WORKING PAPERS IN ECONOMICS

No. 1599

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FROM FIXERS TO FLOATERS: AN EMPIRICAL ANALYSIS OF THE DECLINE IN FIXED EXCHANGE RATE REGIMES 1973-1995

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From Fixers to Floaters: An Empirical Analysis of the Decline in Fixed Exchange Rate Regimes 1973-1995

by

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August 1999

Abstract
The purpose of this article is to explain the decrease in the fixed exchange rate regimes we have experienced the last decades. Our econometric approach is duration analysis, and the explanatory variables used are taken from the literature on optimum currency areas. The sample consists of 51 countries and covers the period 1973-1995. The degree of openness proves to be the most influential variable. Increasing openness by 1% decreases the hazard for adopting a floating exchange rate by 1.29%, i.e. an elasticity of –1.29. The size of a country and the inflationary differential against foreign countries are also significant. But the corresponding elasticities (0.19 and 0.25) are considerably lower than for openness.

Acknowledgements: We would like to thank Gary Fournier and Kyrre Rickertsen for helpful comments.

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1. INTRODUCTION

After the breakdown of the Bretton Woods system a growing number of countries have chosen to let their exchange rates float. In 1973, 19 (15%) of the 128 members of the International Monetary Fund (IMF) were classified as floating exchange rate regimes. In 1995 the number of IMF-members had increased to 180, of which 98 (54 %) were counted as floating regimes. Most of the increase in floating regimes was due to the fact that the "1973-member-countries" had changed status from fixed to float. The purpose of this article is to explain this process empirically.

During the last decades we have seen a marked liberalization in international financial markets. A common view is that it is difficult for countries, which have chosen to deregulate financial markets, to fix the exchange rate (Obstfeld and Rogoff (1995)). Thus, the increase in capital mobility may explain the increase in floating regimes. But there are other explanations, mainly found in the literature on optimum currency areas. Here it is discussed when a fixed contrary to a floating exchange rate is advantageous for a country. Based on this discussion a set of criteria has been developed. The basic premise of this article is that authorities make rational choices, and we therefore expect that countries choose exchange rate regimes according to these criteria.

In the literature the degree of openness seems to be considered as the most important criterion. The larger the degree of openness the more advantageous it is to fix the exchange rate (McKinnon (1963) and Krugman (1990)). Second, we have the size of a country. The smaller a country, the more advantageous it is to have a fixed exchange rate. Small countries are less stable and more prone to speculation (Mundell (1960)). In addition small countries are not able to affect foreign prices, and therefore the terms of trade, by exchange rate policy (McKinnon (1963)). Consequently, the benefit of a change in the exchange rate can be questioned. For small countries the cost of keeping the exchange rate fixed is therefore of a

minor magnitude. The third criterion is structural concentration of production. Here, there is disagreement in the literature as to the sign of this effect. The traditional argument by Kenen (1969) is that specialization in the production calls for a floating exchange rate. On the other hand, Heller (1977) argues that for developing countries specialization means unstable export earnings and the need is therefore a fixed exchange rate. The fourth criterion is geographical concentration in trade, which has been used in the empirical literature on optimum currency areas (Heller (1978)). Heller argues that more concentration calls for a fixed exchange rate. Difference in the rate of inflation between the home country and foreign countries is the fifth criterion. Here, fixed exchange rates require that this difference is small, see Fleming (1971) and Corden (1972). As a sixth variable we mention the degree of economic development. According to Holden, Holden and Suss (1979) the less the degree of development, the stronger is the need for a fixed exchange rate. The last criterion we shall focus on is the degree of capital mobility. As mentioned, a common view is that fixed exchange rates are costly to uphold if capital mobility is perfect, (Obstfeld and Rogoff (1995)). This is opposed to the view in the early stage of the literature on optimal currency areas. In Mundell (1960) and Mundell (1961) it is argued that a high degree of capital mobility calls for fixed rates.

(Table 1 about here)

There has been quite a few studies using the previous criteria to explain the actual choice of exchange rate regimes. Early review articles of the literature are given by Edison (1989) and Edison and Melvin (1990). Table 1 summarizes the studies. If a study reports several estimated models we have chosen to present the model that is most comparable to what is found in other studies.

Country size, inflation differential and production concentration are the most successful variables. All studies that report these variables come up with the expected signs. The estimate of the country size is significant at the 5 % level in two of five cases, while the

estimate of the inflation differential is significant at the 5 % level in two of four cases. In the case of production concentration two out of six studies give a significant effect at the 5 % level. For the other variables the results are mixed. Openness and geographical diversification show up with a wrong sign in two out of seven cases. For capital mobility only Bosco (1987) reports a significant estimate with a positive sign.[1]

The various studies differ as to how many countries are included and the time period covered by the analyses. While Dreyer (1978), Bosco (1987) and Savvides (1990) only look at developing countries, the other studies include all countries.

A common thread is that various types of cross-sectional analysis have been used. Heller (1978) uses discriminant analysis, while Dreyer (1978), Bosco (1987) and Honkapohja and Pikkarainen (1992) use discrete choice models. A weakness with the statistical techniques used is that they are static, which means that they only give a snapshot of the actual situation. If this picture shall be valid the underlying process must be in statistical equilibrium, which means that the various states must be constant over time, even if countries may change exchange rate regime. As described in the first paragraph of this section, this is not the case. The assumption of statistical equilibrium therefore seems not to be validated in the data.

Our econometric approach will be duration analysis, which is better suited to take care of the dynamic nature of the problem. Duration analysis is similar to static categorical response models like the logit or probit: both types of models consider discrete outcomes. In

[1] In the studies not only variables from the optimum currency literature are used. Melvin (1985) included price shocks. He divided the exchange rate regimes into three groups, and estimated a logit-model with only domestic and foreign price shocks as explanatory variables. He found a positive relationship between domestic price shocks and a fixed exchange rate and for foreign price shocks this relationship was negative. The inclusion of four variables from the theory of optimum currency areas added no explanatory power. However, a model consisting of only these variables showed satisfactory results. Savvides (1990) postulated that the variance in the real exchange rate was simultaneously determined with the exchange rate regime, and these variables were treated as endogenously determined. The equation for explaining the exchange rate regime included domestic and foreign price shocks, in addition to five variables from the theory of optimal currency areas. The results as to price shocks support the results from Melvin. However, in the case of Savvides the extra variables from the optimum currency approach added significantly to the equation.

the present case, the outcome is either a fixed or a flexible exchange rate regime. However, categorical response models address an outcome at some point (or period) of time, contingent on the values of the explanatory variables. In duration analysis the time of the response (the transition from fixed to flexible exchange rates) is incorporated into the model, moreover, the explanatory variables are allowed to vary over time. It is also possible to investigate if the passage of time affects the probability of changing regime.

The organization of the paper now is: the next section considers the method in greater detail. Section 3 accounts for the data treatment, Section 4 contains the empirical results, and Section 5 briefly summarizes our main findings.

2. METHOD

Assume that initially a country is in one state (fixed exchange rate) and may change into another state (flexible exchange rate) at any point in time. Let the random variable $T \in (0, \infty)$ denote the time spent in the initial state, i.e. the duration of the fixed exchange rate regime. At T the transition occurs. Let $f(t)$ and $F(t)$ denote the probability density function and the cumulative density function, respectively. It is also useful to define the survivor function, $S(t) = 1 - F(t)$. In the present analysis we focus on the hazard rate. (For expositional simplicity, we postpone the introduction of explanatory variables.) The hazard rate, or transition rate, $q(t)$, is the limit of the probability per time unit that the transition takes place in a small interval after t, conditional on no transition before t. Formally,

$$(1) \qquad q(t) = \lim_{dt \to 0} \frac{\Pr(t \le T < t + dt \mid T \ge t)}{dt}.$$

It follows straightforwardly that

$$(2) \qquad q(t) = \frac{f(t)}{S(t)},$$

and, upon integration, that

$$(3) \qquad S(t) = \exp\left(-\int_0^t q(u)du \right).^2$$

Note that t denotes process time, not calendar time. Also note that we assume that all countries are in the fixed exchange regime initially, and that we only consider one potential event (a transition into the floating regime). The model may be extended to repeated events, but that will not be considered here. The typical pattern is that once in a floating exchange rate regime, a country stays that way.

Even though transitions may occur at any point in time, in applications it may be necessary to group them in intervals because data do not permit to pinpoint the exact dates. This is also the case in the present analysis. It is then necessary to work with discrete hazards. Define the discrete, or grouped, hazard, l_t, as the probability that a transition occurs in the interval $[t, t+1)$, conditional on no transition until t. Using (3), it may be shown that

$$(4) \qquad l_t = 1 - \exp\left(-\int_t^{t+1} q(u)du \right).$$

[2] For proofs, see, e.g., Lancaster (1990).

There are several ways to specify the hazard rate. We use a proportional hazard model with flexible baseline. Assume that the hazard depends on a vector $\mathbf{x}(t)$ of potentially time-varying exogenous variables. The proportional hazard model is then

(5) $$q(t,\mathbf{x}) = q_0(t)\exp(\mathbf{ß}'\mathbf{x}(t)),$$

where $\mathbf{b}$ is a vector of coefficients, and $q_0(t)$ is the baseline hazard. The baseline hazard determines the time dependence of the hazard. We assume here that $q_0(t)$ is some unknown positive function. An obvious special case is when $q_0(t)$ is a constant, another special case is the Weibull hazard. To develop the discrete analogy of (5), assume that $\mathbf{x}(t)$ stays constant at $\mathbf{x}_t$ in [t, t+1). Define $g_t = \ln\left[\int_t^{t+1} q_0(u)du\right]$. Using this definition, normalizing [t, t+1) to unity, and inserting (5) into (4) yields

(6) $$l_t = 1 - \exp\left[-\exp(g_t + \mathbf{ß}'\mathbf{x}_t)\right].$$

The parameters of the model may be estimated by maximum likelihood. Testing if the baseline hazard is time-varying or constant, $\mathrm{H}_0 : g_t = g, \forall\, t,$ is straightforward.

The sampling strategy is important when estimating duration models. In particular, left-censoring poses problems. Left-censoring occurs when an observational unit enters the estimating sample after t = 0 and leads to a downward bias in the estimated hazard rate. It is therefore important that the starting time of the process is known. As we argue in the next section, 1973 is a natural starting point, thus left censoring is not a problem. Right-censoring,

on the other hand, the fact that all countries cannot be observed until a transition takes place, is well taken care of in the maximum likelihood estimation procedure.[3]

3. DATA AND DEFINITIONS

We have relied on IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* for information on exchange rate regime. Here the end-of-the-year exchange rate regime is reported, based on information obtained from the member countries. A problem is that there is not always accordance between the reported regime and the exchange rate policy actually being practised. Countries with an alleged floating exchange rate have been known to intervene regularly in the foreign exchange market, while ostensible peggers have allowed the exchange rate to vary within such wide bands that the peg imposes practically no restrictions on the movements of the exchange rate. Despite this weakness there does not seem to be a better source for information on exchange rate regime. As a consequence, the maximum number of countries in the analyses is limited to 112 – the number of countries that have been IMF-members during the whole period.

As opposed to the theory of optimum currency areas, IMF does not use the simple dichotomy of fixed and floating exchange rate regimes. Instead, the countries are classified in 5 to 10 different categories. These categories represent different degrees of exchange rate flexibility, and in some cases it is hard to decide if they should be classified as fixed or floating exchange rate regimes. This applies in particular for so called "crawling-peg"-regimes. A crawling peg is a fixed exchange rate that is changed at relatively frequent intervals, hence this regime has the characteristics of both a fixed and a floating exchange

[3] For a derivation of the likelihood function, see e.g. Jenkins (1995).

rate. To avoid this problem we have decided to leave out regimes characterized by ”crawling peg”.

Another borderline case is the managed floating. We have decided to define this as floating mainly for two reasons: In the years 1973 to 1981 managed and freely floating exchange rates were put together in the residual category of ”exchange rate not maintained within relatively narrow margins”. Also - because we have omitted ”crawling peg” - this gives a clearer distinction between the two groups of exchange rate regimes. Accordingly, the floaters are those belonging to the residual group in the years 1973 to 1981, and those having managed or freely floating exchange rates in the years 1982 to 1995.

There is also the question of how to treat the countries participating in the European “snake” in the mid-seventies, and the EMS after that.[4] These countries have mutually fixed exchange rates, but float jointly against other currencies. In the context of this article, they certainly belong to the group of “fixed exchange rate regimes”. It can be argued that they were free to drop out of the system and adopt floating exchange rates at any time, and therefore are not different from other fixers. However, one might argue that the decision by these countries to fix their exchange rates is just as much a result of political considerations as of purely economical ones. In addition, the inherent reciprocity makes it easier for a member-country to withstand speculative attacks on its currency. This suggests that membership in the EMS should decrease the hazard for adopting a flexible exchange rate system – a hypothesis that will be tested by including a time-constant dummy for EMS-membership.

To measure duration in the fixed exchange rate regime, we have to choose a starting point. To avoid the problem of left censoring it is important that the starting point coincides with the time the countries entered the risk group. We have therefore chosen 1973 as our starting point. This year saw the end of the Bretton Woods era, and the member countries

were now in principle free to choose which exchange rate regime to adopt. Of course there were exceptions: Canada had had a floating exchange rate since 1970, and some countries had broken out of Bretton Woods in 1972. These countries are omitted from the analysis. The remaining countries enter the risk group in the beginning of 1973, and – as exchange rate regime is observed at the end of the year – may also have a transition during this first year.

We must also define what should constitute a transition. The basic idea in this article is that the transition from fixed to floating exchange rates is a fundamental change, taking place after careful consideration of the alternatives. As a consequence we do not want to call it a transition if a country – because of speculation – decides to let the currency float for a while, and then peg it at a new parity. To avoid this problem we define a transition as taking place in the first of at least two subsequent years of floating exchange rates.

Capital mobility is difficult to measure. Earlier authors have used the ratio of foreign assets of the banking system to the money supply, or the ratio of gross private capital flows to gross domestic product. Following Rose (1996) we have instead used information taken from *Annual Report on Exchange Arrangements and Exchange Restrictions*. Here the existence/non-existence of 5 different restrictions on capital mobility is reported. In the analysis we represent capital mobility by four time-varying dummy variables indicating respectively no restrictions, one restriction, two restrictions, or three restrictions. The reference group is four or five restrictions, i.e. with the lowest degree of capital mobility (only two countries had a year with all five restrictions).

The other explanatory variables are defined as follows.

- For *openness* we have used the ratio of total trade (export + import) to gross domestic product. The data is taken from IMF's *International Financial Statistics* (IFS*).*

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[4] In the final selection of countries these are Belgium, Denmark, France, Germany, Luxembourg, and the Netherlands.

- *Size* is measured by U.S. dollar GDP in 1990-prices, taken from IFS.
- The degree of *structural concentration* is measured by the percentage of the largest single export category in total exports. The categories are on 3-digit SITC-level, and the data is taken from UN's *Handbook of international trade and development*, and *International trade statistics yearbook*.
- For the degree of *geographical concentration* of the external sector we have used the percentage of the largest single export destination in total exports. Again the source is UN's *International trade statistics yearbook.*
- The *inflation differential* is the absolute value of the difference between the country's inflation rate and the world average. The data for this variable are taken from IFS.

After omitting countries with incomplete data from the beginning of the period[5], we are left with 56 countries from the original 112 IMF-members. These 56 countries are listed in the appendix. Countries with missing data at the end of the period are treated as right-censored in the last year with a complete set of variables.

Before the final adjustments for the duration analysis, we take a closer look at two of the more important explanatory factors – openness and capital mobility. We have summarized capital mobility as an index where 0 means that all five restrictions are applied, and so forth, with the maximum value of 5 indicating no capital restrictions. In Figure 1 we show the development over time of the means of openness and the capital mobility index.

(Figure 1 about here)

One might expect openness to show an increasing trend, but this is not supported by the data. As for capital mobility such a trend is identifiable. The figure clearly shows that the surviving fixed exchange regimes (censored) are more open than the countries that had chosen

[5] An example is Romania with missing data on exports, imports and GDP in the years 1973 to 1979.

a floating exchange rate (transition). Apparently, the increasing degree of capital mobility stems from the floaters. The surviving fixed exchange regimes seem to have had a high but stable degree of capital mobility. This is further scrutinized in the bottom box of Figure 1. Here we see that for the censored group capital mobility has increased since the mid-eighties for the EMS-countries, but decreased for the rest of the censored group.

Discarding the countries characterized by "crawling peg" (Chile and Uruguay) and those who did not enter the risk group in 1973 (England, Canada and Italy) leaves us with 51. The variables are observed annually, so there are a total of 666 observations ("country-years"). The mean duration in the fixed exchange rate regime is 13 years, including 14 spells that were censored between 1991 and 1995. In Table 2 descriptive statistics for the exogenous variables are presented.

(Table 2 about here)

4. EMPIRICAL RESULTS

The main purpose of this article is to decide how the hazard for a transition from a fixed to a floating exchange rate regime depends on economic criteria. Our empirical approach – duration analysis – allows for the possibility that this hazard is time-dependent. Economic theory gives no indication of such a relationship. We will therefore subject the question of time dependency to statistical testing.

As suggested in Section 2, we test a time-varying baseline hazard (g_t in equation (6) varies over time) against a time constant baseline ($g_t = g$, all t). Because the hazard cannot be estimated for a year during which no transition occurs, transitions are grouped in three-year

intervals.[6] Furthermore, we will also estimate the models with a dummy for the EMS-members. We thus report estimates from three models in Table 3:

(1) Constant baseline ($g_t = g$, all t)

(2) Time-varying baseline

(3) Constant baseline with EMS-dummy

(Table 3 about here)

As indicated in Table 3, the likelihood ratio test of Model 2 against Model 1 does not reject the null hypothesis of a constant baseline hazard. (The test statistic is 10.79 and distributed as chi-squared with 6 degrees of freedom, with a critical value of 12.59 at the 5% significance level.) Even though the test is in favour of model (1), the coefficients on the explanatory variables are not dramatically affected – the estimates in model (1) and (2) lie within 95% confidence intervals of each other.

Turning now to the effects of the explanatory variables in Model 1, we find that openness and size are statistically significant at the 1% level. The inflation differential is significant at the 5% level. The dummies for capital restrictions are not significant.[7] Openness has a negative effect on the hazard, while size and the inflation differential increase the hazard.

Turning to model (3), which includes the EMS-dummy,[8] we see that the dummy is significant at the 5% level. This is also supported by the likelihood ratio test, which gives a chi-squared statistic of 7.38 with one degree of freedom (critical value = 6.63 at the 1% level

[6] There were no transitions during the years 1974, 1975, 1981, 1984, 1986-1988, and 1995. Altogether there are seven intervals. The length of the final interval is 5 years.

[7] We have also estimated the models with the dummy variables replaced by the index used in Figure 1, with all over similar results. The effect of the capital mobility index was estimated negative and significant at the 10% level in Model 1.

[8] We have also estimated a model with this dummy and a time-varying baseline hazard, but failed to reject the hypothesis of a constant baseline hazard. Therefore, the results from this model are not reported.

of significance). The negative sign of the dummy indicates that membership in the EMS decreases the hazard of adopting a floating exchange rate.

We have also tried other specifications of the baseline hazard – among them a monotonically increasing or decreasing baseline. As none of these performed better than the constant baseline, the results from these estimations are not reported. All the models have also been estimated with a dummy for developing/industrial countries[9], but this dummy was not significant in either of the models. We have also tested for neglected heterogeneity and found no evidence of this.[10] In conclusion, model (3) is the preferred one.

The negative effects of capital mobility are in opposition to the prevalent view that a high degree of capital mobility makes it difficult to defend a fixed exchange rate (Obstfeld and Rogoff (1995)). However, in our preferred model (3), none of the dummies for capital restrictions are statistically significant.

To compare the relative importance of the other variables we have calculated the elasticities evaluated at the mean. For continuous variables, these are simply

$$(7) \qquad \frac{\partial q(t,\bar{x})}{\partial \bar{x}_k}\frac{\bar{x}_k}{q(t,\bar{x})} = \hat{b}_k \bar{x}_k ,$$

where $\bar{x}_k$ is the mean of the k´th variable as reported in Table 2. The estimated elasticities are presented in Table 4.

(Table 4 about here)

According to McKinnon (1963) and Krugman (1990), we would expect increasing openness to decrease the hazard for adopting a floating exchange rate regime. This is strongly supported by the data: Openness is significant at the 5% level, and has an estimated elasticity

[9] Grouped according to International Financial Statistics Yearbook 1993.

of -1.29 – the highest of all. This is also the relationship found in all the earlier studies when this variable was significant.

Although size is significant at the 1% level, the estimated elasticity is only 0.19. The positive effect of size on the hazard accords with what was found in all the earlier studies.

Even though in the theory there is disagreement as to the effect of structural concentration, all earlier studies have found a negative relation between this variable and flexibility of the exchange rate regime. The same effect is also found in this study, with an elasticity of -0.29. However, this variable is not significant.

Geographical concentration is found to have a positive influence on the hazard. This effect is the opposite of what the theory predicted, and none of the earlier studies have found a significant positive relation between this variable and floating exchange rate. The elasticity is 0.26, but the variable is not significant in this study.

There is more agreement regarding the effect of inflation differential: an inflation rate that strongly deviates from that of the rest of the world makes it difficult to fix the exchange rate. This relation is supported by all the earlier empirical studies, as well as by the present. The estimated elasticity is 0.25.

5. CONCLUDING REMARKS

In this study it is tried to explain the large increase in floating exchange rate regimes that we have experienced the last decades. Our econometric approach is duration analysis, which is an improvement compared to earlier studies which used cross-sectional techniques.

In the earlier studies the country size, the inflation differential and structural concentration turned out to be the most successful variables in explaining the frequency of

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[10] The test is for gamma-distributed neglected heterogeneity, cf. Meyer (1990).

floating regimes. We confirm the importance of country size and inflation differential, but not structural concentration. However, the variable that showed up most powerful in our analysis is the openness of a country. The importance of this variable accords with the youngest part of the theoretical literature on optimum currency areas, cf. Krugman (1990).

Our sample includes 51 countries. Of these, 6 (11.8%) countries were floaters in 1973. In 1995 the number of floaters had grown to 39 (76.5%). The 12 countries that have survived with a fixed exchange rate are mainly the EMS-countries – Austria, Belgium, Denmark, Germany, Ireland, Luxembourg and the Netherlands – and the EMS-related country Cyprus. In addition we have one country with a dollar-peg – Panama – and three countries with a currency-basket – Jordan, Malta and Thailand. Except for Germany these countries are characterised as *small open* economies with *low or moderate inflation rates.* According to our analysis these three characteristics count in favour of a fixed exchange rate. But this sample of fixed exchange rate economies also indicates that this may not be enough. Co-operation may be at least as important.

APPENDIX: OVERVIEW OF THE 56 IMF-MEMBERS WITH COMPLETE DATA

Developing Countries	Last observation	Transition/ censored
Chile	Omitted	
Costa Rica	1980	Trans.
Cyprus	1995	Cens.
Dominican Rep.	1985	Trans.
Ecuador	1983	Trans.
El Salvador	1989	Trans.
Ethiopia	1991	Cens.
Ghana	1978	Trans.
Guatemala	1989	Trans.
Honduras	1990	Trans.
India	1979	Trans.
Indonesia	1978	Trans.
Israel	1977	Trans.
Jamaica	1983	Trans.
Jordan	1995	Cens.
Kenya	1993	Trans.
Korea	1980	Trans.
Malaysia	1973	Trans.
Malta	1992	Cens.
Mauritius	1994	Trans.
Mexico	1976	Trans.
Morocco	1980	Trans.
Pakistan	1982	Trans.
Panama	1994	Cens.
Paraguay	1989	Trans.
Peru	1976	Trans.
Philippines	1973	Trans.
South Africa	1979	Trans.
Sri Lanka	1977	Trans.
Tanzania	1990	Cens.
Thailand	1995	Cens.
Trinidad and Tobago	1993	Trans.
Uruguay	Omitted	
Venezuela	1989	Trans.
Zambia	1985	Trans.

Developed Countries	Last observation	Transition/ Censored
Australia	1976	Trans.
Austria	1994	Cens.
Belgium	1994	Cens.
Canada	Omitted	
Denmark	1995	Cens.
Finland	1992	Trans.
France	1973	Trans.
Germany	1995	Cens.
Greece	1976	Trans.
Ireland	1995	Cens.
Italy	Omitted	
Japan	1973	Trans.
Luxembourg	1992	Cens.
Netherlands	1995	Cens.
New Zealand	1979	Trans.
Norway	1992	Trans.
Portugal	1973	Trans.
Spain	1977	Trans.
Sweden	1992	Trans.
United Kingdom	Omitted	
United States	1973	Trans.

The countries are grouped into "developing" and "industrial" according to the classification in *International Financial Statistics Yearbook 1993.*

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TABLE 1 The relationship between the variables and the probability of adoption of flexible exchange rates

Variable	Theory	Earlier empirical findings						
		Heller (1978)	Dreyer (1978)	HH&S (1979)	Melvin (1985)	Bosco (1987)	Savv. (1990)	H&P (1992)
Capital mobility	+ / -	+		-		+	-	-
Openness	-	-	-	-	+	-	-	+
Size	+	+	+		+	+		+
Structural conc.	+ / -		-	-		-	-	-
Geographical conc.	-	-	-	-	-	-	+	+
Inflation differential	+	+		+	+	+		
Econ. development	+			+			+	-
Countries		73	88	75	64	92	39	140
Developing(D)/Industrial (I) countries		D&I	D	D&I	D&I	D	D	D&I

+ indicates a positive relationship.
- indicates a negative relationship.
Dark shaded cells indicate 5% significance level
Brighter shaded cells indicate 10% significance level
No shading indicates statistical insignificance except for Heller (1978) (significance levels not reported)

TABLE 2 **Descriptive statistics for the exogenous variables** (51 countries; 666 ”country-years”).

Variable		Mean	Standard deviation	Min	Max
Openness		0.780	0.417	0.094	2.119
Size		1.13e+11	3.02e+11	6.96e+08	3.70e+12
Structural concentration		29.034	19.758	4.4	94.4
Geographical concentration		28.862	14.873	4.9	79.7
Inflation differential		8.607	7.914	0.028	103.494
# capital restrictions:		Frequency	Percent	Cumulative	
	0	105	15.77	15.77	
	1	314	47.15	62.91	
	2	114	17.12	80.03	
	3	93	13.96	93.99	
	4	38	5.71	99.7	
	5	2	0.3	100	

TABLE 3 **Maximum likelihood estimates of the hazard models with asymptotic standard errors**

	Model 1		Model 2		Model 3	
	Coef	SE	Coef	SE	Coef	SE
3 capital restrictions[a]	-0.436	0.666	-0.634	0.672	-0.499	0.681
2 capital restrictions	0.090	0.654	-0.130	0.653	0.141	0.659
1 capital restriction	-0.615	0.618	-0.921	0.646	-0.570	0.622
No capital restr.	-1.526	0.945	-2.453**	1.091	-0.220	0.926
Openness	-1.874***	0.666	-2.397***	0.715	-1.655**	0.659
Size	1.08E-12***	4.07E-13	1.27E-12***	4.46E-13	1.66E-12***	6.31E-13
Structural concentration	-0.008	0.010	-0.008	0.011	-0.010	0.010
Geographical concentration	0.015	0.011	0.020*	0.011	0.009	0.012
Inflation differential	0.027**	0.012	0.021*	0.012	0.029**	0.012
EMS					-3.216**	1.394
γ	-1.776**	0.728			-1.734**	0.730
γ_1			-2.100***	0.804		
γ_2			-1.317*	0.777		
γ_3			-1.035	0.845		
γ_4			-1.746*	0.955		
γ_5			-1.992*	1.095		
γ_6			-0.758	0.966		
γ_7			-0.161	0.957		
N	666		666		666	
Log likelihood	-125.9974		-120.6036		-122.3052	
Model chi-squared	33.8				41.18	
(Degr. of freedom)	(9)				(10)	

*/**/*** indicates statistical significance at the 0.10/0.05/0.01 level (based on the normal distribution)
[a]Reference: 4-5 capital restrictions
Likelihood ratio tests: Model 2 against Model 1: 10.79 (chi-squared, DF=6)
Model 3 against Model 1: 7.38 (chi-squared, DF=1)

TABLE 4 Estimated elasticities

Variable	Elasticity
Openness	-1.29
Size	0.19
Structural concentration	-0.29
Geographical concentration	0.26
Inflation differential	0.25

The elasticities are based on the estimated coefficients from Table 3, model 3, and the means from Table 2.

FIGURE 1 Means for openness and capital mobility (56 countries)