In particular, higher volatility of terms of trade is likely to favor floating rate regimes as they can help cushion temporary real external shocks. Other authors argue that higher openness provides greater scope for a deep foreign exchange market, making it easier to have a floating regime. Furthermore, it has been argued that openness itself might be endogenous to the exchange rate regime, raising doubts on whether an association between openness and fixed exchange rate regimes could be given an unambiguous casual interpretation (Juhn and Mauro, 2002).

Most empirical studies trying to analyze the impact of explanatory variables on observed exchange rate regime choice have considered many of the optimum currency area variables. These variables include openness (typically measured as imports plus exports divided by GDP), the size of the economy (GDP in common currency), the degree of economic development (GDP per capita) and geographical concentration of trade (the share of trade with the country's main partner) (Heller, 1978; Dreyer, 1978; Holden, Holden and Suss, 1979; Melvin, 1985; Savvides, 1990; Honkapohja and Pikkarainen, 1994; Collins, 1996; Edwards, 1996 and 1999; Rizzo, 1998; Poirson, 2001; Berger, Sturm and de Haan, 2000).

To assess the importance of such long-run determinants, most studies rely on cross-country regressions. Various studies have produced significantly different results for each such determinant depending on the sample of countries, period analyzed, estimation method, exchange rate regime classification, and other determinants included in the estimation. The

majority of empirical results confirm that most of these determinants play an ambiguous role in explaining how countries choose their exchange rate regimes. In particular, openness—the most frequently analyzed variable—is found to be significantly associated with floating regimes by three relatively recent studies (Collins, 1996; Rizzo, 1998; Berger, Sturm and de Haan, 2000), significantly associated with fixed exchange rates with three older studies (Dreyer, 1978; Holden, Holden and Suss, 1979; Honkapohja and Pikkarainen, 1994), and not significantly associated with any particular exchange rate regime by another three older and one recent study (Heller, 1978; Melvin, 1985; Savvides, 1990; Poirson, 2001). Per capita GDP, measuring general economic development, is found to be significantly associated with floating regimes by three studies (Holden, Holden and Suss, 1979; Savvides, 1990; Edwards, 1996), significantly associated with fixed exchange rates by two studies (Honkapohja and Pikkarainen, 1994; Edwards, 1999), and not significantly associated with any particular exchange rate regime by another three studies (Collins, 1996; Rizzo, 1998; Poirson, 2001).

There are, however, a few determinants that appear to generate relatively robust estimation results with respect to the choice of an exchange rate regime. Thus, the size of the economy, measured by nominal GDP in U.S. dollars,[5] turns out to be positively and significantly associated with floating exchange rates in many studies (Melvin, 1985; Collins, 1996; Rizzo, 1998; Poirson, 2001) or positively but not significantly associated with floating (Heller, 1978; Dreyer, 1978; Honkapohja and Pikkarainen, 1994). Moreover, Honkapohja and Pikkarainen (1994) found tentative support for the view that small countries with low commodity diversification of foreign trade tend to peg their exhange rates as a way to avoid excessive real exchange rate volatility. In addition, inflation, measured by the simple rate of change of CPI (not the logarithm or a similar transformation), is almost always positively and significantly associated with floating exchange rates (Collins, 1996; Edwards, 1996 and 1999; Rizzo, 1998; Poirson, 2001). Moreover, Collins (1996) finds that high inflation significantly affects exchange rate regime choice in the opposite direction than low/moderate inflation does. Also, when the simple inflation differential is used, it tends to be positively and signifiantly associated with floating rates (Holden, Holden and Suss, 1979), or not significantly (Heller, 1978; Melvin, 1985). However, using inflation as an explanatory variable in the exchange rate regime choice raises the issue of possible reverse causality. That is, causality might run in both directions: high inflation may make it difficult to sustain an exchange rate peg, but an exchange rate peg (especially hard pegs) might also help to curb inflation. A similar issue can be raised for foreign exchange reserves. The causality does not run only from reserves to exchange rate regimes, since countries that decide to float will not need large reserves.

Furthermore, several volatility variables have been found to be associated with floating exchange rates. Thus, variables related to the terms of trade volatility turn out to be positively and significantly associated with floating regimes (Rizzo, 1998; Poirson, 2001) or positively but not significantly associated (Honkapohja and Pikkarainen, 1994). In addition, the variability in export growth is shown to exhibit a positive significant association with

[5] As a proxy for financial market development, this measure may not always be a good approximation.

floating rates (Edwards, 1996) or a positive but not significant association (Edwards, 1999), while a variable relating to external variability times openness is negatively and significantly associated with floating rates (Edwards, 1996 and 1999). It should be noted that the issue of possible endogeneity of these volatilities to the exchange rate system arises, as theory suggests that a floating exchange rate regime operates as a shock absorber. The real exchange rate volatility is found to be positively and significantly associated with floating rates (Savvides, 1990; Edwards, 1996 and 1999).

Overall, this brief review of the OCA literature reveals the lack of robustness in the empirical findings with regard to the impact of various theoretical determinants in choosing an exchange rate regime. Especially, country characteristics such as openness, development, and geographical diversification of trade have little power in explaining exchange rate regime choice.

B. Capital Account Openness Hypothesis

In the 1990s, several studies looked at capital market factors as potential determinants of the exchange rate regime choice. The working hypothesis of these studies is that increased capital mobility, i.e., countries with an open capital account, prompts these countries to move toward either hard pegs, such as currency unions and currency boards, or pure floats (Obstfeld and Rogoff, 1995; Eichengreen, 1994; Fischer, 2001). This view is predicated on the implied consequences, in terms of the more stringent policy requirements, to maintaining exchange rate pegs.

To test this hypothesis, common measures of capital account openness that have been proposed as explanatory variables of the exchange rate regime choice are the de facto capital openness, measured by the ratio of private capital inflows and outflows to GDP, and capital controls (typically also drawn or constructed from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*). Some studies in the capital mobility tradition include also as an indicator of de facto capital openness the ratio of foreign asset of the banking system to the money supply (Holden, Holden, and Suss, 1979; Savvides, 1990; Edwards, 1996; and Poirson, 2001). However, while capital controls might make it easier to sustain a fixed exchange rate regime,[6] they may not be needed by countries with hard pegs.

C. Institutional and Historical Characteristics Hypothesis

Another set of potential long-run determinants of exchange rate regime choice relates to the institutional and historical characteristics of a country. For example, lack of institutional strength or political instability may make it more difficult to sustain a peg, but may also increase the attractiveness of tying one's hands through a currency board, as was done by countries with a history of high inflation (Berger, Sturm, and Schjelderup, 2001). However, a currency board without the appropriate fiscal institutions would not be sufficient to credibly

[6] In general, such capital flows are assumed to be temporary in nature and effective (Dooley, 1996).

tie one's hands (Milesi-Ferretti, 1994; Tornell and Velasco, 1995). By adopting a credible hard peg, a country's inflationary bias would theoretically converge to the relatively lower bias of the stable reserve-currency country, and thus a possible credibility gain would be realized. However, a country's inflationary bias would be lower and, therefore, the credibility gain would decrease if monetary policy was conducted by a conservative and independent central bank. Then, the attractiveness of a pegging regime would be lowered as the degree of conservatism and independence of the central bank increases (Rogoff, 1985). Most empirical studies in the institutional and historical characteristics tradition have considered variables related to political economy or institutional strength, including political instability, central bank independence, and government characteristics (Edwards, 1996 and 1999; Berger, Sturm, and de Haan, 2000; Poirson, 2001). However, neither theory nor empirical findings have provided unambiguous answers so far.

Finally, several empirical studies have included other macroeconomic variables such as inflation (the country's own inflation, or inflation in excess of partner countries), foreign exchange reserves, measures of volatility of domestic output, exports, domestic credit, or the real exchange rate (Dreyer, 1978; Melvin, 1985; Savvides, 1990; Collins, 1996; Edwards 1996 and 1999; Rizzo, 1998; Berger, Sturm, and de Haan, 2000; Poirson, 2001) as potential determinants of the choice of an exchange rate regime. These studies have not generated any robust results either.

It should be noted that in identifying possible determinants in a government's decision to enter a specific exchange rate regime, the issues of exchange rate regime classification and multicollinearity among independent variables, as well as simultaneity problems, have drawn the attention of researchers as possible factors contributing to the inability to establish firm relationships.

III. Data Sources, Variable Definition, and Methodology

For our empirical analysis, we concentrate on the exchange rate regimes adopted by six Central American countries after the breakdown of the Bretton Woods system, i.e., during the 1974–2001 period. Unless indicated otherwise, all underlying data are from the International Financial Statistics (IFS) of the IMF series. Determinant variable names ending with "5" represent five-year backward-looking moving averages—which implies that the respective series start in 1969. Variable names ending with "l" represent lagged one-period series, while a "D" in the beginning of a name indicates that the variable is first differenced.

For our analysis, we employ the IMF's original classification of countries' self reporting, i.e., the "uncorrected" classification, drawn from IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*, as a measure of the official exchange rate regime choice (OERRCIMF). Other studies that have used this classification are Collins (1996); Edwards (1996); and Berger, Sturm, and de Haan (2000).

The issue of regime classification is of paramount importance for the validity of the empirical results on exchange rate regime choice. Two major concepts have been proposed to classify exchange rate regimes. First, the IMF's original classification of a country's institutional or

legal exchange rate framework, which is based on the member countries' self-declaration. The IMF compiles and publishes these data in its *Annual Report on Exchange Arrangements and Exchange Restrictions*. Second, a country's actual or de facto exchange rate behavior, which is often based on the country's realized exchange rate and reserve movements (Levy-Yeyati and Sturzenegger, 2001; Calvo and Reinhart, 2002; Reinhart and Rogoff, 2002). Also, the IMF has recently started incorporating its own evaluation of exchange rate regimes, thus correcting cases where the de facto system was considerably different than what had been reported by the authorities.

The IMF classifies each country into eight different categories concerning their exchange rate regime. For our purposes, to construct our dependent variable of official exchange rate regime choice, we define as (i) pegging countries those that peg to the U.S. dollar, including those with no separate legal tender, and (ii) nonpegging those with a broadly flexible exchange rate regime. As a variant to this grouping, we disaggregate nonpegging countries into (iii) crawling arrangements, including those with crawling peg or crawling band exchange rate systems, and (iv) floating countries, including independent floating and arranged floating exchange rate regimes. Based on IMF classifications for end-2000, Appendix I shows the six Central American countries with the periods during which they pegged, had adopted a floating regime or were using crawling peg systems.

The dependent variable OERRCIMF changes in the various probit and multinomial logit estimations depending on whether we are interested in examining pegging regimes versus all other arrangements (PEGIMF), or floating rates versus all other arrangements (FLOATIMF), or pegging regimes versus crawling peg arrangements (PEGCPAIMF). Thus, PEGIMF is set to one if a country has fixed its exchange rate against the U.S. dollar, and to zero if a country's currency is floating or adopts a crawling peg regime according to the IMF's original classification.[7] While this binary index reduces the original eight categories of exchange rate regimes in the IMF data to just two or three, it still has considerable variance. For the six countries in our sample between 1974 and 2001 we have 28 x 6 = 168 observations on PEGIMF, of which 64 percent (36 percent) fall into the pegging (nonpegging) exchange rate category (Table 2 of Appendix II). While the number of countries with fixed exchange rate regimes in this region seems to have been reduced over time, a number of countries have gone back and forth between regimes. The question is whether this variance can be explained by the variables proposed in the traditional OCA theory and/or the other hypotheses. Towards this end, our empirical investigation analyzes the explanatory power of a number of variables, which are briefly described in Table 1.[8]

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[7] Similarly, FLOATIMF equals 1 if the country is floating or 0 otherwise; and PEGCPAIMF is set to 1 if the country adopts a crawling peg or 0 otherwise.

[8] Tables 1–3 of Appendix II contain a more detailed description of the data, including sources and summary statistics of all the variables used in the empirical analysis.

Table 1. Constructed Variables Used in the Empirical Analysis

Abbreviation	Description	Underlying Series
Optimun Currency Area Variables		
TOPEN51	Lagged 5-years moving average of trade openness, defined as the average of exports plus imports	IMP, EXP, GDPNOMH
SHRMAJTRD	Exports to largest trading partner as percentage of total exports	EXPMAJ, EXP
LGDPDPPP	Logarithm of GDP at PPP	GDPDPPP
GDPPCPPP	Per capita GDP at PPP	GDPDPPP, POP
TOTCHANGE	Terms of trade percentage change	TOT
GDPRGRH51	Lagged 5-year moving average of real GDP growth rate	GDPH
GDPRGRUS51	Lagged 5-year moving average of real GDP growth in the United States	GDPUS
STDGDPH	Volatility of real GDP in home country	GDPH
STDGDPUS	Volatility of real GDP in the U.S.	GDPUS
STDDCPIH	Volatility of inflation in home country	DCPIH
STDDCPIUS	Volatility of inflation in U.S.	DCPIUS
EXCHSTD	Standard deviation of percentage change in exchange rate	EXCH
Capital Account Openness Variables		
KOPEN51	Capital openness defined as the absolute value of inward and outward capital flows, as percentage of nominal GDP lagged, 5-year moving average	KOPEN, GDPNOMH, AEXCH
Historical and Institutional Variables		
POLINST	Political instability construced as a dummy variable (scale 0–12)	POLINST
Macroeconomic Variables		
DEBTGDPND1	Lagged external debt as percentage of GDP	DEBT, AEXCH, GDPNOMH
LDCPIH	Logarithm of inflation in home country	DCPIH
RESIMP51	Lagged 5-years moving average of international reserves as percentage of imports	RES, IMP, AEXCH

For the regression analysis, we use pooled cross section and time series data. Multivariate probit models are employed when we collapse the exchange rate regime choices into two subgroups (pegs versus all other and floating versus all other). Multinomial logit models are used when we collapse the exchange rate regimes into three groups (pegs, crawling peg regimes and floating), on the assumption that the two alternative regimes to, say, pegs are not close substitutes.[9]

[9] In applications involving alternative choices, multivariate probit models are used when there are several decisions, each between two alternatives, and multinomial logit models (unordered multiple choice models) are used when there is a single decision, among two or more not-ordered alternatives (Greene, 1993, pp. 660–68).

IV. Discussion of Results

Our analysis of the potential determinants of exchange rate regime choice involves many of the variables that have been suggested by theory and have been used in previous studies. Before turning to the regression analysis, we examine the means of a number of potential determinants of exchange rate regimes for pegs, crawling peg regimes and floating, based on the IMF original classification of regimes (Table 3 of Appendix II). Using one-way analysis of variance, we find that the means of possible determinants of exchange rate regimes are significantly different across groups of countries: at the 5 percent level of significance, larger countries, countries with low trade openness, and countries with low output volatility are more likely to float than to peg or enter in crawling peg arrangements; and countries with high capital openness are more likely to peg than float or have crawling peg regimes.[10] However, as shown below, most of these bivariate relationships are no longer significant when controlling for other variables in the context of regression analysis.

Furthermore, the correlation matrix for the potential determinants of exchange rate regimes (Table 4 of Appendix II) shows that, even though many of such determinants are correlated with each other, there do not seem to be obvious signs of multicollinearity. Therefore, the absence of significant and robust results underlying our regressions cannot be attributed to significant high correlations prevailing in the independent variables.

Then probit regressions of exchange rates regimes on the largest number of possible determinants are considered, in turn, for pegs versus all other types of exchange rate regime and floating regimes versus all others (Table 2). It turns out that no variable is significant in the specification that considers pegs versus all other types of regimes, although the correlation matrix for the potential determinants of exchange rate regimes does not indicate that high multicollinearity exists between these variables.[11] However, in the specification considering floating regimes versus all others, a few variables turn out to be significant at the 5 percent level and to have meaningful economic signs. Thus, the greater the economic size of a Central American country, the more likely it is to adopt a nonpegging regime. A similar result was obtained by Mercer-Blackman, Offerdal, and Rennhack (2002). Furthermore, countries with higher real GDP growth rates and/or smaller output variability tend to be associated with floating regimes. Also, the higher the U.S. real GDP growth, the less likely it is that these countries adopt a floating exchange rate arrangement.[12] The working hypothesis

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[10] Since these determinants represent pooled cross-section and time-series data, such findings may also be interpreted to mean that during periods that countries adopt, for example, open capital account policies, they are more likely to peg than to float.

[11] Partial correlation matrix results also indicate that these variables are not very highly collinear.

[12] At the 10 percent significance level, it is also found that high inflation volatility in the home country and low reserves-to-imports ratios tend to be associated with floating regimes.

here is that higher U.S. real output growth strengthens trade links with Central American countries, which, in turn, become more exchange rate risk averse.

Table 2. Estimation Results
(Probit Model)

	1 if Pegging, 0 Otherwise	1 if Floating, 0 Otherwise	
Trade openness	-0.102	0.001	
	(-1.33)	(0.01)	
Share of trade with largest trading partner	-0.021	-0.118	
	(-1.70)	(-1.78)	
Economic size	-3.994	8.784	*
	(-1.04)	(2.46)	
Per capita GNP	-0.001	-0.000	
	(-1.14)	(-0.49)	
Real GDP growth in home country	-0.056	0.453	*
	(-0.37)	(2.05)	
Real GDP growth in the United States	0.546	-1.056	*
	(1.36)	(-2.30)	
Output volatility in home country	0.283	-1.356	*
	(1.17)	(-2.16)	
Output volatility in the United States	-0.108	0.435	
	(-0.14)	(0.52)	
Terms of trade change	-0.022	-0.071	
	(-0.51)	(-1.10)	
Exchange rate volatility	0.014	-0.003	
	(0.42)	(-0.11)	
Dc facto openness to capital flows	0.153	-0.039	
	(1.35)	(-0.45)	
Inflation in home country	-1.803	1.743	
	(-0.69)	(1.15)	
Inflation volatility in home country	-0.329	0.206	
	(-1.62)	(1.83)	
Inflation volatility in the United States	1.850	-0.445	
	(1.15)	(-0.40)	
Reserves to imports ratio	0.032	-0.113	
	(0.71)	(-1.83)	
External debt to GDP ratio	-0.003	0.027	
	(1.25)	(1.17)	
Observations	123	123	

Absolute value of z statistics in parentheses. *Significant at a 5 percent level;** significant at the 1 percent level. The dependent variable is PEGIMF when we consider pegs versus all other exchange rate regimes, and FLOATIMF when we consider floating versus all other arrangements. These variables represent the official exchange rate regime choice according to the original IMF classification, based on countries' self-reporting.

In an attempt to obtain more robust results, we consider various parsimonious specifications that include as potential determinants trade openness, the share of trade with the largest trading partner, and economic size, adding a fourth potential variable, one at a time. Table 3 reports the results obtained from such parsimonious specifications. Then, we run 14 regressions: one with just the core variables, and 13 with the core adding a fourth variable. For each core variable, we report the minimum and maximum Z statistics obtained in the 14 regressions, and the number of times that the variable is significant. The coefficient on economic size is significant in all specifications: the larger the country, the more likely it is to float, including independent floating, and the less likely it is to peg. In addition, in the specification that considers pegs versus all other types of regimes, trade openness is negatively and significantly associated with pegging. This result supports the hypothesis that highly open economies tend to prefer flexible rates as a way to absorb real shocks. However, this finding is not confirmed by any specification considering floating versus all other regimes. The share of trade with the country's main trading partner tends to be associated with nonpegging arrangements, although this possible determinant does not turn out to be significant in most specifications. Among the additional variables, higher inflation is often positively and significantly associated with floating (and negatively but not significantly associated with pegging), though this result should be interpreted with caution owing to the uncertainty regarding the direction of causality. These findings are in agreement with those of Mercer-Blackman, Offerdal, and Rennhack (2002), who used ordered probit regressions.

Table 3. Estimation Results of Parsimonious Models
(Probit Model)

Independent Variable	1 if Pegging, 0 Otherwise			1 if Floating, 0 Otherwise		
Core variables	Min. Z	Max Z	# Sig.	Min. Z	Max. Z	# Sig.
Trade openness	-5.35*	-3.20*	14	-0.89	0.92	0
Share of trade with largest trading partner	-3.12*	-0.89	12	-0.53	0.15	0
Economic size	-6.26*	-4.77*	14	2.95**	5.23**	14
Additional variables	Z Value	Significance		Z value	Significance	
Per capita GDP	-0.96			-2.77	**	
Real GDP growth in home country	-2.54	*		-0.24		
Real GDP growth in the United States	1.01			-3.10	**	
Output volatility in home country	0.11			-2.50	*	
Output volatility in the United States	1.05			-0.25		
Terms of trade change	-1.07			-0.60		
Exchange rate volatility	1.95			-0.09		
De facto openness to capital flows	3.83	**		-1.28		
Inflation in home country	-1.33			2.13	*	
Inflation volatility in home country	-1.78			-0.30		
Inflation volatility in the United States	0.70			0.26		
Reserves to imports ratio	1.00			-2.64	**	
External debt to GDP ratio	2.58	**		-0.15		

* Significant at the 5 percent level; **significant at the 1 percent level.

Other potential determinants of exchange rate regimes enter significantly in several specifications: High output variability in the home country or high reserves-to-imports ratios are often negatively and significantly associated with floating (and positively but not significantly associated with pegging), while high capital account openness and high external debt-to-GDP ratios are often positively and significantly associated with pegging (and negatively but not significantly associated with floating). Also, the higher the output growth in the United States, the less likely it is that these countries float and the more likely it is that they peg (although, in the latter case, the coefficient is not statistically significant). The results for output growth in the home country and per capita income turn out to be more ambiguous: The higher the domestic output growth, the less likely it is to peg or to float (with the latter effect being not significant); and the higher the per capita income in these countries, the less likely it is to float or to peg (with the latter effect being not significant) (see also next paragraph). The multinomial logit regressions do not yield robust results, despite signs that high trade openness is less likely to be associated with pegs or floating rates, and more likely with crawling pegs (Table 4). Furthermore, high export share with the largest trading partner tends to be associated with crawling pegs rather than pegging regimes, while the economic size of a country has no significant explanatory power over the choice of exchange rate regime. In addition, high per capita income tends to be associated more with crawling pegs rather than pegging and floating regimes. Moreover, during periods of high output and inflation volatilities in the United States, these Central American countries are more likely to adopt pegs rather than crawling pegs, and less likely to adopt floating rates rather than crawling pegs (although the latter effects turn out to be not significant).

Table 4. Estimation Results of Parsimonious Models
(Multinomial Logit Model)

Independent Variable	Pegging vs. Crawling Pegs			Floating vs. Crawling Pegs		
Core variables	Min. Z	Max Z	# Sig.	Min. Z	Max. Z	# Sig.
Trade openness	-4.80**	-2.94**	14	-3.93**	-2.82**	14
Share of trade with largest trading partner	-2.45*	-1.32	11	-0.99	-0.31	0
Economic size	-1.52	2.01	0	-0.30	1.20	0
Additional variables	Z Value		Significance	Z Value		Significance
Per capita GNP	-4.47		**	-1.99		*
Real GDP growth in home country	-1.60			-1.16		
Real GDP growth in the United States	-1.09			-1.88		
Output volatility in home country	1.12			-2.22		*
Output volatility in the United States	3.35		**	-0.71		
Terms of trade change	-0.53			-1.64		
Exchange rate volatility	1.32			3.41		**
De facto openness to capital flows	1.26			-0.78		
Inflation in home country	0.15			0.21		
Inflation volatility in home country	-1.19			-0.51		
Inflation volatility in the United States	3.36		**	-0.13		
Reserves to imports ratio	-1.84			0.56		
External debt to GDP ratio	2.83		**	-0.80		

* Significant at the 5 percent level; **significant at the 1 percent level.

Capital account openness does not have much predictive power in determining exchange rate regimes when applied to the data in tandem with the traditional optimum currency area indicators. This result conforms with Juhn and Mauro (2002), and does not support the so called bipolar view that pegs and floating rates are favored against intermediate regimes in the presence of high capital mobility (Eichengreen, 1994; Obstfeld and Rogoff, 1995; Fischer, 2001).

High external debt to GDP ratios are more likely to be associated with pegging regimes than with crawling pegs, in contrast to the findings of Mercer-Blackman, Offerdal, and Rennhack (2002); high domestic output variability is less likely to be associated with floating rates than with crawling pegs; and, countries experiencing high exchange rate volatility are more likely to adopt floating rates than crawling pegs.

It should be mentioned that the variable representing political stability (POLINST) was not included in our analysis because of the limited number of available observations. In this regard, we were not able to test the significance of institutional factors in the choice of exchange rate regime.

V. Summary and Conclusions

Our analysis shows that there is some statistically significant evidence about the determinants of the choices of exchange rate regimes made by the six Central American countries considered. In contrast to some of the existing empirical literature, our estimates indicate that many variables suggested by the optimum currency area theory, but not the variables proposed by the capital account openness hypothesis, are adequate but not robust predictors of exchange rate regime choice in this cross-section and across-time sample of countries.

Relatively stronger explanatory power can be established for trade openness, which is found to be negatively associated with pegs and floats and positively associated with crawling pegs; the share of trade with the largest partner, which is more likely to be associated with nonpegging regimes and, in particular, with crawling pegs; the size of the economy (total GDP at purchasing power parity), which turned out to be positively associated with floating and negatively associated with pegging (consistent with the original OCA theory and recent empirical results); per capita income, which is less likely to be associated with floating than with pegs and, in particular, with crawling pegs; the variability of output in the home country, which turned out to be negatively associated with floating rates in favor of crawling pegs; and the external debt to GDP ratio, which is likely to be associated more with pegs than with nonpegging arrangements, including crawling pegs.

Other weaker relationships revealed by our analysis indicate that high capital account openness is more likely to be associated with pegs; high inflation is more likely to be associated with floating exchange rate arrangements (consistent with the results of many empirical studies); high real output growth in the domestic country is less likely to be associated with pegs; high reserves to imports ratios are less likely to be associated with floating rates; and high nominal exchange rate volatility is more likely to be associated with floating rates than with crawling pegs. Also, it is shown that high growth in the United States

tends to be negatively associated with floating arrangements in these countries, while high U.S. output and inflation volatilities are more likely to be associated with pegs than crawling pegs. Terms of trade fluctuations are not found to be significantly associated with any particular exchange rate regime.

Based on these findings, we may conclude that the choices of exchange rate regime made by these Central American countries during the last quarter of a century have been consistently influenced by conventional long-term economic determinants. Furthermore, one cannot rule out the possibility that other factors, such as, historical, institutional and political circumstances prevailing at the time of adopting a regime, could have also influenced their decisions to a varying degree.

EXCHANGE RATE REGIME CHOICE BY SIX CENTRAL AMERICAN COUNTRIES OVER THE 1974–2001 PERIOD 1/

Country	Country Pegging to:	Pegs 2/	Crawling Arrangements 3/	Floating 4/
Costa Rica	United States	1974–79	1983–2001	1980–82
El Salvador	United States	1974–89 1994–2001		1990–93
Guatemala	United States	1974–87		1988–2001
Honduras	United States	1974–91	1994–2001	1992–93
Nicaragua	United States	1974–88 1990–92	1989 1993–2001	
Panama	United States	1974–2001		

1/ Refers to decisions prevailing at the end of the year.

2/ Includes arrangements involving another currency as legal tender, a conventional fixed peg to a single currency and a peg within a horizontal band.

3/ Includes crawling peg and crawling band arrangements.

4/ Includes independently floating and managed floating arrangements.

DETAILED DEFINITION OF INDEPENDENT VARIABLES AND SUMMARY STATISTICS

Optimum currency area variables

As mentioned in Section II, most of the studies in the OCA tradition employ trade openness, share of trade with the largest trading partner, economic size, per capita GNP, volatility (standard deviation) of terms of trade, growth and volatility of real GDP, inflation and its volatility, and exchange rate volatility as explanatory variables of the exchange rate regime choice.

- Trade openness (TOPEN51). Measured by the average of total imports and exports as percentage of GDP. Home currency GDP was converted into U.S. dollars by using the annual average home currency/U.S. dollar exchange rate.

- Share of trade with the largest trading partner (SHRMAJTRD). Measured by exports to the largest trading partner as a percentage share of total exports, drawn from the IMF's Direction of Trade Statistics.

- Economic size (LGDPDPPP). Measured by the logarithm of total GDP in U.S. dollars at purchasing power parity (PPP), from the World Bank's World Development Indicators (WDI).

- Per capita GDP (GDPPCPPP). Defined as total GNP in U.S. dollars at PPP in 1999, from the WDI, divided by population.

- Terms of trade percentage change (TOTCHANGE). The yearly percentage change of the actual terms of trade for the period 1974–2001 is used as a measure of terms of trade fluctuations, deriving from the IMF World Economic Outlook (WEO).

- Real GDP growth rate at home (GDPRGRH51) and real GDP growth rate in the United States (GDPRGRUS51). Measured by the simple growth rate of real GDP.

- Volatility of real GDP/inflation at home (STDGDPH/STDDCPIH) and at the United States (STDGDPUS/STDDCPIUS). The measure for the volatility of home country/U.S. output that we use is the 5-year period standard deviation of the home country/U.S. real GDP growth rate in local/U.S. dollar currency over the period 1969–2001. For example, the measure for the volatility of output in the year 1974 is calculated as the standard deviation of output for the sample period 1969–73. A similar procedure is applied to construct an empirical measure for the volatility of the home country/U.S. inflation measured by the percentage change in the consumer price index (CPI).

- Standard deviation of percentage change in the exchange rate (EXCHSTD). The yearly standard deviation of the percentage change of the actual monthly exchange rate between the home country and the United States is issued as a measure of the actual exchange rate volatility.

Capital account openness variables

- De facto openness to capital flows (KOPEN51). Measured by the absolute value of inward and outward flows of financial assets and liabilities (i.e., the sum of the absolute values of IFS lines 78bdd,78bed,78bfd,78bgd,78bhd, and 78bid) as percentage of nominal GDP.

Historical and institutional variables

- Political instability (POLINST). Constructed as the average of (a) government stability and (b) political violence and internal conflicts (scale 0–12), from the International Country Risk Guide (ICRG) issued by the Political Risk Services Group. This variable was not utilized in the calculations due to its limited sample size.

Macroeconomic variables

- External debt as percentage of GDP (DEBTGDPND1). External debt is defined as total external debt owed to nonresidents repayable in foreign currency, goods, or services denominated in U.S. dollars. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest on arrears on long-term debt. After transforming GDP into U.S. dollars by using the annual average exchange rate, we scale total external debt by using GDP. Total external debt is taken from the IMF World Economic Outlook (WEO).

- Inflation (LDCPIH). Measured by the logarithm of one plus the percent change in the CPI of the home country.

- International reserves as percentage of imports (RESIMP51). Since both international reserves and imports are denominated in U.S. dollars, this variable is simply calculated as the percentage share of international reserves in nominal imports.

Table 1 of Appendix II provides all underlying series needed to construct the variables shown in text Table 1.
Tables 2–4 of Appendix II show summary statistics of all variables used in the empirical analysis.

Table 1. Original Series Used to Construct the Different Variables

Abbreviation	Description	Unit	Frequency	Countries	Source
OERRCIMF	Official exchange rate regime choice	Dummy variable	Annual	Home	*Annual Report on Exchange Arrangements and Exchange Restrictions* /IMF
EXCH	Monthly exchange rate, average	Home currency per U.S. dollar	Monthly	Home	*International Financial Statistics*/IMF
AEXCH	Annual exchange rate, average	Home currency per U.S. dollar	Annual	Home	*International Financial Statistics*/IMF
KOPEN	Absolute value of inward and outward flows of assets and liabilities	Home currency	Annual	Home	*International Financial Statistics* /IMF
GDPH	Real GDP	Home currency, constant prices	Annual	Home	*International Financial Statistics*/IMF
GDPDPPP	Total GDP in U.S. dollars at purchasing power parity in 1999	U.S. dollar	Annual	Home	WDI/WB
POP	Population	Real number	Annual	Home	*International Financial Statistics*/IMF
GDPUS	Real GDP of United States	U.S. dollar, constant prices	Annual	U.S.	*International Financial Statistics*/IMF
GDPNOMH	Nominal GDP	Local currency	Annual	Home	*International Financial Statistics*/IMF
GDPNOMUS	Nominal GDP of United States	U.S. dollar	Annual	Home	*International Financial Statistics*/IMF
DCPIH	Changes in consumer prices	Percentage	Annual	Home	*International Financial Statistics*/IMF
DCPIUS	Changes in consumer prices in the U.S.	Percentage	Annual	U.S.	*International Financial Statistics*/IMF
DEBT	External debt	U.S. dollar	Annual	Home	World Economic Outlook (WEO)/IMF
IMP	Nominal imports	Local currency	Annual	Home	*International Financial Statistics*/IMF
EXP	Nominal exports	Local currency	Annual	Home	*International Financial Statistics*/IMF
EXPMAJ	Nominal exports to largest trading partner	Local currency	Annual	Home	*International Financial Statistics*/IMF
RES	International reserves	U.S. dollar	Annual	Home	*International Financial Statistics*/IMF
TOT	Terms of trade	Real number	Annual	Home	WEO/IMF
POLINST	Political instability	Dummy variable	Annual	Home	International Country Risk Guide (ICRG)

Table 2. Summary Statistics of Variables Used in the Analysis
(Whole Sample)

Variables	Obs.	Mean	Std Error	Min.	Max.
Trade openness (TOPEN51)	167	27.08	15.58	1.43	153.32
Share of trade with largest trading partner (SHRMAJTRD)	167	42.32	29.82	0.00	224.08
Economic size (LGDPDPPP)	156	10.05	0.26	9.43	10.64
Per capita GDP at PPP (GDPPCPPP)	156	3,098.10	1,509.40	883.2	8,868.10
Real GDP growth in home country lagged, 5-year moving average (GDPRGRH51)	168	2.87	4.68	-26.48	14.19
Real GDP growth in the United States lagged, 5-year moving average (GDPRGRUS51)	168	2.93	2.13	-2.02	7.26
Output volatility in home country (STDGDPH)	168	3.34	2.61	0.33	14.43
Output volatility in the United States (STDGDPUS)	168	2.07	1.03	0.33	3.67
Terms of trade change (TOTCHANGE)	168	1.10	12.18	-28.52	47.14
Exchange rate volatility (EXCHSTD)	168	27.73	314.24	0.00	4,072.7
De facto openness to capital lagged, 5-year moving average (KOPEN51)	138	30.14	84.22	-10.87	637.46
Inflation in home country (LDCPIH)	166	1.10	0.61	-0.03	4.01
Inflation volatility in home country (STDDCPIH)	163	183.53	788.28	0.32	4,371.30
Inflation volatility in the United States (STDDCPIUS)	168	1.79	1.19	0.16	4.31
Reserves to imports ratio lagged, 5-year moving average (RESIMP51)	159	23.62	13.13	2.25	65.60
External debt to GDP ratio lagged (DEBTGDPND1)	168	109.92	282.94	3.75	2,588.30
Official exchange rate regime choice (PEGIMF)	168	0.64	0.48	0.00	1.00

Table 3. Summary Statistics of Explanatory Variables
Under Different Exchange Rate Regimes

Explanatory Variables	Pegs	IMF Classification Crawling Arrangements	Floating	P-Value for Comparison of Means 1/
	Mean (Number of Observations)			
Trade Openness (TOPEN51)	23.7 (107)	39.5 (37)	23.1 (23)	0.0000
Share of trade with largest trading partner (SHRMAJTRD)	36.4 (107)	58.3 (37)	44.1 (23)	0.0005
Economic size (LGDPDPPP)	9.9 (100)	10.2 (34)	10.3 (22)	0.0000
Per capita GDP (GDPPCPPP)	2,679.40 (100)	4,220.70 (34)	3,266.00 (22)	0.0000
Real GDP growth in home country (GDPRGRH51)	2.4 (108)	3.9 (37)	3.6 (23)	0.1692
Real GDP growth in the United States (GDPRGRUS51)	2.9 (108)	3.4 (37)	2.4 (23)	0.2153
Output volatility in home country (STDGDPH)	3.9 (108)	3.0 (37)	1.5 (23)	0.0002
Output volatility in the United States (STDGDPUS)	2.4 (108)	1.4 (37)	1.4 (23)	0.0000
Terms of trade change (TOTCHANGE)	0.7 (108)	2.0 (37)	0.9 (23)	0.8366
Exchange rate volatility (EXCHSTD)	41.6 (108)	2.0 (37)	3.7 (23)	0.7455
De facto openness to capital flows (KOPEN51)	42.1 (96)	2.2 (26)	3.8 (16)	0.0401
Inflation (LDCPIH)	1.0 (108)	1.3 (35)	1.2 (23)	0.0997
Inflation volatility in home country (STDDCPIH)	127.9 (104)	456.0 (36)	8.8 (23)	0.0501
Inflation volatility in the United States (STDDCPIUS)	2.2 (108)	1.1 (37)	1.1 (23)	0.0000
Reserves to imports ratio (RESIMP51)	22.0 (101)	28.2 (35)	24.0 (23)	0.0535
External debt to GDP ratio (DEBTGDPND1)	88.3 (108)	213.1 (37)	45.6 (23)	0.0333

1/ P-value is from the one-way analysis of variance.

Table 4. Correlation Matrix

	TOPEN51	SHRMAJTRD	LGDPDPP	GNPPCPP	GDPRGH51	GDPRGUS	STDGDPH	STDGDPUS	PEGSTD	KOPEN51	LDCPI	STDCPIH	STDCPIUS	RESIMP 51	DEBTGDPND1
TOPEN51	1.00														
SHRMAJTRD	0.21	1.00													
LGDPDPP	-0.10	-0.08	1.00												
GNPPCPP	0.23	-0.10	0.60	1.00											
GDPRGH51	0.07	0.02	0.10	0.20	1.00										
GDPRGUS	-0.04	0.03	0.01	0.03	0.17	1.00									
STDGDPH	-0.02	-0.09	-0.40	-0.14	-0.12	-0.10	1.00								
STDGDPUS	-0.11	-0.08	-0.59	-0.52	-0.10	0.20	0.21	1.00							
PEGSTD	0.23	0.02	0.03	-0.08	-0.14	-0.07	-0.08	-0.09	1.00						
KOPEN51	-0.22	0.07	-0.28	-0.01	-0.14	0.08	0.04	0.09	-0.07	1.00					
LDCPI	0.40	-0.02	0.08	-0.14	-0.13	-0.23	0.05	0.05	0.26	-0.36	1.00				
STDCPIH	0.19	-0.07	0.02	-0.03	0.07	0.05	0.19	0.21	-0.03	-0.20	0.42	1.00			
STDCPIUS	-0.09	-0.08	-0.60	-0.52	-0.15	0.11	0.32	0.76	0.00	0.03	0.10	0.18	1.00		
RESIMP 51	-0.01	0.00	0.44	0.24	0.29	0.18	-0.16	-0.14	-0.15	-0.26	0.03	0.13	-0.29	1.00	
DEBTGDPND1	0.34	0.17	-0.36	-0.08	-0.09	-0.11	0.46	-0.03	0.32	0.11	0.12	0.31	0.09	-0.30	1.00
TOTCHANGE	0.01	0.02	-0.07	-0.07	0.18	0.15	-0.07	0.06	0.05	-0.05	0.04	0.07	0.14	0.09	-0.11

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