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The Choice of Exchange Rate Regimes: An Empirical Analysis for Transition Economies

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The Choice of Exchange Rate Regimes: An Empirical Analysis for Transition Economies*

By

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Abstract

We analyze the choice of exchange rate regimes of the 25 transition economies in Europe and the CIS after 1990. The empirical results show that the traditional Optimum Currency Area considerations provide relevant guidance for the exchange rate regime choices in these countries. Moreover, regime choices are influenced by inflation rates, cumulative inflation differentials, and the availability of international reserves. That is, macroeconomic stabilization and the ability to commit to a credible exchange rate peg play important roles in the determination of exchange rate regime choices. Large government deficits have ambiguous effects; they increase the likelihood of moving from a flexible exchange rate to an intermediate peg as well as the likelihood of moving from a fixed to an intermediate peg.

Keywords: Exchange rate regimes; Transition Economies.
JEL Codes: E52, F31, F33, F41.

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1. Introduction

What is the appropriate exchange rate regime for an economy? Over the past 40 years, economists have developed various answers to this question. Early literature, based on the seminal work on optimal currency areas (OCA) by Mundell, Kenen, and McKinnon, stressed fundamentals related to the ability to cope with demand shocks and the usefulness of monetary policy for aggregate demand management. Subsequent authors writing in the tradition of Poole's (1970) analysis of monetary policy instruments focused on the type and source of the dominant shocks to which an economy is exposed. Building on Barro and Gordon's (1983) work on monetary policy credibility, the literature of the 1980s developed the idea that exchange rate pegs could help import credibility of low inflation policies from a foreign central bank (e.g. Giavazzi and Giovannini (1989) and von Hagen (1991)), a popular justification for Italian and French membership in the European Monetary System. Most recent literature, finally, notes that the currency crises of the 1990s (Mexico, South-East Asia, Russia, Brazil, and Argentina) involved combinations of some form of exchange rate pegging with high capital mobility. It concludes that countries exposed to large capital flows must avoid unstable exchange rate regimes and are left with two corner solutions: a very hard currency peg (such as a currency board or dollarization) or flexible exchange rates, a view that has been dubbed the “hollow-out” hypothesis.[1]

The collapse of the Bretton Woods System in the early 1970s set the stage for more diversified choices of exchange rate regimes and brought in a strand of empirical literature to explain these choices.[2] The early empirical literature addressing this issue found that the fundamentals identified by the OCA approach provided some guidance for observed regime choices (Heller (1978) and Dreyer (1978)). Later studies introduced considerations of optimal macroeconomic stabilization, adding proxies for various types of shocks (Melvin (1985) and Savvides (1990, 1993)). These authors find that the presence of domestic nominal shocks raises the likelihood of a currency peg, while real shocks reduce it. More recent empirical literature considers the influence of political and institutional variables on regime choices and suggests that political instability tends to increase the likelihood of flexible exchange rate regimes (Edwards (1996) and Berger et al. (2000)).

The purpose of this paper is to develop an empirical model of exchange rate regime choice for a group of 25 transition economies in the 1990s. This is an interesting sample, because, not withstanding their economic heterogeneity, these

[1] See Eichengreen (1994), Obstfeld and Rogoff (1995), and Fischer (2001).
[2] See, among others, Heller (1978), Holden et al. (1979), Dreyer (1978), Melvin (1985), Savvides (1990), Edwards (1996), Bernhard and Leblang (1999), and Poirson (2001).

countries share a common history of emerging from socialist regimes largely isolated from the world economy at the end of the 1980s, they all faced large macro economic imbalances and stabilization problems initially, they all became gradually integrated into international trade and financial markets during the period we consider. Yet, there is quite a variety of exchange rate regimes among these countries. The main question of this paper is, how this variety can be explained.

In section 2, we describe the evolution of exchange rate regimes in our sample group. In section 3, we summarize the main arguments for regime choice in the literature. Section 4 develops empirical models of exchange rate regime choice and present estimates of this model. Section 5 concludes.

2. Exchange Rate Regimes in Transition Countries

2.1. Exchange Rate Regime Classification

Member countries of the International Monetary Fund (IMF) declare their exchange rate regimes to the Fund, which reports these regimes annually. Before 1999, countries could declare one of three possible regimes: pegged arrangements, more flexible arrangements, and free floats.[3] This coarse classification was refined in 1999 responding to the observation of a considerable degree of variation in the official descriptions of the policies classified as “pegged” or “more flexible”. The IMF's (1999) classification of exchange rate regimes allows for eight different categories ranging from the adoption of a foreign currency as legal tender to free floats. Table 1 below presents an overview. Our empirical work below applies this classification to the 25 countries in our sample. Since the IMF presents this new scheme only starting in 1997, we used the criteria given in IMF (1999) to reconstruct the classification for our sample countries prior to 1997. Thus, our classification of exchange rate regimes starts in 1990.

Several recent empirical studies of exchange rate policies point out that adjustments in the central parities and foreign exchange market interventions can produce considerable differences between the official regime and the de-facto regime adopted by a country (Calvo and Reinhard (2000), Gosh et al. (1997), and Levy-Yeyati and Sturzenegger (2000)). This does not imply, however, that official regimes are irrelevant. Even if they do not always coincide with de-facto regimes, official regimes are likely to guide financial market expectations about exchange rate developments and affect international financial policy decisions. The existing

[3] The fourth category, “regimes with limited flexibility” was a special one for members of the European Monetary System and the four members of the Gulf Cooperation Council. For the countries in our sample, it was irrelevant.

literature on regime choices has usually focused on the official ones published by the IMF.[4] In this paper, we follow this approach.

Table 1: Exchange Rate Regimes: The IMF's Classification System

Exchange Rate Regime	Descriptions
1 Dollarization, euroization	No separate legal tender
2 Currency Board	Currency fully backed by foreign exchange reserves
3 Conventional Fixed Pegs	Peg to another currency or currency basket within a band of at most +/- 1%
4 Horizontal Bands	Pegs with bands larger than +/- 1%
5 Crawling Pegs	Pegs with central parity periodically adjusted in fixed amounts at a pre-announced rate or in response to changes in selected quantitative indicators
6 Crawling Bands	Crawling pegs combined with bands larger than +/- 1%
7 Managed Float with No Preannounced Path for the Exchange Rate	Active intervention without precommitment to a preannounced target or path for the exchange rate
8 Independent Float	Market-determined exchange rate with monetary policy independent of exchange rate policy

Source: IMF (1999)

2.2. Evolution of Exchange Rate Regimes in Transition Economies

Appendix II records the choices of exchange rate regimes adopted in the transition economies from 1990 through the end of 1999. The exchange rate regime choices are those observed at the end of each year. The entries in Appendix II correspond to the numbers given to the individual regimes in Table 1. While all countries in the sample started with a conventional peg, eleven countries were classified as having adopted free floats and three were following managed floats in 1994. There were then two countries with currency board arrangements and seven that were applying a conventional peg. In 1996, the number of free floaters was eight, while six countries had adopted a managed float. The number of countries with currency boards was still two, and there were just two other countries that had adopted conventional pegs. In 1999, there were six free floaters left, and eleven countries had turned to managed floats. The number of currency board arrangements had increased to three, and the number of conventional pegs was three, too. It is clear from this table that the exchange rate regimes adopted in transition economies are very diversified. Only

[4] An early exception is Holden et al. (1979), who construct an index for exchange rate flexibility. Poirson (2001) also uses a similar flexibility index as the dependent variable in one specification of the empirical model for regime choices. The other specifications all involve discrete dependent variables based on the IMF classification.

Estonia and Slovenia did not change their exchange rate regimes at all during the period from 1991 to 1999.

Table 2: Distributions of Exchange Rate Regimes (in percent)

	1991—1993	1994—1996	1997--1999
All Countries			
Pegged Regimes	45,5	25,3	25,3
Intermediate Regimes	5,5	17,3	16,0
Floating Regimes	49,1	57,3	58,7
EU Candidates[1]			
Pegged Regimes	36,0	46,7	40,4
Intermediate Regimes	12,0	23,3	23,3
Floating Regimes	52,0	30,0	36,7
Other Countries[2]			
Pegged Regimes	53,3	11,1	15,6
Intermediate Regimes	0,0	13,3	11,1
Floating Regimes	46,7	75,6	73,3

Source: Appendix II.
[1] Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia.
[2] Albania, Croatia, Macedonia, and the CIS members (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan).

For a more systematic presentation, and because the full classification would leave us with too few observations in some cases for the empirical analysis intended below, we group our regimes in three categories: “pegged regimes” include the IMF classifications 1-3, “intermediate regimes” classifications 4-6, and “floating regimes” classifications 7 and 8. Table 2 shows the resulting distribution of exchange rate regimes in three different sub-periods based on the number of country-year observations in each period considered. Among all transition countries, roughly half adopted a floating rate in the early 1990s. This share was relatively stable and reached 59 percent at the end of the decade. In contrast, the share of pegged regimes fell substantially, from 45 percent to 25 percent, which made room for the increase in the share of intermediate regimes.

There are visible differences between the European Union (EU) accession candidates and other transition countries. The share of pegs increased from 36 percent to 40 percent among the former, while the share of floats declined from 52 to 37 percent. In contrast, more than 70 percent of the other transition economies finally chose a floating regime. The tendency to adopt “corner solutions” is less prevalent among the EU accession candidates.

Table 3 has more information about the changes in exchange rate regimes during the 1990s. Column (I) reports the cumulative change in exchange rate regimes for each country, while Column (II) reports the number of regime changes. The average absolute regime changes are listed in Column (III). For Column (I), a large positive number means that a country moved to a much more flexible exchange rate regime, while a large negative number indicates that a country tightened its regime. The table indicates that regime choices changed quite frequently during the 1990s. Some countries moved consistently in the same direction, while others moved from less to more flexible regimes and then reversed their choices later. An important implication of this is that the practice of earlier studies of exchange rate regime choices of using data averaged or lagged over several years to explain regime choices can be misleading, as regime choices have changed frequently and, probably, responding to changing economic circumstances. In the empirical work below, therefore, we explain annual exchange rate regime choices over the decade under consideration.

Table 3: Changes in Exchange Rate Regimes: 1990-1999

EU Candidates	(I)	(II)	(III)	Other Countries	(I)	(II)	(III)
CEEC[1]				Albania	5	1	5
Bulgaria	-1	2	5.5	Croatia	4	3	4
Czech Rep.	4	2	2	Macedonia	-5	1	5
Hungary	3	1	3	Armenia	5	1	5
Poland	3	2	1.5	Azerbaijan	4	2	3
Romania	4	3	2	Belarus	4	3	3.3
Slovak Rep.	4	2	2	Georgia	5	4	3.8
Slovenia	0	0	0	Kazakhstan	5	3	2.3
				Kyrgyz Rep.	4	2	3
Baltics				Moldova	5	1	5
Estonia	0	0	0	Russia	0	4	2
Latvia	-5	1	5	Tajikistan	4	2	3
Lithuania	-6	1	6	Turkmenistan	0	2	4
				Ukraine	-1	3	2.3
				Uzbekistan	4	2	3

Source: Appendix II.
Note: Column (I): cumulative changes in exchange rate regimes. Column (II): number of changes in exchange rate regimes. Column (III): average absolute changes in exchange rate regimes.
[1] Central and Eastern European Country (CEEC).

3. Determinants of Exchange Rate Regime Choice

3.1. Theories and Hypotheses

We distinguish between three groups of factors affecting a country's exchange rate regime choice: Economic fundamentals, variables relating to macroeconomic stabilization, and variables relating to the risk of currency crises. Building on Mundell's (1961) work, McKinnon (1963) points to economic size and openness as important fundamentals. He argues that small and open economies are more likely to adopt fixed exchange rate regimes than large and relatively closed economies. Furthermore, a country is more likely to adopt a fixed exchange rate regime, if its trade is heavily concentrated on a particular currency area. Next, Kenen (1969) suggests that countries with very concentrated production structures are more likely to adopt flexible exchange rates than countries with highly diversified production, as exchange rate changes are almost equivalent to changes in the relative output prices and are, therefore, more useful to cope with demand shocks for the former. A final consideration is the development of a country's financial sector. Countries with relatively undeveloped financial sectors often opt for fixed exchange rate regimes, because they lack the market instruments to conduct domestic open market operations and because they wish to shield their fledgling banking industries against large exchange rate movements. Thus, low financial development should increase the probability of adopting fixed exchange rates.

Following Poole's (1970) analysis of the optimal monetary policy instrument, Henderson (1979), McKinnon (1981), and Boyer (1978) argue that fixed exchange rates perform better in terms of output stability in the presence of monetary shocks originating in the domestic economy, while flexible rates perform better in the presence of real shocks. This suggests that countries exposed to large supply-side shocks should opt for flexible exchange rates, while countries suffering from large monetary and financial market disturbances should peg their exchange rates.

Models in the tradition of the monetary approach to exchange rate determination, in contrast, focus on the transmission of inflation between countries and the use of exchange rate policies to achieve low inflation rates. Following Barro and Gordon (1983), numerous authors have argued that countries whose monetary authorities suffer from low credibility of low-inflation policies can import central bank credibility by adopting a fixed exchange rate with a more stable currency (e.g., Fratianni and von Hagen (1992), Giavazzi and Giovannini (1989), and Melitz (1988)). This view was particularly important in the early years of the transition from a socialist to a market economy, when price liberalization and the destruction of monetary overhangs inherited from past led to high inflation. For the initial macro economic

stabilization, a fixed exchange rate could provide a nominal anchor for domestic prices in a situation where no credible domestic monetary institutions existed. Even for transition countries that started transition with more moderate inflation rates, the "Washington consensus" of the early 1990s held that the exchange rate was the appropriate nominal anchor provided that fiscal policy was sustainable (Begg (1998) and Bruno (1991, 1993)).

In recent years, the general trend towards full or large capital mobility has shifted attention to the implications of capital movements for the choice of exchange rate regimes. Fixed exchange rate regimes, when combined with a high degree of capital mobility, are exposed to speculative attacks resulting from fundamental policy inconsistencies (Krugman (1979), Salant and Henderson (1978)), or self-fulfilling expectations that arise in the context of multiple equilibria (Obstfeld (1996)). The lesson is that countries should avoid unstable combinations of capital mobility and exchange rate fixity. Important factors that reduce the risk of speculative attacks are the availability of foreign currency reserves to defend a fixed exchange rate, and the consistency of macro economic policies. Sustainable public finances are a key factor in this regard.

3.2. Data

The explanatory variables used in our empirical estimation are chosen to proxy the factors discussed in subsection 3.1. Detailed definitions and data sources are given in Appendix I. The economic fundamentals include the degree of openness of the economy (OPENNESS), geographical concentration of foreign trade (GEOCON), commodity concentration of foreign trade (COMCON), per capita real GDP (PCGDP), and real GDP.[5] We also consider degrees of openness to the European Union (OPENTOEU) and its quadratic term ($OPENTOEU^2$). This is justified by the importance of the EU, not only as the leading market for many transition countries but also as the ultimate objective of the transition process for the accession countries. The quadratic term allows for the possibility that the marginal desirability of a peg declines as countries become very open. Per capita GDP is included as a proxy for the level of economic development, and GDP measures the size of the economy. These two variables are expressed in logarithms. The last fundamental is the ratio of broad money to GDP (MONEY), which approximates the degree of financial sector development.[6]

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[5] Except for OPENTOEU, the other proxies for fundamentals are all standard in the literature. See, among others, Dreyer (1978), Melvin (1985), Savvides (1990), and Poirson (2001).
[6] See McKinnon (1993) and Hausmann et al. (1999).

Three variables are used to proxy considerations of macroeconomic stabilization. The first measures the volatility of real exchange rate changes (RERVOL), which may call for nominal exchange rate flexibility (Vaubel (1978)). The other two variables are the annual rate of consumer price inflation (INFLATION)[7] and the cumulative inflation differential (CUMINF) vis-à-vis a country's main trading partners. Large but transitory inflation shocks in a given year make a fixed exchange rate less sustainable and call for exchange rate adjustments to realign relative prices. In contrast, large cumulative inflation differentials indicate persistent problems of weak central bank credibility and large domestic nominal shocks, which raise the value of using the exchange rate as a nominal anchor for monetary policy.

Table 4: Determinants of Exchange Rate Regime Choices

Determinants	Proxies	Preferred Regimes
OCA Fundamentals		
High Degree of Economic Openness	OPENNESS	Fixed
High Trade Concentration: Commodities	COMCON	Flexible
High Trade Concentration: Geographical	GEOCON	Fixed
Economic Openness to the EU	OPENTOEU	Fixed
High Level of Economic Development	PCGDP	Ambiguous
Large Economic Size	GDP	Flexible
High Level of Financial Development	MONEY	Flexible
Optimal Stabilization		
Dominance of Real Shocks	RERVOL	Flexible
Weak Central Bank Credibility	CUMINF	Fixed
Transitory Domestic Inflation Shocks	INFLATION	Flexible
Risk of Currency Crisis		
Unsustainable Public Finance	FISCAL	Flexible
Lack of International Reserves	RESERVE	Flexible

We select two variables to account for the risk of currency crisis. The first is the ratio of non-gold international reserves to broad money (RESERVE), a measure of the availability of international liquidity. This should be particularly important for the viability and credibility of any rigidly fixed exchange rate regime.[8] The other is the ratio of the government fiscal budget balance to GDP (FISCAL), a proxy for the soundness of fiscal fundamentals, which plays a crucial role in both first and second

[7] In order to dampen the impact of some hyperinflationary episodes on the estimation without deleting them from the sample, we follow Gosh et al. (1997) to transform the inflation rate (x) by x/(1+x), which measures the depletion of the real value of the currency.

[8] Edwards (1996) and Poirson (2001) find strong evidence that reserve sufficiency increases the likelihood for fixed exchange rates being adopted. Meese and Rose (1998) also report

generation currency crisis models.[9] Besides these variables, we also include a dummy variable for the membership of the Commonwealth of Independent States (CIS), CISDUMMY. The CIS countries started their transition process later than most Central and Eastern European Countries (CEECs), their pace of reform is also slower than the CEECs.

In Table 4 we summarize our discussion on the determinants of exchange rate regime choices, their proxies used in the empirical estimations, and the directions of their influence on regime choices.

4. Empirical Results

4.1 A Static Model of Regime Choice

We describe the choices of exchange rate regimes in our sample using a discrete variable, y(i,t), which takes a value of y(i,t)=1 if a fixed regime is selected by country i in year t, y(i,t)=2 for an intermediate regime, and y(i,t)=3 for a floating regime. This choice is based on the latent variable y(i,t)*, which is a function of the economic variables discussed above. A larger value of the latent variable indicates that a more flexible regime is desirable for the country and period under consideration. Given the discrete nature of regime choices, we assume that a country chooses a fixed peg, y(i,t)=1, if the latent variable is below a certain threshold, $y(i,t)^* \leq c_1$. Similarly, a floating rate regime is chosen, y(i,t)=3, if the latent variable is above a second threshold, $y(i,t)^* > c_2$, with $c_2 > c_1$. The intermediate regime is chosen if the latent variable falls between the two thresholds. In the empirical estimation, c_1 is normalized to zero.

We first consider a static model of exchange rate regime choice. In this model we assume that the latent variable y(i,t)*, is a linear function of a vector of contemporaneous explanatory variables, Z(i,t),

$$y(i,t)^* = Z(i,t)'\beta + u(i,t), \quad i=1,2,\ldots,N, \quad t=1,2,\ldots,T(i), \qquad (1)$$

where N is the number of countries, and T(i) denotes the total number of observations for country i. The error term, u(i,t), is assumed to be i.i.d with a logistic distribution function. This gives rise to an ordered logit model, which explains the probability of a country to choose one of the three exchange rate regimes given Z(i,t) (Train, 1986). Because the explanatory variables included in Z(i,t) may not be truly

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some indirect evidence to this effect. Rizzo (1998) and Berger et al. (2000), however, provide some counter evidence.

exogenous to the regime choices in reality, we instrumentalize all the explanatory variables (except for the CISDUMMY) using their own lagged values as instruments.

Table 5 reports our estimates. A positive sign associated with a variable means that a larger value raises the probability for a more flexible regime being chosen. We first report a general specification in column (1) including all variables in the estimation, while the specification in column (2) only retains those variables that are statistically significant at a level of ten percent. For an easier interpretation of the results, Table 5 also reports the marginal effects on the probability of choosing a fixed or a flexible rate regime. These marginal effects indicate the increase in the probability of adopting a fixed (flexible) exchange rate regime due to a unit-increase in the explanatory variable under consideration. For example, the probability of a fixed rate regime is $Prob(y(i,t)=1) = F(y(i,t)^* \leq 0) = F(-Z(i,t)'\beta)$. The marginal effect of the j-th element of Z on this probability is $-f(-Z(i,t)'\beta)\beta_j$. Here, F denotes the distribution function of the error term, and f the density function. Since this effect depends on $Z(i,t)'\beta$, and is, therefore, different for different realizations of the explanatory variables, we evaluate the marginal effects for the hypothetical case of a "typical" intermediate regime, i.e., a country for which $Z(i,t)'\beta$ lies in the middle of the interval $[0, c_2]$.[10] For example, the estimated marginal effects of "OPENNESS" reported in Table 5 indicate that an increase in the ratio of international trade to GDP by one percent increases the hypothetical country's probability of adopting a fixed exchange rate regime by 0.34 percent and decreases the probability of adopting a flexible rate regime by 0.34 percent. As the probabilities sum to one, the marginal effects must sum to zero for all three regimes. For this reason we only report marginal effects on the two corner regimes. The marginal effects for the dummy variables are computed for the switch from zero to one.

A first point to note is that the model has quite reasonable explanatory power, predicting 72 to 79 percent of all regime choices correctly. A likelihood ratio (LR) test for the exclusion of the seven variables not contained in the reduced specification of column (2) does not reject this restriction (The Chi-square test statistic is C=6.61 with seven degrees of freedom). The lower value of the Akaike Information Criterion (AIC) also suggests that the more parsimonious model is preferable.

The estimates suggest that the fundamentals considered by traditional theories of exchange rate regimes affect the choices of the transition economies. The

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[9] For the first generation currency crisis model see Krugman (1979); for the second generation model see Obstfeld (1994, 1996). See also the discussion in Begg et al. (1999).

[10] Alternatively, we could evaluate the marginal effects at the sample mean of $Z(i,t)'\beta$. However, since the sample mean often lies in the vicinity of the upper threshold, the

OPENNESS variable is significant and bears a negative sign, confirming our expectation that more open economies are more likely to choose fixed regimes. The positive sign on ($OPENTOEU^2$) suggests that the relation is non-linear. As openness to the EU in particular increases, its marginal effect on the probability of choosing a fixed rate regime declines. Note that, in our sample, there is no country whose openness is large enough to make the squared term dominate the linear one. As expected from the OCA perspectives, geographical concentration of trade works in favor of fixed rates, while commodity concentration clearly increases the chance for flexible regimes. Economic size represented by GDP increases the likelihood of fixed regimes, a result which is in contrast to the prediction of traditional theory, but its influence is statistically insignificant. Finally, low financial sector development raises the probability of a fixed regime being selected. This is as expected.

In contrast, the variables related to macroeconomic stabilization turn out to be insignificant. A likelihood ratio test for joint significance of these variables leads to the same conclusion (The Chi-square test statistic is C=1.02 with three degrees of freedom.) Similarly, our measure of fiscal performance does not seem to have a significant impact on regime choices. However, the availability of international reserves is highly significant and correctly signed, indicating that the availability of foreign exchange reserves makes the choice of an exchange rate peg more likely. Finally, the CIS dummy indicates that these countries have a significantly higher tendency to adopt a flexible rate regime than the other transition economies.

Given the larger unconditional tendency of CIS countries to adopt a floating rate regime, we next ask whether these countries are also different in their reactions to the other variables contained in the model. To answer this question, we interact all explanatory variables with the CIS dummy. Table 6 reports the results of the parsimonious specification retaining only those interaction terms which are found to be significant at the 10 percent level (The Chi-square statistic for a test of the joint significance of the twelve variables excluded from the general specification is C=14.4 with seven degrees of freedom.) We report the interactive term in boldface, if the relevant total impact, i.e., the sum of the coefficients on the respective variable with and without the interactive dummy, is significantly different from zero at the 10 percent level. The table shows that differentiating between the CIS and the remaining countries makes a difference for some but not all explanatory variables. The model now predicts 80 percent of all observed choices correctly.

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probability of choosing a fixed regime becomes very low and the marginal effects are uninformative.

OPENNESS remains negatively significant for the reference group, but its net effect works in the direction of a floating rate regime for the CIS countries. There is now no separate effect of openness to the EU. Geographical concentration of trade works in favor of a floating rate regime among the reference countries, but strongly in favor of a fixed rate regime among the CIS countries. The table shows that the degree of financial sector development, measured by MONEY, remains positively significant only for the CIS countries only. This may reflect the smaller variation of this variable across countries in the reference group.

Turning to macroeconomic stabilization, we find that the cumulated inflation differential is now significant with the expected, negative sign. For both groups of countries, large cumulated inflation differentials favor the choice of a fixed exchange rate as expected. In contrast, a high rate of inflation in a given year favors the choice of a more flexible regime in the reference group, but it leads to the choice of a more rigid regime among the CIS countries. While the effect in the reference group is as expected, the result for the CIS countries may reflect their tendency to peg to the Russian rouble in the early 1990s. The volatility of real shocks increases the likelihood of a fixed exchange rate in the reference group, which goes against conventional models of macroeconomic stabilization. Finally, the availability of international reserves remains an important determinant of regime choice among the reference countries and the CIS countries. Its effect, however, is smaller among the CIS countries than the reference countries.

4.2. A Dynamic Model of Regime Choice

The static model embeds the assumption that governments choose an exchange rate regime every year without regard to their choices in the preceding year. This assumption seems unrealistic, as credibility matters much for exchange rate policies, and credibility is gained by remaining in the same regime for some time. That is, a country's regime choice in a given year is likely to be correlated with its choice in the previous year. In view of this, we extend our model to allow for the assumption that past regime choices affect current choices. We do this in two ways. First, by adding two dummy variables for the past regimes to model (1). The first dummy, LAGFLEX is one, if the previous regime was a flexible one and zero otherwise. The second dummy, LAGFIX, is one, if the previous regime had a fixed exchange rate and zero otherwise. Second, we interact the explanatory variables relating to macro economic stabilization and the risk of currency crisis with these two dummy variables, to allow for the possibility that the effect of these variables on the current regime choice depends on the previous year's exchange rate regime. Note that the reference case

are all years where the previous regime was an intermediate peg. The resulting model is,

$$y(i,t)^*=Z(i,t)'\beta+\Sigma_{j=1,2}\alpha_j g_j(i,t-1)+\Sigma_{j=1,2}Z(i,t)'\gamma_j g_j(i,t-1) + u(i,t). \quad (2)$$

Here, $g_1(i,t-1)$ is the LAGFLEX dummy, and $g_2(i,t-1)$ the LAGFIX dummy. Thus, the reference case is an intermediate regime in the preceding year. The second term on the right hand side then measures the effect of the previous year's exchange rate regime on the current choice, while the last term allows for different slope coefficients depending on the previous year's regime. Note that the elements of the vectors γ_j, j=1,2, are set to zero for the variables representing economic fundamentals, because these variables do not change much over time. The estimation takes the first regime choice as determined by pre-sample history. As before, we estimate an ordered logit model. All explanatory variables are instrumentalized by lagged values.

The results of model (2) are presented in Table 7. We report only the parsimonious specification; the exclusions from the general specification is not rejected statistically (The Chi-square test statistic is C=3.6 with eight degrees of freedom.) The explanatory power of the model is better than before, with 92 percent of correct in-sample prediction. Note, first, that the fundamentals remain statistically significant and with the same signs as in the static model. The same is true for the reserves variable, which remains significant and favors the choice of a fixed exchange rate independently of the preceding exchange rate regime.

The significant coefficients on the two dummy variables LAGFIX and LAGFLEX indicate that there is considerable persistence in the exchange rate regime choices. There is now a significantly positive effect of real exchange rate volatility in the reference case, indicating that countries choose a more flexible regime in the face of large real exchange rate shocks. While this is as expected, the interactive terms indicate that the choices are different when the last period's regime had a floating or a fixed exchange rate. With a floating rate in the previous period, countries seem to prefer a more rigid exchange rate regime when real exchange rate volatility is currently large, while real exchange rate volatility does not seem to matter if the previous year's regime had a fixed exchange rate.

Turning to inflation rates, the results are similar. Starting from an intermediate regime, high current inflation rates lead countries to adopt a more flexible regime as expected. In contrast, the inflation rate does not affect the current regime choice, if the previous regime had a floating or a fixed exchange rate. While the former result is

compatible with what we expect, the latter indicates that countries stick to a fixed rate regime even if its viability is undermined by a high inflation rate.

Finally, we find no influence of the fiscal balance on regime choices in the reference case of a preceding intermediate regime. However, the coefficients on the interactive terms with the fiscal balance are significant but with opposite signs. Since the balance is positive in the case of a budget surplus, the interpretation is that fiscal deficits favor the adoption of intermediate regimes both when the preceding regime had a floating and a fixed rate. The former result suggests that, coming from a floating regime, countries tighten their exchange rate regime in the presence of large deficits in order to impose some discipline on budgetary policies. Coming from a fixed rate regime, however, large budget deficits lead to a softening of the peg in order to reduce the risk of speculative attacks.

5. Conclusions

In this paper, we present an empirical study of the choice of exchange rate regimes for the group of 25 transition economies in Central and Eastern Europe and the CIS. We have approached this analysis from three different angles: traditional optimum currency area theory, macroeconomic stabilization, and concerns about currency crisis and the viability of exchange rate policies.

The empirical results indicate that exchange rate regime choices are largely consistent with the predictions of international macroeconomics during the period under consideration. This is interesting given the fact that the countries included in our sample only started to participate in international trade and capital markets when they emerged from socialism a decade ago.

The results suggest that countries with geographically concentrated foreign trade or with diversified product structure are more likely to adopt fixed exchange rate regimes. Economic openness also works in the same direction. A more advanced financial system favors the choice of flexible exchange rates, as it permits the development of more sophisticated instruments for the conduct of monetary policy. These arguments suggest that the reasoning of optimum currency-area literature provides considerable guidance for the choice of exchange rate regimes. The only factor which is not consistent with this is economic size; we find that larger countries in our sample are more likely to adopt a fixed exchange rate regime.

Among the variables related to macroeconomic stabilization, current inflation as well as cumulative inflation differentials play important roles in the regime choice. High current inflation rates make fixed exchange rate regimes more difficult to

sustain. As expected, they increase the probability of adopting more flexible regimes. In contrast, large cumulative inflation differentials vis-à-vis a country's main trading partners signal problems of weak central bank credibility and lead to more stable exchange rates, probably by adopting exchange-rate based disinflation programs. Among the crisis variables the availability of foreign exchange reserves strongly favors fixed regimes, as large reserves can enhance the sustainability of such regimes. There are differences between the non-CIS and the CIS countries in choosing the exchange rate regimes. Overall, the CIS countries have shown a stronger preference for flexible exchange rate regimes than the Central and East European countries. This may reflect the desire of the latter to tie themselves more strongly to the European Union, to whose currency they peg in practice. The CIS countries seem to pay less attention to reserve adequacy in their regime selection than the non-CIS countries.

Our dynamic choice model shows that past regime choices strongly influence current decisions, not only directly through the regime persistency, but also indirectly via the interaction with real exchange rate volatility, inflation rates, inflation differentials, and fiscal deficits. The dynamic model suggests that current regime choices are more consistent with the predictions of international macro economics when countries had adopted an intermediate or a flexible exchange rate regime in the preceding period. Specifically, real exchange rate volatility and inflation rates have no significant impact on the current regime choice, if the preceding regime had a fixed exchange rate. This may reflect a tendency for countries to become hard-nosed about pegging their exchange rates rigidly even under unfavorable conditions, perhaps in an attempt to invest in credibility. In contrast, countries tend to loosen their exchange rate regimes in the presence of large fiscal deficits if the previous regime had a rigidly fixed exchange rate. This indicates an awareness of the risk of speculative attacks when fiscal and monetary policies are inconsistent with each other.

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Table 5: Static Ordered Choice Model

Variable	(1) Coeff.	S.E.	(2) Coeff.	S.E.	Marginal Effects[1] FIX	FLEX
OPENNESS	-3.14**	1.30	-1.60*	0.86	0.34	-0.34
OPENTOEU	-7.06	8.51				
$OPENTOEU^2$	17.79*	9.35	6.56***	2.33	-1.41	1.41
GEOCON	-13.64*	8.23	-17.75***	5.98	3.82	-3.82
COMCON	14.22***	5.09	13.70***	4.47	-2.95	2.95
PCGDP	-0.11	0.67				
GDP	-0.63	0.42				
MONEY	3.43*	1.85	1.26	1.27	-0.27	0.27
RERVOL	-0.39	1.02				
INFLATION	1.40	1.42				
CUMINF	-0.10	0.24				
RESERVE	-3.74***	0.93	-2.90***	0.73	0.62	-0.62
FISCAL	8.63	11.76				
CISDUMMY	5.59***	1.47	5.22***	1.04	-0.31	0.68
CONSTANT	3.78	5.58	3.29	3.66		
THRESHOLD	1.61***	0.29	1.57***	0.28		
No. of Obs.	140		140			
Log-likelihood	-85.4		-88.7			
AIC[2]	111.4		97.7			
Correctly Predicted (%)	72.1		78.6			

Note: Statistics with *, **, or *** are significant at 10%, 5%, or 1% level, respectively.
[1] Marginal effects based on specification (2) and evaluated at the midpoint between the two thresholds, except for CISDUMMY, whose marginal effects are computed as the changes in the relevant probabilities when the dummy switches from zero to unity. FIX and FLEX stand for fixed and flexible regimes, respectively.
[2] Akaike Information Criterion (AIC) defined by AIC=K-l, where K is the number of parameters and l the log-likelihood of the model. See Amemiya (1981)

Table 6: Static Ordered Choice Model with Interactive Dummy

Variables	(3)[a] Coeff.	S.E.	Marginal Effects[1] FIX	FLEX
OPENNESS	-11.36***	2.79	2.02	-2.02
GEOCON	30.27*	15.90	-5.37	5.37
COMCON	20.56***	6.65	-3.65	3.65
PCGDP	5.05***	1.18	-0.90	0.90
GDP	-2.03***	0.58	0.36	-0.36
OPENNESS*CIS	**16.32****	3.96	-2.90	2.90
GEOCON*CIS	**-98.85****	26.83	17.54	-17.54
MONEY*CIS	61.66***	21.90	-10.94	10.94
RERVOL	-2.62**	1.27	0.46	-0.46
INFLATION	15.67***	3.47	-2.78	2.78
CUMINF	-1.41***	0.37	0.25	-0.25
INFLATION*CIS	-**20.40****	4.41	3.62	-3.62
RESERVE	-12.10***	2.69	2.15	-2.15
RESERVE*CIS	**7.19****	2.40	-1.28	1.28
CISDUMMY	52.10***	14.64	-0.23	0.77
CONSTANT	-14.72*	7.77		
THRESHOLD	2.41***	0.44		
No. of Obs.	140			
Log-likelihood	-61.1			
AIC	78.1			
Correct pred. (%)	80.0			

Note: Statistics with *, **, or *** are significant at 10%, 5%, or 1% level, respectively.
[a] Coefficients in bold are significant at 10% or higher levels if summed with the non-interactive counterparts.
[1] Marginal effects based on specification (3) and evaluated at the midpoint between two thresholds, except for CISDUMMY, whose marginal effects are computed as the changes in the relevant probabilities when the dummy switches from zero to unity. FIX and FLEX stand for fixed and flexible regimes, respectively.

Table 7: Dynamic Ordered Choice Model

Variables	(4) Coeff.	S.E.	Marginal Effects[1] FIX	FLEX
OPENNESS	-24.11***	8.57	0.41	-0.41
COMCON	39.17*	21.04	-0.66	0.66
PCGDP	16.34***	5.90	-0.28	0.28
GDP	-5.89***	2.05	0.10	-0.10
OPENNESS*CIS	43.61***	13.85	-0.74	0.74
GEOCON*CIS	-312.60***	102.5	5.27	-5.27
MONEY*CIS	248.31***	88.83	-4.19	4.19
INFLATION*CIS	-32.91**	12.73	0.56	-0.56
RESERVE*CIS	23.70**	10.63	-0.40	0.40
RERVOL	19.50*	10.25	-0.33	0.33
RERVOL*LAGFLEX	**-30.00****	13.48	0.51	-0.51
RERVOL*LAGFIX	-28.31**	12.67	0.48	-0.48
INFLATION	34.51**	13.30	-0.58	0.58
INFLATION*LAGFLEX	-22.57**	9.28	0.38	-0.38
INFLATION*LAGFIX	-49.80***	17.54	0.84	-0.84
CUMINF	-2.04*	1.06	0.03	-0.03
CUMINF*LAGFLEX	**-8.43****	2.77	0.14	-0.14
CUMINF*LAGFIX	**-2.14****	1.08	0.04	-0.04
RESERVE	-37.29***	13.74	0.63	-0.63
FISCAL*LAGFLEX	231.15***	81.75	-3.90	3.90
FISCAL*LAGFIX	-115.63**	51.55	1.95	-1.95
LAGFLEX	30.15***	10.14	-0.02	0.98
LAGFIX	-7.55**	3.73	0.95	-0.02
CISDUMMY	159.68***	52.99	-0.02	0.98
THRESHOLD	8.10***	2.51		
No. of Obs.	140			
Log-likelihood	-22.4			
AIC	48.4			
Correct pred. (%)	92.1			

Note: Statistics with *, **, or *** are significant at 10%, 5%, or 1% level, respectively.
[1] Marginal efects based on specification (4) and evaluated at the midpoint between the two thresholds, except for CISDUMMY, LAGFLEX, and LAGFIX, whose marginal effects are computed as the changes in the relevant probabilities when the dummy switches from zero to unity. FIX and FLEX stand for fixed and flexible regimes, respectively.

Appendix I: Definition of Variables and Sources of Data

CISDUMMY: Dummy for the member countries of the Commonwealth of Independent States, including Armenia, Azebaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

COMCON: Commodity concentration of foreign trade, measured by the Gini-Hirschman coefficient defined below. Commodities are first defined at the one-digit SITC level (0-9) to create ten broad groups and then reclassified into seven main commodity categories. Denote exports of commodity i from country j by X_{ij} and country j's total export by X_j, the Gini-Hirschman coefficient for country j, C_j, is defined as $C_j = \sqrt{\{\sum_i (X_{ij}/X_j)^2\}}$. Data on commodity trade are from International Trade Center.

CUMINF: Cumulative differentials in annual consumer price inflation rates vis-à-vis main trading partners. A positive entry denotes a cumulative higher inflation than a weighted average of the main trading partners. The starting year is 1990. The five largest trading partners are involved in the calculation, with weights equal to their respective trade shares. Data source is IMF, *International Financial Statistics* (various issues).

FISCAL: General government budget balance, normalized by GDP. A positive (negative) entry denotes a surplus (deficit). Data source is IMF, *International Financial Statistics* (various issues), and EBRD, *Transition Report* (1999).

GDP: Gross domestic products in current prices, in billions of US dollars and then in logarithms. Data are from IMF, *World Economic Outlook* Database, September 2000.

GEOCON: Geographic concentration of foreign trade, measured by the Gini-Hirschman coefficient denoted by C_j for country j. Denote country j's total bilateral trade with country I by X_{ij}, and country j's total trade by X_j, then $C_j = \sqrt{\{\sum_i (X_{ij}/X_j)^2\}}$. Only five largest trade partners are considered for the calculation of this coefficient since they usually account for more than two-thirds of the foreign trade in the countries in question. Data source is IMF, *Direction of Trade Statistics* (various issues).

INFLATION: Change in the consumer prices, annual average, transformed using the formula $x^* = x/(1+x)$. Data source is IMF, *International Financial Statistics* (various issues).

MONEY: Broad money, normalized by GDP. Broad money is the sum of „money" and „quasi-money". Data source is IMF, *International Financial Statistics* (various issues).

OPENNESS: Degree of openness to foreign economies, measured by the ratio of total trade volume to GDP. Total trade volume is the sum of goods export (f.o.b.) and goods import (c.i.f.). Trade data are from IMF, *Direction of Trade Statistics* (various issues). GDP data are from IMF, *World Economic Outlook* Database, September 2000.

OPENTOEU: Degree of openness to the EU, measured by the share of trade with the EU in total trade. Data source is IMF, *Direction of Trade Statistics* (various issues).

PCGDP: Per capita GDP, in thousands of US dollars and then in logarithms. Data are from IMF, *World Economic Outlook* Database, September 2000.

RERVOL: Volatility of the real exchange rate, measured by the standard deviation in the monthly change of the real effective exchange rate. The change of the real effective exchange rate is the weighted average of changes of five bilateral effective exchange rates vis-à-vis five largest trade partners. The weights are their respective trade shares. Both home and foreign consumer price inflation rates are used in the calculation. Data sources are IMF, *International Financial Statistics* (various issues), and UN Economic Council for Europe Database provided by Charles Wyplosz.

RESERVE: Ratio of non-gold international reserves to broad money. Data sources are IMF, *International Financial Statistics* (various issues), *Country Report* (various issues), and EBRD, *Transition Report* (1999).

Appendix II: Exchange Rate Regimes in Transition Countries

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
EU Accession Candidates: Central and Eastern European Countries										
Bulgaria	3	8	8	8	8	8	8	2	2	2
Czech Rep.	3	3	3	3	3	3	4	7	7	7
Hungary	3	3	3	3	3	6	6	6	6	6
Poland	3	5	5	5	5	6	6	6	6	6
Romania	3	7	8	8	8	8	8	8	7	7
Slovak Rep.	3	3	3	3	3	3	4	4	7	7
Slovenia	na	(7)	7	7	7	7	7	7	7	7
EU Accession Candidates: Baltics										
Estonia	na	na	2	2	2	2	2	2	2	2
Latvia	na	na	(8)	(8)	3	3	3	3	3	3
Lithuania	na	na	(8)	(8)	2	2	2	2	2	2
Other Central and Eastern European Countries										
Albania	3	3	8	8	8	8	8	8	8	8
Croatia	na	na	3	8	4	4	4	4	4	7
Macedonia	na	na	8	8	3	3	3	3	3	3
Commonwealth of Independent States										
Armenia	na	na	(3)	(8)	8	8	8	8	8	8
Azerbaijan	na	na	(3)	(3)	8	8	8	8	7	7
Belarus	na	na	(3)	(3)	(7)	7	4	7	7	7
Georgia	na	na	(3)	(8)	7	7	7	3	8	8
Kazakhstan	na	na	(3)	(8)	8	8	8	7	7	8
Kyrgyz Rep.	na	na	(3)	(8)	8	7	7	7	7	7
Moldova	na	na	(3)	(8)	8	8	8	8	8	8
Russia	na	na	(3)	(8)	8	4	6	6	7	8
Tajikistan	na	na	na	(3)	(3)	8	8	8	7	7
Turkmenistan	na	na	(3)	(3)	3	7	7	3	3	3
Ukraine	na	na	(3)	(8)	8	7	7	4	4	7
Uzbekistan	na	na	(3)	(3)	(8)	7	7	7	7	7

Note: End-year observations. Codes in parentheses refer to the periods when the newly-introduced national currencies have not yet assumed the status as the sole legal tender. The meanings of the codes are: na=not available, 1=currency union (no separate legal tender), 2=currency board arrangements, 3=conventionally fixed pegs (adjustable pegs, de facto pegs), 4=horizontal bands, 5=crawling pegs, 6=crawling bands, 7=managed floating without preannounced path for the exchange rate, 8=independent floating.

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