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Barry Eichengreen
Raul Razo-Garcia

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ABSTRACT

We analyze disagreements over de facto exchange-rate-regime classifications using three popular de facto regime data series. While there is a moderate degree of concurrence across classifications, disagreements are not uncommon, and they are not random. They are most prevalent in middle-income countries (emerging markets) and low-income (developing) countries as opposed to advanced economies. They are most prevalent for countries with well-developed financial markets, low reserves and open capital accounts. This suggests caution when attempting to relate the exchange rate regime to financial development, the openness of the financial account, and reserve management and accumulation decisions.

Barry Eichengreen
Department of Economics
University of California, Berkeley
549 Evans Hall 3880
Berkeley, CA 94720-3880
and NBER
eichengr@econ.Berkeley.edu

Raul Razo-Garcia
Department of Economics
Carleton University
Ottawa K1S 5B6
Canada
rrazogar@connect.carleton.ca

1 Introduction

Since the breakdown of Bretton Woods, a large literature has developed around the choice of exchange rate regime. One strand, drawing on the theory of optimum currency areas, asks why countries adopt the exchange rate regime they do (see Honkapohja and Pikkarainen 1992, Rizzo 1998, and Edwards 1999). Another explores the implications of that choice for real and financial variables such as interest rate volatility, business cycle co-movements, real exchange rate variability and financial stability (see Mussa 1986, Baxter and Stockman 1989, and Hausmann, Gavin, Pages-Serra, and Stein 1989). It is fair to say that these questions have come to constitute one of the principal preoccupations of empirical international economists.

A limitation of the early literature is that it utilized the International Monetary Fund's *de jure* classification of exchange rate regimes.[1] As published in the Fund's *Annual Report on Exchange Arrangements and Exchange Restrictions*, this index summarized countries' self-reported exchange rate regimes. The problem was gaps between officially reported and actually prevailing exchange rate arrangements. An example is the case of a government seeking to keep its exchange rate pegged and reporting the *de jure* regime accordingly but ultimately unable or unwilling to maintain its peg.[2] Alternatively, countries officially committed to flexible exchange rates might exhibit fear of floating (Calvo and Reinhart 2002); they might intervene in the foreign exchange market to limit actual variability. Either way, the implications for studies of choice of exchange rate regime and its consequences are not happy.

These observations have given rise to attempts to classify countries according to actual practice – to identify the *de facto* exchange rate regime – of which Bubula and Ötker-Robe (2002), Reinhart and Rogoff (2004) and Levy-Yeyati and Sturzenegger (2005) are prominent examples. Reinhart and Rogoff (RR) divide their observations into those in which a country has a unified exchange rate versus dual or parallel rates.[3] For countries with only official rates they then use statistical methods to verify the accuracy of the *de jure* classification and/or place the observation into an alternative category, relying

[1] A minority of the literature instead utilized actual exchange rate volatility, variously measured, as a proxy for the *de facto* regime (see Holden, Holden, and Suss 1979 and Bayoumi and Eichengreen 1997).

[2] This is the case analyzed by Alesina and Wagner (2006).

[3] Recently, Bubula and Ötker-Robe's *de facto* classification has been extended further back to cover the period since 1980 by Anderson (2009).

mainly on data on exchange rate variability, variability relative to officially-announced bands, and observed inflation. For countries with dual and parallel rates they do likewise on the basis of the market-determined rate. Levy-Yeyati and Sturzenegger (LYS), for their part, classify exchange rate regimes on the basis of the volatility of the nominal exchange rate, the variability of its rate of change, and the volatility of international reserves. Bubula, Ötker-Robe and Anderson (BORA) utilize actual exchange rates supplemented by information from IMF country reports and related sources ("press reports, news articles, and other relevant papers").

These studies are widely cited, and the series on *de facto* exchange rate regimes they provide have been widely used. It is unsettling, therefore, that they do not agree. Countries classified as maintaining a fixed exchange rate by one set of investigators are sometimes classified as floating by another, and vice versa. This follows from the fact that different authors use different variables in their algorithms for classifying countries, attach different weights to different series, and employ different degrees of judgment. Since it is not always clear why countries are classified as they are, it is not always clear why the alternative series differ. These questions about the reliability of *de facto* exchange rate classifications in turn raise questions about the reliability of studies utilizing them. To illustrate the point, we show in Appendix B that earlier studies of the impact of the exchange rate regimes on, inter alia, economic growth and financial instability are sensitive to the particular *de facto* exchange rate regime classification employed.

But while the existence of disagreements is well known, their extent and incidence are not. Our goal in this paper is therefore to document and analyze the extent and nature of disagreements among alternative *de facto* exchange rate regime classifications. We consider the Reinhart-Rogoff, Levy-Yeyati-Sturzenegger and Bubula-Ötker-Robe-Anderson classifications. We assemble two-way tables to study correspondences between the schemes. We test whether classifications are effectively independent using a Chi-square test and provide a statistical measure of the extent of agreement. We then use mixed-probit models in which an unobservable propensity to disagree is related to a vector of economic and financial covariates to identify the sources of disagreements.

While the different classifications are not independent according to our Chi-square tests (*de facto* regime classifications are not randomly assigned), the extent of agreement

is fair to moderate, not substantial.[4] In a non-negligible number of cases the discrepancy is large: countries classified as operating a peg by one set of authors are described as freely floating by another, and vice versa.

Importantly, discrepancies are not random. They are greater among middle-income (emerging markets) and low-income (developing) countries than high-income (advanced) countries. Some high-income countries like the United States have had floating exchange rates for years and intervene sparingly in foreign exchange markets, while others have operated well-specified pegs (European countries under the European Monetary System, for example). Ample institutional detail results in a relatively high degree of agreement across classifications. The same is not always true of emerging markets and developing countries. It is when analyzing these countries that users of *de facto* exchange rate regime classifications need to exercise particular caution.

We also find that disagreements tend to be clustered in periods of currency volatility. Periods of high volatility often coincide with crises and changes in exchange rate regime. This suggests that investigators should exercise special caution when relating the *de facto* exchange rate regime to financial crises.[5]

We further find that *de jure* classifications are an important source of disagreement on how to classify exchange rate regimes in emerging markets and developing countries. This is true even when we control for other economic and financial characteristics of countries. Evidently, the fact that some investigators constructing *de facto* classifications rely more heavily than others on the IMF's *de jure* classification leads to disagreements.

Finally, we find that the disagreement among alternative classifications is greatest for countries with relatively well developed financial markets and low reserves. The openness of the financial account is also an important source of disagreements between some classifications. This suggests caution when attempting to relate choice of exchange rate regime to financial development, openness of the financial account, and reserve-management decisions.

The rest of the paper is organized as follows. In Section 2 we study correspondences among *de facto* classifications and measure the extent of agreement using Kappa statistics and Chi-square tests. Section 3 presents the mixed-probit model and results. In Section

[4] The language here is from Landis and Koch (1977).

[5] As not a few studies have attempted over the years.

4 we check the robustness of the findings with respect to different dividing lines between pegs, intermediate regimes and flexible rates. Final remarks are in Section 5.

2 Data Analysis

Different studies distinguish different exchange rate regimes. A first step in comparing alternative schemes is thus to collapse the larger number of categories into a consistent set: pegs, intermediate regimes, and floats, reflecting the traditional tripartite categorization. Previous studies provide a good deal of guidance about how to go about this, and there is broad agreement about where to draw the lines.[6] It could be, however, that collapsing a larger number of categories spuriously introduces disagreements by placing the dividing line between pegs, floats and intermediate regimes at incompatible points. It will be important therefore to check that our findings are robust to different dividing lines.[7]

Combining market exchange rates and other series with assessments of the nature of the exchange rate regime drawn from consultations with member countries and IMF country desk economists, Bubula, Ötker-Robe and Anderson distinguish thirteen exchange rate arrangements. We collapse their thirteen categories into hard pegs, intermediate and floating regimes following Eichengreen and Razo-Garcia (2006). Our definition of hard pegs includes regimes that use another currency as legal tender, currency union, currency board, and economic union or monetary coordination agreement (see Table 1). Intermediate regimes include conventional fixed pegs to a single currency, conventional fixed pegs to a basket, pegs within a horizontal band, forward-looking crawling pegs, forward-looking crawling bands, backward-looking crawling pegs, backward-looking crawling bands, and tightly managed floating. Floating regimes include other managed floats and independently floats.[8]

When there are multiple exchange rates, Reinhart and Rogoff (2004) use information from informal (black or parallel) markets to identify exchange rate arrangements. They argue that market-determined dual or parallel markets are important, if not better, indicators of the underlying monetary policy. We map their fourteen categories into pegs,

[6] For discussion see Eichengreen and Razo-Garcia (2006).

[7] In particular, we will want to consider dividing lines that maximize the concordance between different series.

[8] This classification has been updated by IMF staff through 2008.

intermediate regimes and floats as follows.[9] Hard pegs comprise categories 1 through 3 in Reinhart and Rogoff's (2004) classification: no separate legal tender, pre-announced pegs or currency boards, and pre-announced horizontal bands narrower than, or equal to, plus/minus 2%. Soft pegs consist of categories 4 through 11: *de facto* pegs, pre-announced crawling pegs, pre-announced crawling bands narrower than, or equal, to +/-2%, *de facto* crawling pegs, *de facto* crawling bands narrower than, or equal to, +/-2%, pre-announced crawling bands wider than, or equal, to +/-2%, *de facto* crawling bands narrower than, or equal to, +/-5%, and moving bands narrower than, or equal to, +/-2% (i.e., allowing for both appreciation and depreciation over time). Floats include two categories: managed floating and freely floating. The observations in Reinhart and Rogoff's "freely falling" category are reclassified using their detailed chronologies.[10]

Finally, Levy-Yeyati and Sturzenegger (2005) assume that pegs are associated with low volatility of exchange rates (in levels and changes) and high volatility of international reserves, while floating regimes are characterized by volatile exchange rates (in levels and changes) and stable international reserves. They use cluster analysis to distinguish five arrangements: 1) inconclusive; 2) floats; 3) dirty floats; 4) crawling pegs; and 5) pegs.[11] We count categories 3, 4 and some of the regimes in category 5 as intermediate regimes (see Table 1).

[9] See Table 1.

[10] A country's exchange rate regime is classified as "freely falling" when the 12-month inflation rate is equal to or exceeds 40% in one year, or the six months following an exchange rate crisis where the crisis marked a movement from a peg or an intermediate regime to a floating regime (managed or freely floating). For more details on this classification, see the Appendix in Reinhart and Rogoff (2004).

[11] A country's ER arrangement is classified as "inconclusive" when the volatility of the ER and the volatility of international reserves are low. In their latest update, less than 2% of regimes were classified as "inconclusive." Since we could not re-classify these observations into pegs, intermediate or floating regimes they are left out of the analysis.

Table 1: Collapsing the Currency Spectrum into Hard Pegs, Intermediate and Floating Regimes

	RR†	**BORA**‡	**LYS**§
Hard Pegs	No separate legal tender	Another currency as legal tender	Fix 1♯
	Pre announced peg or currency board arrangement	Currency union	
	Pre announced horizontal band narrower than or equal to +/-2%	Currency board	
		Economic union/Monetary coordination agreement	
Intermediate	De facto peg	Conventional fixed peg to a single currency	Fix 2♯
	Pre announced crawling peg	Conventional fixed peg to a basket	Dirty
	Pre announced crawling band narrower than or equal to +/-2%	Pegged within horizontal bands	Crawling peg
	De facto crawling peg	Forward-looking crawling peg	
	De facto crawling band narrower than or equal to +/-2%	Forward-looking crawling band	
	Pre announced crawling band wider than or equal to +/-2%	Backward-looking crawling peg	
	De facto crawling band narrower than or equal to +/-5%	Backward-looking crawling band	
	Moving band narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	Other tightly managed floating	
Floating	Managed floating	Managed floating with no predetermined	Float
	Freely floating	path for the ER	
		Independently floating	

Notes: † Reinhart and Rogoff *de Facto* classification: 1980-2006. Freely Falling Reclassified following Chronologies.
‡ Bubula, Ötker-Robe and Anderson *de Facto* classification: 1980-2007
§ Levy-Yeyati and Sturzenegger *de Facto* classification: 1980-2004. ♯ Fix 1 is fixed ERR in LYS and an hard peg *de jure* classification (Gosh, Gulde and Wolf).
♯ Fix 2 is a fixed ERR in LYS and a non-hard peg in a de jure classification (Gosh, Gulde and Wolf).

2.1 Contingency Tables

Reinhart and Rogoff vs Bubula, Ötker-Robe and Anderson

Table 2 presents two-way tables for the three pairs of *de facto* classifications. In panel A we combine the data for advanced, emerging market and developing countries. Panel B restricts the sample to emerging markets, panel C to advanced countries, and panel D to developing countries.

Panel A shows that RR and BORA agree on 69% of observations.[12] Floating regimes display the highest discrepancy, followed by soft pegs and then hard pegs. While more than half of floating rates in BORA are classified as intermediate regimes by RR, a bit less than 50% floating rates in RR are classified as intermediate regimes by BORA. Roughly a fourth of intermediate regimes in RR are classified as hard pegs or floating rates by BORA, and about a third of soft pegs in BORA are classified as either hard pegs or flexible rates by RR. Highlighting the scope of potential disagreement is the fact that 21 hard pegs in RR are classified as floats by BORA.

These patterns differ across emerging markets, advanced and developing countries. For example, hard pegs appear to be less difficult to identify in advanced countries than emerging markets and developing countries (first matrix in Panels B, C and D). In emerging markets, whereas half of all floating regimes in BORA (RR) are classified as intermediate regimes by RR (BORA), 23% (20%) of intermediate regimes in BORA (RR) are classified as floating by RR (BORA).

Both classifications exhibit a higher degree of correspondence for advanced countries. Approximately 16% (22%) of intermediate regimes in BORA (RR) are classified as floats by RR (BORA). It would appear that hard pegs are especially difficult to identify in developing countries: 26% of hard pegs in RR are classified as intermediate regimes or floating by BORA.

Analyzing changes in the contingency tables over time, there is evidence of increasing agreement about hard pegs and floats but declining agreement about intermediate regimes. BORA identify fewer intermediate regimes in relatively recent years, while RR do not.[13] The number of observations classified as intermediate by RR and floating by BORA has

[12] Out of 3857 regimes, RR and BORA agree in 837 hard pegs, 1392 intermediates and 421 floats.

[13] While more than 70% of the regimes classified in 1980 by BORA were soft pegs, in 2007 this proportion reduced to 40%.

risen rather than falling over time.[14] Finally, the number of regimes classified as hard pegs by RR and intermediate by BORA fell in the 1980s and remained roughly constant thereafter.

Panel A in Figure 1 shows the proportion of observations for which the two classifications agree. The concordance between these two schemes improved from 1980 to 1985 and has since then remained more or less constant at 70%.

Reinhart and Rogoff vs Levy-Yeyati and Sturzenegger

RR and LYS agree on 60% of regimes (second matrix in Panel A of Table 2), fewer than RR and BORA. 41% of hard pegs in RR are classified as intermediate or floating regimes by LYS. While 60% of RR's flexible regimes are classified as soft pegs by LYS, 59% of floats in LYS are classified as intermediate arrangements by RR. Evidently, intermediate regimes are specially hard for these two sets of investigators to agree on. Of the 2073 intermediate arrangements in LYS, 538 (26%) are classified as hard pegs and 433 (21%) as floats by RR, while of the 1560 soft pegs in RR 443 (28%) are grouped as floats by LYS. RR thus classify many more observations as hard pegs and considerably fewer as intermediate regimes.

Results are similar for emerging markets and developing countries (second matrix in Panels B and D of Table 2). Quite a few cases classified as hard pegs by RR are classified as intermediates by LYS. Similarly, not a few arrangements classified as intermediates by one scheme are categorized as flexible by the other. For advanced economies (second matrix in Panel D), there is more agreement.

The main change over time is increased agreement about hard pegs. There is also a declining number of cases in which RR=floating and LYS=intermediate regime. In contrast, the number of observations classified as intermediate by RR and as floating by LYS rises with time.

Panel B in Figure 1 shows changes over time in the fraction of arrangements on which the two classifications agree. Contrary to the lack of improvement in the extent of agreement between RR and BORA, the concordance between RR and LYS rises with time: whereas RR and LYS agreed on 55% of the observations in the 1980s, they agree on more

[14] The latter at the expense of the observations classified as floating by RR and as soft pegs by BORA.

than two thirds of regimes in 2004.[15]

Levy-Yeyati and Sturzenegger vs Bubula, Ötker-Robe and Anderson

LYS and BORA agree on 75% of regimes (third matrix in Panel A of Table 2), higher than any other pair.[16] Intermediate and floating regimes are again the most difficult on which to agree. While more than 50% of regimes classified as flexible by BORA are classified as intermediates by LYS, 46% of floats in LYS are classified as intermediate arrangements by BORA. Of 1914 intermediate arrangements in LYS, 112 (6%) are classified as hard pegs and 386 (20%) as flexible regimes by BORA, while of the 1741 soft pegs in BORA, 321 observations (18%) are classed as floats by LYS. BORA classify more regimes as both hard pegs and floats than LYS.

For emerging markets and advanced countries, LYS and BORA agree on almost all hard pegs. However, they show less agreement about intermediate regimes and floats (third matrix in Panels B and C in Table 2). They have also difficulty in agreeing on regimes in developing countries more generally (Panel D in Table 2).

The two classifications exhibit a higher degree of correspondence over time on hard pegs and floating regimes but not on intermediate regimes.[17] Overall, panel C in Figure 1 shows a decline in the degree of agreement between LYS and BORA from 1980 to 1994 followed by a rise back up to earlier levels around 2004.

Robustness Checks

We perform two robustness checks. First, to see whether the results are driven by differences in sample periods we assemble a three-way table limited to the period common to all three schemes (1980-2004).[18] We still find large-off diagonal cells, which indicates that disagreements are not driven by differences in sample period.[19]

Second, we check whether disagreements are mainly due to discrepancies in timing.

[15] The reason is that both classifications have agreed more in terms of hard pegs over time.

[16] 667 arrangements were classified as hard pegs, 1416 as intermediates, and 369 as floating regimes by both schemes.

[17] The number of observations classified as floats by BORA and as intermediate regimes by LYS has increased over time. In particular, it appears that LYS classifications has problems to identify regime in periods of macroeconomic distress.

[18] Available from the authors upon request.

[19] By construction, the three-way table limits the analysis to those observations for which we have the three classifications.

To do this we compute the proportion of the off-diagonal cells where one of the two regime classifications changed in year t, creating a disagreement that did not exist in year $t-1$, and then the other classification changed in year $t+1$, making the disagreement go away.[20] Only 2.9% of our recorded disagreements (off-diagonal cells) between RR and BORA are due to this "one-year" discrepancy.[21] Although higher ratios are observed for the other two pairs, 7% for RR-LYS and 15% for BORA-LYS, here too it remains that our results are not mainly driven by disagreements in the timing of exchange rate regime shifts.

2.2 Independence (Chi-Square) Tests

In Table 3 we test whether two *de facto* classifications are independent using the Chi-square (χ^2) statistic[22]

$$\chi^2 = \sum_i \sum_j \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

where O_{ij} is the observed frequency for regime i in classification 1 and regime j in classification 2, and E_{ij} is the expected frequency for the cell corresponding to the i^{th} regime in the first classification and the j^{th} arrangement in the second scheme.[23] The null hypothesis is rejected if this statistic exceeds the critical value obtained from the χ^2 distribution with m degrees of freedom.[24] In all cases the null of independence is rejected, supporting the hypothesis that the three classifications are related.

[20] For example, RR identify an intermediate regime for Sweden in 1992 while BORA identify a float. In this specific example, the disagreement between the two classifications is due to a disagreement in the timing of an exchange rate regime change: BORA identify a switch from a soft peg to a floating regime in 1992 and RR in 1993.

[21] This ratio also includes cases in which BORA changed in year t, creating a disagreement that did not exist in the previous year, and then in period $t+1$ this changed is reversed.

[22] For example, for the pair RR-BORA under the null hypothesis Pr(RR=Hard Peg|BORA=Hard Peg)=Pr(RR=Hard Peg|BORA=Intermediate)=Pr(RR=Hard Peg|BORA=Floating)=Pr(RR=Hard Peg).

[23] The χ^2 test is inappropriate if any expected frequency is below 1 or if the expected frequency is less than 5 in more than 20% of the cells. Had this been the case, we would have to combine rows or columns.

[24] The degrees of freedom are equal to (3-1)·(3-1).

Table 2: Two-Way Tables. Number of Countries with Hard Pegs, Intermediate and Floating Regimes.

Panel A: Advanced, Emerging Market and Developing Countries

		BORA					LYS					LYS			
R & R		HP	Inter.	Float	Total	R & R		HP	Inter.	Float	Total	BORA		HP	Inter.	Float	Total
	HP	**837**	277	21	1135		HP	**765**	538	23	1326		HP	**667**	112	3	782
	Inter.	56	**1392**	466	1914		Inter.	15	**1102**	443	1560		Inter.	4	**1416**	321	1741
	Float	2	385	**421**	808		Float	0	433	**290**	723		Float	0	386	**369**	**755**
	Total	895	2054	908	3857		Total	780	2073	756	3609		Total	671	1914	693	3278

Panel B: Emerging Market Countries

		BORA					LYS					LYS			
R & R		HP	Inter.	Float	Total	R & R		HP	Inter.	Float	Total	BORA		HP	Inter.	Float	Total
	HP	**81**	29	5	115		HP	**73**	67	5	145		HP	**67**	2	0	69
	Inter.	1	**388**	101	490		Inter.	0	**238**	175	413		Inter.	0	**270**	164	434
	Float	0	122	**102**	224		Float	0	114	**101**	215		Float	0	67	**92**	159
	Total	82	539	208	829		Total	73	419	281	773		Total	67	339	256	662

Panel C: Advanced Countries

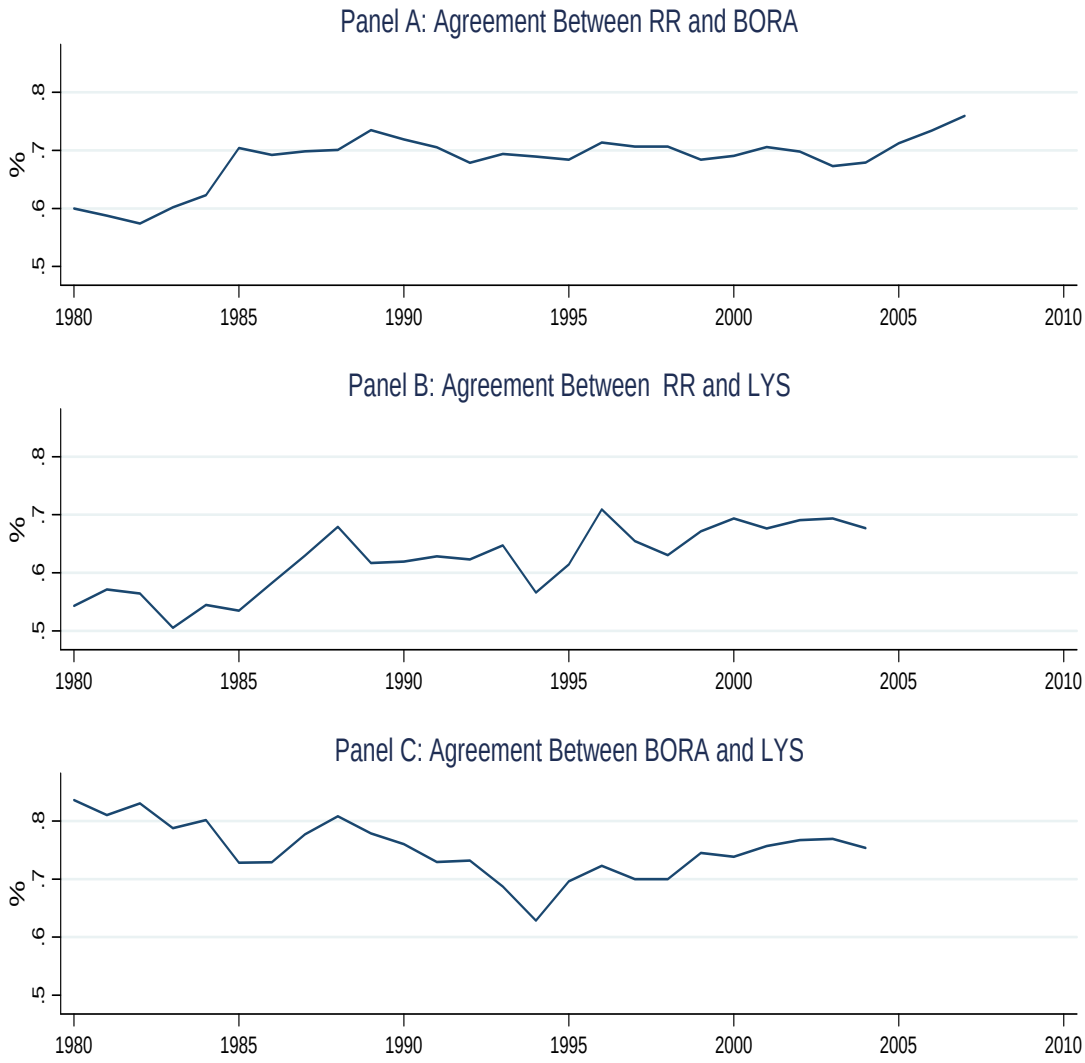
		BORA					LYS					LYS			
R & R		HP	Inter.	Float	Total	R & R		HP	Inter.	Float	Total	BORA		HP	Inter.	Float	Total
	HP	**106**	3	1	110		HP	**76**	25	2	103		HP	**63**	19	0	82
	Inter.	19	**237**	74	330		Inter.	0	**273**	89	362		Inter.	0	**204**	43	247
	Float	0	45	**147**	192		Float	0	57	**129**	186		Float	0	49	**124**	173
	Total	125	285	222	632		Total	76	355	220	651		Total	63	272	167	502

Panel D: Developing Countries

		BORA					LYS					LYS			
R & R		HP	Inter.	Float	Total	R & R		HP	Inter.	Float	Total	BORA		HP	Inter.	Float	Total
	HP	**650**	245	15	910		HP	**616**	446	16	1078		HP	**537**	91	3	631
	Inter.	36	**767**	291	1094		Inter.	15	**591**	179	785		Inter.	4	**942**	114	1060
	Float	2	218	**172**	392		Float	0	262	**60**	322		Float	0	270	**153**	423
	Total	688	1230	478	2396		Total	631	1299	255	2185		Total	541	1303	270	2114

Notes: The first matrix in each panel presents the two-way table associated with Reinhart and Rogoff vs Bubula, Ötker-Robe and Anderson classifications. The second matrix compares Reinhart and Rogoff with Levy-Yeyati and Sturzenegger scheme. The last matrix in each panel presents the Bubula,Ötker-Robe and Anderson vs Levy-Yeyati and Sturzenegger two-way table.

Figure 1: Proportion of the Regimes for Which Two Classifications Agree



Note: The three graphs present the fraction of the observations in which a pair of classifications agree (hard-pegs-hard-pegs, intermediate-intermediate, floating-floating).

2.3 Analysis of the Correspondence using Kappa Statistics

The Kappa Statistic (Cohen, 1960) is scaled to be 0 when the extent of agreement is what would be observed by chance and 1 when there is perfect agreement. For intermediate cases, Landis and Koch (1977) suggest the interpretations in Table 4.

Let m be the number of "raters" and k the number of regimes. For two "raters," $m = 2$, define w_{ij} $(i = 1, \ldots, k, j = 1, \ldots, k)$ as the weights for agreement and disagreement.

Table 3: Nonparametric Test of Independence

	χ^2	***df***	**p-value**
Reinhart and Rogoff vs Bubula and Ötker-Robe			
All Countries	2598	4	<0.0001
Emerging Market	603	4	<0.0001
Advanced	659	4	<0.0001
Developing	1404	4	<0.0001
Reinhart and Rogoff vs Levy-Yeyati and Sturzenegger			
All Countries	1778	4	<0.0001
Emerging Market	373	4	<0.0001
Advanced	580	4	<0.0001
Developing	900	4	<0.0001
Bubula and Ötker-Robe vs Levy-Yeyati and Sturzenegger			
All Countries	2972	4	<0.0001
Emerging Market	662	4	<0.0001
Advanced	502	4	<0.0001
Developing	1860	4	<0.0001

Source: Author's estimates

Table 4: Degree of Agreement

Min	Max	Correspondence
below	0.00	Poor
0.00	0.20	Slight
0.21	0.40	Fair
0.41	0.60	Moderate
0.61	0.80	Substantial
0.81	1.00	Almost Perfect

Source: Landis and Koch (1977)

Since the data are not weighted, $w_{ii} = 1$ and $w_{ij} = 0$ for $i \neq j$. The observed degree of agreement is

$$p_o = \sum_{i=1}^{k} \sum_{j=1}^{k} w_{ij} p_{ij} \tag{1}$$

where p_{ij} is the fraction of regimes i by first classification (rater) and j by the second.

The expected degree of agreement is

$$p_e = \sum_{i=1}^{k} \sum_{j=1}^{k} w_{ij} p_i p_j \tag{2}$$

where $p_i = \sum_j p_{ij}$ and $p_j = \sum_i p_{ij}$. The Kappa statistic is computed as

$$\widehat{\kappa} = \frac{p_o - p_e}{1 - p_e} \tag{3}$$

If RR and BORA had classified regimes randomly with probabilities equal to the overall proportions, we would expect the two classifications to agree on 38% of regimes. In fact they agree on 69%, 49% of the way between random and perfect agreement. From this we conclude that the strength of agreement is moderate (see Table 4) and reject the null that RR and BORA are classifying regimes randomly. Advanced countries exhibit the highest degree of correspondence (64% of the way between random agreement and perfect agreement), followed by developing countries (46%) and emerging markets (42%).

The strength of agreement between RR and LYS is similarly moderate. These two classifications agree on 60% observations, 36% of the way between random and perfect agreement. Advanced countries exhibit the highest degree of agreement (54%), followed by developing countries (33%) and emerging countries (21%).

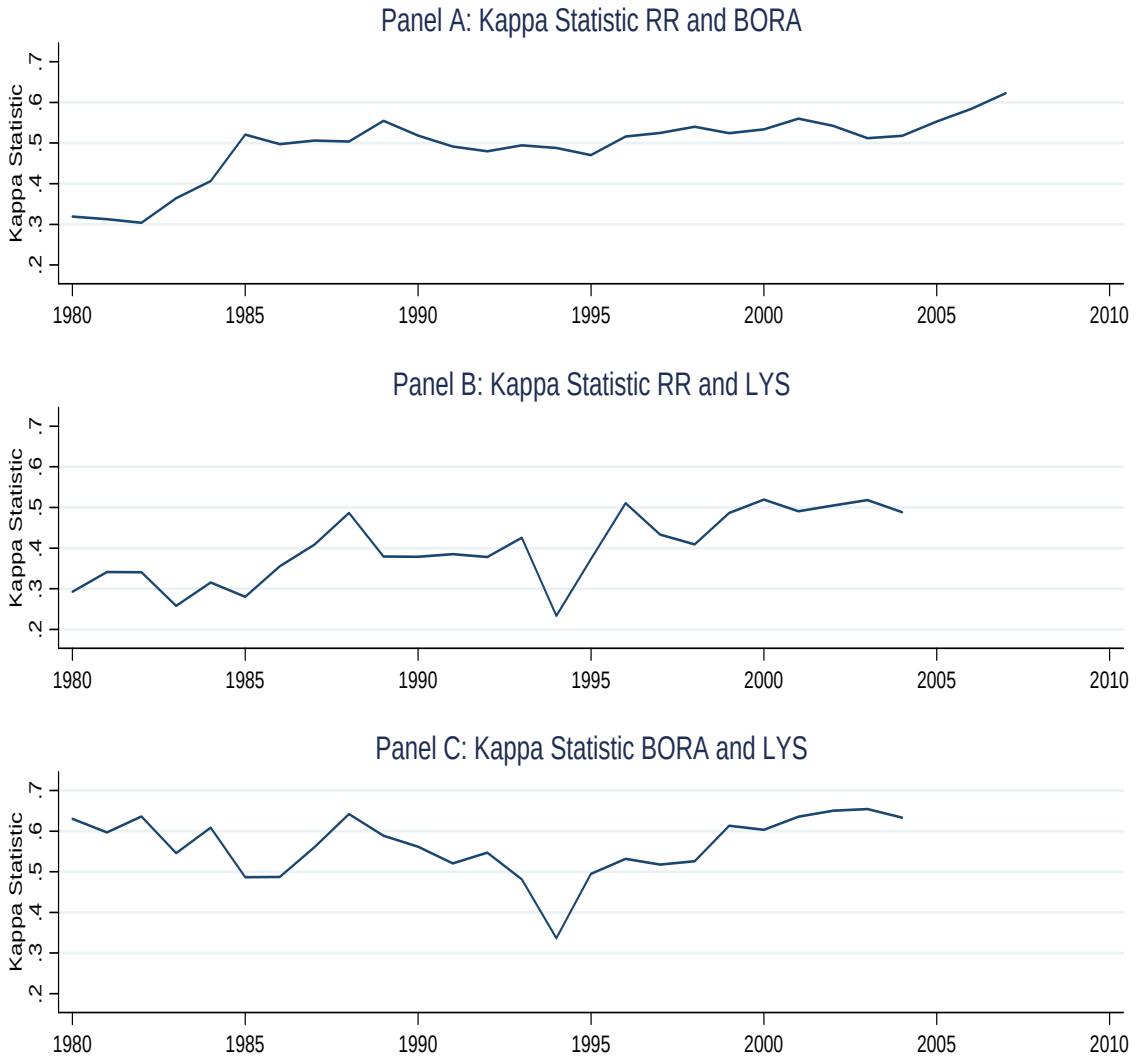
BORA and LYS agree on 75% observations, 58% of the way between random and perfect agreement. Again this is a moderate level of agreement. However, advanced and developing countries exhibit a substantial degree of agreement: 63% and 61%, respectively.[25]

In Figure 2 we show the Kappa Statistic over time. RR and BORA exhibit rising agreement over time. The same rising trend is evident for the RR-LYS pair but not for LYS-BORA Again, we can observe that the two pairs including LYS classification show a jump in the Kappa Statistic around 1994. For the pair BORA-LYS, for example, the degree of agreement changes from moderate to fair from 1993 to 1994.

Predictably, agreement is lower still when we compute the combined Kappa Statistic for the three classifications ($m = 3$). Let α_{ni} be the number of ratings on observation n^{th}

[25] Followed by a moderate degree of agreement in emerging countries (37%).

Figure 2: Evolution of the Kappa Statistic Among *De Facto* Exchange Rate Regimes Classifications



and regime i, $i = 1, 2, 3$. Now define the overall proportion of ratings in regime i as

$$\overline{p}_i = \sum_{n=1}^{N} \frac{\alpha_{ni}}{N\overline{m}}$$

where $\overline{m} = \sum_{n=1}^{N} \frac{m_n}{N}$ and m_n is the number of "raters" in observation n^{th}.[26] The combined

[26]For some observations we only have two classifications so in that case $m_n = 2$. For the observations with three *de facto* classifications $m_n = 3$.

Table 5: Kappa Statistics.

	Agreement	Expected Agreement	Kappa Statistic	Standard. Error	Z	Prob>Z
Reinhart and Rogoff vs. Bubula, Ötker-Robe and Anderson						
All Countries	0.6871	0.3819	0.4937	0.0116	42.60	0
Emerging Markets	0.6888	0.4658	0.4174	0.0266	15.70	0
Advanced Countries	0.7753	0.3766	0.6396	0.0290	22.05	0
Developing	0.6632	0.3761	0.4602	0.0148	30.99	0
Reinhart and Rogoff vs Levy-Yeyati and Sturzenegger						
All Countries	0.5977	0.3697	0.3617	0.0116	31.19	0
Emerging Markets	0.5330	0.4084	0.2106	0.0268	7.87	0
Advanced Countries	0.7343	0.4183	0.5432	0.0297	18.31	0
Developing	0.5799	0.3733	0.3296	0.0150	21.99	0
Bubula, Ötker-Robe and Anderson vs Levy-Yeyati and Sturzenegger						
All Countries	0.7480	0.4076	0.5746	0.0127	45.32	0
Emerging Markets	0.6480	0.4391	0.3725	0.0294	12.68	0
Advanced Countries	0.7789	0.4017	0.6304	0.0337	18.71	0
Developing	0.7720	0.4110	0.6129	0.0158	38.72	0

Kappa statistic is obtained as

$$\overline{\kappa} = \frac{\sum_i^3 \overline{p}_i \overline{q}_i \widehat{\kappa}_i^*}{\sum_i^3 \overline{p}_i \overline{q}_i} \tag{4}$$

where $\overline{q}_i = 1 - \overline{p}_i$ and

$$\widehat{\kappa}_i^* = \frac{B_i - W_i}{B_i + (\overline{m} - 1)W_i} \tag{5}$$

B_i and W_i are the between- and within-observations mean square, respectively, and are defined as

$$B_i = \frac{1}{N} \sum_{n=1}^{N} \frac{(\alpha_{ni} - m_n \overline{p}_i)^2}{m_n}$$

$$W_i = \frac{1}{N(\overline{m} - 1)} \sum_{n=1}^{N} \frac{\alpha_{ni}(m_n - \alpha_{ni})}{m_n}$$

The first column of Table 6 presents the combined Kappa Statistic, while the next three columns show the Kappa Statistic for each regime.[27] Overall, agreement is moderate (0.46). There is considerably more agreement about hard pegs than other regimes. The

[27]Since the number of raters is not constant for all the observations (i.e. 2 or 3) it is not possible to calculate the approximate standard errors and the Z-statistic.

combined Kappa Statistic indicates that the strength of agreement between the three classifications is only fair for emerging markets. Advanced countries again exhibit the highest degree of agreement (0.61), followed by developing countries and then emerging markets.

Table 6: Combined Kappa Statistics.

	$\overline{\kappa}$	$\widehat{\kappa}^*_{hard\ peg}$	$\widehat{\kappa}^*_{intermediate}$	$\widehat{\kappa}^*_{flexible}$
All Countries	0.4588	0.7372	0.3522	0.2887
Emerging Markets	0.3260	0.7672	0.2307	0.1899
Advanced Countries	0.6087	0.8597	0.5161	0.5249
Developing	0.4438	0.6949	0.3457	0.2074

3 Mixed Probit Models

In this section we estimate mixed-probit models to analyze how economic and institutional factors affect the probability of agreement.

3.1 Definition of the Discrete Variables

Let RR_{it}, $BORA_{it}$ and LYS_{it} be the exchange rate regime of country i in period t obtained from Reinhart and Rogoff; Bubula, Ötker-Robe and Anderson; and Levy-Yeyati and Sturzenegger classifications, respectively. Formally,

$$Y_{it} = \begin{cases} \text{HP} & \text{if ERR by Y is a hard peg} \\ \text{I} & \text{if ERR by Y is an intermediate regime} \\ \text{F} & \text{if ERR by Y is a floating regime} \end{cases}$$

where $Y = \{RR, BORA, LYS\}$.

For each pair of classifications X and Z, for $X = \{RR, BORA\}$, $Z = \{BORA, LYS\}$ and $X \neq Z$, we define 3 dummy variables. The first, $D^{X>Z}$, captures whether macroeconomic and institutional factors affect the probability of observing a more flexible regime in classification X relative to the regime in classification Z; $X > Z$ (e.g. RR=Intermediate and BORA= Hard Peg). $D^{Z>X}_{it}$, the second binary variable, analyzes the opposite case;

observations in which classification Z implies a more flexible arrangement than classification X ($Z > X$). The third variable, $D_{it}^{X \neq Z}$, is used to investigate what factors systematically affect the probability of observing different regimes in X and Z *de facto* classifications (the off-diagonal elements of the two-way table). Formally, these three variables are defined as

$$D_{it}^{X>Z} = \begin{cases} 1 & \text{if } X_{it} > Z_{it} \\ 0 & \text{if } X_{it} = Z_{it} \end{cases}$$

This dummy variable is related to the lower-triangular elements of the contingency tables.

$$D_{it}^{Z>X} = \begin{cases} 1 & \text{if } X_{it} < Z_{it} \\ 0 & \text{if } X_{it} = Z_{it} \end{cases}$$

This dummy variable is related to the upper-triangular elements of the contingency table.

$$D_{it}^{X \neq Z} = \begin{cases} 1 & \text{if } X_{it} \neq Z_{it} \\ 0 & \text{if } X_{it} = Z_{it} \end{cases}$$

This dummy variable is related to the off diagonal elements of the two-way tables.

For each of these three dummy variables we propose a discrete choice model in which an unobservable measure of disagreement is defined as

$$D_{it}^{*\Lambda} = X'_{it}\beta^{\Lambda} + \alpha_i + \epsilon_{it} \tag{6}$$

where $\Lambda = \{X > Z, Z > X, X \neq Z\}$, $D^{*\Lambda}$ is an unobservable latent index describing the likelihood of observing event Λ, X_{it} is a vector of exogenous regressors, β is a vector of parameters associated with X_{it}, α_i is a country-specific random effect affecting the probability of event Λ (assumed to be *i.i.d.* normally distributed with mean zero and variance σ_α^2), and ϵ_{it} is a random term representing all the factors affecting $D^{*\Lambda}$ not included in X. We assume that the probability density function of ϵ_{it} is the standard normal distribution ($\epsilon_{it} \sim N(0,1)$). Although $D^{*\Lambda}$ cannot be observed, we observe the three discrete variables defined above.[28]

[28] Initially we defined two extra dummy variables to deal with two of the off-diagonal elements of the two-way tables with more disagreements, entries (2,3) and (3,2). For the sake of brevity we exclude

3.2 Explanatory Variables

We define *Flexible de Jure* as a dummy variable equal to one if the IMF *de jure* classification signifies a float and *Intermediate de Jure* as a binary variable equal to one if the IMF *de jure* classification denotes a soft peg.[29]

Other independent variables are inflation, per capita income, M2/GDP as a proxy for financial development, reserves (normalized by M2), trade openness ($\frac{exports+imports}{GDP}$), size, degree of democratization, financial openness, and two binary variables denoting advanced or emerging market countries. We also include the volatility of the nominal exchange rate defined as the standard deviation of the monthly change of the (log) nominal exchange rate over the preceding five years. All explanatory variables, except for the dummies and the democracy measure, are lagged one year.

3.3 Results

Table 7 uses data for advanced, emerging market and developing countries, Table 8 for emerging markets only, and Table 9 for advanced countries only.[30] The first three columns present the results for RR-BORA, columns (4)-(6) for RR-LYS, and columns (7)-(9) for BORA-LYS.

The results suggest that inflation, international reserves, financial openness, financial development, per capita income, intermediate and flexible *de jure* are significant sources of disagreement over how to classify exchange rate regimes. Inflation significantly increases the likelihood of disagreements. The coefficient on this variable is significantly different from zero at conventional confidence levels in five of the nine models estimated. The results suggest that higher inflation increases the likelihood of disagreements between RR and BORA and between BORA and LYS but not between RR and LYS to the same extent. Specifically, inflation increases the chances of observing a flexible regime in RR

the results obtained with these two variables because they are similar to the findings obtained with models $D_{it}^{X>Z}$ and $D_{it}^{Z>X}$. We do not define dummy variables for the combinations of X=hard peg and Y=flexible (entry [3,1]), Z=flexible and X= hard peg (entry [1,3]), and Z=hard peg and X=intermediate (entry [2,1]) because there are not enough observations to identify the coefficients.

[29] Since *Hard peg de Jure*+*Intermediate de Jure*+*Flexible de Jure*=1, then, in some models *Flexible de Jure* or *Intermediate de Jure* is dropped off when one of these three binary variables is equal to zero for all the observations included in that model (e.g. *Intermediate de Jure*+*Flexible de Jure*=1). In some extreme cases both variables, *Intermediate de Jure* and *Flexible de Jure*, are dropped off because one of those variables is equal to one for all the observations included in that model.

[30] A table presenting the results for developing countries is included in the Appendix (Table 14).

relative to BORA and LYS (models 1 and 4) and in BORA relative to LYS (model 7). This plausibly reflects the fact that LYS's cluster analysis relies exclusively on reserves and the nominal exchange rate to identify the regimes while the other two schemes use additional information on, inter alia, prices.

The size and significance of the coefficients associated with inflation also differ across advanced, emerging and developing countries. Among emerging markets, the probability of disagreement increases with inflation in five of the nine models; however, in only one of them is statistically significant (model 4 in Table 8). For advanced countries, inflation is positive and significant in four of the nine models (Table 9). In high-income countries inflation becomes positive and significant in models (2) and (5), implying that in advanced countries with high inflation, BORA and LYS are likely to classify an exchange rate regime as more flexible than RR. This is plausibly due to the fact RR use inflation to classify regimes whereas LYS does not.

Per capita income, which plausibly proxies for the strength of institutions, negatively affects the probability of disagreement in six of the nine models. In three of these six models the coefficient is different from zero at conventional levels (models 1, 5 and 8 in Table 7). Per capita income lowers the probability of identifying a more flexible regime in RR than BORA (model 1), the likelihood of observing a more flexible regime in LYS relative to RR (model 5), and the probability that exchange rate arrangement identified by LYS is more flexible than BORA (model 8). Other things equal, RR are more likely classify a regime as more flexible than LYS in higher per capita income countries (model 4). Similarly, per capita income raises the probability of identifying a more flexible regime in BORA than RR (model 2).[31]

There is also some evidence that disagreements are more prevalent in more financially developed economies, where financial development is proxied by the M2/GDP ratio. But this effect is limited to the RR-BORA and RR-LYS pairs. M2/GDP is positive and significant in three models (Table 7, models 2, 3 and 4), indicating that the cases in which RR identify a more flexible regime than LYS, and BORA a more flexible than RR are more prevalent in countries with relatively well developed financial markets (models 2 and 4). In contrast, having a more developed financial system reduces the probability

[31] Just a few of these results survive when we re-estimate the models using only emerging markets data. On the contrary, the majority of these findings hold when we use data from high-income countries.

of identifying a more flexible regime by RR relative to BORA (model 1).

Results here differ between emerging markets and advanced countries, however. In the estimates for emerging markets, while two significant coefficients associated with M2/GDP in Table 7 (models 2 and 4) are not longer significant in Table 8, two of the insignificant coefficients in Table 7 become statistically different from zero at conventional levels in the emerging market subsample (Table 8, models 5 and 6). An emerging market having a more developed financial sector increases the probability that LYS will classify a regime as more flexible than RR. In the advanced country subsample, M2/GDP is no longer significant in model (4), but it becomes significant in models (5), and (6). The most striking differences are in the magnitude of the coefficients associated with M2/GDP in models (3), (6) and (9). These positive coefficients again indicate that the development of financial markets increases the probability of a disagreement.

Similarly, disagreements are greater for countries with low international reserves, as proxied by the reserves/M2 ratio. All the coefficients associated with international reserves are negative. There is a negative correlation, for example, between international reserves and the probability of identifying a more flexible regime by RR relative to BORA and LYS (models 1 and 4) and the likelihood that LYS will classify a regime as more flexible than RR and BORA (models 5 and 8). This might seem counterintuitive given the build-up of foreign exchange reserves in emerging markets and the fact that we still observe many off-diagonal entries different from zero in Panel B of Table 2. In Table 8 we therefore re-estimate the models including only emerging markets. Although the coefficients on reserves mostly remain negative, only two of them are statistically significant at conventional significance levels. We find very different results for advanced countries (Table 9). In high-income countries, in contrast, high international reserves consistently raise the probability of disagreement.

There is evidence, in addition, that financial openness is related to the probability of disagreement. But this evidence is stronger for the RR-BORA and RR-LYS pairs than for BORA-LYS. This may reflect the fact that RR use data on black market rates for financially closed economies, whereas the other two do not. While model (3) in Table 7 suggests that for financially-open economies the likelihood of a disagreement between RR and BORA is high, model (6) indicates that financial openness decreases the likelihood

of disagreements between RR and LYS. These results are mainly driven by the fact that financial-openness raises the probability that BORA classify a regime as more flexible than RR (model 2) and decreases the likelihood of RR classifying a regime as more flexible than LYS (model 4). For the BORA-LYS pair, we find that the probability of BORA classifying a regime as more flexible than LYS raises with the degree of financial account openness (model 7).[32]

Differences in reliance on *de jure* classifications also appear to be an important source of disagreement. A *de jure* floating regime, for example, increases the likelihood that BORA will classify a regime as more flexible than RR (model 2) and LYS (model 7), the probability of finding a more flexible regime in LYS relative to RR (model 5), and the likelihood of RR classifying a regime as more flexible than LYS (model 4). Evidently, some investigators (e.g. BORA) rely more on the IMF's *de jure* classification than others, and this leads to a significant number of disagreements. Most of these results hold when the model is re-estimated using only data from advanced countries or emerging markets. Similarly, the presence of a *de jure* intermediate regime raises the probability that RR will identify the regime as a float while BORA classify it as intermediate (model 1) and likelihood that LYS classify a regime as more flexible than RR (model 5). For BORA-LYS pair, the three coefficients in models (7)-(9) are positive and significantly different from zero at conventional levels suggesting that the presence of a *de jure* intermediate regime increases the off-diagonal entries of the two-way table associated with this pair.[33]

The coefficient associated with "democratic level" is significant in seven of the nine models. While RR and BORA and RR and LYS are less likely to disagree over more democratic countries (models 3 and 6 in Table 7), BORA and LYS tend to disagree more (model 9). In particular, democratic countries exhibit a lower probability of identifying a more flexible regime by RR relative to BORA and LYS (models 1 and 4), a lower likelihood that BORA will classify a regime as more flexible than RR (model 2), and higher likelihood of observing a more flexible regime in LYS than BORA (model 7). Similar results are obtained for the emerging market subsample. In contrast, in advanced countries with highly democratic political systems the three *de facto* classifications are

[32]These results hold in the advanced and emerging market sub-samples.

[33]Some of these results survive in the emerging market and advance countries sub-samples, however, in some cases there *de jure* intermediate regime was not linearly independent of *de jure* flexible regime so we drop it from the regression.

Table 7: All Countries: Mixed-Probit Models.

	RR (*X*) vs *BORA* (*Z*)			*RR* (*X*) vs *LYS* (*Z*)			*BORA* (*X*) vs *LYS* (*Z*)		
	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflation	1.280	-.140	.858	1.541	-.343	.406	.888	.473	.601
	(.451)***	(.465)	(.294)***	(.392)***	(.349)	(.272)	(.363)**	(.412)	(.286)**
Per Capita Income	-1.878	.560	-.133	.780	-.468	-.196	.309	-1.192	-.331
	(.591)***	(.268)**	(.203)	(.349)**	(.200)**	(.174)	(.267)	(.392)***	(.218)
M2/GDP	-1.662	1.033	.714	.883	.098	.285	-.006	-.404	.112
	(.655)**	(.364)***	(.298)**	(.480)*	(.288)	(.255)	(.404)	(.467)	(.310)
Reserves/M2	-.952	-.194	-.153	-.654	-.306	-.321	-.222	-.575	-.269
	(.450)**	(.225)	(.194)	(.341)*	(.166)*	(.152)**	(.229)	(.270)**	(.173)
Financial Openness	-.149	.181	.092	-.293	-.039	-.095	.117	-.089	.002
	(.087)*	(.046)***	(.039)**	(.065)***	(.039)	(.035)***	(.050)**	(.058)	(.038)
Flexible *De Jure*	1.013	.802	.602	.343	1.521	1.726	2.184	.360	1.535
	(.556)*	(.146)***	(.132)***	(.145)**	(.242)***	(.227)***	(.351)***	(.300)	(.221)***
Intermediate *De Jure*	2.087	.177	.423		1.642	1.714	.913	.964	1.003
	(.540)***	(.141)	(.126)***		(.229)***	(.218)***	(.344)***	(.272)***	(.211)***
ER Volatility	.131	.481	.269	-.094	-.193	-.124	.150	.509	.322
	(.338)	(.931)	(.281)	(.175)	(.357)	(.167)	(.437)	(.272)*	(.246)
Trade Openness	-1.115	.005	-.036	-.699	.025	-.153	-.099	-.590	-.263
	(.513)**	(.227)	(.202)	(.333)**	(.172)	(.156)	(.225)	(.276)**	(.175)
Size	.016	-.078	-.033	-.047	.002	-.008	-.047	.008	-.025
	(.043)	(.042)*	(.023)	(.034)	(.010)	(.009)	(.029)	(.020)	(.016)
Democratic Level	-.062	-.021	-.040	-.029	-.005	-.013	.007	.036	.021
	(.017)***	(.011)*	(.009)***	(.012)**	(.009)	(.007)*	(.011)	(.012)***	(.008)**
Emerging Market	.815	-.365	-.018	.096	.048	.067	-.318	.615	.197
	(.715)	(.394)	(.343)	(.418)	(.228)	(.205)	(.275)	(.344)*	(.230)
Advanced Country	3.363	-2.116	-.240	-1.007	-.148	-.283	-1.306	.846	-.141
	(1.315)**	(.741)***	(.570)	(.776)	(.414)	(.369)	(.587)**	(.703)	(.449)
Constant	-2.792	-1.767	-1.297	-2.139	-1.832	-1.721	-2.520	-1.514	-1.491
	(.842)***	(.321)***	(.280)***	(.416)***	(.267)***	(.251)***	(.388)***	(.373)***	(.261)***
Observations	2183	2434	2702	1820	2146	2428	2014	2050	2363

Notes: All the models are estimated using random effects. Standard Errors in parenthesis.
In model (4) Intermediate *De Jure* is not linearly independent of Flexible *De Jure* and Hard Peg *De Jure*.

less likely to disagree (Table 9).

Exchange rate volatility is also associated with discrepancies among BORA and LYS classifications. This variable enters as significantly different from zero in column 8 of Table 7. While all three sets of authors use this variable in constructing their classifications, periods of volatility are also periods when regimes change, making classification particularly difficult. Finally, while economic size does not affect the probability of a disagreement when we estimate these equations on the full sample (Table 7), it does help to explain discrepancies for emerging markets. Specifically, disagreements among *de facto* classifications are less likely in the cases of larger emerging markets.

Table 8: Emerging Markets: Mixed-Probit Models.

	RR (*X*) vs *BORA* (*Z*)			*RR* (*X*) vs *LYS* (*Z*)			*BORA* (*X*) vs *LYS* (*Z*)		
	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflation	-.784	-.248	.436	.998	-.209	.319	.425	.624	-.005
	(.952)	(.815)	(.451)	(.540)*	(.508)	(.375)	(.530)	(.567)	(.403)
Per Capita Income	-3.792	.636	.799	1.371	.381	.471	.485	-.276	.372
	(3.091)	(.473)	(.450)*	(.668)**	(.378)	(.288)	(.408)	(.538)	(.288)
M2/GDP	-7.837	-.010	-.957	.480	.988	.901	.694	-.331	.331
	(2.114)***	(.646)	(.565)*	(.835)	(.519)*	(.417)**	(.627)	(.681)	(.456)
Reserves/M2	-4.974	-.439	-1.255	-.805	.003	-.161	.358	-.305	.031
	(1.735)***	(.743)	(.566)**	(.671)	(.543)	(.426)	(.748)	(.598)	(.467)
Financial Openness	-.065	.236	.174	-.375	-.044	-.157	.121	-.072	-.099
	(.139)	(.084)***	(.069)**	(.113)***	(.068)	(.056)***	(.091)	(.088)	(.063)
Flexible *De Jure*	1.432	1.294	.876	.668	1.005	1.231	1.816	-.381	.565
	(1.368)	(.300)***	(.252)***	(.218)***	(.398)**	(.345)***	(.623)***	(.445)	(.331)*
Intermediate *De Jure*	1.903	-.038	.197		1.280	1.159	.833	.639	.634
	(1.377)	(.267)	(.236)		(.377)***	(.327)***	(.604)	(.403)	(.318)**
ER Volatility	-.105	-3.124	.306	-.151	-.319	-.112	.116	.589	.292
	(.406)	(2.270)	(.325)	(.188)	(.658)	(.174)	(.466)	(.293)**	(.261)
Trade Openness	1.872	.609	.702	-.122	-.487	-.514	-.418	-1.148	-.857
	(1.284)	(.396)	(.359)*	(.551)	(.322)	(.253)**	(.380)	(.458)**	(.296)***
Size	.292	-.110	-.050	.190	-.205	-.062	.122	-.327	-.100
	(.233)	(.097)	(.079)	(.106)*	(.084)**	(.053)	(.068)*	(.106)***	(.055)*
Democratic Level	-.083	-.038	-.058	-.030	-.008	-.012	.027	.036	.035
	(.036)**	(.020)*	(.017)***	(.020)	(.015)	(.012)	(.022)	(.017)**	(.013)***
Constant	-.052	-1.740	-.858	-2.786	-1.464	-1.344	-3.201	.107	-.634
	(1.586)	(.566)***	(.498)*	(.638)***	(.475)***	(.389)***	(.713)***	(.582)	(.389)
Observations	579	596	696	460	563	662	448	530	594

Notes: All the models are estimated using random effects. Standard Errors in parenthesis.
In model (4) Intermediate *De Jure* is not linearly independent of Flexible *De Jure* and Hard Peg *De Jure*.

4 Alternative Configurations

We now check the robustness of our findings with respect to different dividing lines between pegs, intermediate regimes and flexible rates. Specifically, we consider what dividing lines maximize the concordance between the three schemes by maximizing the combined Kappa Statistic. This requires analyzing 10,710 different ways of collapsing the 13 categories in Reinhart and Rogoff, the 14 regimes in Bubula, Ötker-Robe and Anderson, and the 5 categories in Levy-Yeyati and Sturzenegger into pegged, intermediate and floating arrangements.[34]

[34]Considering all potential ways of collapsing the three *de facto* classifications would infeasible (i.e. too many combinations and high computational cost) and some combinations in any case would not make sense. For that reason we only consider 7, 34 and 45 different ways of collapsing the 5 regimes in Levy-Yeyati and Sturzenegger, the 13 categories in Reinhart and Rogoff, and the 14 regimes in Bubula, Ötker-Robe and Anderson into pegs, intermediate and floats, respectively (10,710=7*34*45). Let Y_l be the category l in classification Y ($= \{RR, BORA, LYS\}$) with $l = 13$ for Reinhart and Rogoff, $l = 14$ for Bubula,Ötker-Robe and Abderson and $l = 5$ for Levy-Yeyati and Sturzenegger. The most important constraint we impose to make our analysis feasible and consistent is the following: if category Y_m implies a lower degree of flexibility than Y_n (e.g $BORA_m$=currency board and Y_n=pegged within horizontal bands) then Y_m cannot be assigned into a more flexible regime (e.g. float) than Y_n (e.g. intermediate).

Table 9: Advanced Countries: Mixed-Probit Models.

	RR (*X*) vs *BORA* (*Z*)			*RR* (*X*) vs *LYS* (*Z*)			*BORA* (*X*) vs *LYS* (*Z*)		
	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflation	15.774 (9.162)*	24.731 (10.486)**	11.575 (3.887)***	-11.339 (5.923)*	6.198 (2.823)**	2.654 (2.539)	-8.614 (6.565)	6.600 (4.030)	4.364 (2.783)
Per Capita Income	-2.844 (1.810)	1.586 (.906)*	-1.655 (.630)***	-2.429 (1.173)**	-1.265 (.481)***	-2.160 (.579)***	.792 (.628)	-1.692 (.972)*	-.764 (.540)
M2/GDP	11.680 (2.746)***	12.323 (2.876)***	9.664 (1.794)***	-.927 (1.949)	1.466 (.686)**	2.510 (.760)***	.122 (.978)	.299 (1.757)	1.462 (.747)*
Reserves/M2	19.350 (7.611)**	7.402 (5.092)	8.184 (3.067)***	1.849 (5.039)	.463 (1.909)	2.383 (1.844)	.091 (3.519)	.523 (3.318)	.0009 (2.134)
Financial Openness	-1.844 (.766)**	.757 (.413)*	.299 (.239)	-1.704 (.897)*	-.060 (.153)	-.073 (.149)	.523 (.255)**	-.015 (.241)	.072 (.157)
Flexible *De Jure*	-2.257 (1.434)	2.587 (.707)***	2.409 (.565)***	7.471 (2.954)**	1.363 (.353)***	1.691 (.357)***		-1.046 (.594)*	1.278 (.322)***
Intermediate *De Jure*		.328 (.691)	.911 (.547)*						
ER Volatility	43.612 (62.708)	-23.941 (37.479)	-6.465 (24.880)	-36.452 (32.673)	-33.042 (19.277)*	-28.798 (16.801)*	13.976 (27.183)	55.736 (29.139)*	21.207 (17.910)
Trade Openness	-13.292 (4.741)***	.076 (2.079)	3.318 (1.677)**	9.852 (4.223)**	.718 (1.062)	1.963 (1.294)	-5.692 (2.068)***	-2.724 (2.379)	-2.035 (1.467)
Size	.009 (.071)	-.424 (.121)***	-.058 (.055)	-.013 (.063)	-.001 (.014)	.0009 (.023)	-.140 (.061)**	.026 (.033)	-.045 (.033)
Democratic Level	-2.132 (1.108)*	-.922 (.698)	-1.131 (.429)***	-1.453 (1.593)	-.716 (.275)***	-.986 (.299)***	7.918 (637.807)	-.548 (.351)	-.757 (.336)**
Constant	13.788 (11.340)	-7.913 (8.257)	-.056 (4.695)	7.581 (15.257)	6.198 (2.674)**	8.993 (2.997)***	-79.430 (6378.067)	5.198 (3.781)	6.775 (3.462)*
Observations	483	507	552	435	467	516	417	415	459

Notes: All the models are estimated using random effects. Standard Errors in parenthesis.
In models (1), (4)-(9) Intermediate *De Jure* is not linearly independent of Flexible *De Jure* and Hard Peg *De Jure*.

The configuration maximizing the combined Kappa Statistic is shown in Table 10. The only differences from the configuration used above are that: 1) Pre announced horizontal bands narrower than or equal to +/-2% in Reinhart and Rogoff are now counted as intermediate regimes rather than hard pegs; 2) Managed floating in Reinhart and Rogoff is now categorized as an intermediate regime rather than floating; and 3) Managed floating with no predetermined path for the exchange rate in Bubula, Ötker-Robe and Anderson is counted as an intermediate regime rather than floating.

The combined Kappa-statistic, in Table 11, rises by 7%, from 0.4588 to 0.4905. Relative to the two-way statistics shown in Table 5, the degree of agreement for all countries increases for the three pairs (Table 12). But while the concordance between RR and BORA increases for emerging markets and developing countries, it falls for advanced countries. Agreement between RR and LYS rises for high-income (advanced) and low-income (developing) countries and keeps constant for emerging markets. The strength of agreement between BORA and LYS falls for advanced countries and emerging markets but increases for developing economies.

Comparing the two-way tables in Tables 2 and 13, we see that the now higher degree of agreement across classifications is reflected mainly in greater agreement about intermediate regimes. [35]

We also find more agreement about floats. Arithmetically, the decline in the proportion of flexible arrangements in RR (-13%) and BORA (-11%) is greater than the decline in the proportion of observations on which both classifications identify a floating regime (-7%).[36]

Panel A of Table 13 also shows that agreement is more extensive with this new configuration because of fewer observations in the larger off-diagonal cells (cells [2,3] and [3,2] of the two-way tables). The number of observations in cell (3,2) of the two-way table associated with RR and BORA, RR=flexible and BORA=intermediate falls from 385 to 182. Similarly, the number of observations in cell (2,3), RR=intermediate and BORA=flexible, falls from 466 to 322. While the entry (3,2) in the two-way table of RR and LYS falls from 433 to 111, the cell (2,3), RR=intermediate and LYS=flexible, rises only from 443 to 584. Thus, the rise in (2,3) is more than offset by the decline in (3,2), implying a higher degree of agreement between RR and LYS. The strength of agreement between BORA and LYS rises due to the fact that the decrease in entry (3,2) more than offsets the increase in cell (2,3).

While agreement between RR and BORA is higher with this new configuration for emerging markets and developing countries, it is lower for advanced countries. The improvement in the concordance between RR and BORA for emerging markets and developing countries is caused by an increase in agreement about intermediate regimes and a fall in the number of observations classified as intermediate by one scheme and flexible by the other (cells [2,3] and [3,2]). The lower agreement between RR and BORA for advanced

[35]This change is driven by an increase in the number of intermediate regimes in both RR and BORA and by the fact that agreement about intermediate regimes increases more, as a percentage of the total number of regimes, than the fraction of intermediate arrangements in RR and BORA.For example, agreement about intermediate regimes in RR and BORA increases to 2018 or 52% of the all the regimes in this new configuration of exchange rate arrangements (Panel A Table 13) from 1392 or 36% of all the arrangements (Panel A Table 2). This increase of 16 percentage points is greater than the increase in the number of arrangements identified as intermediate regimes in RR (13%) or BORA (11%). With the new dividing lines there are 434 (11%) more intermediate regimes in BORA, relative to the configuration presented in Table 1 and 483 (13%) more soft pegs in RR. The number of hard pegs, intermediate and floating regimes does not change in LYS because the diving lines between categories is the same in Tables 2 and 13.

[36]We obtain these numbers from Tables 2 and 13. The proportion of floating regimes decreases from 21% to 8% in RR and from 23% to 12% in BORA. While in Table 2 RR and BORA agree on 421 floating regimes, the two schemes agree on 144 with the new configuration (Table 13).

countries is due to the increase in cell (2,3).

With the new configuration, the Kappa statistic associated with RR-LYS classifications remains constant for emerging markets while rising for advanced and developing countries. Greater agreement about soft pegs and fewer observations in cell (3,2), RR=Flexible and LYS=Intermediate, drive the rise in agreement between RR and LYS classifications for high- and low-income economies.[37] In contrast, the concordance between BORA and LYS rises only for developing countries.

In sum, even when the correspondence across the three classifications is maximized we still observe many disagreements, and the overall patterns described above continue to obtain.

5 Final Remarks

In this paper we have analyzed disagreements between *de facto* exchange-rate-regime classifications using data on three popular classification schemes. While there exists a reasonable degree of concurrence across classifications, disagreements are not uncommon, and they are not random. Disagreements are most prevalent in middle-income countries (emerging markets) and low-income (developing) countries. Some are centered in periods of currency volatility when the exchange-rate regime is prone to change. *De jure* classifications are also a source of disagreement on how to classify exchange rate practice in emerging markets and developing countries, suggesting that different investigators rely on them to differing extents. Disagreements are relatively prevalent for countries with well-developed financial markets and low reserves. Financial openness is also an important source of disagreements between some *de facto* classifications.

The existence of disagreements among the popular *de facto* exchange-rate-regime classifications suggests caution when using them in empirical work. The incidence and correlates of those disagreements suggest particular caution when using them to analyze exchange-rate regimes in emerging markets and developing countries. It suggests special caution when attempting to relate the *de facto* exchange rate regime to financial stability, financial development, the openness of the financial account, and reserve management

[37] For these type of countries the decrease in cell (3,2) is higher than the increase in the number of regimes in cell (2,3). Therefore, the total number of observations in the off-diagonal cells decreases.

and accumulation decisions.

On a more positive note, these findings also point to the countries and country characteristics on which investigators should focus when refining existing *de facto* regime classifications and constructing new ones.

Table 10: Alternative Collapsing of the Currency Spectrum into Hard Pegs, Intermediate and Floating Regimes

	RR[†]	**BORA**[‡]	**LYS**[§]
Pegs	No separate legal tender	Another currency as legal tender	Fix 1[♯]
	Pre announced peg or currency board arrangement	Currency union	
		Currency board	
		Economic union/Monetary coordination agreement	
Intermediate	Pre announced horizontal band narrower than or equal to +/-2%	Conventional fixed peg to a single currency	Fix 2[♯]
	De facto peg	Conventional fixed peg to a basket	Dirty
	Pre announced crawling peg	Pegged within horizontal bands	Crawling peg
	Pre announced crawling band narrower than or equal to +/-2%	Forward-looking crawling peg	
	De facto crawling peg	Forward-looking crawling band	
	De facto crawling band narrower than or equal to +/-2%	Backward-looking crawling peg	
	Pre announced crawling band wider than or equal to +/-2%	Backward-looking crawling band	
	De facto crawling band narrower than or equal to +/-5%	Other tightly managed floating	
	Moving band narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	Managed floating with no predetermined path for the ER	
	Managed floating		
Floating	Freely floating	Independently floating	Float

Notes: † Reinhart and Rogoff *De Facto* classification. Freely Falling Reclassified following Chronologies.

‡ Bubula, Ötker-Robe and Anderson *De Facto* classification.

§ Levy-Yeyati and Sturzenegger *De Facto* classification. ♯ Fix 1 is fixed ERR in LYS and an hard peg *de jure* classification (Gosh, Gulde and Wolf).

♯ Fix 2 is a fixed ERR in LYS and a non-hard peg in a de jure classification (Gosh, Gulde and Wolf).

Table 11: Combined Kappa Statistic: New Configuration

	$\overline{\kappa}$	$\widehat{\kappa}^*_{hard\ peg}$	$\widehat{\kappa}^*_{intermediate}$	$\widehat{\kappa}^*_{flexible}$
All Countries	0.4905	0.7381	0.4295	0.1719

Table 12: Kappa Statistic: New Configuration

	Agreement	Expected Agreement	Kappa Statistic	Standard. Error	Z	Prob>Z
Reinhart and Rogoff vs. Bubula, Ötker-Robe and Anderson						
All Countries	0.7775	0.4795	0.5726	0.0125	45.77	0
Emerging Markets	0.8094	0.6276	0.4883	0.0258	18.91	0
Advanced Countries	0.7484	0.4239	0.5633	0.0278	20.25	0
Developing	0.7742	0.4653	0.5778	0.0167	34.58	0
Reinhart and Rogoff vs Levy-Yeyati and Sturzenegger						
All Countries	0.6487	0.4166	0.3978	0.0119	33.43	0
Emerging Markets	0.5317	0.4456	0.1553	0.0216	7.18	0
Advanced Countries	0.7773	0.4470	0.5972	0.0275	21.75	0
Developing	0.6517	0.4202	0.3993	0.0164	24.30	0
Bubula, Ötker-Robe and Anderson vs Levy-Yeyati and Sturzenegger						
All Countries	0.7590	0.4485	0.5630	0.0127	44.26	0
Emerging Markets	0.6329	0.4551	0.3264	0.0246	13.25	0
Advanced Countries	0.7390	0.4134	0.5551	0.0336	16.51	0
Developing	0.8032	0.4683	0.6299	0.0170	37.12	0

Table 13: Two-Way Tables. Number of Countries with Pegs, Intermediate and Floating Regimes. New Configuration

Panel A: Advanced, Emerging Market and Developing Countries

		BORA					LYS					LYS			
		HP	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**
R & R	**HP**	**837**	288	8	1133	**R & R**	**765**	537	21	1323	**BORA**	**667**	112	3	782
	Inter.	57	**2018**	322	2397		15	**1425**	584	2024		4	**1614**	483	2101
	Float	1	182	**144**	327		0	111	**151**	262		0	188	**207**	**395**
	Total	895	2488	474	3857		780	2073	756	3609		671	1914	693	3278

Panel B: Emerging Market Countries

		BORA					LYS					LYS			
		HP	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**
R & R	**HP**	**81**	31	3	115	**R & R**	**73**	67	5	145	**BORA**	**67**	2	0	69
	Inter.	1	**567**	88	656		0	**318**	256	574		0	**307**	211	518
	Float	0	35	**23**	58		0	34	**20**	54		0	30	**45**	75
	Total	82	633	114	829		73	419	281	773		67	339	256	662

Panel C: Advanced Countries

		BORA					LYS					LYS			
		HP	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**
R & R	**HP**	**106**	2	0	108	**R & R**	**76**	25	0	101	**BORA**	**63**	19	0	82
	Inter.	19	**295**	111	425		0	**330**	120	450		0	**208**	67	275
	Float	0	27	**72**	99		0	0	**100**	100		0	45	**100**	145
	Total	125	324	183	632		76	355	220	651		63	272	167	502

Panel D: Developing Countries

		BORA					LYS					LYS			
		HP	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**		**HP**	**Inter.**	**Float**	**Total**
R & R	**HP**	**650**	255	5	910	**R & R**	**616**	445	16	1077	**BORA**	**537**	91	3	631
	Inter.	37	**1156**	123	1316		15	**777**	208	1000		4	**1099**	205	1308
	Float	1	120	**49**	170		0	77	**31**	108		0	113	**62**	175
	Total	688	1531	177	2396		631	1299	255	2185		541	1303	270	2114

Notes: The first matrix in each panel presents the two-way table associated with Reinhart and Rogoff vs Bubula, Ötker-Robe and Anderson classifications. The second matrix compares Reinhart and Rogoff with Levy-Yeyati and Sturzenegger scheme. The last matrix in each panel presents the Bubula,Ötker-Robe and Anderson vs Levy-Yeyati and Sturzenegger two-way table.

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A Mixed Probit Models: Developing Countries

Table 14: Developing Countries: Mixed-Probit Models.

	$RR\,(X)$ vs $BORA\,(Z)$			$RR\,(X)$ vs $LYS\,(Z)$			$BORA\,(X)$ vs $LYS\,(Z)$		
	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$	$X > Z$	$Z > X$	$X \neq Z$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflation	2.215 (.713)***	.306 (.606)	1.261 (.465)***	1.841 (.684)***	-.731 (.558)	.302 (.447)	1.301 (.556)**	.020 (.674)	.732 (.456)
Per Capita Income	-1.661 (1.352)	.733 (.590)	.421 (.522)	-.671 (1.186)	.518 (.445)	.219 (.402)	-1.287 (.758)*	.128 (.784)	-.777 (.554)
M2/GDP	.172 (1.073)	-.389 (.613)	-.030 (.526)	-1.362 (1.040)	-2.078 (.565)***	-1.917 (.503)***	-.032 (.784)	-.533 (.855)	.087 (.592)
Reserves/M2	-.323 (.459)	-.280 (.248)	-.129 (.213)	-.735 (.464)	-.491 (.195)**	-.485 (.181)***	-.290 (.258)	-.727 (.325)**	-.354 (.200)*
Financial Openness	-.167 (.134)	.215 (.063)***	.132 (.055)**	-.317 (.106)***	.012 (.057)	-.048 (.051)	.112 (.063)*	-.120 (.087)	.024 (.053)
Flexible *De Jure*	-.343 (.644)	.330 (.195)*	.191 (.183)	-.678 (.254)***	1.893 (.365)***	1.862 (.338)***	2.219 (.506)***	.998 (.480)**	1.776 (.342)***
Intermediate *De Jure*	1.663 (.606)***	.210 (.191)	.457 (.176)***		2.182 (.346)***	2.299 (.325)***	1.236 (.501)**	.990 (.445)**	1.067 (.328)***
ER Volatility	-.045 (1.418)	.931 (1.080)	-.208 (.850)	-.216 (1.113)	1.055 (.955)	.487 (.778)	-.183 (1.087)	.739 (1.284)	.110 (.893)
Trade Openness	-1.154 (.592)*	-.386 (.339)	-.514 (.294)*	-.911 (.479)*	-.117 (.261)	-.262 (.236)	.408 (.305)	-.491 (.361)	.104 (.226)
Size	1.231 (1.075)	-1.267 (1.050)	-.294 (.704)	1.340 (.819)	-1.442 (.777)*	-.506 (.478)	-.372 (.789)	-1.447 (1.271)	-.878 (.722)
Democratic Level	-.046 (.020)**	-.001 (.015)	-.025 (.012)**	-.005 (.017)	.003 (.012)	-.003 (.010)	-.001 (.013)	.029 (.017)*	.010 (.011)
Constant	-2.998 (.867)***	-.868 (.435)**	-.737 (.384)*	-1.175 (.578)**	-1.443 (.384)***	-1.315 (.357)***	-2.791 (.566)***	-1.696 (.529)***	-1.656 (.370)***
Observations	1121	1331	1454	925	1116	1250	1149	1105	1310

Notes: All the models are estimated using random effects. Standard Errors in parenthesis.

B Macroeconomic Performance, Banking Crises and Exchange Rate Regime

In this section we estimate regressions that relate economic growth and the likelihood of banking crises to the exchange rate regime. These illustrate and underscore our point about the critical importance of differences across *de facto* exchange rate regime classifications for the conclusions drawn by researchers for a range of important empirical questions.

B.1 Economic Growth

Following Ghosh, Gulde, and Wolf (2003) we study the relationship between per capita real GDP growth and the exchange rate regime controlling for variables that capture factor accumulation (investment/GDP and the average number of years of schooling of

the population) and catch-up effects (log of the ratio of the country's per capita GDP to that of the United States). Following their specification, trade openness, taxes as a share of GDP, terms of trade growth (to control for terms of trade shocks), population growth and population size are added to the regression:

$$\begin{aligned}\Delta y^{pc} =& \beta_0 + \beta_1\ Investment/GDP + \beta_2\ Trade\ Openness + \beta_3\ \Delta TOT + \beta_4\ Schooling + \\ & \beta_5\ Tax\ ratio + \beta_6\ \log(Initial\ Income/U.S.\ Income) + \beta_7\ Population\ Growth + \\ & \beta_8\ \log(Population) + \beta_9\ Pegged\ Regimes + \beta_{10}\ Intermediate\ Regimes + \epsilon \quad (7)\end{aligned}$$

where Δy^{pc} is the per capital real GDP growth, ΔTOT denotes terms of trade growth and $Schooling$ the average years of schooling.

Table 15 presents the results. The first three columns show the estimated coefficients for the benchmark model (equation 7) using the three *de facto* exchange rate regime classifications. The next three columns add fixed effects to the benchmark model. Table 16 uses observations for emerging markets only, and Table 17 for advanced countries only.

With the exception of the tax ratio and the RR and BORA pegged regime dummies, the other right-hand-side variables display the expected signs and are statistically significant at conventional levels of significance in the benchmark models. The key result for present purposes is that the coefficients associated with the regime dummies exhibit different signs across exchange rate regime classifications. While pegged and intermediate regimes appear to spur economic growth when the LYS classification is used, the opposite result is found when RR or BORA is utilized. Also, while the pegged and intermediate regime dummies are both statistically significant when the LYS classification is used, only the intermediate regime dummy is significant when RR or BORA are utilized. Similar results are obtain when fixed effects are added.

In summary, results look different when one uses different *de facto* classifications.

B.2 Banking Crises

In this section we examine how the choice of exchange rate regime affects the probability of a banking crisis.[38] A probit model is proposed to estimate the effect of the exchange

[38]Banking crises are identified as in Laeven and Valencia (2008). They define a systemic banking crisis when the corporate and financial sectors of a country experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time.

rate regime on that probability.

In this exercise we follow the empirical model proposed by Domac and Martinez Peria (2003). The exchange rate regime and a vector of macroeconomic and financial variables (the inflation rate, the level and growth of real GDP per capita, the change in the terms of trade, the ratio of net capital flows to GDP, the ratio of domestic credit to GDP, the growth of domestic credit, and the ratios of M2 to reserves and foreign liabilities to foreign assets) are included as explanatory variables. Two binary variables, pegged regimes and intermediate regimes, are then added to investigate the link between the exchange rate regime and the probability of a banking crisis. The three *de facto* exchange rate regime classification are again used to check the robustness of the results.

Table 18 reports the results. The first three columns use the three *de facto* classifications and data from advanced, developing and emerging market countries. Columns (4)-(6) use data for emerging markets only, and columns (7)-(9) for advanced countries only. The estimated coefficients associated with pegged and intermediate regimes are strikingly different across *de facto* exchange rate regime classifications, again underscoring our point.

Table 15: Per capita Real GDP growth regressions: Advanced, Developing and Emerging Market Countries

	Benchmark Model			Fixed Effects Model		
	LYS	RR	BORA	LYS	RR	BORA
	(1)	(2)	(3)	(4)	(5)	(6)
Investment/GDP	.001 (.0001)***	.001 (.0001)***	.001 (.0001)***	.002 (.0002)***	.002 (.0002)***	.002 (.0002)***
Trade Openness	.009 (.003)***	.008 (.003)***	.008 (.003)***	.022 (.006)***	.024 (.006)***	.024 (.006)***
Terms of Trade Growth	.021 (.009)**	.022 (.009)**	.021 (.009)**	.016 (.009)*	.017 (.009)*	.016 (.009)*
Average years of Schooling	.003 (.0005)***	.003 (.0005)***	.003 (.0005)***	.002 (.002)	.002 (.002)	.002 (.002)
Tax ratio	.005 (.009)	-.002 (.009)	.003 (.009)	.034 (.019)*	.026 (.019)	.033 (.019)*
Initial Income/U.S. Income	-.011 (.002)***	-.010 (.002)***	-.011 (.002)***			
Population Growth	-.595 (.101)***	-.543 (.101)***	-.568 (.102)***	-.449 (.230)*	-.476 (.228)**	-.450 (.230)*
Population Size	.001 (.0007)	.001 (.0007)*	.001 (.0007)**	.014 (.011)	.012 (.011)	.018 (.011)
Pegged regimes (LYS)	-.008 (.003)***			-.005 (.005)		
Intermediate regimes (LYS)	-.005 (.002)**			-.007 (.003)**		
Pegged regimes (RR)		.005 (.004)			.010 (.006)*	
Intermediate regimes (RR)		.013 (.003)***			.014 (.005)***	
Pegged regimes (BORA)			.0001 (.003)			.013 (.006)**
Intermediate regimes (BORA)			.005 (.003)**			.010 (.004)***
Fixed Effects	No	No	No	Yes	Yes	Yes
Observations	1949	1949	1949	1949	1949	1949
R^2	.146	.154	.146	.072	.074	.074
F-statistic	33.259	35.326	33.252	15.853	16.189	16.205

Notes: Standard errors in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Table 16: Per capita Real GDP growth regressions: Emerging Markets

	Benchmark Model			Fixed Effects Model		
	LYS	RR	BORA	LYS	RR	BORA
	(1)	(2)	(3)	(4)	(5)	(6)
Investment/GDP	.003 (.0003)***	.002 (.0003)***	.002 (.0003)***	.003 (.0004)***	.003 (.0004)***	.003 (.0004)***
Trade Openness	-.005 (.005)	-.001 (.004)	-.003 (.005)	-.008 (.012)	-.003 (.012)	-.003 (.012)
Terms of Trade Growth	.020 (.019)	.016 (.019)	.018 (.019)	.022 (.019)	.021 (.019)	.022 (.019)
Average years of Schooling	.002 (.001)	.001 (.001)	.003 (.001)**	.004 (.005)	.002 (.005)	.009 (.005)*
Tax ratio	.047 (.019)**	.022 (.020)	.045 (.019)**	.040 (.034)	.029 (.034)	.049 (.033)
Initial Income/U.S. Income	-.011 (.003)***	-.007 (.003)**	-.011 (.003)***			
Population Growth	-.463 (.257)*	-.638 (.253)**	-.418 (.259)	-.675 (.547)	-.690 (.556)	-.674 (.545)
Population Size	.004 (.002)**	.004 (.002)**	.006 (.002)***	-.017 (.029)	-.007 (.030)	-.030 (.029)
Pegged regimes (LYS)	.020 (.007)***			.036 (.012)***		
Intermediate regimes (LYS)	-.010 (.004)***			-.005 (.004)		
Pegged regimes (RR)		.041 (.009)***			.042 (.011)***	
Intermediate regimes (RR)		.034 (.008)***			.042 (.010)***	
Pegged regimes (BORA)			.035 (.008)***			.046 (.013)***
Intermediate regimes (BORA)			.015 (.006)**			.016 (.007)**
Fixed Effects	No	No	No	Yes	Yes	Yes
Observations	528	528	528	528	528	528
R^2	.264	.263	.26	.135	.145	.138
F-statistic	18.5	18.442	18.144	8.491	9.221	8.732

Notes: Standard errors in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Table 17: Per capita Real GDP growth regressions: Advanced Countries

	Benchmark Model			Fixed Effects Model		
	LYS	RR	BORA	LYS	RR	BORA
	(1)	(2)	(3)	(4)	(5)	(6)
Investment/GDP	.001 (.0003)***	.001 (.0003)***	.001 (.0003)***	.003 (.0004)***	.003 (.0004)***	.003 (.0004)***
Trade Openness	.019 (.003)***	.019 (.003)***	.020 (.003)***	.062 (.010)***	.064 (.010)***	.051 (.009)***
Terms of Trade Growth	.050 (.025)**	.044 (.025)*	.044 (.025)*	.049 (.024)**	.049 (.023)**	.049 (.024)**
Average years of Schooling	.003 (.0006)***	.003 (.0007)***	.003 (.0007)***	.004 (.002)**	.004 (.002)***	.003 (.002)*
Tax ratio	.017 (.014)	.013 (.014)	.010 (.014)	.058 (.027)**	.059 (.026)**	.054 (.027)**
Initial Income/U.S. Income	-.020 (.004)***	-.020 (.004)***	-.019 (.004)***			
Population Growth	-.717 (.214)***	-.683 (.213)***	-.658 (.213)***	-1.879 (.321)***	-1.841 (.320)***	-1.915 (.324)***
Population Size	.001 (.0008)	.001 (.0009)*	.002 (.0008)**	.018 (.021)	-.006 (.023)	.017 (.021)
Pegged regimes (LYS)	-.010 (.004)***			-.016 (.005)***		
Intermediate regimes (LYS)	-.005 (.003)**			-.001 (.003)		
Pegged regimes (RR)		-.009 (.004)**			-.030 (.007)***	
Intermediate regimes (RR)		-.004 (.003)			-.018 (.007)**	
Pegged regimes (BORA)			-.007 (.004)*			(.005)**
Intermediate regimes (BORA)			-.002 (.003)			-.004 (.004)
Fixed Effects	No	No	No	Yes	Yes	Yes
Observations	532	532	532	532	532	532
R^2	.165	.161	.157	.207	.215	.193
F-statistic	10.327	9.992	9.719	14.407	15.136	13.271

Notes: Standard errors in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Table 18: Probit Model for Banking Crises

	All Countries			Emerging Markets			Advanced Countries		
	LYS	RR	BORA	LYS	RR	BORA	LYS	RR	BORA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflation	.009 (.004)**	.010 (.004)**	.010 (.004)**	.016 (.008)**	.016 (.008)**	.015 (.008)*	.058 (.034)*	.060 (.034)*	.059 (.033)*
Terms of Trade Growth	-.009 (.005)*	-.009 (.005)*	-.009 (.005)*	.006 (.010)	.005 (.009)	.006 (.009)	-.085 (.043)**	-.087 (.043)**	-.086 (.044)**
M2/Reserves	-.011 (.005)**	-.010 (.005)**	-.010 (.005)**	.019 (.017)	.015 (.016)	.015 (.016)	-.012 (.013)	-.009 (.013)	-.014 (.012)
GDP per Capita	-.028 (.008)***	-.027 (.009)***	-.031 (.009)***	-.038 (.025)	-.042 (.025)*	-.035 (.026)	.051 (.024)**	.054 (.025)**	.048 (.024)**
GDP per Capita Growth	-.046 (.011)***	-.045 (.011)***	-.043 (.011)***	-.080 (.020)***	-.084 (.020)***	-.080 (.020)***	-.161 (.075)**	-.161 (.075)**	-.164 (.075)**
Domestic Credit Growth	-.0006 (.001)	-.0007 (.001)	-.0007 (.001)	-.002 (.003)	-.0009 (.003)	-.002 (.003)	-.044 (.017)***	-.045 (.017)***	-.038 (.017)**
Domestic Credit/GDP	.007 (.002)***	.008 (.002)***	.008 (.002)***	.010 (.003)***	.010 (.003)***	.010 (.003)***	.005 (.005)	.005 (.005)	.003 (.005)
Foreign Liabilities/Foreign Assets	.0002 (.0001)	.0002 (.0001)	.0002 (.0001)	.0003 (.0003)	.0003 (.0003)	.0003 (.0003)	-.001 (.002)	-.001 (.002)	-.002 (.002)
Net Capital Flows/GDP	-.008 (.007)	-.008 (.007)	-.007 (.007)	-.005 (.014)	-.005 (.014)	-.003 (.014)	.068 (.046)	.071 (.046)	.078 (.046)*
Pegged regimes (LYS)	-.241 (.153)			-.570 (.400)					
Intermediate regimes (LYS)	-.148 (.109)			-.285 (.180)			-.048 (.364)		
Pegged regimes (RR)		.032 (.206)			.332 (.502)				
Intermediate regimes (RR)		.107 (.178)			.443 (.447)			.122 (.425)	
Pegged regimes (BORA)			-.296 (.161)*			-.507 (.441)			
Intermediate regimes (BORA)			-.249 (.132)*			.003 (.269)			-.635 (.354)*
Observations	1526	1526	1526	374	374	374	347	346	347

Notes: Banking crises are identified as in Laeven and Valencia (2008). Standard Errors in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1%, respectively. All the explanatory variables are lagged one period. Intermediate Regime is dropped from the models of advanced countries because its lack of variation.