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EXPLAINING SHIFTS IN EXCHANGE RATE REGIMES

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Abstract

Issues surrounding exchange rates continue to fascinate both economists and political scientists. Although a relatively large literature has grown around attempting to explain the choice of exchange rate regime, empirical estimation has failed to find a generally satisfactory explanation of it. Shifts between exchange rate regimes are even less well understood. This paper focuses on such shifts and examines them by estimating both an economics only specification and one that is augmented with political variables. As a robustness check we also estimate a data driven specification using a large and comprehensive set of economic and political variables. In addition, we examine shifts between international macroeconomic archetypes to see whether similar factors are at work. In terms of exchange rate regime shifts, we find that although unobservable country specific factors are significant, there are other systematically important factors including, in particular, economic growth and IMF involvement. Central bank independence, financial openness and the incidence of crises may also exert an influence. In contrast, we find that selected political variables are generally insignificant in affecting shifts, although they may influence the size of shifts, once they happen.

JEL: F30, F33

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1   Introduction

Since the demise of the Bretton Woods adjustable peg system in 1973 and the beginning of the 'modern era', economists have been fascinated by the subject of exchange rates. In terms of the volume of research that has been conducted, this fascination has focused mainly on the determination of exchange rates and the relative values of currencies. But it has also covered the choice of exchange rate regime and, to a much lesser extent, changes in exchange rate regime. Truth to tell, the research has not led to great advances in knowledge. As far as the choice of exchange rate regime is concerned, while a number of studies have claimed to discover variables that exert a significant effect, the overall explanatory power of the underlying models remains poor. Even less is known about why countries shift between regimes, in spite of the fact that such shifts are often high profile events. Research has investigated the frequency with which changes are made and the direction of change, but it has not sought to explain in any detail why the changes are made and what factors influence them.

This article seeks to add to our understanding of why shifts in exchange rate regimes occur. The issue is complex. Past researchers have used different ways of classifying exchange rate regimes, not all of which lead to similar conclusions. Shifts vary in terms of their direction and size. Politics as well as economics seem likely to be involved. Moreover, it is not simply a matter of shifts being associated with changes in the variables that affect choice. There appears to be a strong element of state dependence. Once having chosen a particular regime, countries seem to become increasingly reluctant to abandon it. Even so, the world provides plenty of examples of countries giving up an exchange rate peg, or a strongly managed exchange rate regime in favour of a more flexible one. There are also examples of moving in the opposite direction. While case studies can help to explain why these shifts occur, it remains interesting to know whether there are more systematic influences.

The paper is organised in the following way. Section 2 briefly reviews the existing literature on the choice of exchange rate regime and on the pattern of change. Section 3 offers an informal analytical framework that attempts to establish some hypotheses about exchange rate regime shifts. In this section shifts are also put into the context of a broader change in the overall design of macroeconomic policy as reflected by the policy space created by the international macroeconomic trilemma. Shifts in exchange rate regimes are likely to be aligned to changes in the degree of monetary independence and the openness of the capital account. Section 4 is

divided into various subsections that cover the incidence of shifts, the methodology used and the results obtained. In this section we consider both the direction and size of shifts in exchange rate regimes but we also examine changes in the design of international macroeconomic policy more broadly defined. We draw on a comprehensive range of economic and political data and use models that are driven by the relevant theory and by the data. Section 5 discusses and interprets our findings using the analytical framework and the a priori hypotheses established in section 3. Section 6 presents a brief summary and makes some concluding remarks about future research.

2   Literature review

Compared to many topics in economics much of the literature on the choice of exchange rate regime is fairly recent. After all, throughout the Bretton Woods era countries had relatively little choice. The modern literature has been comprehensively surveyed and augmented in a recent book by Klein and Shambaugh (2010). This allows our treatment of it to be brief.

Early studies tested the ability of optimum currency area theory to empirically explain the choice of regime, with the broad conclusion emerging that it was indeed consistent with the theory. Fixity seemed to be positively related to the degree of openness and the diversification of trade (Heller, 1978; Dreyer, 1978; Holden et al., 1979). Meissner and Oomes (2009) later found that the strength of trading partnerships affected the choice of anchor currency.

Further studies by Collins (1996), Rizzo (1998) and Bayoumi and Eichengreen (1998) provided some further support for OCA theory, although they also found that open economies tended to opt for greater exchange rate flexibility. From these studies it emerged that countries seemed more likely to opt for a flexible exchange rate regime as they got bigger and became more developed; ideas for which additional evidence has been provided by Husain et al. (2005). It also seemed to be the case that faster inflation and larger current account deficits were associated with more flexible exchange rate regimes. Bayoumi and Eichengreen (1998) found that flexible rate regimes are more common where there are asymmetric shocks. However, at odds with the consensus, Poirson (2001) reported little support for OCA theory in explaining the choice of exchange rate regime in an analysis of 93 industrial and developing economies for the year 1999.

Other studies have examined the extent to which the exchange rate has been used to insulate economies from shocks abroad, or to allow domestic shocks to be exported (Melvin, 1985; Sav-

vides, 1990). Carmignani et al. (2008) go on to examine whether fixed exchange rates have been used as a commitment device to induce stability, but find that if anything the causal connection has worked the other way around.

Empirical analyses of the choice of exchange rate regime have not ignored the political influences on it. Bernhard and Leblang (1999) examine the importance of the political and electoral system, as well as the degree of democracy, and show that there are different relationships depending on the types of country included in the sample (industrial or developing). Leblang (1999) finds that democratic developing countries are more likely to choose a flexible rate regime. Broz (2002) similarly finds that autocratic political systems are associated with fixed exchange rates. In the same vein, Frieden et al. (2010) report that undemocratic political systems are more likely to go hand in hand with exchange rate pegs.

Since the benefits and costs of different exchange rate regimes will not be universally and evenly spread throughout an economy, parts of the literature have empirically tested whether the size of the affected constituencies influences the choice of regime. Blomberg et al. (2005) and Broz and Frieden (2006) conclude that fixed exchange rates are more likely to be found in countries where there is a larger trade sector that benefits from the greater certainty that fixed rates impart.

Klein and Shambaugh (2010) test a model that endeavours to incorporate both the economic variables derived from OCA theory and some of the political variables identified by the extant literature. Their results are, however, generally disappointing in the sense of failing to find a clear explanation of the choice of exchange rate regime. The highest degree of significance is attached to former colonial status (where colonies opt for pegs) and to country fixed effects that are unobservable. In his review of Klein and Shambaugh's book, Rose (2011) is similarly dismissive of the extent to which the literature has established what the main determinants are. Indeed, rather more strongly, he points out that "Klein and Shambaugh show convincingly that theories of exchange rate regime determination simply work terribly in practice" (p. 655).

Other contributions to the literature examine changes (or the lack of change) in the choice of exchange rate regime. An early study by Klein and Marion (1997) examined the duration of pegs in Latin America, while subsequent research by Klein and Shambaugh (2008) investigates the tendency for countries to 'flip' back to earlier exchange rate choices after they have been abandoned. They find that inertia in the choice of regime builds up over time. In a related

vein, von Hagen and Zhou (2007) report considerable evidence for state dependence, with the past choice of regime strongly influencing the current choice. A group of studies also examines changes in exchange rate regimes from the perspective of the bi-polar hypothesis which implies that countries will migrate towards the polar extremes of immutable fixity or free flexibility (Husain et al., 2005; Masson, 2001). They find little support for it. Alesina and Wagner (2006) find that it is more likely that countries will be forced to abandon an exchange rate peg when they have poor institutions.

Basically there are so many gaps in our understanding of exchange rate regimes that it is difficult to know where to start, or, according to Rose (2011), whether it is worth the effort to try and fill the gaps. This paper is motivated by the quest to find a more systematic explanation of why countries change their choice of exchange rate regime than is permitted by a case study examination of a series of high profile episodes. Indeed, from the range of issues that could be investigated further, the circumstances in which countries decide to change their choice of exchange rate regime seems to us to be the most interesting, as well as the least researched. In a way, our paper is trying to respond to one of Rose's main 'gripes' about the Klein and Shambaugh book that he reviews, namely that transitions between exchange rate regimes are essentially ignored, or at least only treated in a way that is mechanical and almost devoid of economics. Our purpose in what follows is to try and improve on this.

We also try to fill another gap by examining changes in the design of international macroeconomic policy in the context of the international macroeconomic trilemma. Here, shifts in exchange rate regimes are seen as only one element, alongside financial openness and monetary independence.

3 An Analytical Framework

In 1990, the UK shifted its exchange rate policy, joined the Exchange Rate Mechanism of the European Monetary System and started to peg the value of sterling. In 1992, the UK withdrew from the ERM and allowed the value of sterling to float freely again. In 1994, Mexico relaxed its policy of aligning the value of the peso to the US dollar. In 1997, Thailand, followed by a number of other East Asian countries, moved over to a more flexible exchange rate regime, but Hong Kong did not. Similar events could be recorded for Russia and Brazil in the late 1990s and for Argentina and Turkey in the early 2000s. One assumes that these decisions, as well as similar

ones in other countries, were not made in a purely serendipitous way, but had an underlying rationale. Why then were the decisions taken? What factors were influencing them? Are there determinants that are systematically significant, or is every case unique and idiosyncratic?

Casual observation of the circumstances in which the changes occurred is suggestive. The UK joined the ERM as a way of anchoring inflationary expectations, and left it in order to relax the constraints that were imposed on domestic monetary policy. Quitting the ERM also allowed the value of sterling to fall in order to encourage economic growth and reduce unemployment in advance of elections. Mexico, and many of the other emerging economies in the above list, moved in the direction of greater exchange rate flexibility when confronted with falling international reserves, a serious economic crisis, capital reversals and ebbing confidence in international capital markets. They were left with few other options. In some of these cases, they were also following the advice received from the IMF, which was involved in helping to navigate a way out of the crisis. In many of these cases the introduction of greater exchange rate flexibility permitted monetary policy to be chosen on the basis of domestic economic circumstances, rather than to protect the value of the currency.

Observations like these allow us to begin to accumulate a group of factors that may more generally be associated with exchange rate regime shifts, with some of these favouring a move towards greater fixity and others towards greater flexibility. A pattern also begins to emerge about the direction in which the exchange rate is expected to move when the shift is towards greater flexibility. While there could be some counter examples, the above cases seem to suggest that this will usually involve a fall in the currency's value.

The purpose of this section is to examine, in principle, some ideas about what factors may be associated with exchange rate regime shifts. A series of a priori hypotheses is formulated that can then be tested against the empirical evidence.

Leading on from analyses that claim that the choice of exchange rate regime is based on OCA criteria, it might appear to follow that changes in these criteria would then lead to changes in the choice of regime. However, as noted in the previous section, there appears to be a substantial degree of state dependence in the choice of exchange rate regime. Besides this, although the OCA criteria may vary across countries, they will tend to change only slowly over time within countries. It would therefore seem unlikely that shifts in exchange rate regime will be well explained in this way. On the other hand, a change in macroeconomic performance with, for

example, accelerating inflation and a deteriorating current account could in theory be important factors in accounting for a shift either towards greater fixity, as part of a strategy of exchange rate based stabilization, or towards greater flexibility in an attempt to restore real exchange rate equilibrium. A shift towards greater exchange rate flexibility might also be expected in circumstances where international reserves have been heavily depleted, creditworthiness has fallen, foreign capital is exiting and other economic reforms have already been tried and have failed. The shift to a flexible exchange rate may be a last resort. This was indeed the situation in many of the cases mentioned at the beginning of this section.

As with OCA criteria, economic size and stage of economic development that have been found to exert some influence over the choice of exchange rate regimes, are unlikely to alter swiftly enough to be driving shifts in exchange rate regime in individual countries. The same may apply to some of the political variables that have been found in the literature to influence the choice of regime. But other political variables may remain relevant. Changes in the orientation of the government (right or left wing), and the proximity of elections may, in principle, be anticipated to have a potential effect on shifts in exchange rate regime, although precisely what this effect will be is more ambiguous. A newly elected right wing government may, for example, be more strongly inflation-averse and therefore favour a pegged rate. Alternatively, it may ideologically prefer to leave foreign exchange markets to operate freely. Moreover, as an election approaches, a government may be anxious not to be seen to be altering a pivotal policy tool. Or it may be anxious to receive the expansionary boost that it believes would be associated with a fall in the value of the currency.

Other political and institutional factors may also be important. Governments may, for example, have been using a fixed exchange rate as a counter inflationary device. Establishing an independent central bank and adopting a policy of inflation targeting may provide an alternative way of anchoring inflationary expectations, and may therefore encourage a shift towards a more flexible exchange rate regime.

While changes in OCA criteria over time were deemed above to be unlikely to affect shifts in exchange rate regime, the framework provided by the international macroeconomic policy trilemma may be more fertile. This views changes in exchange rate regimes as only one component of an overall change in international macroeconomic policy. In principle, for example, a move in the direction of capital account liberalization might be expected to be associated with

an accompanying move towards greater exchange rate flexibility. As the mirror image to this, the introduction of capital controls might go together with a shift towards greater exchange rate fixity.

In summary, the discussion in this section suggests a number of factors that could, in principle, be associated with shifts in exchange rate regime. It also suggests factors that are unlikely to be connected with such shifts, even though they may be analytically linked to the choice of regime. However, reverting to the cases mentioned at the outset of the section, perhaps the clearest connection is to be expected between a shift away from fixed rates and towards more flexible ones in the event of severe economic crises. The connection may be particularly strong where the IMF is involved and is advocating such a shift. Given its institutional interest in exchange rate regimes, it might be expected that involvement with the Fund would exert an impact on shifts in exchange rate regime. In addition to this, the Fund's attitude towards capital account liberalization and its past opposition to the use of capital controls would lead to the expectation that the design of international macroeconomic policy would also be affected by the IMF.

Finally, in thinking about shifts in exchange rate regime, it is important to think about the absence of shifts or, in other words, stability in the choice of exchange rate regime. As noted in the previous section, the literature has discovered a significant degree of state dependence. This suggests that there may need to be a fairly compelling reason to shift exchange rate regime before the shift actually occurs.

Working on the assumption that governments are more likely to switch policy in circumstances where economic performance is deemed unsatisfactory, it follows that they are less likely to switch policy where performance is deemed satisfactory. While there are various elements to a social welfare function, it seems reasonable to suggest that governments will be less likely to shift exchange rate regime where an economy is experiencing a relatively fast rate of economic growth and a relatively low rate of inflation. By the same token, low economic growth, high inflation, crisis conditions and IMF involvement might be expected to lead to a reassessment of international macroeconomic policy and a shift in exchange rate regime.

Some of the individual cases mentioned at the beginning of this section, such as the UK in 1992 and Argentina a decade later, at least superficially suggest that economic stagnation and falling living standards might contribute to the shift in regime. In the next section and its

various subsections we attempt to test some of these ideas empirically.

4   The Empirics

4.1   Measuring shifts in exchange rate regimes and policy archetypes

In the empirical analysis we employ five dependent variables.[1] We begin by constructing the variable *Regime*, which is a discrete dichotomous variable that captures exchange rate regime shifts. We construct the variable using the coarse index developed by Reinhart and Rogoff (2004) and extended by Ilzetzki et al. (2011). It does not contain any information about the magnitude or the direction of the shift (whether, for example, the regime changed from a pegged exchange rate to a managed float or whether it changed from a freely floating exchange rate to a fixed one). But our analysis goes beyond the incidence of exchange rate regime shifts. It considers the effects of economic and political factors on the size of a shift given the direction of the change. To do this, we construct variables *RegimeFlex* and *RegimeFix*.

Next, we construct *RegimeFlex*, a discrete ordered variable measuring the extent of exchange rate regime changes in the direction of more flexibility. The higher the value of the variable, the greater the extent of the transition towards a more flexible exchange rate regime. *RegimeFix* measures the extent of exchange rate regime changes in the direction of less flexibility. The higher the value of the variable, the greater the extent of the transition towards a less flexible exchange rate arrangement. We use these two variables in determining which economic or political factors may have a bearing on the size of a shift.

In addition to these variables, we also employ a discrete polytomous variable (*RegimePoly*), which reflects all shifts in either direction.[2] In contrast to the ordered variables, *RegimePoly* also includes a zero category to capture the absence of exchange rate regime shifts. Due to the volume of the output generated by the models utilizing this variable, estimation results are not reported but are simply referred to in the text. The full results are available from the authors on request.

The fifth variable that we use is a discrete binary variable that enables us to study transitions from a particular international macroeconomic policy trilemma outcome to another. Trilemma outcomes are policy configurations that involve the degree of exchange rate stability, the extent

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[1]Details on the construction of the variables can be found in Appendix A.
[2]We use the terms *polytomous* and *multinomial* interchangeably throughout the text.

of financial account openness and the level of monetary policy autonomy. The nature of this measure is broader compared to that of an exchange rate regime and derives directly from the arbitrage conditions of standard small open economy models.

To facilitate our analysis, and following Bird et al. (2012), we classify these configurations into four distinct policy archetypes: a 'US archetype' with monetary autonomy, an open financial account and a low degree of exchange rate stability; a 'Hong Kong archetype' with a stable exchange rate and an open financial account (but no monetary autonomy); a 'China archetype' with monetary autonomy, a stable exchange rate and a closed financial account; and a 'Middle archetype' that features moderate degrees of exchange rate stability, financial account openness and monetary autonomy.[3,4]

As already mentioned, this measure treats exchange rate policy as part of a broader choice within the context of the international policy trilemma. The implication is that there will be more frequent shifts across archetypes, as a change in any of the three policy aspects (exchange rate stability, financial account openness and monetary autonomy) may be sufficient to change the archetype. The enhanced sensitivity of this measure, however, comes with a limitation in that the three-dimensional aspect of the policy choice does not allow us to order outcomes in the same way as with the measures based on one-dimensional exchange rate regimes shifts.

The number of exchange rate regime shifts and archetype shifts (by year) are shown in Figure 1.

4.2 Explaining shifts in exchange rate regimes and policy archetypes

4.2.1 What countries do

Table 1 shows the percentage of observations that fall into each of the Reinhart and Rogoff (2004) classifications. The prevalent arrangements tend to be ones that allow (some) control of the exchange rate value or at least the band within which the currency is allowed to float. The frequency of free floating has been in decline since the early 1990s in favour of less flexible exchange rate arrangements (regimes 1, 2 and 3)—see Figure 3.

This picture is broadly consistent with the one painted by the trilemma outcomes, the

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[3]Data on exchange rate stability are from Aizenman et al. (2010) and on financial account openness from Chinn and Ito (2008). We construct a monetary autonomy variable that derives from the open economy trilemma—see Appendix A.

[4]The four archetypes defined here enable us to discuss international macroeconomic policy in a more stylised framework but should not be taken literally as holding perfectly at all times.
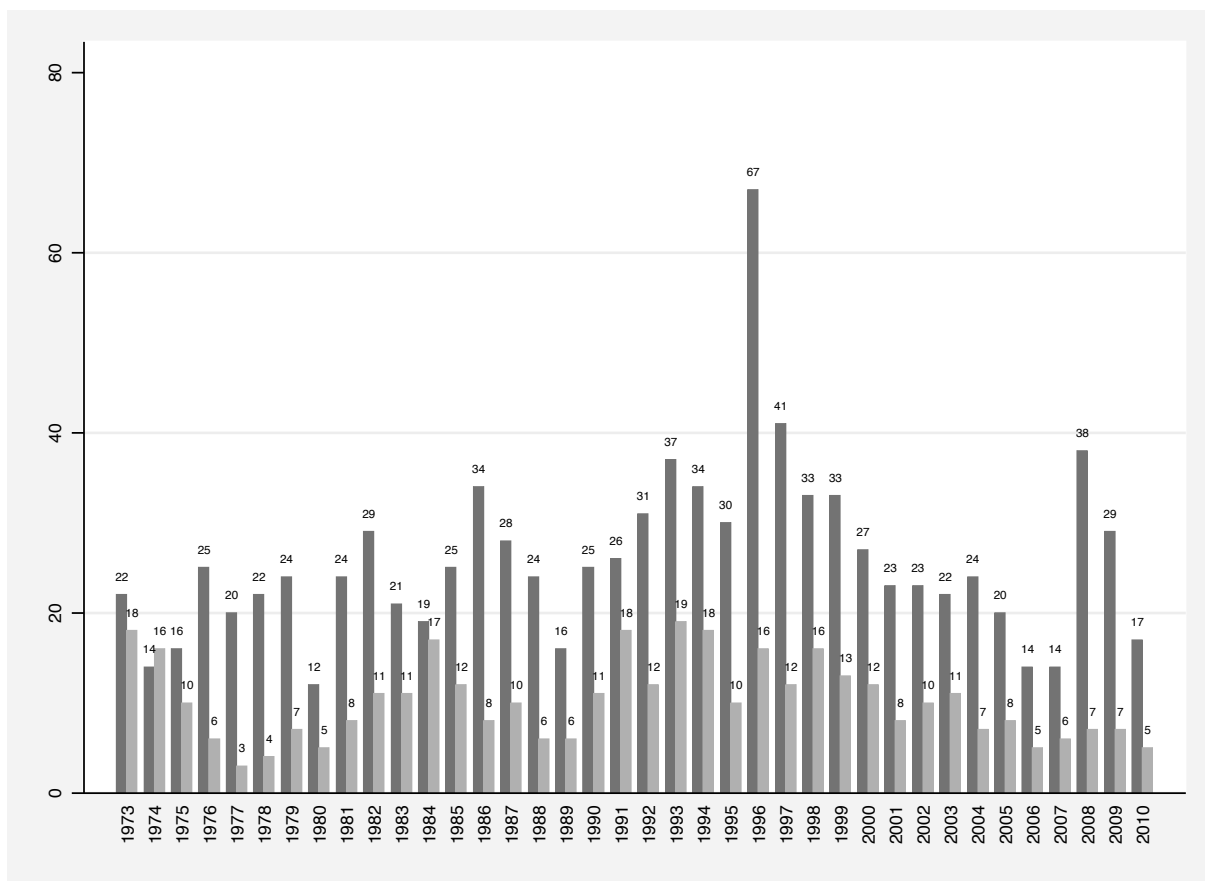
Figure 1: Regime Shifts (light grey) and Archetype Shifts (dark grey) 1973–2010

distribution of which can be seen in Figure 2 along with that of the exchange rate regime classifications from Reinhart and Rogoff (2004). The China archetype is the most popular one with almost 48% of the observations falling in this category. The freely floating (USA) archetype represents 3.34% of the observations—a similar number to the freely floating category in Reinhart and Rogoff (2004).[5]

The breakdown of the international macroeconomic policy archetypes over time uncovers some interesting trends:[6] the China-archetype (Archetype1 in the graph) has generally been declining (even though it increased in 2009 and 2010), whereas the Middle and USA archetypes have seen limited changes in recent years. In contrast, there has been a steady increase of the Hong Kong archetype.

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[5]In reality, the freely falling category cannot really be defined as an exchange rate regime as such but rather as a property of flexible exchange rates in crisis. The freely floating and the freely falling regimes together account for just over 11% of observations in the sample.

[6]To be precise, what we refer to here is the *clustering* around an archetype. See Appendix A for details on the classification of observations into policy archetypes.

Table 1: Exchange Rate Regimes and Archetypes 1973–2010

Code	Details	Obs.	%
	Coarse classification		
1	No separate legal tender Pre announced peg or currency board arrangement Pre announced horizontal band that is narrower than or equal to +/-2% De facto peg	2,183	39.89
2	Pre announced crawling peg Pre announced crawling band that is narrower than or equal to +/-2% De factor crawling peg De facto crawling band that is narrower than or equal to +/-2%	1,465	26.77
3	Pre announced crawling band that is wider than or equal to +/-2% De facto crawling band that is narrower than or equal to +/-5% Moving band that is narrower than or equal to +/-2% Managed floating	1,079	19.72
4	Freely floating	184	3.36
5	Freely falling	442	8.08
6	Dual market in which parallel market data is missing	119	2.17
	International macroeconomic policy archetypes		
1	China archetype (stable exch. rate, closed fin. acc., monetary autonomy)	2,653	47.58
2	Hong Kong archetype (stable exch. rate, open fin. acc., no monetary autonomy)	1,483	26.60
3	USA archetype (floating exch. rate, open fin. acc., no monetary autonomy)	186	3.34
4	Middle archetype (moderate stability, financial openness, monetary autonomy)	1,254	22.49

Notes: Source for coarse classification: Reinhart and Rogoff (2004). Source for archetypes: authors' calculations (for details see Appendix A).

It is evident that most countries choose to implement policies that allow them at least some degree of influence over the exchange rate. While there may be a fear of floating (Calvo and Reinhart, 2002), open financial accounts may make it difficult to sustain pegged exchange rates (Obstfeld and Rogoff, 1995).

4.2.2 A close look at the data

Table 2 presents data on the durability of exchange rate regimes. A first observation is that exchange rate regimes persist, with the less flexible regimes being the most persistent. However, more flexible arrangements are also quite persistent. Table 2 also shows transition probabilities across trilemma outcomes. Generally, shifting to an adjacent regime is more likely than shifting to a more distant one.

Using the updated coarse index from Reinhart and Rogoff (2004) Table 3 confirms that the majority of shifts are towards an adjacent exchange rate regime. Only a tiny fraction, less than one percent, moved between the extremes of fixed and floating exchange rate regimes.

Low income countries experience more frequent exchange rate regime shifts (9.22%) than
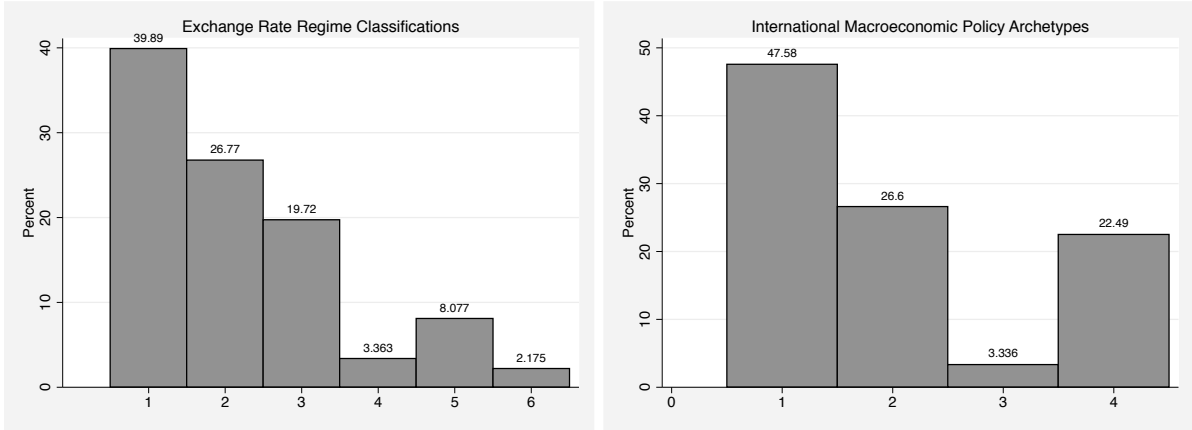
Figure 2: Distribution of Exchange Rate Regimes and Policy Archetypes (%)
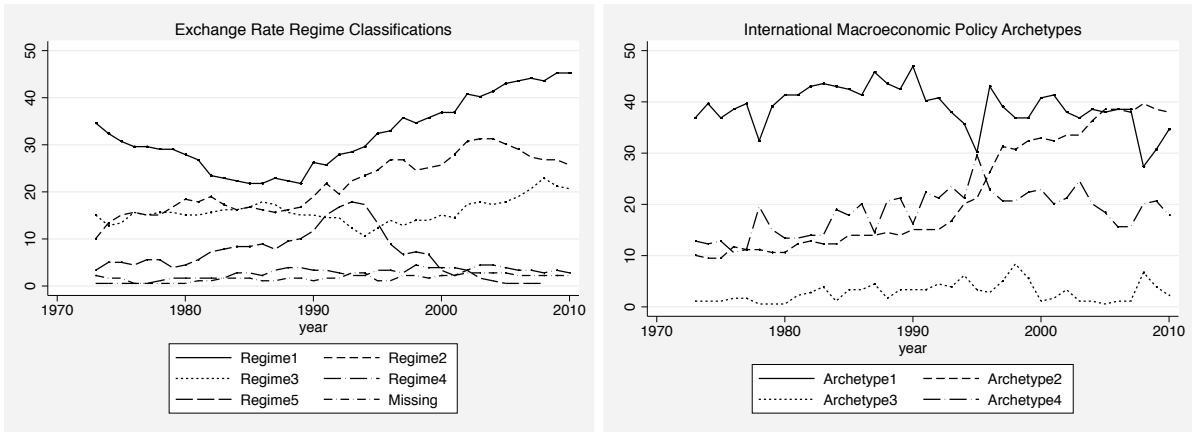
Figure 3: Distribution of Exchange Rate Regimes and Policy Archetypes (%) Over Time

middle income countries (7.45%) or high income countries (5.35%) with a small majority of these being in the direction of more flexibility (57 vs 48 shifts, respectively). Overall, the directions of regime shifts balance out: there are 194 shifts towards more flexible exchange rates and 195 shifts towards less flexible exchange rates. Regionally, we observe a higher than average frequency of exchange rate regime transitions in Europe & Central Asia and Latin America & the Caribbean (around 10.0% of observations). East Asia & the Pacific also exhibit an above average propensity to shift. In contrast, Middle East and North Africa, South Asia and sub-Saharan Africa have fewer and, generally, less sizeable shifts.

Countries seem to shift across archetypes more frequently; 17.63% of observations are classified as a shift using this measure. Again, LICs have a greater propensity to shift compared to MICs and HICs. Countries in Europe & Central Asia and in East Asia & the Pacific shift their

Table 2: Transition Probabilities and Frequencies

Coarse classification

	1	**2**	**3**	**4**	**5**
1	2030	34	18	3	13
	(0.966)	(0.016)	(0.009)	(0.001)	(0.006)
2	35	1324	41	2	12
	(0.025)	(0.935)	(0.029)	(0.001)	(0.008)
3	14	38	937	4	43
	(0.013)	(0.037)	(0.903)	(0.004)	(0.041)
4	3	2	4	162	7
	(0.017)	(0.011)	(0.022)	(0.910)	(0.039)
5	17	27	45	9	335
	(0.039)	(0.061)	(0.102)	(0.020)	(0.760)

International macroeconomic policy archetypes

	1	**2**	**3**	**4**
1	2259	8	48	262
	(0.877)	(0.003)	(0.019)	(0.102)
2	9	1363	6	31
	(0.006)	(0.967)	(0.004)	(0.022)
3	32	6	53	90
	(0.177)	(0.033)	(0.293)	(0.497)
4	247	67	75	831
	(0.202)	(0.055)	(0.061)	(0.681)

Notes: Frequencies are reported in the top row corresponding to each regime and transition probabilities are reported in parentheses in the row below. Shifts to regime 6 (dual market in which parallel market data is missing) are not reported. The table should be read horizontally, e.g., the probability of switching from regime 1 to regime 2 is 0.018, whereas the probability of switching from regime 2 to regime 1 is 0.024.

international macroeconomic policy configurations more often than other regions.[7]

4.2.3   Explaining shifts in exchange rate regimes

In seeking to explain shifts in exchange rate regimes we draw on the ideas discussed earlier. In section 3 we pointed out that some of the variables that, in principle, influence the choice of regime will not be empirically relevant as an indicator of the timing of a shift in that choice. Country characteristics such as geographical location and language as well as colonial history do not change over time and others, such as the degree of trade openness change only slowly. Moreover, we noted that there is apparently a significant degree of inertia in the selection of exchange rate regime.

In the empirical estimations that follow, we build on the hypothesis that countries will be

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[7]Recall that the regional breakdowns exclude HICs.

Table 3: Exchange Rate Shifts: Number, Magnitude and Direction

Cat.	Sub.	No.	Magnitude Direction: more flex.				Direction: less flex.				Arch
			1	2	3	4	1	2	3	4	
Income	LIC	105	27	23	3	4	20	19	4	5	275
	(%)	9.22	2.36	2.00	0.26	0.35	1.75	1.66	0.35	0.44	21.60
	MIC	201	38	38	11	8	40	34	22	10	543
	(%)	7.43	1.40	1.40	0.41	0.29	1.47	1.25	0.81	0.37	19.60
	HIC	83	28	10	3	1	27	8	4	2	165
	(%)	5.35	1.80	0.64	0.19	0.06	1.74	0.52	0.26	0.13	10.76
Region*	EAP	36	6	11	2	1	5	7	4	0	127
	(%)	8.82	1.47	2.67	0.49	0.24	1.22	1.70	0.97	0.00	24.47
	ECA	35	4	5	0	2	9	4	7	4	89
	(%)	10.39	1.17	1.45	0.00	1.45	2.62	1.16	2.04	1.16	32.13
	LAC	108	16	19	9	7	19	21	11	6	185
	(%)	9.91	1.47	1.74	0.82	0.64	1.74	1.92	1.01	0.55	18.35
	MENA	23	7	5	1	0	4	3	3	0	70
	(%)	5.58	1.69	1.21	0.24	0.00	0.97	0.73	0.73	0.0	17.07
	SA	15	6	2	0	0	6	1	0	0	52
	(%)	6.82	2.73	0.91	0.00	0.00	2.73	0.45	0.00	0.00	19.26
	SSA	89	26	19	2	2	17	17	1	5	295
	(%)	6.47	1.88	1.37	0.14	0.14	1.23	1.23	0.07	0.36	18.92
Total		389	93	71	17	13	87	61	30	17	983
(%)		7.21	1.72	1.31	0.31	0.24	1.61	1.13	0.55	0.31	17.63

Notes: * Regional breakdown excludes HICs. Shifts to and from regime 6 (dual market in which parallel market data is missing) are excluded.

unlikely to change policies for as long as macroeconomic performance in terms of economic growth and inflation is perceived as being satisfactory. A change in policy may be most likely during a crisis. The crisis may result either from the current account or the capital account. We attempt to capture the current account influence directly and the capital account influence more indirectly by looking at credit ratings and flows of foreign direct investment.

However, the need to alter exchange rate policy may also be expected to depend on the level of international reserves that can act as a cushion against adjustment. Institutional arrangements in the form of an independent central bank may have a significant influence, since inflation targeting may have replaced a pegged exchange rate as a means of anchoring inflationary expectations. We also test to see whether fiscal imbalances affect the propensity to shift exchange rate regime, as would be implied by the first generation currency crisis model.

Politics may also be influential in as much as the ideology of the incumbent government may affect the appeal of pegged as opposed to flexible exchange rates. The stage of the electoral cycle may also be important. Going beyond this, and in the context of the international macroeconomic policy trilemma, the propensity to shift exchange rate regime will be affected by

attitudes and policies with regards capital mobility. Finally, we are interested to test whether the involvement of the IMF is linked to the probability of a change in exchange rate regime and the design of international macroeconomic policy.

We approach our empirical analysis in a number of stages. To begin with, we test a model that focuses on economic factors alone. We not only examine the ability of these factors to explain shifts in exchange rate regime, but we also investigate their links more broadly to the choice of international macroeconomic policy and shifts between policy archetypes. As a robustness check, we examine a parameterization that is driven by our large and comprehensive data set. Finally, we augment the specification with the political variables discussed above.

The variables we use in our economics-only model are real GDP per capita growth rate, foreign direct investment inflows as a percentage of GDP, the budget balance as a percentage of GDP and inflation. We supplement these variables with international reserves (% GDP), the degree of financial account openness, and two dummies: one capturing the presence of an independent central bank and the other capturing participation in an IMF program in the previous five years. Data are drawn from *World Development Indicators*, Chinn and Ito (2008), Hammond (2011) and the *International Monetary Fund*'s website.

The political economy variables we consider include a change in government, an election in the legislature, the ideological orientation of the executive, the political system and the number of years in office. The data we use are drawn from the *Database of Political Institutions* (Beck et al., 2001; Keefer, 2010)—henceforth, *DPI*.

These specifications of the model are used in *panel logit* estimations to explain the incidence of exchange rate regime shifts (dependent variable *Regime*), as well as in *ordered logit* estimations to explain the magnitude of such shifts given the direction of change (dependent variables *RegimeFlex* and *RegimeFix*). The same specifications—dropping the degree of financial account openness—are used to explain shifts between archetypes (variable *Archetype*).[8]

The panel data model for discrete and dichotomous dependent variables (in this case variables

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[8]The financial account openness variable is excluded, as it has been used in the construction of the archetypes variable.

Regime and *Archetype*) can be written as

$$y_{it}^* = \mathbf{x_{it}}\boldsymbol{\beta} + \nu_{it} + u_i, \; i=1,\ldots,n, \; t=1,\ldots,T_i$$

$$y_{it} = 1 \text{ if } y_{it}^* > 0, \text{ and } 0 \text{ otherwise}$$

where it is assumed that u_i is panel-specific unobserved heterogeneity, which is orthogonal to $\mathbf{x_{it}}$. The latter assumption implies the use of random effects. Errors ν_{it} are distributed according to the logistic distribution independently of u_i. The coefficient $\rho = \sigma_u^2/(\sigma_u^2 + \sigma_\nu^2)$ in the estimation output is the proportion of the total variance explained by the panel variance. In our results, this coefficient is statistically significant and this provides justification for the use of the panel structure (as opposed to pooling the observations).

The panel-specific log-likelihood is given by

$$l_i = \int_{-\infty}^{\infty} \frac{e^{-u_i^2/2\sigma_u^2}}{\sigma_u\sqrt{2\pi}} \left[\prod_{t=1}^{n_i} \Psi\left(y_{it}, \mathbf{x_{it}}\boldsymbol{\beta} + u_i\right) \right] du_i$$

which can be approximated by a Gauss-Hermite quadrature (Greene, 2012).

A non-panel polytomous multinomial model can be written as

$$Prob(y_i = j) = \frac{e^{\mathbf{x_i}\boldsymbol{\beta_j}}}{\sum_{k=0}^{J} e^{\mathbf{x_i}\boldsymbol{\beta_k}}}$$

where $j = 0, 1, \ldots, J$ are the possible unordered outcomes. This model is not identified and therefore we need to set one of the $\boldsymbol{\beta}$s equal to 0. Asume that $\boldsymbol{\beta_0} = 0$. Then an identified model is

$$Prob(y_i = j|\mathbf{x_i}) = \frac{e^{\mathbf{x_i}\boldsymbol{\beta_j}}}{\sum_{k=1}^{J} e^{\mathbf{x_i}\boldsymbol{\beta_k}}}$$

for $j = 0, 2 \ldots, J$. The log-likelihood is

$$lnL = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} ln Prob(y_i = j)$$

where

$$d_{ij} = \begin{cases} 1 & \text{if } y_i = j \\ 0 & \text{otherwise} \end{cases}$$

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This can be solved using the Newton-Raphton maximisation procedure. We use this method to model the polytomous variable *RegimePoly*, even though we do not tabulate the results due to space constraints.[9]

Finally, for $j = 1, \ldots, k$ ordered outcomes, the probability of a given observation is

$$Prob(y_i = j) = Prob\left(\mu_{j-1} < \mathbf{x_i}\boldsymbol{\beta} + u \le \mu_j\right)$$

or

$$Prob(y_i = j) = \frac{1}{1 + e^{-\mu_j + \mathbf{x_i}\boldsymbol{\beta}}} - \frac{1}{1 + e^{-\mu_{j-1} + \mathbf{x_i}\boldsymbol{\beta}}}$$

where the $k - 1$ μs are cut-off points to be estimated along with the βs. We use the ordered logit to model variables *RegimeFlex* and *RegimeFix*.

4.2.4 Results from the economics-only model

Table 4 reports results from the economics-only specification. Growth has a negative sign and is statistically significant in the *Regime* equation but not so in the *Archetype* one. Inflation, in contrast, is insignificant in explaining the likelihood of exchange rate regime shifts, but it has a positive and statistically significant coefficient for shifts between archetypes.

Turning to the other variables, a reduced budget deficit or increased surplus is associated with a reduction in the probability of an exchange rate regime shift but is not significantly linked to the probability of a shift between archetypes. Even though we lag all variables by a year in the estimations, we do not draw causal inferences from the results. The empirical connection between the budget balance and the probability of a shift in the exchange rate regime may mean that countries with better public finances resort to exchange rate regime shifts less frequently, or that countries that shift less frequently exert better control over their public finances, or both.

The estimated coefficients of the budget balance are different across the two ordered specifications. In specification III, the coefficient is positive, indicating that the probability of a larger shift towards more flexibility increases with the budget balance.

Financial account openness is negatively associated to the probability of an exchange rate regime shift. The same is true of central bank independence. Our discussion in section 3 provides a potential rationale as to why these associations may exist.

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[9]The data and Stata© code that replicates the analysis are available from the authors.

Table 4: Incidence and Magnitude of Shifts—Economics-Only Model

			Type of Shift	
	(I)	(II)	(III)	(IV)
	Binary	**Binary**	**Ordered**	**Ordered**
	Regime	**Archetype**	**RegimeFlex**	**RegimeFix**
Growth	−0.035*	−0.014	−0.015	−0.056*
	(0.019)	(0.014)	(0.062)	(0.033)
FDI	−0.035	−0.033**	0.190*	0.054
	(0.027)	(0.016)	(0.112)	(0.099)
Budget	−0.066***	−0.019	0.185***	−0.067*
	(0.020)	(0.014)	(0.068)	(0.038)
Inflation	-0.0001	0.010***	0.029**	0.035***
	(0.0005)	(0.002)	(0.014)	(0.009)
Reserves	-0.006	0.006	−0.043	−0.006
	(0.009)	(0.005)	(0.030)	(0.026)
Fin. Openness	−0.769**		−2.646***	0.087
	(0.317)		(0.888)	(0.667)
CBI	−0.852*	−0.006	−1.222	−12.92
	(0.477)	(0.262)	(1.285)	(898.37)
IMF	0.483**	0.481***	−2.263	0.372
	(0.211)	(0.147)	(0.572)	(0.505)
Intercept	−2.578***	−2.119***		
	(0.282)	(0.174)		
ρ	0.188***	0.179***		
	(0.053)	(0.040)		
Cut 1			−2.043	1.417
			(0.781)	(0.674)
Cut 2			0.210	3.270
			(0.718)	((0.748))
Cut 3			1.556	5.109
			(0.809)	(0.911)
Obs.	2,298	2,386	67	106

Notes: Columns (I) and (II) of the results report estimated coefficients from random effects panel logit estimations. Columns III and IV report estimated coefficients from ordered non-panel logit estimations. Standard errors are reported in parentheses. All independent variables are lagged by one year. For details on variables' definitions and construction see text and appendices. Significance at 1, 5 and 10% levels denoted by ***, ** and *, respectively.

The only variable that explains shifts in both exchange rate regimes *and* between policy archetypes is IMF involvement. Having an IMF program means that a country is more likely to experience an exchange rate regime shift in the following five years. Other than this variable, the *Regime* and *Archetype* models are very different. In the latter, foreign direct investment enters with a negative sign. That is, greater foreign direct investment is associated with greater archetype stability.

Table 5 reports average marginal effects for the ordered models. The effects of each variable on the probability of an exchange rate regime shift by one, two, three or four categories are reported for changes in both directions. A caveat needs to be raised here as some explanatory

Table 5: Average Marginal Effects for Ordered Regressions—Economics-Only Model

Exchange rate regime shift towards *more* flexibility by:

	One step	Two steps	Three steps	Four steps
Growth	0.003	−0.001	−0.001	-0.001
	(0.011)	(0.003)	(0.004)	(0.003)
FDI	−0.034*	0.009	0.013	0.011
	(0.019)	(0.007)	(0.008)	(0.008)
Budget	−0.033***	0.009*	0.013**	0.011**
	(0.011)	(0.005)	(0.005)	(0.005)
Inflation	−0.005**	0.001	0.002**	0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
Reserves	0.008	−0.002	−0.003	−0.003
	(0.005)	(0.002)	(0.002)	(0.002)
Fin. Openness	0.474***	−0.132**	−0.185**	−0.158**
	(0.127)	(0.062)	(0.072)	(0.078)
CBI	0.229	−0.109	−0.073	−0.048
	(0.236)	(0.151)	(0.062)	(0.035)
IMF	0.046	−0.011	−0.018	−0.017
	(0.098)	(0.022)	(0.040)	(0.038)

Exchange rate regime shift towards *less* flexibility by:

	One step	Two steps	Three steps	Four steps
Growth	0.011*	−0.005*	−0.004	−0.002
	(0.006)	(0.003)	(0.003)	(0.001)
FDI	−0.010	0.004	0.004	0.002
	(0.019)	(0.008)	(0.007)	(0.004)
Budget	0.013*	−0.006**	−0.005	−0.002
	(0.007)	(0.003)	(0.003)	(0.001)
Inflation	−0.007***	0.003***	0.003***	0.001**
	(0.002)	(0.001)	(0.001)	(0.0005)
Reserves	0.001	-0.001	−0.0005	−0.003
	(0.005)	(0.002)	(0.002)	(0.025)
Fin. Openness	−0.017	0.007	0.007	0.003
	(0.130)	(0.055)	(0.051)	(0.025)
CBI	0.480***	−0.301***	−0.129***	−0.050***
	(0.044)	(0.044)	(0.031)	(0.019)
IMF	−0.074	0.033	0.028	0.013
	(0.101)	(0.048)	(0.037)	(0.017)

Notes: Average marginal effects are reported. Standard errors in parentheses. All independent variables are lagged by one year. For details on variables' definitions and construction see text and appendices. Significance at 1, 5 and 10% levels denoted by ***, ** and *, respectively.

variables have very few observations corresponding to particular shifts. This limitation should be borne in mind when interpreting the average marginal effects recorded in the table.

In some cases, an effect has one sign for a one-step exchange rate shift and another for a larger shift. For example, financial account openness is positively associated with a one-step shift towards more flexibility but is negatively associated with larger shifts. The overall effect is a negative one. Note that there is no statistically significant link between financial account openness and the magnitude of shifts in the direction of less flexibility.

A similar change in the sign of the marginal effect is observed in the cases of inflation and the budget balance (in the direction of greater flexibility), and of inflation and central bank independence (in the direction of less flexibility). Inflation may not be significantly associated with the likelihood of shifts in exchange rate regimes (see Table 4) but, when these materialise, it affects the size of the shift. Financial account openness, in contrast, helps explain both the incidence of exchange regime shifts and the magnitude of the shift towards more flexibility. There is no link with shifts towards less flexibility. Central bank independence can also explain part of the likelihood of an exchange rate shift, as well as the magnitude of a shift towards less flexibility. The association is, in both cases, negative. In this specification, central bank independence is associated with greater policy stability.

Marginal effects on the probability of a *zero* value (i.e. no shift) from a multinomial estimation (not reported) confirm the significance for a subset of variables, namely the budget balance, financial account openness and IMF involvement. The estimated coefficients have the expected signs, i.e. they are positive, positive, and negative, respectively. In this estimation, FDI inflows and reserves also are statistically significant (both with positive signs, as expected). Central bank independence, while retaining its negative coefficient, loses its significance.

We further check the results of the economics-only model by sequentially adding to the specification each of the crisis variables in Reinhart and Rogoff (2008). We find that inflation crises, banking crises and stock market crashes are positively associated with the probability of a regime shift. Whichever way the causality goes, these types of crises and exchange rate regime changes go together. Likewise, inflation crises, domestic debt crises and stock market crashes accompany archetype shifts.

Financial reform is associated with a reduced probability of a shift between archetypes. This is not the case with exchange rate regime shifts. The measure we use in these two estimations

is the normalised (from zero to one) index of financial reform in Abiad et al. (2008). When using the measure of credit controls (which ranges from 'fully repressed' to 'fully liberalised') the estimated coefficient is significantly negative for both the *Regime* and *Archetype* estimations. Fewer credit controls are associated with a reduced probability of both exchange rate regime and archetype shifts.[10]

4.2.5 Testing robustness using Autometrics

A question is whether other variables from our comprehensive dataset presented in Appendix B could do a better job in explaining shifts in exchange rate regime. To answer this we need an objective way to select the variables that can be used in estimation.

We use a general-to-specific approach, which is implemented with the model selection algorithm provided in Autometrics.[11] Automatic model selection has been a contentious topic in the econometrics literature but there is scope to adopt it when there are many candidate variables, as it is the case here. We run a simple OLS of the binary dependent variable *Regime* on all variables in each category. Autometrics eliminates the insignificant variables while checking that certain diagnostic criteria are met and an encompassing test is passed.[12]

From each regression (corresponding to each category) we select the variable with the highest *t*-statistic. The specification then includes exports (% GDP), debt assets (% GDP), the budget balance (% GDP), money and quasi-money (% GDP) along with the rest of the control variables (reserves, financial openness, central bank independence and the IMF dummy). The results confirm the significant association between the budget balance, financial account openness, IMF involvement and exchange rate regime shifts. Exports, debt assets and money are insignificant. However, the last two variables are significant in the archetype estimation: higher debt assets and financial depth (as captured by the money to GDP ratio) are associated with a lower probability of a shift between archetypes. In this specification the coefficient of the budget balance is also significant (and negative).

In general terms, the data driven model confirms many of the findings that emerge from our

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[10]In additional estimations, not reported here, changes in the sovereign ratings by Fitch are found to be positively associated with exchange rate regime shifts, although not with shifts in international policy more broadly defined.

[11]Castle et al. (2009) find that the model selection algorithms in Autometrics are generally superior to the others examined, even though it has to be noted that the test results rely on the assumption of orthogonal explanatory variables and spherical error terms.

[12]For the latter see Doornik (2008).

earlier economics-only model.

4.2.6 Adding a political dimension

To this point, the empirical analysis has not considered the potential links between political variables and the probability of shifts in exchange rate arrangements or between international macroeconomic policy archetypes. However, questions concerning the potential effects of a change in government, the ideological profile of the executive, the length of time remaining until completion of the term in office and general aspects of the political landscape need to be examined given the importance attached to them in many of the studies investigating the choice of exchange rate regime.

The first question we are interested in is whether changes in government are a potential contributor to regime shifts. To capture changes in the executive, we construct a dummy variable using *execme* from the *DPI* (Keefer, 2010). There are 562 such changes in the sample. We also include a dummy for when elections for the legislature have taken place (which may or may not have led to a change in the executive).

The specification also controls for the political leanings of the executive. We generate dummy variables for *left*, *right* and *center* executives, as defined in variable *execrlc* (Keefer, 2010). We also consider the wider political system, i.e. whether the country has a parliamentary system, a presidential system or an assembly-elected president. The relevant dummies are created using *system* in *DPI*.

A further question we explore is whether shifts tend to occur earlier or later in the executive's tenure. We use variable *yrcurnt*, which records the number of years left in current term (Keefer, 2010).

Finally, we augment the model with a variable that captures the checks and balances in the political system. These are coded to take discrete values from one to 18—a higher number indicating more checks and balances. For details, see the description of variable *checks* in Keefer (2010).

Estimation results of these specifications are reported in Table 6. It is striking that there is no significant link between any of the political variables and the probability of an exchange rate regime shift.[13] The inclusion of the political variables leads to a drop in the number of

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[13]We have estimated this specification by sequentially adding (and dropping) each of the political variables in Appendix B but the results were similar.

Table 6: Incidence and Magnitude of Shifts—A Model with Economics and Politics

		Type of Shift		
	(I) Binary Regime	(II) Binary Archetype	(III) Ordered RegimeFlex	(IV) Ordered RegimeFix
Growth	−0.059**	−0.023	−0.120	−0.131**
	(0.027)	(0.021)	(0.109)	(0.060)
FDI	−0.031	−0.004	0.604***	0.108
	(0.036)	(0.020)	(0.231)	(0.145)
Budget	−0.041	−0.033	0.299**	0.007
	(0.028)	(0.021)	(0.135)	(0.082)
Inflation	−0.000	0.011***	0.057**	0.051***
	(0.001)	(0.003)	(0.023)	(0.013)
Reserves	−0.004	0.016**	−0.073	0.001
	(0.011)	(0.006)	(0.046)	(0.036)
Fin. Openness	−0.569		−6.005**	0.609
	(0.518)		(2.321)	(0.959)
CBI	−0.769	−0.381	−3.008	
	(0.518)	(0.319)	(2.391)	
IMF	0.845***	0.471**	−1.368	0.010
	(0.271)	(0.189)	(1.024)	(0.843)
Exec. Change	−0.263	0.215	−0.659	1.347
	(0.346)	(0.251)	(1.294)	(0.999)
Election	−0.065	0.154	4.158**	−1.078
	(0.289)	(0.195)	(1.901)	(0.969)
Left	0.134	−0.045	−0.196	−0.064
	(0.237)	(0.177)	(0.846)	(0.552)
Parliament	−0.035	−0.739***	0.420	−2.144***
	(0.300)	(0.224)	(0.944)	(0.804)
Years in Term	0.108	−0.066	1.116**	−0.080
	(0.090)	(0.065)	(0.511)	(0.250)
Intercept	−2.781***	−1.882***		
	(0.456)	(0.292)		
ρ	0.105***	0.099***		
	(0.057)	(0.039)		
Cut 1			−0.513	0.377
			(1.462)	(1.263)
Cut 2			2.028	2.915
			(1.464)	(1.326)
Cut 3			4.045	5.385
			(1.661)	(1.529)
Obs.	1,426	1,463	40	69

Notes: See Table 4. Political variables are not lagged.

observations available for estimation. Consequently, the results in Table 6 are not directly comparable to those in Table 4, and some of the coefficients lose their significance. However, the relationships between the probability of a regime shift and the real output growth rate (per capita) and IMF involvement remain significant. There is evidence therefore that regime transitions are an economic phenomenon driven by growth considerations and connected to IMF involvement. The multinomial marginal effect of growth is, however, insignificant. IMF involvement and reserves are significant—we find a negative effect for the IMF dummy and a positive one for reserves.[14]

In the *Archetype* model inflation and IMF involvement retain their statistical significance. Reserves also now appear significant. Countries with parliamentary systems seem to experience less frequent archetype shifts.

While political variables do not have explanatory power in terms of the probability of exchange rate regime shifts they perform better in explaining the magnitude of shifts, when these happen. Election years and the number of years remaining in the term of office are positively linked to the magnitude of an exchange rate regime shift in the direction of greater flexibility. A parliamentary system is negatively linked to the likelihood of a sizeable transition towards a fixed exchange rate arrangement.

5 Discussion and Interpretation

There are at least two ways of interpreting the empirical results reported in the previous section. The first picks up on one aspect of the findings that we have so far not mentioned and focuses on the significance of the intercepts which implies that shifts in exchange rate regimes are, to a substantial degree, idiosyncratic and influenced by unobservable and country specific factors. Given the large number and wide range of variables tested in our empirical analysis, it remains a challenge to identify what the omitted variables might be. This interpretation is consistent with much of the literature on the choice of exchange rate regime, where unobservable country fixed effects are found to be significant. But, at the same time, it seems improbable that the decision to shift from one exchange rate regime to another is purely country specific and that there are no common factors influencing the decision.

The second interpretation of our results is more positive and lends support to this view.

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[14]Recall that these are marginal effects on the probability that a shift does *not* take place.

This suggests that the findings are broadly in line with the following account that itself draws on our analytical framework presented in Section 3. Countries are in general unlikely to shift their exchange rate regime for as long as key aspects of economic performance are deemed satisfactory. In particular, in circumstances where a country is experiencing a reasonable rate of economic growth and relatively small fiscal deficits, there is a low probability that there will be shift in exchange rate regime, either in the direction of greater or of less flexibility. There is a bias in favour of the *status quo ex ante*. Results from other studies reported in Section 2 confirm this.

However, in circumstances where the rate of economic growth falls, and fiscal deficits become larger, there is an increasing probability that countries will shift exchange rate regime. They may also modify their choice of international macroeconomic policy. The shift may be in the direction of greater fixity, possibly motivated by a desire to impose more discipline over the conduct of macroeconomic policy, or it may be in the direction of greater flexibility and be motivated by a desire to stimulate economic growth by increasing international competitiveness.

Where there is a strong desire to reduce inflation, a shift to a fixed exchange rate regime may make sense in the context of a strategy of exchange rate based stabilization. However, governments may instead opt to create an independent central bank and shift to a policy of inflation targeting based on independent monetary policy. As implied by the international macroeconomic trilemma, and in an environment of high capital mobility, they may then opt to shift to a flexible exchange rate regime. Our results indicate that these factors may indeed be at work, although a lack of robustness implies caution in putting too much emphasis on this account of events.

Our results also suggest that dissatisfaction with economic performance is not necessarily associated with the current account of the balance of payments. Current account deficits may be sustainable where international reserve holdings are relatively high and, more particularly, where countries have access to private international capital. It may instead be a sudden stop in capital inflows or capital reversals that lead to a loss of sustainability that then results in a shift in the choice of exchange rate regime. Some of our results suggest that a fall in a country's creditworthiness is indeed associated with a shift in exchange rate regime.

Where the balance of payments becomes unsustainable, countries may be driven to negotiate programs with the International Monetary Fund. There is little doubt that the Fund will express

views on the nature of the exchange rate regime. It is therefore not surprising to find that the Fund's involvement is systematically associated with both a shift in exchange rate regime and a shift in international macroeconomic policy. However, our results show that there is no particular tendency for involvement with the IMF to result in the adoption of a more flexible exchange rate regime.

A casual observation that changes in economic policy are more likely in crisis conditions also seems to be borne out by some of our results relating to shifts in exchange rate regime. Crises imply that current policies are not working and that shifts in direction are required. This applies to exchange rate policy. To a lesser extent it also applies to the other components of the trilemma.

Although, as we report in Section 2, some studies have suggested that political factors play a significant role in determining the choice of exchange rate regime, our results fail to discover any significant connection between the specific political variables in our data set and changes in exchange rate regime. For example, there does not appear to be any systematic association between the political leanings of the government or the stage of the electoral cycle and the incidence of exchange rate regime shifts. However, this is not to argue that political factors are uninvolved in such regime shifts. On the contrary, it seems likely that it is the perceived political costs of deteriorating economic performance that induce governments to change their international macroeconomic policies, including the exchange rate regime. From the individual cases mentioned at the beginning of section 3, for example, there can be little doubt that the political fall-out from a poor and worsening economic situation encouraged the UK authorities in 1992 and the Argentine authorities in 2002 to alter their exchange rate policies.

In practice, it seems that both of the interpretations offered above have a degree of legitimacy. The empirical results reported in this paper suggest that there are systematic patterns surrounding the shift in exchange rate regimes. We know something about such shifts. However, we certainly do not know everything. It remains a challenge to explain the causal connections underlying the statistical relationships that our empirical analysis reveals. Moreover, unobservable country specific factors certainly play a significant part.

In broad terms our findings are consistent with many of the ideas that our theoretical discussion raised. There is evidence that countries are more likely to shift exchange rate regime as economic performance, as proxied by economic growth and to some extent by fiscal deficits

deteriorates. Having said this, governments exhibit a reluctance to alter their chosen exchange rate regime. Past decisions about exchange rate policy continue to influence contemporary ones.

6   Concluding Remarks

Although there are plenty of high profile examples of countries changing their exchange rate regime both in the direction of greater fixity as well as greater flexibility, it is a phenomenon that has not been generally well understood. Events involving a shift in exchange rate regime have normally been analysed as country case studies. Large sample investigation has not been successful in identifying a well performing model of the choice of exchange rate regime, let alone one that explains shifts in that choice. Indeed, most of the evidence has tended to focus on inertia in exchange rate policy.

This paper has sought to make a contribution by identifying factors that systematically seem to exert an influence over exchange rate regime shifts. It is, in the main, an empirical investigation, but one that is assisted by informal theorising. We examine the circumstances in which countries seem most likely to shift regime, and consider both the direction and the size of shifts. We also allow for the fact that shifting the exchange rate regime may represent only one component in a broader shift in the design of international macroeconomic policy, as suggested by the international macroeconomic trilemma. We therefore examine the different influences that may be at work. We also experiment with a data driven model based on a large and comprehensive data set of economic and political variables.

As with other studies of the choice of exchange rate regime, we find that country specific factors make a significant contribution to explaining shifts in both exchange rate regimes and international macroeconomic policy. However, we also discover that there are a number of factors that exert a more systematic influence. For the most part, these factors are economic in nature. Most importantly, exchange rate regime shifts are more likely in the aftermath of poor economic performance, and the size of the shifts are linked to political variables. Finally, we find that the chances of a shift in one direction or the other are much higher when the IMF is involved.

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A Appendix: Construction of Dependent Variables

Table A.1: Construction of Dependent Variables: Direction and Magnitude of Shifts

RR Coarse	1	2	3	4	5
1		1	2	3	4
2	5		6	7	8
3	9	10		11	12
4	13	14	15		16
5	17	18	19	20	

Notes: The elements of the matrix represent numerical labels (the actual values from the data are reported in Table 2). All off-diagonal elements represent exchange rate regime shifts. Elements in the upper triangular capture shifts towards more flexibility, whereas elements in the lower triangular capture shifts towards less flexibility.

The five exchange rate regimes coded in the coarse index (Reinhart and Rogoff (2004) and Ilzetzki et al. (2011)) appear in the heading column and heading row of Table A.1. Shifts towards more flexibility appear above the diagonal, whereas shifts towards less flexibility appear below the main diagonal.

The ordered dependent variables capture both the direction and the magnitude of each exchange rate regime shift. To do this, we have grouped together (i.e. assigned the same index value to) all shifts of the same magnitude given the direction of the shift. For example, labels 1, 6, 11 and 16 just above the main diagonal in the table represent shifts towards more flexibility by one step (countries that moved from exchange rate regime 1 to exchange rate regime 2, from regime 2 to regime 3, and so on). All observations that satisfy these criteria (of direction and size) are assigned an index value of 1 in the dependent variable. Labels 2, 7 and 12 represent shifts towards more flexibility by two steps (countries that shifted from regime 1 to regime 3, from regime 2 to regime 4, and so on). These are assigned a value of 2. We continue in the same fashion to index observations up to a value of 4 (the maximum magnitude of a regime shift towards more flexibility).

The same procedure is applied for shifts toward less flexibility. Labels 5, 10, 15 and 20 below the main diagonal represent a shift in this direction by one step (countries that moved from regime 5 to regime 4, from regime 4 to regime 3, and so on). An index value of 5 is applied to such observations. The maximum shift towards less flexibility can be four steps, i.e. a country that moved from regime 5 to regime 1. An index value of 8 is assigned to such observations.

We group together all index values from 1 to 4 (largest shift towards more flexibility) into a
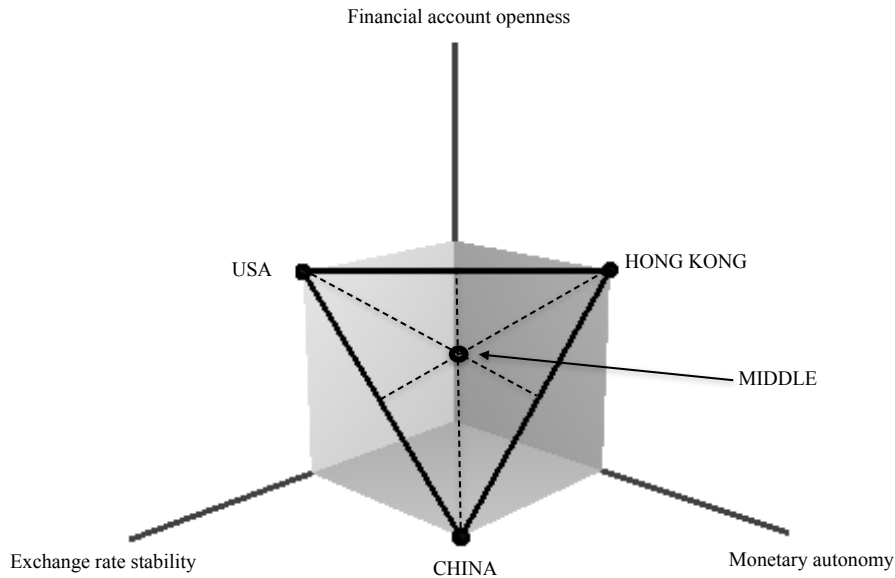
Figure 4: The Four Archetypes

discrete ordered dependent variable (*RegimeFlex*). This variable captures the size of exchange rate regime shifts towards more flexibility. We also group together all index values from from 5 to 8 into a separate discrete ordered dependent variable that captures the size of exchange rate shifts towards less flexibility (*RegimeFix*).

Concatenating the two ordered variables, and adding zeros to capture observations where a shift has not taken place, generates a non-ordered polytomous discrete variable (*RegimePoly*). A binary version of this variable (*Regime*) registers a value of one for each exchange rate regime shift and a value of zero otherwise. It provides information on the occurrence of a transition but not on its direction or magnitude.

The fifth variable used in the analysis, *Archetype*, is a discrete binary variable that captures changes across four different international macroeconomic policy archetypes. The archetypes represent different policy outcomes within the trilemma constraint. The latter is the surface of the triangle USA, CHINA, HONG KONG in Figure 4. All observations lie in the space between the axes and the constraint by construction.[15] Using the Euclidean norm we calculate the distances from the USA, China, Hong Kong and Middle archetypes and use the shortest one to classify each observation. When a country changes its archetype this registers as a value of one in the dependent variable.

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[15]This is possible because we measure monetary autonomy as a residual, i.e., $mi = 2 - ers - kaopenn$ and truncate it at value 1; see Appendix B for variable definitions.

B Appendix: Variable Details

Table B.1: List of Variables (1973–2010)

Name	Description/Units	Source	Obs.	Use
Economic Variables				
I. National Accounts and Labour Force				
gdppc_const	GDP per capita (constant 2000 US$)	WDI	5,872	‡,◇
gdp_const	GDP (constant 2000 US$)	WDI	5,875	†,◇
gdp_curr	GDP (current US$)	WDI	5,953	●
gdp_lcu	GDP (current LCU)	WDI	6,038	●
fcons_gdp	Final consumption expenditure, etc. (% of GDP)	WDI	5,511	†
gfcf_gdp	Gross fixed capital formation (% of GDP)	WDI	5,316	†
ggfce_gdp	General government final cons. exp. (% of GDP)	WDI	5,469	†
imports_gdp	Imports of goods and services (% of GDP)	WDI	5,654	†
exports_gdp	Exports of goods and services (% of GDP)	WDI	5,654	†
nettrade_gdp	Exports – Imports (% of GDP)	WDI	5,654	†
unempl	Unemployment, total (% of total labor force)	WDI	2,220	○
II. Balance of Payments and IIP				
fdi_inf_gdp	Foreign direct investment, net inflows (% of GDP)	WDI	5,456	‡
cab_gdp	Current account balance (% of GDP)	WDI	4,881	†
nfa_lcu	Net foreign assets (current LCU)	WDI	5,676	†,§
pea	Portfolio equity assets	LM-F (2007)	5,177	†,§
pel	Portfolio equity liabilities	LM-F (2007)	5,193	†,§
fdia	FDI assets	LM-F (2007)	5,202	†,§
fdil	FDI liabilities	LM-F (2007)	5,229	†,§
debta	Debt assets (portfolio debt + other investment)	LM-F (2007)	5,220	†,§
debtl	Debt liabilities (portfolio debt + other investment)	LM-F (2007)	5,228	†,§
fdera	financial derivatives assets	LM-F (2007)	5,182	†,§
fderl	financial derivatives liabilities	LM-F (2007)	5,182	†,§
totalassets	Total assets	LM-F (2007)	5,203	†,§
totalliab	Total liabilities	LM-F (2007)	5,207	†,§
netiip	Net IIP as officially reported	LM-F (2007)	1,508	○,§
pda	Portfolio debt assets	LM-F (2007)	1,690	○,§
pdl	Portfolio debt liabilities	LM-F (2007)	1,680	○,§
othia	Other investment assets	LM-F (2007)	1,690	○,§
othil	Other investment liabilities	LM-F (2007)	1,679	○,§
III. Government and Public Sector Finance				
budget	Budget balance (%GDP)	EIU	3,166	‡
eds_gni	External debt stocks (% of GNI)	WDI	3,696	†
cash_gdp	Cash surplus/deficit (% of GDP)	WDI	1,521	○
tax_rev_gdp	Tax revenue (% of GDP)	WDI	1,698	○
cgd_gdp	Central government debt, total (% of GDP)	RR (2008)	2,021	○
IV. Prices, Money and Finance				
inflation	Inflation, consumer prices (annual %)	WDI	5,196	‡
infl_def	Inflation, GDP deflator (annual %)	WDI	5,829	†
ccg_gdp	Claims on central gov., etc. (% GDP)	WDI	5,465	†
dc_gdp	Dom. credit provided by banking sector (% of GDP)	WDI	5,529	†
dir	Deposit interest rate (%)	WDI	4,409	†
lir	Lending interest rate (%)	WDI	4,219	†
m2_gdp	Money and quasi money (M2) as % of GDP	WDI	5,129	†
rir	Real interest rate (%)	WDI	4,049	†
spread	Interest rate spread (lending rate minus deposit rate, %)	WDI	3,903	†

Table B.1: List of Variables (1973–2010)

Name	Description/Units	Source	Obs.	Use
cos_gdp	Claims on other sectors of the dom. econ. (% of GDP)	WDI	1,180	∘
bcar	Bank capital to assets ratio (%)	WDI	933	∘
blrar	Bank liquid reserves to bank assets ratio (%)	WDI	1,231	∘
stocks_gdp	Stocks traded, total value (% of GDP)	WDI	1,980	∘
stocks_to	Stocks traded, turnover ratio (%)	WDI	1,866	∘
	Financial Liberalization			
directedcredit	Directed credit/reserve requirements	ADT (2008)	2,605	†
creditceilings	Aggregate Credit Ceilings	ADT (2008)	1,534	†,∘
creditcontrols	Credit Controls	ADT (2008)	2,605	†
intratecontrols	Interest rate controls	ADT (2008)	2,605	†
entrybarriers	Entry barriers/pro-competition measures	ADT (2008)	2,605	†
bankingsuperv	Banking Supervision	ADT (2008)	2,605	†
privatization	Privatization	ADT (2008)	2,605	†
intlcapital	International capital flows	ADT (2008)	2,605	†
securitymarkets	Security Markets	ADT (2008)	2,605	†
finref_n	Financial Reform Index (normalized), 0 to 1	ADT (2008)	2,605	†
large_rev	dummy=1 if d.index$\leq$-3	ADT (2008)	2,516	†
reversal	dummy=1 if d.index$<$0 & d.index$>$-3	ADT (2008)	2,605	†
reform	dummy=1 if d.index$>$0 & d.index$\leq$2	ADT (2008)	2,516	†
large_reform	dummy=1 if d.index$>$2	ADT (2008)	2,516	†
status_quo	dummy=1 if d.index=0	ADT (2008)	2,516	†
	Crises			
cr_inf	Inflation crises	RR (2008)	2,546	†
cr_debtdom	Domestic debt crises	RR (2008)	2,584	†
cr_debtext	External debt crises	RR (2008)	2,584	†
cr_bank	Banking crises	RR (2008)	2,546	†
cr_stock	Stock market crashes	RR (2008)	1,892	∘
	Exchange Rates, Reserves and Other Indicators and Variables			
regime	1 if regime shift takes place, 0 otherwise (binary)	Authors	5,394	♣
regimeflex	Indexes shifts towards more flexibility (ordered)	Authors	194	♣
regimefix	Indexes shifts towards less flexibility (ordered)	Authors	195	♣
regimepoly	Indexes all shifts and no shifts (multinomial)	Authors	5,576	♣
archetype	1 if archetype shift takes place, 0 otherwise	Authors	5,394	♣
rr_coarse	Coarse de facto exchange rate regime classification	RR (2004)	4,820	⋆
rr_fine	Fine de facto exchange rate regime classification	RR (2004)	4,820	⋆
class_imf	IMF official exchange rate regime classification	RR (2004)	4,387	⋆
mi	Monetary independence	BMP (2012)	5,410	⋆
ers	Exchange rate stability	ACI (2010)	6,266	⋆
imf_dumm5	1 for five years after an IMF program, 0 otherwise	IMF	6,802	‡
cbi	1 in all years after central bank independence, 0 otherwise	Hammond (2011)	6,802	‡
kaopenn	Financial account openness (normalised between 0 and 1)	CI (2008)	5,454	‡,⋆
reserves	Total reserves minus gold (current US$)	WDI	5,767	‡,§
reer	Real effective exchange rate index (2005 = 100)	WDI	2,923	†,⋄
tot	Net barter terms of trade index (2000 = 100)	WDI	3,874	†,⋄
trade_gdp	Trade (Imports + Exports % of GDP)	WDI	5,654	†
fitch	1 if a ratings change takes place, 0 otherwise	Fitch Ratings	1,229	∘
	Political Institutions			

I. Chief Executive Variables

Name	Description/Units	Source	Obs.	Use
system	Political System	BCGKW (2001)	5,584	‡,✠
yrsoffc	Chief Executive Years in Office	BCGKW (2001)	5,591	†

Table B.1: List of Variables (1973–2010)

Name	Description/Units	Source	Obs.	Use
finittrm	Finite Term in Office	BCGKW (2001)	5,509	†
yrcurnt	Years Left in Current Term	BCGKW (2001)	4,394	‡
multpl	Can Chief Executive Serve Multiple Terms	BCGKW (2001)	4,263	†
military	Is Chief Executive a Military Officer?	BCGKW (2001)	5,579	†
defmin	Is Defense Minister a Military Officer?	BCGKW (2001)	4,880	†
percent1	President Percentage of Votes, first round	BCGKW (2001)	1,886	†,∘
percentl	President Percentage of Votes, last round	BCGKW (2001)	406	†,∘
prtyin	Party of Chief Exec. Length of Time in Office	BCGKW (2001)	4,389	†
execme	Name of Executive Party	BCGKW (2001)	5,515	‡,✠
execrlc	Chief Executive Party Orientation	BCGKW (2001)	5,504	‡,✠
execnat	Chief Executive Party: Nationalist	BCGKW (2001)	5,528	†
execage	Age of Chief Executive Party	BCGKW (2001)	4,204	†
allhouse	Does Party of Executive Control All Houses?	BCGKW (2001)	4,648	†

II. Party Variables in the Legislature

Name	Description/Units	Source	Obs.	Use
totalseats	Total Seats in Legislature	BCGKW (2001)	5,959	†
gov1me	Name of Largest Government Party	BCGKW (2001)	4,797	†
gov1seat	Number of Seats of Largest Government Party	BCGKW (2001)	5,885	†
gov1vote	Vote Share of Largest Government Party	BCGKW (2001)	4,743	†
gov1rlc	Largest Government Party Orientation	BCGKW (2001)	4,739	†
gov1nat	Largest Government Party: Nationalist	BCGKW (2001)	4,764	†
gov1age	Age of Largest Government Party	BCGKW (2001)	4,346	†
opp1me	Name of Largest Opposition Party	BCGKW (2001)	3,636	†
opp1seat	Number of Seats of Largest Opposition Party	BCGKW (2001)	5,870	†
opp1vote	Vote Share of Largest Opposition Party	BCGKW (2001)	4,876	†
opp1rlc	Largest Opposition Party Orientation	BCGKW (2001)	3,622	†
opp1nat	Largest Opposition Party: Nationalist	BCGKW (2001)	3,646	†
opp1age	Age of Largest Opposition Party	BCGKW (2001)	3,205	†
oppmajh	Does One Opposition Party have a Maj in the House?	BCGKW (2001)	4,763	†
oppmajs	Does One Opposition Party have a Maj in the Senate?	BCGKW (2001)	1,612	†,∘
legelec	Legislative Election Held	BCGKW (2001)	5,604	‡
exelec	Presidential Election Held	BCGKW (2001)	5,605	†
numgov	Number of Government Seats	BCGKW (2001)	5,959	†
numvote	Vote Share of Government Parties	BCGKW (2001)	5,959	†
numopp	Number of Opposition Seats	BCGKW (2001)	5,959	†
oppvote	Vote Share of Opposition Parties	BCGKW (2001)	5,959	†
maj	Margin of Majority	BCGKW (2001)	4,724	†
partyage	Average Age of Parties	BCGKW (2001)	4,346	†
herfgov	Herfindahl Index of Government Parties	BCGKW (2001)	4,727	†
herfopp	Herfindahl Index of Opposition Parties	BCGKW (2001)	3,571	†
frac	Fractionalization Index	BCGKW (2001)	4,666	†
oppfrac	Opposition Fractionalization Index	BCGKW (2001)	3,553	†
govfrac	Government Fractionalization Index	BCGKW (2001)	4,727	†

III. Electoral Rules

Name	Description/Units	Source	Obs.	Use
liec	Legislative Electoral Competitiveness	BCGKW (2001)	5,578	†
eiec	Executive Electoral Competitiveness	BCGKW (2001)	5,578	†
ssh	Number of Seats in Senate/Total Seats in Both Houses	BCGKW (2001)	1,652	†,∘
pluralty	Plurality	BCGKW (2001)	4,232	†
pr	Proportional Representation	BCGKW (2001)	3,800	†
housesys	Electoral Rule House	BCGKW (2001)	4,189	†
sensys	Electoral Rule Senate	BCGKW (2001)	658	†,∘
thresh	Vote Threshold	BCGKW (2001	2,267	†,∘
dhondt	D'Hondt System	BCGKW (2001	2,209	†,∘
cl	Closed List	BCGKW (2001)	2,544	†

Table B.1: List of Variables (1973–2010)

Name	Description/Units	Source	Obs.	Use
fraud	Vote Fraud	BCGKW (2001)	4,661	†
II. Federalism				
auton	Autonomous Regions	BCGKW (2001)	5,556	†
author	State Gov Authority over Tax, Spend, or Legislating	BCGKW (2001)	1,883	†,○
II. Stability and Checks & Balances				
tenlong	Longest Tenure of a Veto Player	BCGKW (2001)	5,497	†
tenshort	Shortest Tenure of a Veto Player	BCGKW (2001)	5,504	†
polariz	Polarization	BCGKW (2001)	5,072	†
tensys	System Tenure	BCGKW (2001)	5,573	†
checks	Checks and Balances	BCGKW (2001)	5,438	†
stabns	Stability	BCGKW (2001)	5,306	†

Notes: (♣): Dependent variable; (‡): Independent variable used in the baseline, extended or augmented specifications; (†): Independent variable used in robustness checks; (§): Variable normalised by GDP (local currency unit or USD); (◇): Variable transformed to a percent change; (✠): Other variable transformation; (●): Variable used to normalise other variables; (⋆): Variable used in the construction of a dependent variable; (○): Variable has limited number of observations (less than 2,500). WDI: World Development Indicators; IMF: International Monetary Fund Lending arrangements; ACI (2010): Aizenman et al. (2010); ADT (2008): Abiad et al. (2008); BCGKW (2001): Beck et al. (2001); BMP (2012): Bird et al. (2012); CI (2008): Chinn and Ito (2008); LM-F (2007): Lane and Milesi-Ferretti (2007); RR (2004): Reinhart and Rogoff (2004); RR (2008): Reinhart and Rogoff (2008).