Fixed, Float, or Intermediate?
A Cross-Country Time Series Analysis of Exchange-Rate Regimes

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Abstract

In this paper we investigate the factors determining the choice of three exchange regimes using cross-country pooled data with the multinomial logit model. We find that the traditional variables such as the size of the economy, exchange rate volatility, capital mobility, inflation, and openness increase the probability of a floating or intermediate regime, as expected. Domestic policies, financial factors, adverse shocks to foreign variables (e.g., current account, foreign liabilities, reserves) also affect the choice of the exchange regime.

Our findings show that there is no one-size-fits-all model for all regions. Fundamental variables explain better regime changes in Europe and the CFA Franc countries, while financial and policy variables perform better regime choices in Latin America, East Asia and the Pacific area. This result is consistent with the general perception that the currency crises that hit the international markets during the last two decades were fundamentals-driven in the case of Europe and Latin America but financial-driven in the case of the Asian crisis.

Key Words: exchange rate regimes, multinomial logit model, optimum currency area, currency crises.

JEL Classification Numbers: F31, F33, F21.

Introduction

After the dollar crisis that led to the collapse of the Bretton Woods system in the early 1970's, several industrial countries abandoned their fixed exchange rate regimes and shifted to floating rates. Since then, the choice of the exchange rate regime has been the subject of a lively debate in international finance. To this day there is still no consensus over issues such as the optimal choice of regimes, their determinants, and whether regimes are sustainable or not. In this study, we investigate the determinants of three exchange rate regimes (fixed, flexible and intermediate) and examine how regimes are chosen.

Not surprisingly, a large volume of literature examines countries' choice of exchange rate regime, which can be divided into two main groups: earlier studies and currency crises models. The first group examines the systematic differences between float and peg countries. The analysis in this group of studies is closely related to the literature on the optimal currency area originated by Mundell (1961), and explains the regime changes with macroeconomic fundamentals. The currency crises that occurred in the international financial market in the 1980's and 1990's lead to a second development in the literature initiated by Krugman (1979). These models explain the currency collapse mainly with financial variables.[1]

Although developed separately in time as a response to different questions, these two strands of the literature are closely related. If a change in one of the independent variables raises the probability of a collapse of the currency, it also affects the probability of a change in the exchange regime. In this paper, we use this correspondence to compare both the optimal currency area (OCA) and the currency crisis (CC) models and analyze the determinants of the choice of the currency regime with data from 138 countries.

The contribution of this study to the literature is threefold. First, unlike the previous studies, which examined the choice between two exchange rate regimes, we use the multinomial logit model, and apply it to a cross-section data that spans the period 1982 to 1999. This approach allows unordered choice between three exchange rate regimes and to our knowledge none of the previous studies applies this methodology for the exchange rate analyses and uses a data span as long as ours. Second, to explore the differences in international monetary arrangements, we cover three different currency zones, the US dollar, the ECU/EMU, and the CFA Franc. Previous literature confines the analysis mainly to the US dollar zone. Third, we compare the two streams of the literature and examine the conditions under which a particular model is more useful at explaining the choice of exchange rate regimes. Our approach provides a much richer framework for the analysis, and reveals interesting results.

[1] See Edison and Melvin (1990) and LeBaron and McCulloch (2000) for reviews of these discussions.

The full-sample results with the OCA model show that the probability of choosing flexible or intermediate regimes over a fixed regime increases with the traditional variables, such as the size of the economy, exchange rate volatility, capital mobility, inflation, and low openness. The results with the CC model, however, suggest that policy variables and financial factors also affect the choice of the exchange regime. Adverse shocks to foreign factors, which deteriorate the current account, swell foreign liabilities, and reduce reserves, increase the probability of choosing the flexible or intermediate exchange regime over the fixed regime. At the regional level, the OCA model performs better in Europe and Latin America, and the CC model explain better the regime changes in East Asia and the Pacific regions and in the CFA area. This result is consistent with the general perception that the currency crises that hit the international markets during the last two decades were fundamentals-driven in the case of Europe and Latin America but financial-driven in the case of the Asian crisis.

I. A review of the variables

Various studies used an array of dependent and independent variables to analyze the exchange rate regimes. In the following section we survey the most common variables. We discuss two sets of explanatory variables that the previous studies relied on to estimate the probability of choosing a particular exchange regime. We compare the explanatory variables from two approaches. The first group of variables is drawn from the OCA discussion, and the second group is from the CC literature.

1. Dependent variable

Various methods and measures were used in the literature. They range from a discriminant analysis (Heller, 1978), flexibility index (Holden, Holden, and Suss, 1979), to discrete variables. The latter consist of the following categories: two regimes with fixed and flexible rates (Dreyer, 1978, Savvides, 1990, Bosco, 1987), three regimes with fixed, intermediate, and float (Bosco, 1987), and four regimes with single-currency peg, basket peg, crawling peg and float (Melvin, 1985).

During the 1990s the studies on exchange rate regimes inquire the reasons behind the collapse of fixed exchange regimes and develop various crash measures. Since our emphasis is on regime change rather than the crash itself, we will not elaborate on these measures. Interested readers may consult Frankel and Rose (1996), Sachs, Tornell and Velasco (1996), Kaminsky, Lizondo and Reinhart (1998).

The IMF exchange rate classification (1983-1998) broadly divides the exchange rate regimes into four categories: fixed, flexibility limited (crawling peg), managed float (dirty float), and independent float. For our dependent variable, we consider three regimes following

Masson's (2000) categorization, and define the two middle categories as an "intermediate" regime.[2]

2. Explanatory variables

(i) OCA model

These models emphasize the role of economic characteristics of a country in the determination of the choice of the exchange rate regimes (Heller, 1978, Dreyer, 1978, Holden, Holden, and Suss, 1979, Bosco, 1987). The most common variables used in these studies are: openness of the country, size of capital transactions, the economy size, patterns of international trade, inflation differential.

Among the macroeconomic variables, *the economy size* is likely to be positively related to the degree of flexibility. The smaller the economy, the more vulnerable it is to external shocks transmitted through the exchange rate, the higher the probability that it will opt for a low degree of flexibility of the regime (Heller, 1978). *Openness* is negatively related to exchange rate flexibility, everything else being constant. The more open an economy, the worse-off is the inflation-unemployment trade-off with a flexible exchange rate because of the ensuing depreciation of the currency, and the larger is the impact on the economy of a foreign shock (Rogoff, 1985). Thus, the country will likely opt for a low degree of flexibility to circumvent the disadvantage of openness on inflation. Finally, *inflation differential* is positively related to the degree of exchange rate flexibility. A country with a relatively high inflation rate needs to adjust its fixed exchange rate frequently to remain competitive, which is likely to lead to the abandonment of the fixed regime in favor of a flexible one.

Later studies also explore the effect on the regime choice of monetary and inflationary shocks, real exchange rate volatility, and financial integration, measured by capital flows. *Variability of the real exchange rate* is generally positively related to exchange rate flexibility. Higher variability is more likely to shift the country to the floating exchange regime, which is expected to offset the exchange rate volatility (Melvin, 1985 and Savvides, 1990). *Capital mobility* is likely to be positively related to the degree of flexibility. Countries with high capital mobility and fixed exchange rates lose their monetary policy independence, hence their ability to conduct stabilization policies. In the face of an adverse shock, countries tend to opt for flexible exchange rates to prevent a costly adjustment of the economy. However, some analysts also argue that low capital mobility requires the trade account to adjust for international imbalances,

[2] The latest IMF classification (1999) adopts a more detailed categorization of regimes: 1) Exchange arrangement with no separate legal tender, 2) Currency board arrangement, 3) Conventional pegged arrangement, 4) Pegged exchange rate within horizontal bands, 5) Crawling peg, 6) Crawling band, 7) Managed floating with no pre-announced path for the exchange rate, 8) Independently floating. In our analysis, we group regimes 1, 2, and 3 under "Fixed", 4,5,6, and 7 under "Intermediate", and 8 as "Float".

supporting the case for a flexible regime (Bosco, 1987). If this argument holds, we would expect to find a negative relation between capital mobility and the probability of countries opting for a flexible regime. The negative relation between high capital mobility and the flexibility of the exchange rate regime goes also back to the OCA discussion (Mundell, 1961).

(ii) CC model

The currency crises that occurred in the international financial markets during the 1980s and 1990s led to new models that stress the currency collapses (Krugman, 1979, Obsteld, 1994, Chang and Velasco, 1998). These models test the factors affecting the probability of a collapse of the exchange rate regime on country panels. They are constructed with different independent variables from the previous literature and include macroeconomic, external and foreign variables (Frankel and Rose, 1996, Sachs, Tornell and Velasco, 1996). More recently, analyses also incorporate other financial variables such as return on equity market and the ratio of M2 money supply to banking reserves, contagion (Eliasson and Kreuter, 2001), while some include traditional variables such as exports and the real exchange rate, as early-warning indicators that predict the collapse (Kaminsky, Lizondo and Reinhart, 1998).

Among the macroeconomic variables, g*overnment spending*, which is a proxy for fiscal policy, can have two opposing effects on the degree of flexibility of exchange rates. The first effect leads to a positive relation. A fiscal expansion increases expectations about the monetization of the debt, provokes crashes and thus forces the government to switch to higher flexibility. Empirically, this view is supported by Eichengreen, Rose and Wyplosz (1995) and Moreno (1995) but not by Frankel and Rose (1996). The second effect is based on the simple Mundell-Fleming type of model. Under perfect capital mobility, fiscal policy is effective only if the exchange rate is fixed. Hence, governments that frequently rely on fiscal policy for economic stabilization will opt for a fixed exchange regime, suggesting a negative relation between public spending and the degree of flexibility. *Bank domestic credit* measures the health of the banking system and is perceived by market participants as positively related to the degree of flexibility. An expansion in bank credits increases the ratio of bad loans to good loans, which leads to speculative attacks on the currency (Sachs, Tornell, Velasco, 1996). Alternatively, a high level of credits revive markets' fear of a government bailout financed by printing money, followed by loss of central bank's reserves and abandonment of fixed rates (Kaminsky and Reinhart, 1999). *Economic growth*, as a crude approximation for the political and economic cost in the government's loss function, is expected to be negatively related to the degree of flexibility. Economic recession can increase the probability of a currency crisis and encourage the government to switch to a higher degree of flexibility (Frankel and Rose, 1996).

The two external variables, the c*urrent account balance* and *foreign reserves,* are negatively correlated with the flexibility of the exchange rate. A worsening in the current

account or inadequate reserves are likely to generate self-fulfilling expectations of a currency collapse, trigger a currency crisis and force the country to adopt a high degree of flexibility. *Short-term flows*, such as portfolio investment and other investment, are volatile and thus considered to be destabilizing for fixed rates and positively related to the degree of flexibility. They are also associated with moral hazard in large amounts of international lending, which triggers massive capital outflows that lead to a currency crisis and the abandonment of the fixed rates (Radelet and Sachs, 1998, Chang and Velasco, 1998). The effect of *FDI (foreign direct investment)* on the exchange rate regime depends on whether it contributes to the stability or the volatility of capital flows and therefore is ambiguous. One view argues that because it entails ownership in domestic companies, FDI is a stable component of capital flows and does not fluctuate during economic and financial turbulence (Chuhan et al., 1994). Thus, higher inflows of FDI stabilize capital flows and help preserve fixed regimes. An opposing view is that in a currency crisis, FDI is associated with a high variability of capital, which is reflected in increased transfers between the parent company and the subsidiary (Dooley et al., 1994). The implication is that increase in the volatility of capital flows makes policy makers opt for a higher degree of flexibility. *The degree of overvaluation of the exchange rate*, a measure of competitiveness, is positively related to the degree of flexibility. An overvalued exchange rate creates a high cost for maintaining fixed rates and therefore leads to its abandonment in favor of more flexible rates (e.g., Frankel and Rose, 1996).

Foreign variables are negatively related to the degree of flexibility. Many studies emphasize the importance of high f*oreign interest rates* in affecting capital outflows and putting pressure on fixed exchange regimes and their eventual abandonment (Calvo et al., 1992, Chuhan et al., 1994, Fernandez-Arias, 1996). A negative *foreign economic growth* (contraction) deteriorates the trade account, which can be overturned only by devaluing or floating the currency.

II. Data and methodology

1. Data

All series are annual and cover the period 1982 to 1999. The World Development Indicators is the main source for most of the independent variables. Exceptions are the German GDP and PPP, which are from the OECD's Statistical Databases and the weighted average of foreign GDP (OECD countries), from the OECD Statistical Compendium. Data for foreign liability and FDI comes from the International Monetary Fund's Balance of Payment Statistics. Data for the dependent variable, the exchange rate regime, are collected from the International Monetary Fund's Exchange Arrangements and Exchange Restrictions Annual Reports.

We initially started with 200 countries that belong or used to belong to one of the three currency zones. After excluding those with missing data, we ended up with 138 countries for

our analysis (92 in the US-dollar zone, 28 in the ECU zone and 18 in the CFA Franc zone), giving us a full sample size of 1749. The categorization of currency zones is based on Yeyati and Sturzengger (1999), and the regional classifications of countries are from the World Bank development report (see appendix for the list of countries). The explanatory variables, their symbols and definitions are as follows:

OCA model: The economy size (**gdp**) is the natural log of PPP based gross domestic product. The openness of the country (**open)** consists of the ratio of the import+export to the GDP. The inflation differential (**inf**) is the difference between the gross domestic inflation and foreign inflation rates, both in natural logarithms. The size of capital mobility (**gcf**) is the ratio of gross capital flows (assets plus liabilities) to GDP, and consists of FDI flows, portfolio investment and other flows. Variability or volatility of the real exchange rate (**rerv**) is the standard deviation of the real exchange rate during the last five years, with the real exchange rate defined as the ratio of foreign price denominated in domestic currency to domestic price.

CC Model: Government spending (**gov**) is defined as the GDP share of government final consumption expenditure. Bank credit (**bankc**) consists of the domestic credit provided by banking sector as a share of GDP. Economic growth (**dgdp)** is the year-over-year percentage change in per capita GDP. Foreign reserves (**rsv**) are the ratio of gross international reserves to imports. Gross reserves consist of holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. The current account balance is expressed as a ratio to GDP (**cab)** and short-term flows, or foreign liabilities (**fliab**) are expressed as the ratio of portfolio and other investments flows to exports. Foreign direct investment is also defined as a ratio to exports (**fdi**). Overvaluation of the exchange rate (**dev**) is the deviation from the last five-year average of the real exchange rate. The last two foreign variables are foreign interest rate (**intf**) and foreign economic growth (**dgdpf**) calculated as the percentage change in foreign per capita real GDP.

In the CC literature, foreign liability variables are commonly expressed as a ratio to GDP, external debt, or export. Since there is no theoretical basis for such a decision, we examined the correlation matrix in an attempt to minimize the potential multicollinearity problem among capital flow variables, reserves and the current account. Not surprisingly, the most significant correlation is between capital flows and the current account (Table 1). Normalizing with exports (first entry in each cell) reduces the correlation between FDI, the current account and reserves, while normalizing with GDP (second entry in each cell) decreases the correlation between short-term flows, fliab, and the current account. We opted to use the export ratios because it reduces the correlation with foreign reserves substantially.

Currency zones: An important contribution of this paper is to cover three different currency zones: the US dollar, the ECU, and the CFA Franc currency zones. Rather than limiting the analysis to a single zone like most of the previous literature does (US dollar zone), examining several zones could deepen further our understanding of exchange rate regimes.

The foreign factors (world interest or inflation rate) that previous studies examine consist of the US variables or the OECD country averages. This methodology implicitly assumes the US or the OECD economy is the key external factor for most currencies. However, a number of currency zones exist in the real world, and many currencies are adjusted to other currencies besides the US dollar. In those cases, a country of an anchor currency is likely to have greater economic impact on member countries of the currency zone than the United States. With this logic, we compute each zone's foreign variables (inflation differential, real exchange rate, foreign interest, and foreign economic growth) based on the anchor country's variables. More specifically, for countries from the US dollar zone, the ECU zone, and the CFA Franc zone the foreign variables are based on, respectively, the US, German, and French variables.

2. Methodology

Previous studies used various statistical techniques to analyze the choice of the exchange rate regime. Besides rare analyses based on OLS (Holden, Holden, and Suss, 1979), the methodology generally consists of discrete choice models: binary probit (Savvides, 1990, Frankel and Rose, 1990, Eichengreen, Rose and Wyplosz, 1996), binary logit (Bosco, 1987), ordered probit (Dreyer, 1978), ordered logit (Melvin, 1985, Bosco, 1987, Eliasson and Kreuter, 2001), and unordered multinomial logit (Bosco, 1987).

The studies that are based on ordered choice assume that a country changes the degree of flexibility of the exchange rate regime sequentially, e.g., go from a fixed to intermediate and from intermediate to floating. However, this assumption is at odds with the historical facts (e.g., the European experience). This point is taken in Frankel (1999) and the evidence supporting the unordered choice is presented in Bosco (1987) and Masson (2000). To check this point, we compared the ordered and unordered multinomial logit approaches for the OCA and CC models. We find that in both cases, the Akaike Information Criterion (AIC) and the pseudo-R^2 results support the unordered multinomial logit model over the ordered logit model (Table 2, top panel).

We thus adopt a multivariate model with an unordered polychotomous dependent variable (Nerlove and Press, 1973), and estimate a multinomial logit model by pooling the data across countries and time periods. We choose the fixed exchange regime as the base regime and the intermediate and the floating regimes as the first and the second categories. The contemporaneous interaction between economic fundamentals and the exchange rate regimes

may create an endogeneity problem. To control this problem, we lag with one period all economic fundamentals.

The multinomial logit model is based on the "independence of irrelevant alternatives", the IIA property, which assumes that the ratio of two probabilities is not affected by the other choices and that the choice of any two alternatives is independent from the others. If this assumption were violated, the estimated coefficients would be biased. We use the Small-Hsiao procedure to test for the IIA assumption.[3] For both the OCA model, and the CC model, the respective $\chi^2(6)$, $\chi^2(11)$ values are smaller than their critical values at the 95% confidence level, suggesting that test results cannot reject the null of IIA, and that the estimators of the restricted and unrestricted sets do not differ significantly (Table 2, lower panel). Thus, we can safely assume that the data have the IIA property for both models.

III. Empirical results

In the next subsections we examine the empirical evidence based on both models covering the period 1982 to 1999 (Tables 3 and 4). In the first (middle) panel of each table, the base category is the fixed exchange rate regime and the figures indicate the probability of choosing between a fixed and floating (fixed and intermediate) regime when an independent variable changes. Similarly, the third panel shows the probability of choosing a floating regime when the base category is an intermediate regime. Figures in parentheses are the z-statistics associated with the estimates.

The two goodness of fit measures, a LR test statistics distributed as $\chi^2(10)$ and $\chi^2(20)$ for each model respectively, and the pseudo-R^2 suggest that the models explanatory power is reasonable and compares well with the literature (e.g., the pseudo-R^2 is about 0.20 in Frankel and Rose, 1996). Comparing across models, AIC suggests that the OCA model in general outperforms the CC model in explaining the choice of the exchange rate regime. However, as we will see below, this result conceals important regional differences.

1. The OCA model

All of the independent variables are highly significant in the first category of fixed-float at the 95 % confidence level (Table 3, first column). Three out of five variables, size, openness and inflation enter the regressions significantly across all regime changes. Consistent with the theory, the probability of choosing flexible over fixed exchange rate

[3] An alternative procedure, the Hausman and McFadden test is not applicable in our case because our data set does not satisfy the convertibility condition for the covariance matrix.

regime increases the larger is the economy, the less open it is, the higher the exchange rate volatility, the higher capital mobility, and the higher the relative inflation rate.

Most variables affect the probability of the choice of an intermediate regime over a fixed one in the same way as floating over fixing (first column, middle panel). All effects are significant at 95 % confidence level, except the variability of the overvalued exchange, which loses its statistical significance. Openness has a distinct effect: an increase in the openness of a country increases the probability of choosing an intermediate regime. This is quite intuitive: In contrast to the flexible regime, the intermediate regime can moderate the negative impact of the foreign shocks on the open economy, and it can adjust the trade imbalance more effectively than the fixed regime. Because of these trade-offs, an open economy is more likely to favor the intermediate than the fixed regime.

Results are somewhat mixed when we choose the intermediate regime as the base category (first column, third panel). The effect on the probability of the choice of floating over an intermediate regime is consistent with the theory and the top panel for openness, capital flows, and volatility of the exchange rate. The sign of the economy size, and inflation differential, however, is the opposite of the theory's prediction. Overall, inflation differential and country size are the most robust determinants of exchange regimes across regimes. This result is consistent with the finding of Bosco (1987) where inflation differential is a significant variable that explains three different regimes, even though his analysis is conducted over three years during the 1980s.

2. The CC model

Independent variables, in general, have a high significance level in explaining the choice of floating regime (Table 4, column 1, first and middle panels). In choosing floating over fixed regime, domestic factors enter the equations significantly and with the right sign (column 1, first panel). An increase in domestic bank credits, and a decline in economic activity lead countries to prefer floating rather than fixed regime. Higher government spending supports the hypothesis that a large government tends to adopt a fixed exchange rate. Most of the foreign factors also enter significantly. A deterioration of current account, a rise in foreign liabilities and a fall in reserves (not significant) lead a country to opt for floating regime, consistent with the theory. An increase in foreign interest and growth rates, however, do not have the predicted sign.

Most domestic and foreign variables are consistent with the theory when the choice is between fixed and intermediate regimes (first column, middle panel). An decrease in government spending, an increase in bank credits, domestic growth, reserves, foreign liabilities, a deterioration of current account all lead to choosing the intermediate regime over the fixed regime. When the choice is between intermediate and float, a smaller number of effects are

consistent with the theory (column 1, third panel): an increase in bank credits, a decline in government spending, worsening of the current account, an increase in foreign liabilities make countries with an intermediate regime abandon it for a floating regime. The other variables do not have the predicted sign by the theory.

A further piece of evidence we obtain from these estimates is the relative importance of the independent variables in the choice of each regime. In determining the choice between fixed and floating regimes, the current account, and the inflation differential; between fixed and intermediate regimes, the current account, foreign variables and domestic growth; between intermediate and floating regimes, foreign interest rates matter most.

Interestingly, two variables, fdi and the overvaluation measure, have no significant effect in choosing any regime. This comes as a surprise because these are variables that have an important role in the theoretical explanation of the currency crises. In particular, fdi is long believed to be positively correlated with currency collapses. One possibility is that the relevant variable should be fdi outflows, or net flows rather than inflows as we have in the analysis. We conducted the analysis separately with each measure. However, the significance of either measure was even weaker than that of the inflows, ruling out the measurement problem as a culprit.[4]

Another reason may be multicollinearity that makes the estimates inefficient. The correlation matrix of variables shows that variables such as reserves, current account, foreign liabilities and fdi exhibit a moderate degree of correlation (Table 1). To test this possibility, we regroup these variables, which are correlated and are believed to exert an influence on the choice of the exchange rate regime, and conduct a principal component analysis. We use the first three principal components, which explain 89 percent of the variance of the variables (Table 5). The components enter regression equations significantly in at least one of the panels (column 2, Table 4), where they are expressed as PC1, PC2 and PC3. However, they do not affect the significance or the sign of the other estimates in either regime choice. We also ran the regressions without current account and reserves, including one and not the other. None of these cases affected the significance of the fdi parameter. We thus decided to continue with the original specification where the variables of the eigenvectors are estimated separately, since this specification offers the advantage of analyzing their effects explicitly.

3. Regional models

In this section, we check for changes in model coefficients across geographical regions: the ECU and Deutsche Mark region in Europe (EUR); the CFA Franc zone (CFA); and the two US dollar zones, the Latin American zone, comprised of South America and the Caribbean zone

[4] This is not quite surprising since net flow figures are unreliable. When the outflow figures are not available, the series contain inflows.

(LAT) and the East Asian and the Pacific zone (EAP). As before, we compare both the OCA and the CC models (Tables 3 and 4, last 4 columns in each panel). The pseudo-R^2 is higher in most cases compared to the full sample.

Our findings show that there is no one-size-fits-all model for all the areas. The OCA model is based on the fundamentals of the economy, while the CC model's variables reflect the financial conditions in the economy. Many researchers argue that currency regime changes in Latin America and Europe are caused by the deterioration of economic fundamentals, while currency crises in Asia stem from financial sources. Our results are consistent with the common wisdom: the pseudo-R^2 and the AIC suggest that the OCA model performs better in explaining the choice of exchange rate regime in Europe and LAT, and the CC model in the EAP and the CFA countries. For the CFA region, since the sample of floating exchange rate is nonexistent, both models only provide the estimates for the choice between fixed and intermediate regimes.

The OCA model: Country size, gdp, is a significant explanatory variable across regions and regimes. Consistent with the theory, the larger the country size, the higher is the probability that the country will opt for a more flexible regime in all areas (Table 3, last 4 columns in each panel). Openness is an important factor in explaining the choice of the flexible regime in Europe and EAP region, and it significantly affects the choice between the fixed and intermediate regimes in LAT. Financial integration, gfc, is not an important factor determining the exchange rate regime in LAT, but it significantly increases the probability of choosing the floating regime in both Europe and EAP areas. Consistent with the theory, a high relative inflation moves both the LAT and the EAP region economies away from the fixed, towards a more flexible regime. Not surprisingly, real exchange rate volatility is a significant determinant of the choice of exchange regime in Europe and LAT but not in EAP and the CFA areas. As the sign suggests, economies experiencing high volatility in their currency value opt for a more flexible regime.

At first glance, the estimated coefficients of two variables Europe are opposite to what the theory predicts. An increase in inflation and decline in exchange rate volatility are associated with a move away from floating regime. These signs, however, are consistent with the experience of the European countries. Since the 1980s, anchoring currencies to the Deutsche mark, reputed for its anti-inflationary stance rate, successfully reduced inflation. During this process, convergence of the main economies towards a single currency required to satisfy the conditions to join the European Monetary Union leading to stabilization of exchange rates.

The CC Model: Although this framework does not perform too well for Europe, it has substantial explanatory power for the EAP and the CFA regions and several variables in the model shed light on the regional characteristics of the last two decades (Table 4, last 4 columns in

each panel). Government spending is a significant factor in explaining the choice of a fixed regime in LAT and CFA regions, and away from the intermediate regime in the EAP region. It also has one of the largest coefficients, thus the largest impact on the determination of the regime in EAP. However, fiscal policy has no role in the determination of exchange regimes in Europe. Monetary policy, represented by domestic bank credits, significantly affects the choice of exchange regimes in all regions, except LAT. Higher bank credits increase the probability of governments opting for a more flexible regime in EU and CFA, and moving away from the intermediate regime in EAP.

An increase in foreign liabilities raises the probability of a more flexible regime in all regions, albeit less significantly in Europe. By contrast, large inflows of fdi significantly affect the choice of fixed regime in Europe and the choice from fixed to float in EAP, while it has no effect in other regions. A decline in foreign reserves and deterioration of the current account significantly affect the choice of a more flexible regime over the fixed regime in EAP. The influence of reserves and in particular the current account is less strong and the direction of the effect is less clear in other regions. The foreign interest rate significantly affects the regimes in LA and EAP but the sign is not always consistent with the theory. A decline in the EAP domestic growth rate increases the probability of governments opting for float.

In summary, our findings reveal a complex picture about the experience of the LAT, in particular the EAP regions, and the currency crises that afflicted them in the past. First, the traditional variables, such as loss of competitiveness, foreign reserves, foreign interest rates and growth influence the determination of the exchange rate regime in LA but not in the expected direction. Second, a combination of domestic and foreign factors explains the shift away from the fixed regimes in the EAP region. These are: a decline in FDI and a rise in foreign liabilities, deterioration of the current account, fall in foreign reserves, and a decline in growth.

IV. Conclusion

In this paper we examine countries' choice of exchange rate regimes with an unordered multinomial choice variable analysis. We compare two types of model, the optimal currency area and the currency crisis models, and consider three different currency blocks, the US dollar, the ECU, and the CFA Franc. Our methodology, data span and the comparison of the two models provide a rich framework that allows a detailed and original analysis of three exchange rate regimes.

We find that over the full sample, the optimal currency area (OCA) models generally have a higher explanatory power the currency crisis (CC) models in explaining the choice of the exchange regime. However, at the regional level, the OCA models, reflecting the economic fundamentals, perform better in Europe and Latin America, and the CC models, which reflect the

effects of financial variables, perform better in East Asia and Pacific regions and in CFA area. This result is consistent with the general perception that the currency crises that hit the international markets during the last two decades were fundamentals-driven in the case of Europe and Latin America but financial-driven in the case of the Asian crisis. In each region, in turn, different variables affect the probability of choosing one regime over the other.

The full-sample results with the OCA model reveal that the probability of choosing flexible or intermediate regimes over a fixed regime increases with the size of the economy, exchange rate volatility, capital mobility, and inflation, decreases with openness. The results with the CC model suggest that domestic factors such as expansionary policies, recessions, and adverse foreign factors such as deterioration of the current account, a rise in foreign liabilities, fall in reserves increase the probability of choosing flexible or intermediate exchange regime. This is another remarkable result of our analysis supporting evidence against the two-pole hypothesis that argues that intermediate regimes are not viable. A more formal treatment of this issue is the subject of another paper.

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Appendix: List of Countries

USD Zone

LAT: Latin America and the Caribbean

Antigua and Barbuda, Argentina, Bahamas The, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela RB,

EAP: East Asia and the Pacific

Australia, China, Hong Kong, Indonesia, Japan, Korea Rep., Lao PDR, Malaysia, Mongolia, New Zealand, Papua New Guinea, Singapore, Solomon Islands, Thailand,

Other regions

Algeria, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, Burundi, Canada, Egypt Arab Rep., Ethiopia, Gambia The, Georgia, Germany, Ghana, Guinea, Hungary, India, Iran Islamic Rep., Israel, Jordan, Kenya, Kyrgyz Republic, Lithuania¸ Malawi, Maldives, Mauritania, Mauritius, Mozambique, Nepal, Nigeria, Pakistan, Romania, Russian Federation, Rwanda, Saudi Arabia, Sierra Leone, South Africa, Sri Lanka, Syrian Arab Republic, Tanzania, Turkey, Turkmenistan, Uganda, Ukraine, Zambia, Zimbabwe,

CFA Franc Zone

Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Congo Rep., Cote d'Ivoire, Equatorial Guinea, Gabon, Guinea-Bissau, Madagascar, Mali, Morocco, Niger, Senegal, Togo, Tunisia

Europe: ECU and the DM zone

Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Greece, Iceland, Ireland, Italy, Macedonia FYR, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom

Table 1: Correlation matrix between regression variables and foreign variables*

	gov	bankcr	dpgdp	rsv	Cab	fliab	Fdi	devav	nint	dpgdpf
fliab	-0.059	-0.059	0.025	-0.067	-0.305	1.00	-0.038	0.029	0.075	0.002
	0.071	0.058	0.010	-0.061	-0.160	1.00	0.022	-0.020	0.070	0.009
fdi	-0.043	-0.030	0.162	-0.005	-0.407	-0.038	1.00	-0.045	-0.030	-0.037
	0.016	-0.039	0.177	-0.032	-0.504	0.022	1.00	-0.123	-0.079	-0.088

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*The first entry in each cell is the correlation between a variable and fliab or fdi normalized with exports, and the second entry is the correlation with the same variable normalized with GDP.

Table 2: Multinomial Logit vs. Ordered Logit and Small-Hsiao Test of IIA*

		Multinomial Logit		Ordered Logit
OCA	**AIC**	1.682		1.787
	Pseudo-R^2	0.192		0.137
CC	**AIC**	1.943		1.962
	Pseudo-R^2	0.071		0.055

		Small-Hsiao Test		
Base Category/Eliminated Category:		Fixed/Intermediate	Fixed/Float	Intermediate/fixed
OCA	**LL**	-273.99840	-348.74733	-272.53839
	LLR	-272.33044	-346.36598	-272.18655
	χ^2(6)	3.336	4.763	0.704
	P	0.7657	0.5746	0.9944
CC	**LL**	-305.88351	-461.77549	-270.97318
	LLR	-296.76165	- 456.91623	-264.89424
	χ^2(11)	18.244	9.719	12.158
	P	0.0761	0.5559	0.3519

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* LL is the log likelihood for weighted average of coefficients in two half-samples, and LLR is based on the restricted model. P is the probability associated with the χ2 test. The critical values at the 95% confidence level for χ^2 is 12.95 for the OCA model and 19.68 for the CC model

Table 3: OCA Model Estimates[a]

	Full Sample	EU	CFA	LAT	EAP	Full Sample	EU	CFA	LAT	EAP	Full Sample	EU	CFA	LAT	EAP
	Fixed-Float					Fixed-Intermediate					Intermediate-Float				
gdp	0.54**	0.36*	----	0.73**	0.31**	0.70**	0.73**	1.27	1.04**	0.74**	-0.16**	-0.37*	----	-0.3**	-0.43**
	(12.5)	(1.7)	----	(5.0)	(2.1)	(18.1)	(6.1)	(5.3)	(6.8)	(5.2)	(3.9)	(1.8)	----	(2.5)	(3.2)
open	-0.01**	-0.08**	----	0.01	-0.04**	0.01**	0.00	-0.01	0.02**	0.01**	-0.01**	-0.08**	----	-0.01	-0.05**
	(2.9)	(4.6)	----	(1.3)	(3.7)	(3.9)	(0.4)	(0.8)	(2.5)	(2.3)	(5.5)	(4.7)	----	(1.3)	(4.4)
Inf	0.03**	-0.29**	----	0.08**	0.14**	0.04**	0.01	0.11**	0.09**	0.12**	-0.01**	-0.3**	----	-0.01	0.03
	(5.4)	(4.8)	----	(4.5)	(3.2)	(7.0)	(1.3)	(4.9)	(4.9)	(2.6)	(2.0)	(4.9)	----	(0.9)	(1.1)
gcf	0.01**	0.04**	----	0.00	0.04**	0.01**	-0.01	0.02	0.00	-0.03	0.00	0.04**	----	0.00	0.06**
	(2.1)	(3.4)	----	(0.1)	(2.9)	(2.3)	(0.9)	(0.7)	(0.1)	(1.2)	(0.2)	(4.1)	----	(0.1)	(2.7)
rerv	1.05	7.2**	----	1.55*	-0.67	0.33	-1.34	0.62	1.38*	-0.26	0.72**	8.54**	----	0.17	-0.4
	(4.8)	(5.2)	----	(1.9)	(0.4)	(1.5)	(2.0)	(0.7)	(1.7)	(0.2)	(3.8)	(5.8)	----	(0.3)	(0.4)
C	-13.93	-5.5	----	-19.4	-5.71	-18.07	-17.72	-31.39	-26.87	-19.09	4.14	12.22	----	7.47	13.38
	(12.6)	(0.9)	----	(5.2)	(1.4)	(18.3)	(5.5)	(5.6)	(6.9)	(5.1)	(3.8)	(2.1)	----	(2.3)	(3.4)
LRT: 255.29 (Full Sample); 239.15 (Factor Analysis); 173.28 (EU); 92.24 (CFA); 265.97 (LAT); 100.90 (EAP)															
Pseudo-R^2: 0.071 (Full Sample); 0.066 (Factor Analysis); 0.098 (EU); 0.695 (CFA); 0.188 (LAT); 0.562 (EAP)															
AIC: 1.943 (Full Sample); 1.95 (Factor Analysis); 1.881 (EU); 0.428 (CFA); 1.757 (LAT); 1.178 (EAP)															

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[a] z-statistics in parenthesis; *,** significant at the 10-percent and 5-percent levels, respectively. LRT is the Likelihood Ratio Test distributed as χ^2.

Table 4: CC Model Estimates[a]

	Full Sample	Factor Analysis	EUR	CFA	LAT	EAP	Full Sample	Factor Analysis	EUR	CFA	LAT	EAP	Full Sample	Factor Analysis	EUR	CFA	LAT	EAP
	Fixed-Float						Fixed-Intermediate						Intermediate-Float					
gov	-0.05**[*]	-0.05**	0.04**	----	-0.18**	-0.01	0.00	0.00	0.00	-0.71**	-0.09**	-0.44**	-0.05**	-0.05**	0.04	----	-0.10**	0.43**
	(4.3)	(4.3)	(0.9)	----	(5.0)	(0.2)	(0.4)	(0.5)	(0.1)	(4.3)	(3.4)	(4.7)	(4.0)	(3.9)	(0.9)	----	(2.6)	(4.6)
bnkc	0.01**	0.01**	0.02**	----	-0.01	0.01	0.01**	0.01**	0.00	0.26**	0.00	-0.02**	0.00**	0.00**	0.02**	----	-0.01	0.03
	(5.7)	(5.9)	(2.7)	----	(1.2)	(1.2)	(3.5)	(3.7)	(0.3)	(5.0)	(0.5)	(2.8)	(2.7)	(2.9)	(3.2)	----	(0.8)	(3.9)
dgdp	-0.04**	-0.04**	-0.20**	----	-0.03	-0.25**	0.02**	0.02**	0.01	0.05	0.02	0.21**	-0.06**	-0.06**	-0.21**	----	-0.05	-0.46
	(3.0)	(2.9)	(3.4)	----	(1.0)	(3.2)	(2.0)	(2.1)	(0.3)	(0.8)	(0.9)	(2.9)	(4.3)	(4.3)	(3.7)	----	(1.6)	(5.4)
rsv	-0.04	----	-0.10	----	0.15**	-0.97**	0.06**	----	-0.11**	-0.73**	0.13**	-0.40**	-0.10**	----	0.01	----	0.02	-0.56
	(1.1)	----	(1.0)	----	(2.5)	(3.9)	(2.5)	----	(2.0)	(2.0)	(2.5)	(2.7)	(3.0)	----	(0.1)	----	(0.4)	(2.3)
cab	0.07**	----	0.05	----	0.03	0.25**	0.05**	----	0.05*	0.02	0.02	0.16**	0.02**	----	-0.01	----	0.01	0.10
	(6.1)	----	(0.9)	----	(1.0)	(3.7)	(5.3)	----	(1.7)	(0.2)	(1.0)	(2.4)	(2.0)	----	(0.2)	----	(0.3)	(1.3)
fliab	0.01	----	0.02*	----	0.02**	0.04*	0.00*	----	0.01	0.07**	0.02**	0.00	0.00**	----	0.01	----	0.00	0.04
	(3.8)**	----	(1.9)	----	(2.3)	(1.8)	(1.8)	----	(0.9)	(3.4)	(2.8)	(0.2)	(2.2)	----	(1.4)	----	(0.0)	(1.8)
fdi	0.01	----	-0.42*	----	-0.02	-1.15**	0.03*	----	-0.32**	0.09	-0.02	-0.02	-0.01	----	-0.10	----	-0.01	-1.13
	(0.9)	----	(1.8)	----	(0.6)	(3.3)	(1.7)	----	(2.6)	(0.6)	(0.7)	(0.4)	(0.8)	----	(0.4)	----	(0.2)	(3.3)
dev	-0.07	-0.06	-0.68	----	1.78**	-1.01	-0.13	-0.14	-0.40	4.86**	1.13**	0.53	0.06	0.07	-0.28	----	0.64	-1.54
	(0.6)	(0.6)	(0.9)	----	(3.6)	(1.0)	(1.4)	(1.4)	(1.1)	(3.7)	(2.7)	(0.50)	(0.5)	(0.6)	(0.4)	----	(1.5)	(1.8)
intf	-0.25**	-0.25**	0.13	----	-0.32**	-0.37**	-0.06**	-0.06**	0.09	-0.32*	-0.15**	-0.06	-0.19**	-0.19**	0.04	----	-0.17**	-0.30
	(7.5)	(7.4)	(1.2)	----	(4.4)	(3.1)	(2.6)	(2.6)	(1.2)	(1.7)	(3.1)	(0.7)	(5.7)	(5.6)	(0.4)	----	(2.4)	(2.5)
dgdpf	-0.09**	-0.09**	0.00	----	-0.16**	-0.03	-0.06**	-0.06**	-0.03	0.09	-0.12**	-0.18**	-0.02	-0.02	0.03	----	-0.05	0.15
	(3.8)	(3.7)	(0.0)	----	(3.0)	(0.3)	(3.7)	(3.7)	(0.7)	(0.7)	(2.9)	(2.0)	(1.0)	(0.9)	(0.5)	----	(0.9)	(1.4)
C	2.52	2.17	-3.74	----	5.11	9.13	0.11	0.01	0.26	-2.70	2.22	9.51	2.41	2.16	-4.00	----	2.89	-0.39
	(6.3)	(5.6)	(2.0)	----	(5.7)	(4.2)	(0.4)	(0.0)	(0.2)	(1.0)	(3.3)	(4.8)	(5.9)	(5.5)	(2.3)	----	(3.4)	(0.2)
PC1		0.06**						0.06**						0.00				
		(4.7)						(5.9)						(0.1)				
PC2		-0.02						0.03*						-0.05**				
		(1.0)						(1.8)						(2.7)				
PC3		0.03						0.07**						-0.04**				
		(1.3)						(4.0)						(2.0)				
LRT: 255.29 (Full Sample**)**; 239.15 (Factor Analysis); 173.28 (EU); 92.24 (CFA); 265.97 (LAT); 100.90 (EAP)																		
Pseudo-R^2: 0.071 (Full Sample**)**; 0.066 (Factor Analysis); 0.098 (EU); 0.695 (CFA); 0.188 (LAT); 0.562 (EAP)																		
AIC: 1.943 (Full Sample**)**; 1.95 (Factor Analysis); 1.881 (EU); 0.428 (CFA); 1.757 (LAT); 1.178 (EAP)																		

Table 5: Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.57	0.51	0.39	0.39
2	1.06	0.13	0.27	0.66
3	0.93	0.50	0.23	0.89
4	0.43		0.11	1.00
Eigenvectors				
	1	2	3	4
rsv	0.36	0.39	0.81	-0.26
cab	0.70	-0.05	-0.06	0.71
fliab	-0.39	-0.60	0.59	0.39
fdi	-0.48	0.70	0.05	0.53