The political economy of participation in IMF programs: a disaggregated empirical analysis

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What factors determine whether or not countries have programs with the International Monetary Fund (IMF)? The existing literature suggests that a number of economic and political variables are important, but there is disagreement about their relative significance. Moreover, the fit of general participation models is not particularly good. An increasingly popular view in the recent literature is that the pattern of IMF lending is politically driven and that it reflects the interests of the Fund's leading shareholders; the US is seen as exerting a powerful influence. Using both quantitative and qualitative techniques, and based on an informal analytical framework, we examine in detail the factors that may be at work. We cover the period from 1984 to 2008. We discover considerable variation across the nature of programs (concessional and non-concessional), income levels, geographic regions, and time periods. The degree of observed variation means that it is unsafe to use one general participation model as the basis for evaluating the effects of IMF programs. It also means that the design of policy needs to reflect the nuances that the data reveal.

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1. Introduction

In the aftermath of the global financial and economic crisis in 2008/2009, close attention has once again been paid to the role of the International Monetary Fund (IMF). Some countries with balance of payments problems have entered into programs with the Fund, including some relatively wealthy ones long since thought to have graduated from the IMF's list of clients. Others have run balance of payments surpluses and have accumulated large reserves, possibly motivated by a desire to avoid the need for IMF assistance. Unfortunately, the factors that shape the pattern of participation in IMF programs remain unclear.

Many contend that political influence from the Fund's most powerful members seeps into its decision-making and undermines its technocratic credentials, systematically skewing participation in IMF programs. More specifically, allies and partners of the United States are suspected of receiving programs more easily, and on better terms. Our purpose here is to investigate the economic and geopolitical factors associated with the initiation of Fund programs.

Using a rigorous empirical examination of the political economy variables that are derived from theorizing and that have been included in previous studies, we in particular seek to discover the extent of US influence over participation in IMF

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programs. We begin by outlining a brief and informal analytical framework within which the determination of participation may be conceptualized. We then examine what the existing literature tells us about the potential determinants. Next, we present and estimate our own base model, but extend this by disaggregating it in various ways. In a concluding section, we summarize some of our most important findings and briefly explore their implications for other aspects of research into the IMF.

2.   Participation in IMF programs: a simple analytical framework

A brief and informal model to explain the pattern of IMF arrangements begins with the assumption that a country will be more likely to contemplate turning to the Fund when its balance of payments becomes unsustainable.[1] While its specific causes may vary, unsustainability generally reflects a combination of domestic economic imbalances and the presence of external shocks. Economic imbalances typically arise from economic mismanagement including excessive fiscal deficits financed either by the accumulation of large foreign debts or by inflationary monetary expansion. Shocks may emanate from the current account (such as terms of trade shocks) or the capital account (such as capital reversals, or sudden stops or capital flight). These underlying problems will sometimes be structural, enduring, and difficult to correct in the short to medium term. On other occasions, they may be temporary and almost self-correcting. Consequently, we should expect some countries to have an enduring relationship with the IMF while others are infrequent clients.

Responding to an unsustainable balance of payments situation requires a blend of financing (including the running down of international reserves) and adjustment (including exchange rate devaluation or aggregate demand contraction). Some governments may quickly seek IMF assistance to supplement short-term financing capacity. But even governments that are disinclined to turn to the Fund may ultimately be forced to do so if their international reserves and borrowing options are depleted before adjustment policies bring about a sustainable balance of payments. Foreign creditors may also place considerable pressure on a country to follow an IMF program in order to improve their chances of getting repaid.

Domestic politics may play a key role in determining whether or not a government seeks IMF assistance. When facing powerful special interests that are adversely affected by IMF policy requirements, especially with approaching elections, governments may be disinclined to refer to the Fund even though, in principle, a program provides resources that can allow a slower speed of adjustment to be adopted or can be used to compensate losers. Having the IMF as a scapegoat for politically unpopular policies (Vreeland 1999) may be insufficient to overcome a government's desire for national control over economic policy.

When the combination of these demand side factors ultimately compels a government to request its assistance, the IMF must determine its response. Politics may also play a significant role on the supply side as well. A principal-agent model suggests that the IMF will seek to promote (at least in part) the interests of its principals, variously identified as international financiers (Gould 2003), the richer shareholders of the IMF (Copelovitch 2005), or just the US (Thacker 1999).

There is little doubt that the US has the ability to exert considerable influence within the IMF. It retains an effective veto over key decisions affecting quota increases, SDR allocations, and reforms to conditionality and IMF lending facilities. The tradition of consensus for important decisions also gives it considerable influence, which may be

supplemented by the use of "soft power" to affect outcomes indirectly. The US Congress provides clear guidelines on how US Executive Directors (USED) are to act at the IMF in order to promote US interests, as documented in the annual reports produced by the Treasury Department for Congress.[2] Of the fourteen provisions circumscribing the USED's actions, only five deal with technical economic guidance. The remaining ones address democratic governance, social stability, corruption and bribery, social equity, labor standards, ethnic strife, the environment, and heavily indebted poor countries.

Does the US use its influence in a systematic way to reward friendly states? When important US interests are not at stake, the USED may opt not to interfere with the IMF's routine decisions. However, when they are, the US may either apply direct pressure or use its voting power to bring about a particular outcome. Alternatively, it may rely on the discretion of IMF staff and management to accommodate US interests as it seeks to avoid explicit and direct involvement. Indeed, there may be considerable self-selection on the demand side for IMF programs; governments on good terms with the US may quickly turn to the Fund, while less favored governments may not bother to approach the IMF expecting that an agreement will be opposed.

This simple framework suggests that there is likely to be a fairly standard list of economic and political factors that will be closely associated with the presence of an IMF arrangement. Agreements will be quite probable when there are both severe economic conditions and accommodating political circumstances. However, our analysis also suggests that, in many cases, agreement will be contingent on the presence of certain combinations of economic and political factors. Their relative significance and the required combinations are also likely to differ across time periods, regions, and income groups, as well as across individual countries. The causes of balance of payments difficulties may, for example, differ between low income and emerging economies. In some cases, domestic politics may be conducive to an agreement, but in others represent a barrier. Finally, the influence of international politics in general and US interests in particular, may sometimes be crucial.

This theoretical discussion implies that standard large sample estimations will struggle to identify a single universal model of IMF participation with strong explanatory powers. Instead, the results of statistical models will likely be very sensitive to characteristics of the sample such as country wealth, program type, time, and even location. Consequently, it is necessary to be careful about drawing general conclusions on IMF program participation on the basis of the estimation results from one sample. Similarly, when evaluating IMF program effects, selection bias corrections need to reflect the sensitivity to different sample characteristics.

3.   Existing studies of IMF participation?

There is an extensive literature that looks either directly or indirectly at participation in IMF programs. Our focus here is on the large sample quantitative studies since we are seeking to discover the extent of any systematic influence. Useful reviews of the literature may be found in Bird (2007), Steinwand and Stone (2008) and Moser and Sturm (2011).

The large sample focus should not be interpreted to mean that small sample investigation and individual case studies are unimportant. With respect to US interests, there have been many examples described in Swedberg (1986), Finch (1989), Stiles (1991), Meltzer (2000), and elsewhere that cite instances of US influence on Fund operations. However, these accounts are anecdotal in nature and do not in themselves constitute strong evidence of systematic bias.

Early quantitative studies typically focused on the country-level economic conditions associated with IMF programs. Bird and Orme (1981) provided the first examination and concluded that a more nuanced approach that incorporated political and institutional factors was needed. However, the studies that followed continued to focus primarily on economic determinants (Conway 1994; Cornelius 1987; Joyce 1992; Knight and Santaella 1997; Rowlands 1995; Santaella 1996). These articles highlighted factors such as balance-of-payments performance, international reserve cover, gross domestic product (GDP) growth, external debt and debt service, inflation, the fiscal balance, and a country's domestic credit to the government. Though a degree of consensus began to form around some of the economic dimensions of the basic model, for others, such as reserve depletion, a rather ambiguous and complex relationship with IMF programs emerged (Bird and Rajan 2002).

A consistent finding was that a history of frequent engagement with the IMF did much to explain future involvement. This variable was in turn interpreted as incorporating unobserved effects such as institutional learning or inertia. There was also the notion that there is a fixed political cost associated with turning to the Fund, which, once incurred, makes subsequent agreements less daunting. More frequent interactions between the country officials negotiating programs and IMF staff may also facilitate future programs.

Unfortunately, these studies found it difficult to identify a single uniform model that is able to explain well the pattern of IMF programs. For example, in a typical sample, an unconditional guess of "no agreement" would itself be correct 80–85% of the time given the overall incidence of IMF programs, and the prediction rates of participation models are often only marginally better.

The challenge of finding a better model was generally taken up by researchers who concentrated on the domestic political and economic conditions of potential Fund clients.[3] In this vein, Vreeland (1999), and Przeworski and Vreeland (2000, 2002) introduced more rigorous modeling and estimation of the domestic political determinants of IMF agreements. While these studies generally reinforced previous results in terms of the significant economic variables, it was also found that countries were more likely to seek an IMF program reasonably shortly after elections had taken place.

While Rowlands (1995) investigated and found a weak connection between US military and economic assistance and IMF agreements, it was not until Thacker (1999) that the perspective of international relations and geostrategic interests became a critical component in the examination of IMF agreements. Researchers had become interested in the use of UN voting similarities as a measure of foreign policy alignment (Voeten 2000). Thacker operationalized this by examining whether a country voted the same way as the US on United Nations (UN) resolutions deemed to be of importance to the US. More specifically, he examined whether a country's votes were becoming increasingly aligned with US votes over time, and whether the change in alignment affected its access to IMF resources. He concluded that US foreign policy interests had a statistically significant effect that was robust over both the Cold War and post-Cold War periods of his 1985–1994 sample. Although Thacker was himself somewhat cautious about the interpretation of his results, and others were concerned about the lack of underlying theory (Foot 2003), his article marked an important turning point.

There were several studies that followed up on Thacker's results. Bird and Rowlands (2001) concluded that some of Thacker's results seemed to be sample-specific and that many basic political economy variables failed to improve the explanatory power of the economic model of IMF agreements. The inclusion of US trade flows also failed to

provide evidence of strategic influence. Oatley and Yackee (2000, 2004) found that countries to which US banks were heavily exposed were treated more favorably by the IMF, though the coefficient estimate on UN voting proximity was only marginally significant. In their probit regression of 24 developing countries, Eichengreen, Gupta, and Mody (2004) found that while UN voting affinity with the United States had a statistically significant relationship with IMF program presence, the coefficient's sign implied that a country voting differently than the US on key UN votes was *more* likely to receive IMF financing. Stone (2008) sought to capture US interests using foreign aid allocations and found that countries that received relatively large amounts of US foreign aid were significantly more likely to have an IMF program; by contrast, he found that UN voting had no apparent influence.[4]

Barro and Lee (2005) examined not only UN voting coincidence with the US but also similar UN voting proximity variables and trade variables for the UK, Germany, France, and Europe as a whole. Of these, only the UN voting affinity with Europe, and the US trade variables, had statistically significant coefficient estimates in their fully specified model. Copelovitch (2005) also extended the focus beyond US influence, finding that Group of Five (G5) bank exposure increased the amount of financial support offered, though the coefficient estimate for US military aid was statistically insignificant. These findings were supported by Broz and Hawes (2006) who found that US and German bank exposures were linked to higher IMF participation rates, though again there was no connection to UN voting affinity with US or European interests. Breen (2010) also emphasized G5 banking exposure with results that were consistent with those of Copelovitch (2005). While Sturm, Berger, and Haan (2005) could not replicate Copelovitch's results for bank exposure, they did find that IMF participation was affected by executive elections, legislative elections, the percentage of veto players who drop from the government, and the presence of ethnic tensions. Ghosh et al. (2007) did not find any significant relationship between US and Western European foreign policy variables and IMF lending. More recently, however, Presbitero and Zazzoro (2012) have found that political similarity with G7 countries is positively correlated with the probability of entering a loan agreement with the Fund.

A pattern of inconsistent results encouraged attempts to incorporate political influence in more complex ways. For example, Andersen, Harr, and Tarp (2006) argue that a country's true preferences, or "bliss point," are reflected in its voting patterns on non-key UN resolutions. Their empirical analysis supported the hypothesis that countries which subordinated their preferences and voted with the US more often on key votes than non-key votes were rewarded with IMF resources. Dreher, Sturm, and Vreeland (2006, 2009) and Dreher and Vreeland (2011) extended the literature by examining whether temporary United Nations Security Council (UNSC) membership affected a country's relationship with organizations such as the Fund. Their results indicated that UNSC membership led to a greater likelihood that an IMF member would receive a Fund arrangement during their period of tenure; this effect was less important after the period of the Cold War.

Contrasting results were, however, found by Reynaud and Vauday (2009) who constructed a "geopolitical potential" variable to measure a country's geopolitical importance. The variable's components included energy resources, nuclear energy endowment, military power, and geographic size. Their geopolitical potential variable was found to be statistically significant in all specifications, while the UN voting variable was significant in only one specification, and the UNSC membership indicator was never significant. Disaggregating a part of their study by program type also

revealed that geopolitical factors seemed to be most important when non-concessional loans were being disbursed.

Insights from disaggregation were also provided by Pop-Eleches (2008, 2009) who estimated participation equations for different regions and time periods. In terms of political influence, he found that voting alignment with the United States at the UN only seemed to matter for post-Soviet countries following the collapse of the Communist bloc, whereas American foreign assistance was important only for Latin American countries from 1990 to 2001. Similarly, Bird and Rowlands (2009) disaggregated their sample by per-capita income and concluded that even the economic factors driving participation in IMF programs differed significantly between low-income and middle-income countries.[5]

Finally, Moser and Sturm (2011) made an important contribution to our understanding of the post-Cold War participation of countries in IMF programs using a variety of techniques to identify the variables that exert a statistically significant and robust effect on IMF agreements. They emphasize the need to distinguish between concessional and non-concessional arrangements and show that political variables exert greater influence over program conditions than participation. Their results are, however, somewhat at odds with Steinwand and Stone's (2008, 129) overall conclusion that,

> one of the most robust findings that emerges from the new focus on political determinants of IMF lending is that program initiation is significantly shaped by the geopolitical preferences of the countries that contribute the most resources, particularly the United States.

Given the conflicting evidence cited above, the objective of this article is to provide a more detailed and systematic examination of the evidence regarding the importance of political – especially geopolitical – variables for estimating the propensity of countries to sign IMF agreements. Our base probit participation model incorporates both economic and political variables as determinants of a country's propensity to sign an IMF agreement. In particular, we set out to answer the following questions relating to participation in IMF programs.

(1) *How sensitive are the results of a basic participation model to the specification of program eligibility?* A concern is that some previous studies may not have allowed for the possibility that the absence of a program reflects ineligibility to draw resources from the Fund.

(2) *Is it important to distinguish between relatively rich and poor countries, and between concessional and non-concessional IMF programs?* Our working hypothesis is that relatively low-income countries will turn to the IMF in circumstances that differ from those that are associated with drawings by emerging economies.

(3) *Are the results stable across different time periods and regions?* Our hypothesis here is that there are both temporal and regional variations, such that a participation model that works reasonably well for one time period and for one region may not work so well at other times and in other regions.

(4) *What evidence is there for the proposition that geopolitical interests have a significant systematic effect on participation in IMF agreements?* Our working hypothesis is that while such interests may be important in some cases, this does not necessarily imply that there is a systematic and relatively universal effect.

4.   New large sample evidence on IMF participation

The base probit model is estimated using an unbalanced panel of 1632 observations for 114 countries over the period 1984–2008. We chose to end the data in 2008 in order to avoid the noise that might be connected to the global economic and financial crisis that erupted in that year. The choice of explanatory variables follows from our earlier conceptual discussion and the results of previous studies. Variables that did not generate statistically significant coefficient estimates were dropped from the estimation in order to maximize the sample size. While not exhaustive or comprehensive, the model is reasonably representative of past efforts to capture the determinants of IMF participation, and the results are largely robust to minor variations in the estimating equation. Appendix 1 provides a fuller explanation and discussion of the basic variables and the hypotheses that typically link them to IMF program participation.[6]

Subsequent steps in the article estimate this base model for different sample specifications or versions of the key variables. The use of a disaggregated approach allows us to reduce the chances of specification error, as the robustness of each variable is tested in numerous ways. It also helps to identify the sub-samples that seem to be driving the general results. Furthermore, it allows us not only to paint a more accurate picture of IMF program participation, but also to investigate the extent to which evaluations of the effects of IMF programs effects may be unreliable as a consequence of using inappropriate selection equations.

Four observations regarding the base model should be noted from the outset. First, running the estimation using a model that has only past IMF agreements yields a pseudo R^2 value of 0.1397 on a sample of 3213 observations.[7] Since the interpretation of this variable is unclear, we test whether it is linked primarily to the need to roll over IMF debt. While our results suggest that this may indeed be an important factor in serial IMF program, it does not fully explain the effect of past IMF programs on subsequent ones.

Second, by way of comparison, one version of our base model that could be estimated on a reasonably large sample size of 2557 observations yielded a pseudo R^2 of 0.20, considerably above the 0.11 reported by Moser and Sturm (2011) for a slightly larger sample of 2753 observations. Clearly, there is room to improve some of the existing models.

Third, our preferred base model generates a pseudo R^2 of just over 0.21 on a sample of 1632 observations. This level of explanatory power is high relative to most of the equations reported in the existing literature and suggests that our base model is relatively well designed. As with most models, however, the actual number of correctly predicted cases is only 79.28%, which is only 3.25% more than a simple guess that there are no agreements (which would be correct 76.03% of the time). However, even this result is an improvement over many of the cases where similar measures are provided.

The results of the base model appear in the first results column of Table 1, while the second column presents the associated marginal effects (calculated at the mean of the explanatory variables).

In constructing the base model, several political variables were tried before arriving at the final specification used.[8] The variables included US economic aid, USAID aid, US State Department aid, US military aid, total G5 aid (including testing each G5 country individually), total G5 exports (including testing each G5 country individually), total G5 imports (including testing each G5 country individually), G5 bank exposure

Table 1. Base model probit regression of the probability of entering an IMF program.

Explanatory variable (all lagged one year)	Base model		Base model (marginal effect)	Expanded base model	
IMF variables					
Past IMF programme	0.746***	0.085	0.190	0.682***	0.0882
IMF debt/GDP	2.13**	0.895	0.544	2.01*	0.910
Global economic variables					
Crude oil prices	−0.595***	0.185	−0.152	−0.653***	0.207
Agricultural prices	0.00625**	0.00257	0.00160	0.00620	0.00409
Exports to G5 countries	−0.963*	0.456	−0.247	−0.683	0.424
Political variables					
UN voting proximity	0.537***	0.154	0.138	0.658***	0.181
US economic aid	1.67***	0.340	0.427	1.68***	0.370
Legislative election	0.228**	0.0991	0.0618	0.262***	0.101
Executive elections	0.256*	0.118	0.0713	0.204†	0.120
Domestic economic variables					
Debt service to exports ratio	1.64***	0.227	0.421	1.67***	0.242
Current account/GDP < −0.03	0.306***	0.0816	0.0777	0.288***	0.0823
Reserves to months of imports	−0.0509***	0.0174	−0.0130	−0.0631***	0.0179
Real per capita GDP growth	−0.0127*	0.00610	−0.00326	−0.0120*	0.00610
Real per capita GDP	−0.0453***	0.0157	−0.0116	−0.120***	0.0309
Official arrears	−0.0158*	0.00754	−0.00405	−0.0189**	0.00752
Private arrears	0.0101***	0.00388	0.00258	0.0101**	0.00403
Income (base = low income)					
High-middle income	–		–	0.570***	0.204
Low-middle income	–		–	0.144	0.115
Decade (base = post 1990s)					
1980s	–		–	−0.0953	0.154
1990s	–		–	−0.198†	0.118
Regions (base = Mid-East, N. Africa)					
Sub-Saharan Africa	–		–	−0.0886	0.1803234
Europe and Central Asia	–		–	−0.0450	0.220
Latin America and Caribbean	–		–	−0.112	0.179
South Asia	–		–	−0.178	0.222
East Asia and Pacific	–		–	−0.483**	0.207
Constant	−2.12***	0.284	0.00	−1.77***	0.462
Sample size		1631		1631	
Percentage with an agreement		23.97		23.97	
Pseudo R^2		0.2117		0.2237	
Percentage correctly classified		79.28		79.58	
Improvement over "no" guess		3.25		3.74	

Notes: Reported coefficient estimates significant at the 1, 2.5, 5, and 10% levels (one-tailed test) are identified with ***, **, *, and †, respectively. Robust standard errors are reported.

(including testing each G5 country individually), numerous variations of UN voting coincidence on key votes, membership on the UN Security Council, presence of coups, democracy and autocracy measures, the timing of elections, and various levels and changes in levels of Freedom House measures of civil and political freedom. While many of these variables have been found to have statistically significant coefficient estimates in models presented by other researchers, there was no such finding when the variables were added individually or in combination with our model. Consequently, we suspect that previous conclusions regarding the importance of these political variables

may not be very robust. While we cannot definitively reject their potential influence, the statistical insignificance of these variables' coefficient estimates in our model, which has more observations and higher overall R^2 values, suggests that the influence of these factors is far less systematic than has sometimes been suggested.[9]

From the above list, political variables were included in the base model where they generated statistically significant coefficient estimates. These were the one-year lagged versions of UN voting similarities with the US, US economic aid, elections (both legislative and executive), and trade links with G5 countries.[10] The first two of these corroborate the idea that there is a higher likelihood of IMF agreements for countries with favorable links to the US.[11] In Table 1 we also report for the base model the marginal effects of each variable, as calculated for a country with explanatory variables at the mean of their distribution. For example, a 10% movement in its UN voting pattern toward the United States would increase such a country's probability of entering into an IMF program by about 1.4% (10 × 0.138). A recent election is also associated with a higher propensity (of around 6 to 7%) for a country to sign an IMF agreement. Higher trade links with G5 countries in the form of exports to them are associated with a lower probability of an IMF agreement, but this relationship seems more likely to reflect the impact of economic conditions rather than political ones.[12]

In terms of the more conventional economic variables, a reasonably typical story emerges from the base model. Higher propensities to enter a Fund agreement are linked to higher indebtedness to the IMF (separate from recent programs), high global agricultural prices,[13] high debt service burdens,[14] current account deficits in excess of 3% of GDP, and the presence of debt arrears to private creditors.[15] By contrast, high global oil prices, high international reserves, high rates of economic growth, high average income levels, and arrears to official creditors are linked to lower propensities to enter into IMF agreements.

We conducted a variety of tests on our base model. First was an analysis of multicollinearity which we undertook by examining the variance inflation factors (VIF) from an OLS regression with the same variables; none of the VIF values exceeded five, the most strict of the typical cutoff indicators of multicollinearity.[16]

The results of this model are also qualitatively unchanged when the equation is estimated using robust estimations, random-effects, or a population-averaged model. Despite losing over 15% of our sample, the main results for a conditional fixed-effects model remained reasonably similar qualitatively, though the statistical significance of most coefficient estimates fell, particularly for the use of IMF credit, executive elections, economic growth, and private arrears. Fixed-effects estimations can be problematic, however, as they may mask other sources of cross-country variation.

As a first step in testing the sensitivity of the results, we also re-estimated the base case with dummy variables to identify critical sub-samples based on average income level, time, and region.[17] These results appear in the last column of Table 1 and show that most coefficient estimates are reasonably unaffected, although only three sub-sample indicators have statistically significant coefficient estimates. Taking into account the conditional effects of the other model variables, these indicators suggest that high middle-income countries have a greater likelihood of program participation than low-middle or low-income countries. The 1990s also seemed to have slightly lower participation levels relative to the post 1990s period, as did the East Asian and Pacific group of countries. This test is suggestive of some sub-sample distinctions, but whether these differences extend to fundamentally different results for the model in these sub-samples remains unclear. Our next sub-sections investigate these components of the model's sensitivity.

4.1. Model specification: program eligibility

Our first test relating to model specification investigates the extent to which the results are affected by whether they include only countries that are eligible to sign an agreement. Many studies are silent on this issue. Ignoring ineligibility allows our base model sample to increase by almost 600 cases and, unsurprisingly, the pseudo R^2 drops from 0.2125 (on 1631 observations) to 0.1046 (on 2202 observations). While it is impossible to determine whether the drop in explanatory power is due solely to the change in the sample, we can gain some insights by examining the pattern of predictions. For the base model, the ratio of countries that are predicted to sign an agreement and that actually sign one, relative to those that do not, is 0.54. Therefore, there are many countries signing agreements that are not predicted to do so by the model. The ratio declines sharply to 0.04 when the sample includes ineligible countries. Failing to correct the sample for ineligibility substantially increases the rate of false positives generated. In short, the model is predicting that countries will sign an agreement when in fact they do not because they already have one and are therefore ineligible to sign a new one.

4.2. Model specification: disaggregation by country income and program type

Our second test examines whether participation models are sensitive to levels of national income. Table 2 presents the results of the base model estimated using higher middle-income, lower middle-income, and low-income country groups. The results from these different sub-samples indicate that some of the variables that are statistically significant in the full sample perform less well when the sample is disaggregated by income. Specifically, most global economic variables, elections, and arrears have statistically insignificant estimated coefficients, calling into question their robustness.

Further, there are several common influences across the samples, including past arrangements with the IMF (though indebtedness to the Fund seems less important for poor countries), US economic aid, and debt service burdens. The lower middle-income group shares a statistically significant estimated coefficient on the UN voting variable with richer countries, and sensitivity to excessive current account deficits and income levels with poorer countries. Only high middle-income countries have signing propensities that are affected by reserve levels and economic growth. So, while there are differences across the models suggesting that separate estimation may be useful, it is unclear whether low middle-income countries are best included with the poorer or wealthier countries in the sample.

The base model's overall performance also varies widely across the sub-samples, with a pseudo-R^2 ranging from 0.38 for the higher middle-income group to 0.26 for the lower middle-income group, and 0.14 for the low-income group. Thus, the biggest challenge remains estimating the signing of IMF programs for low-income countries (Bird and Rowlands 2009).

The political variables we identify perform relatively well when the sample is disaggregated by income. While the estimated coefficients indicate some sensitivity to disaggregation, US economic aid is robustly associated with IMF agreements. Aligning with the US on key votes at the UN also seems to increase the probability of middle-income countries (both higher and lower) signing an IMF agreement. Recent elections are uniformly and positively correlated with signing propensities, and the associated coefficient estimate occasionally approaches statistical significance.

Table 2. Base model probit regression of IMF program signing, by income group.

Explanatory variable (all lagged one year)	Higher middle-income		Lower-middle income		Low income	
IMF variables						
Past IMF programme	0.734***	0.222	0.66***	0.144	0.381**	0.150
IMF debt/GDP	15.2**	5.00	4.71*	2.16	1.18	1.13
Global economic variables						
Crude oil prices	−1.68*	0.790	−0.269	0.307	−0.388	0.523
Agricultural prices	−0.00956	0.00763	0.0135***	0.00424	−0.000891	0.00444
Exports to G5 countries	−1.10*	0.561	−1.28	0.993	−1.88	2.16
Political variables						
UN voting proximity	0.996**	0.432	0.560*	0.256	0.137	0.259
US economic aid	1.82***	0.695	4.10***	1.35	7.57***	2.48
Legislative election	0.279	0.214	0.190	0.152	0.274	0.184
Executive elections	0.413	0.252	0.0383	0.194	0.374†	0.218
Domestic economic variables						
Debt service to exports ratio	2.37***	0.546	2.27***	0.480	1.10***	0.417
Current account/GDP < −0.03	0.224	0.176	0.264*	0.130	0.332**	0.147
Reserves to months of imports	−0.107***	0.0357	−0.0553†	0.0316	0.00479	0.0379
Real per capita GDP growth	−0.0435***	0.0161	−0.0147	0.0107	0.00420	0.00833
Real per capita GDP	−0.0324	0.0450	0.−120***	0.0380	−0.337**	0.135
Official arrears	−0.0332	0.0213	−0.0140	0.0101	0.0036	0.0197
Private arrears	0.00901†	0.00493	0.007785	0.00937	0.0142	0.0432
Constant	−0.448	0.926	−2.85***	0.559	−1.05†	0.583
Sample size	418		739		474	
Percentage with an agreement	22.25		21.65		29.11	
Pseudo R^2	0.381		0.2631		0.1357	
Percentage correctly classified	85.17		82.41		76.16	
Improvement over "no" guess	7.42		4.06		5.27	

Notes: Reported coefficient estimates significant at the 1, 2.5, 5, and 10% levels (one-tailed test) are identified with ***, **, *, and †, respectively. Robust standard errors are reported.

As an alternative approach to dealing with differences in income levels, many researchers have also differentiated between concessional (SAF, ESAF, and PRGF) and non-concessional (SBA and EFF) arrangements. Table 3 shows our results for the base model using this distinction.

There should be some similarities to the income-based samples, since concessional programs are available only to low-income countries. In fact, the base model does reasonably well overall in estimating both types of programs, although as noted in Bird and Rowlands (2007) the specific determinants appear relatively distinct. Indeed, aside from a few key variables (past involvement with the IMF, and debt service burdens), if the coefficients for the variables are significant in estimating one type of program, they are not significant in explaining the other type. For income per capita, the estimated coefficients are both statistically significant, but of opposite sign.[18] This result suggests that there may be an important non-linearity in the relationship between country income levels and IMF participation.

In terms of the political variables, the non-concessional SBA and EFF programs seem far more susceptible to the influence of US interests (a result confirmed by Andersen, Harr, and Tarp (2006)) and to that of executive elections. By contrast, the signing of concessional programs is relatively immune to any apparent geopolitical interference, but is positively correlated with recent legislative elections. Consequently,

Table 3. Base model probit regression of IMF program signing, by program type.

Explanatory variable (all lagged one year)	Non-concessional programmes		Concessional programmes	
IMF variables				
Past IMF programme	0.715***	0.0998	0.471***	0.120
IMF debt/GDP	1.06	0.888	1.20	0.898
Global economic variables				
Crude oil prices	−0.481**	0.205	−0.0968	0.143
Agricultural prices	−0.00342	0.00289	0.0142***	0.00329
Exports to G5 countries	−0.548†	0.329	−12.9***	3.99
Political Variables				
UN voting proximity	1.01***	0.179	−0.0309	0.212
US economic aid	1.45***	0.366	−1.30	1.31
Legislative election	0.105	0.111	0.286*	0.135
Executive elections	0.266*	0.128	0.187	0.159
Domestic economic variables				
Debt service to exports ratio	1.74***	0.243	1.05***	0.310
Current account/GDP < −0.03	0.140	0.0905	0.277**	0.111
Reserves to months of imports	−0.0583***	0.0195	−0.0357	0.0262
Real per capita GDP growth	−0.0233***	0.00738	0.0131†	0.00699
Real per capita GDP	0.0502***	0.0158	−0.250***	0.0553
Official arrears	−0.00919	0.0101	−0.0193***	0.00555
Private arrears	0.0103**	0.00406	0.00537	0.00695
constant	−2.06***	0.320	−2.44***	0.367
Sample size	1631		1631	
Percentage with an agreement	15.57		9.93	
Pseudo R^2	22.31		28.04	
Percentage correctly classified	85.47		90.37	
Improvement over "no" guess	1.04		0.30	

Notes: Reported coefficient estimates significant at the 1, 2.5, 5, and 10% levels (one-tailed test) are identified with ***, **, *, and †, respectively. Robust standard errors are reported.

concessional programs do not seem to be simply the poor countries' versions of non-concessional programs; participation in IMF programs embodying different degrees of concessionality appears to be driven by different factors.

4.3. Model specification: stability over time and across regions

Our third test explores the stability of the political influences over time and across regions. While we conducted numerous sub-sample estimations, in the results reported here (Table 4) we focus on three time periods: the 1980s, the 1990s, and post-1999. We also examine six regions.

Using the decades we choose is convenient in part to provide some balance in tracing the evolution of participation, but, more importantly, because the selected decades were associated with varying political circumstances. The 1980s represents a period dominated by the developing country debt crisis, the Cold War, and a Republican President in the United States. The 1990s represents the immediate post-Cold War period with the White House occupied by a Democrat for eight years. The new millennium is dominated by a Republican presidency in the United States and the associated "War on Terror".

Past IMF programs, high debt service burdens, and US economic aid are all statistically significant across all three time periods. The base model best fits the 1980s, when executive elections, large current account deficits, and the presence of private arrears were also all positively correlated with the signing of IMF programs. The model fits the 1990s least well, when UN voting alignment with the US, legislative elections, low reserves and the absence of official arrears were associated with IMF participation. Finally, since the end of the last millennium, low crude oil prices, low exports to G5 countries, and higher income levels are all associated with a greater likelihood of signing an IMF agreement. There is still a (less significant) connection with UN voting proximity and US economic aid during this period. It is interesting to note that it is during the 1990s that the geopolitical interests of the United States are perhaps at their most influential.

Finally, we investigate trends in IMF signings more generally by re-estimating the base model with time dummies. There is weak evidence that the probability of signing an IMF agreement increases slightly over time for the sample period. However, the associated coefficient estimate is statistically significant only at the 0.09 level.

The R^2 values for the regional estimations (all years) vary widely (0.204–0.371) and are roughly and negatively associated with sample size.[19] Table 5 summarizes the base model's performance and identifies the key political variables that affect IMF participation.

Over the full sample period, the different regions exhibit significant differences in terms of the explanatory variables that are statistically significant. For the political variables, South Asia and the Americas are the two regions that seem most affected by US geopolitical interests, as captured by US economic aid. The results for Africa indicate that US geopolitical interests are only marginally important (significance levels for coefficient estimates between 0.05 and 0.10). However, domestic legislative elections are more strongly associated with subsequent IMF program participation.

Finally, our most disaggregated estimations are conducted on country groups (low and middle income) and regions for the three different time periods. The results for the political variables are summarized in Table 6.

Table 4. Base model probit regression of IMF program signing, by decade.

Explanatory variable (all lagged one year)	1980s	1990s	2000s
IMF variables			
Past IMF programme	0.761***	0.712***	0.761***
	2.30	2.83	1.64
IMF debt/GDP	0.198	0.140	0.159
	1.68	1.77	1.65
Global economic variables			
Crude oil prices	−0.0662	1.25	−0.539
	0.878	1.59	0.361
Agricultural prices	0.0108	0.00797	−0.00624
	0.00884	0.00654	0.0165
Exports to G5 countries	1.51	−0.601	−2.80***
	1.49	0.594	0.933
Political Variables			
UN voting proximity	0.449	0.831***	0.725*
	0.306	0.316	0.326
US economic aid	5.64***	3.40***	1.29*
	2.13	1.24	0.600
Legislative election	−0.0895	0.366**	0.229
	0.225	0.160	0.161
Executive elections	0.664**	0.0207	0.273
	0.265	0.198	0.184
Domestic economic variables			
Debt service to exports ratio	1.98***	1.55***	1.75***
	0.496	0.490	0.410
Current account/GDP < −0.03	0.658***	0.235†	0.145
	0.173	0.126	0.149
Reserves to months of imports	−0.0804†	−0.0562*	−0.0160
	0.0422	0.0262	0.0265
Real per capita GDP growth	−0.0156	−0.00482	−0.0225†
	0.0136	0.00817	0.0136
Real per capita GDP	−0.0544	−0.0325	−0.0705**
	0.0460	0.0251	0.0287
Official arrears	−0.00762	−0.0182***	−0.00674
	0.0221	0.00709	0.0116
Private arrears	0.0694**	0.00981†	0.00229
	0.0277	0.00560	0.00678
constant	−3.10***	−2.99***	−0.740
	1.01	0.860	1.56
Sample size	389	622	620
Percentage with an agreement	28.53	27.17	23.40
Pseudo R^2	0.2692	0.2014	0.2261
Percentage correctly classified	77.89	76.37	84.68
Improvement over "no" guess	6.42	3.54	8.08

Notes: Reported coefficient estimates significant at the 1, 2.5, 5, and 10% levels (one-tailed test) are identified with ***, **, *, and †, respectively. Robust standard errors are reported.

Table 5. Regional equation summaries for the full sample period.

Region	Sample size, R^2, and percent correctly predicted	Political variables with statistically significant coefficient estimates
South Asia	112, 0.3667, 86.61	US economic aid (+)
Europe and Central Asia	152, 0.2582, 76.32	None
Middle East and North Africa	120, 0.3596, 87.5	None
Sub-Saharan Africa	566, 0.2026, 75.8	UN voting (~+) US economic aid (+) Legislative elections (+)
Latin America and Caribbean	430, 0.2315, 81.4	US economic aid (+) Executive elections (~+)
East Asia Pacific	242, 0.3495, 93.94	None

Notes: (+) means positive and significant at the 5% one-tailed test level of significance. (~+) significant at between the 5% and 10% one-tailed test level of significance.

These results should be regarded with some caution, as the sample sizes are generally fairly small, and, in some cases, had to be extended beyond the ten years of a decade in order to permit the estimation to converge.[20] The estimations exhibit a high degree of inconsistency and variability across time and regions. Model performance varies widely, and the coefficient estimates for individual political (and often economic) factors not only alter across estimations, but often fail to present a coherent pattern. For example, for the Middle East and North Africa region, no political variables emerge as having statistically significant coefficient estimates in the full-period sample, although this is not true for all the sub-periods. Similarly, for Sub-Saharan Africa, the UN voting and US economic aid variables have weakly significant coefficient estimates in the full sample, but they never attain this status in any of the individual sub-periods.

To investigate geopolitical interests further, we re-estimated our disaggregated models using a measure to capture the change in the way a country's UN voting aligns with that of the US. This enabled us to revisit Thacker's (1999) hypothesis concerning US influence. We found that his results only hold true for a restricted time period around 1990, and only for Latin America and the Caribbean in the 1990s, and for Eastern Europe and Central Asia from the late 1980s to the mid-1990s.[21] In fact, the UN voting change variable has a weakly significant but *negative* coefficient for East Asia and the Pacific for the 1990s. We explore this result further in the next section.[22]

From the above analysis, we conclude that the large sample evidence on the signing of IMF agreements is rather unstable.[23] The influence of specific political (and economic) variables does not appear to be systematic. Defining a stable large sample model is highly problematic; in some instances, a variable may have a significant coefficient estimate for some parts of a sample or for certain agreements, but not for others. Claims that there is a single "correct" estimating equation are therefore suspect, if not simply wrong.

However, a reasonably robust model actually appears to lose very little explanatory power even when variables with fairly consistent coefficient significance are dropped. For example, the base estimation we report retains an R^2 value above 0.2 (compared to the full model R^2 of 0.2122) following the removal of any single variable, with the exception of past IMF programs (where the R^2 drops to 0.1672) and the debt service burden (where the R^2 drops to 0.1911).[24] The main message, therefore, may be that if

Table 6.   Political variable summaries for group-period disaggregated estimations.

Period group	Full sample	1980s	1990s	2000s
Full sample	UN voting (+) US aid (+) Leg. elect. (+) Exec. elect (+)	US aid (+) Exec. elect (+)	UN voting (+) US aid (+) Leg. elect. (+)	UN voting (+) US aid (+) Exec. elect (~+)
High middle-income	UN voting (+) US aid (+) Exec. elect (~+)	Leg. elect (+)[a]	UN voting (+)	US aid (~+) Exec. elect (+)
Low-middle income	UN voting (+) US aid (+)	US aid (~+) Exec. elect (+)	UN voting (~+) US aid (+) Exec. elect (~+)	UN voting (~+)
Low income	US aid (+) Exec. elect (~+)	US aid (+)	Leg. elect. (+)	None
Non-concessional programmes	UN voting (+) US aid (+) Exec. elect (+)	US aid (+) Exec. elect (+)	UN voting (+) US aid (+) Leg. elect (~+)	UN voting (~+) Exec. elect (~+)
Concessional programmes	Leg. elect (+)	UN vote (~+) Exec. elect (+)	Leg. elect. (~+)	None
South Asia	US aid (+)	UN voting (~+)[b] US aid (~+) Exec. elect (+)	UN voting (+)[c] US aid (−) Exec. elect (~−)	UN voting (−)[d]
Europe and Central Asia	None	None	None	Leg. elect (~+)
Middle East and North Africa	None	UN voting (+)[a] US aid (+) Exec. elect (+)	UN voting (~−)[e]	None
Sub-Saharan Africa	UN voting (~+) US aid (~+) Leg. elect (+)	None	Leg. elect. (+)	None[f]
Latin America and Caribbean	US aid (+) Exec. elect (~+)	Exec. elect. (+)	UN voting (+) US aid (~+)	US aid (+)
East Asia Pacific	None	None[a]	US aid (+) Leg. elect. (+)	Leg. elect. (+)[g]

[a]Sample extended to 1984–1994 to allow estimations to converge.
[b]1984–1996.
[c]1987–1999.
[d]1990–2008.
[e]1989–1999.
[f]1992–2008.
[g]1999–2008. In some cases one of the election variables are dropped from the estimations as they are always associated with no agreements.

we want better equations for predicting the pattern of participation in IMF agreements, we may need to look more carefully at individual country circumstances. Although some basic influences may often be at work, a detailed explanation of participation in IMF programs needs to be much more idiosyncratic.

5.   The significance of political factors in explaining prediction errors

Finally, following Bird and Rowlands (2002), we examine whether our model is relatively weaker at predicting the presence or the absence of agreements, and how these model predictions are influenced by the inclusion or exclusion of political variables. If the US is able to use its power at the IMF to impose its views, it should be able to

prevent any country it deems undesirable from receiving IMF assistance, while ensuring that any preferred country receives support.

Of the 511 agreements signed in the sample, there are 49 instances of a country obtaining an IMF program despite having voted with the US less than 25% of the time in both the current and preceding year. In fact, there are 18 instances of signings where a country voted with the US fewer than 10% of the time, and 13 cases where countries never voted the same as the US on key votes. Did these countries have a particularly compelling need for IMF resources on the basis of their economic situation? To test this, we calculated the predicted probability of signing an agreement using models both with and without other political variables. We find that the average estimated probability of an agreement is actually lower for the signing countries that did not ever vote with the US (0.33) than for those that voted with the US more than 50% of the time (0.41). Political affinity with the US, as reflected by voting alignment at the UN, does not seem to make an IMF program dramatically more likely.

But what if the US only exercises its influence to assist its "close" friends? There are seven cases in our sample where the predicted signing probability was above 0.75 (which is relatively high) but the country concerned did not have a program with the IMF despite voting with the US more than 60% of the time. For some reason, these countries were not rewarded with a program even though they had an apparently strong case for one on conventional economic grounds, and even though they were apparently closely allied with the US.

Our results confirm those reported more fully by Mylonas (2011), who examines type I and type II errors from disaggregated estimations. He concludes that, at least for certain regions, the addition of the UN voting variable does not reduce the error rate of predictions in a manner consistent with the US influence hypothesis. In fact, in his analysis of the period 2000–2008, there were only four cases of the seventeen false negative results in which the UN voting variables had a value of at least one standard deviation above the mean, while the value was significantly below the mean for seven of these cases. Again, these results raise doubts about the extent and universality of US influence over program participation, although there is still the possibility that US interests in particular cases are not being accurately captured by voting alignment.

6. Concluding remarks

The objective of this article has been to expand our understanding of participation in IMF programs by undertaking a detailed and disaggregated empirical investigation based on an informal analytical framework. Having a better comprehension of the circumstances in which countries sign programs with the Fund is important when evaluating the effects of programs and when dealing with the problem of selection bias by matching the propensities to use IMF resources as between program and non-program countries. It is also important from a policy perspective in calculating the adequacy of IMF resources, and in seeking to encourage countries to draw resources from the IMF and exploit the benefits of reserve pooling rather than build up their own reserves as a form of self-insurance against future economic crises.

The following conclusions may be drawn from our analysis. First, explanatory variables that are found to be associated with participation in IMF agreements rarely exhibit the kind of robustness needed for a canonical model. While some variables such as past IMF program exposure and debt service burdens perform reasonably well in most models and across different samples, many variables display too much inconsistency to

generate a truly convincing overall model. Consequently, we may have to be satisfied with a fairly broad set of factors that are generally, but not consistently, correlated with the propensity to adopt an IMF program. Having said this, when judged by standard goodness-of-fit criteria, our base model provides a superior explanation compared with many others reported elsewhere in the literature.

A second related observation is that it is important to choose an equation to esti-mate the probability of IMF programs that is relevant for the countries and the circum-stances that are being studied. Many results vary with the degree of concessionality, the level of national income, regional location, and time period. At the same time, our find-ings also suggest that, apart from previous program engagement with the Fund, there is no one particular variable whose omission substantially reduces our ability to explain the incidence of IMF programs. Even the existence of previous IMF programs may be more significant for some forms of IMF lending, such as concessional lending to low-income countries, than others.

Third, the influence of geopolitical factors in general and US foreign policy interests in particular on IMF lending suffers from the same overall inconsistency in sub-samples that is observed with several other explanatory variables. Detailed analysis suggests that there is no systematic connection between voting with the US at the UN and receiving an IMF program. While the caveat to this is that US interests may not be well captured by such voting affinity, and while US influence may be exhibited in other ways, such as the number and nature of program conditions and the size of loans, our findings suggest that the idea of an overarching and ever present influence of the US on IMF lending has been over played in some parts of the recent literature.

Our basic conclusion is that participation in IMF programs is not straightforward and is therefore not easy to explain statistically. The pursuit of a universal and general model is likely to go unrewarded. This is not because a crucial determining variable has been omitted in existing studies, but because different countries arrange programs with the IMF in different sets of circumstances. While not every case is completely idi-osyncratic and patterns do exist, there is a range of patterns. Recognizing this relatively simple point carries important messages for policy and for the design and evaluation of the facilities under which the IMF lends. It is also important in debates about the Fund's overall lending capacity.

Acknowledgements

Notes

1. Bird and Rowlands (2006) and Bird (2007) present expanded versions of the conceptual framework.
2. The Secretary of the Treasury is required by Section 610(a) and 613(a) of the *Foreign Operations, Export Financing and Related Programs Appropriations Act, 1999*, to report the USED's actions in relation to policies described in Section 610 of the Act (United States Department of the Treasury 1999, 2008).
3. There were several other researchers who pursued the path of developing more sophisticated economic models. Elekdag (2006) for example emphasizes global economic conditions such as oil prices, world interest rates, and GDP, while Gunduz (2009) emphasizes the link between economic shocks and the more specific use of individual IMF facilities.

4. Of course the end conclusion is much the same: countries close to the US are treated better. The question is which variable best measures this closeness.

5. Bird and Rowlands (2006) also make the case for disaggregation, particularly by income group. Boughton (2001) describes the institutional evolution of Fund agreements, suggesting that the factors associated with signing a Fund agreement are likely to change significantly over time. Bird and Rowlands (2011) provide an analysis of aggregate IMF lending, presenting it as episodic and unpredictable.

6. See Appendix for summary statistics.

7. Various pseudo R^2 goodness-of-fit measures have been used and criticized in the econometric literature (see Windmeijer 1995, for a good investigation into the various methods). To avoid being drawn into this debate, the conventional pseudo R^2 measure is used throughout this study. While not ideal, the pseudo R^2 is one of the few means of comparing basic model performance in terms of explanatory power. We have also included in the tables the percentage of correct predictions.

8. This same iterative process was used to narrow down the categories and precise form of the other economic and institutional variables as well.

9. To maintain comparability across the samples and to illustrate the sensitivity of coefficient estimates, we have used the same base model for the sub-sample estimations.

10. Mylonas (2011) examines a model without the election variables in order to retain a larger sample size and reports results that are qualitatively similar to ours.

11. As we are interested primarily in the consistency of the coefficient estimates across the models and sub-samples, and in the relative performance of the models, we interpret only a few coefficient estimates of particular interest.

12. Although the level of G5 exports to a country would be the most likely trade variable to create G5 political support for a program, not G5 imports from a country, our results showed this to be statistically insignificant. This finding contradicts political economy explanations offered by Breen (2010), Pop-Eleches (2009), and Broz and Hawes (2006).

13. The price of metal was also tested but its estimated coefficient was statistically insignificant. A commodity price variable that included oil, agricultural, and metal prices had a statistically significant coefficient estimate, but since its effect was not as pronounced, it was replaced by the separate variables for oil and agricultural prices. Cerutti (2007) makes a strong case for the inclusion of global economic factors in a model of IMF agreements.

14. Other debt variables were used as well, but ultimately dropped as they had statistically insignificant coefficient estimates in the final model. Two variations of the external debt stock and service variables were tested: public and publicly guaranteed long- and short-term debt; and private non-guaranteed long- and short-term debt. Debt rescheduling indicators were also used, but were not found to be statistically important in the final estimations despite their direct institutional connection to Paris and London Club rescheduling. In related work, Mylonas (2011) found debt rescheduling variables to be important factors in determining LIC participation in IMF programs.

15. Of five studies that examined how a country's arrears influence its propensity to initiate an arrangement, however, only Rowlands (1995) finds any statistically significant results, a finding consistent with political economy arguments such as those offered by Gould (2003).

16. We did the same multicollinearity tests for all of the sub-sample estimations as well. Only three variables had a VIF factor greater than 5, but none exceeded 10, the weaker but still standard cutoff. Re-estimation dropping the variables with VIF values in excess of 5 did not lead to any significant changes in the results.

17. We thank an anonymous referee for this suggestion, and for suggesting that we examine the variances of the explanatory variables in the sub-samples. A review of the subsample data indicated that in almost all cases the standard deviation was higher than in the base sample, and rarely dramatically different, so that lack of (or indeed excessive) variation is unlikely to be a problem in making statistical inferences.

18. We also estimate the signing of these two program types on narrower samples of all middle-income countries for non-concessional programs, and low middle and poorer countries for concessional programs. The results are essentially the same as those reported in Table 3, though the pseudo R^2 for concessional program participation estimated on only low and lower middle-income countries does drop to 0.237.

19. Harrigan, Wang, and El-Said (2006) provide an example of a regionally focused study, having examined program participation in this Middle East. Our emphasis here is on comparisons across regions.
20. Even relatively small changes in the model yielded slightly different results. For example, Mylonas (2011) used similar models with slightly different explanatory variables and associated sample changes due to missing variables. While some of his results are identical, others vary slightly across the most disaggregated region-period samples reported in Table 6.
21. Pop-Eleches (2009) also tested UN voting proximity and movement variables in a disaggregated model but the study focused specifically on Eastern Europe during the 1990s, and Latin America from 1982 to 2001. He found that UN voting only matters for Eastern European countries following the Cold War.
22. We also tested for the impact of UNSC membership, which Dreher et al. (2006, 2009), and (Dreher and Vreeland 2011) show to be a statistically significant factor in explaining IMF agreements. In our analysis, the variable is not statistically significant, and in Mylonas (2011) the variable's coefficient estimate was incorrectly signed in all the specifications and only statistically significant in the middle-income group (at the 5% level).
23. The results reported in the tables often exhibit quite different coefficient estimates across the samples. In some cases, these differences may simply be due to the non-linearity in the model and the different means and distributions of the explanatory variables for each sample. In other cases, the difference may be the consequence of a fundamentally distinct effect of an explanatory factor on the propensity to sign an IMF agreement. While investigating these specific differences would be interesting, it would be a lengthy and speculative process that would distract us from the emphasis of this article on examining model performance overall.
24. Some preliminary analysis also suggests that the implications for selectivity bias are also relatively mild. Our results from a treatment effects model of the response of capital flows to IMF agreements indicate that the core results are largely unaffected by moderate changes in the selection equation (Bird and Rowlands 2011).

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Appendix 1. Key explanatory variables (mean, standard deviation, minimum, maximum for the full sample of 1631 observations used in the base estimation), and the specific hypothesis being tested regarding their effect on IMF program signing. Note that there are, in some instances, alternative hypotheses

IMF-related variables

Past IMF program (0.508, 0.500, 0, 1). An indicator variable taking the value of 1 if the country had been under an IMF program in any of the previous three years. If a country has a history of recent IMF programs, then it should have a higher propensity to sign a new agreement.

IMF debt/GDP (0.0230, 0.0459, 0, 0.522). The ratio of IMF credit (outstanding and disbursed) used by a country as a proportion of its GDP. If a country has a high outstanding IMF debt use, then the IMF may be inclined to continue to support it with new agreements.

Global economic variables

Crude oil prices (0.363, 0.343, 0.162, 5.93). The spot price market for oil in dollars per barrel, deflated by the US GDP deflator. If oil prices are high, global economic conditions are likely strong and the demand for IMF credit will be lower.

Agricultural prices (96.4, 15.5, 61.3, 120.3). The world agricultural price index. If the world agricultural price index is high, then the high price of critical food imports will increase demand for IMF support.

Exports to G5 countries (0.0878, 0.345, 0.00000823, 6.07). The sum of the country's exports to the G5 countries, in thousands of real $US. If exports to G5 countries are rising, then demand for hard currency from the IMF will decline and the propensity to sign an agreement will decline.

Political variables

UN voting proximity (0.456, 0.261, 0, 1). The number of key resolutions at the UN in which a country voted the same as the United States as a share of total votes (not including abstentions or absences). If a country votes in a similar manner as the United States, then it will receive more IMF programs.

US economic aid (0.0308, 0.139, 0, 2.69). The share of US economic aid to a country as a share of total US foreign aid. If the share of US aid to the country increases, then the country will be more likely to receive an IMF agreement.

Legislative election (0.223, 0.416, 0, 1). An indicator of whether a country has had a recent legislative election. If a country has had a recent election, then the country is more likely to be willing to sign an IMF agreement.

Executive elections (0.125, 0.331, 0, 1). An indicator of whether a country has had a recent executive election. If a country has had a recent election, then the country is more likely to be willing to sign an IMF agreement.

Domestic economic variables

Debt service to exports ratio (0.192, 0.170, 0.00287, 3.09). The ratio of the country's total external debt service payments to exports. If the debt service ratio increases, then there is a higher likelihood of an IMF program being signed.

Current account/GDP < −0.03 (0.524, 0.500, 0, 1). An indicator of whether a country has a current account deficit in excess of 3% of GDP. If a country has a large current account deficit, then it is more likely to sign an IMF program agreement.

Reserves to months of imports (3.64, 3.14, 0, 27.1). The total number of months of imports that a country can finance using its total reserves. If a country has higher reserve levels, it will be less likely to sign an IMF agreement.

Real per-capita GDP growth (2.12, 6.50, −45.4, 66.1). The rate of growth of real per-capita GDP. If a country has a higher growth rate, then there is a lower probability that it will need an IMF program.

Real per-capita GDP (3.92, 3.04, 0.287, 15.7). The level of real per-capita GDP as calculated using the Penn World Tables chain method. If a country's population has a higher income level on average, then it will be less likely to need an IMF program.

Official arrears (1.97, 8.03, 0, 87.8). The amount of interest arrears a country owes to official creditors, in $US millions. If a country owes interest to official creditors, then it will be less likely to sign an IMF program since it will be excluded by official creditors or will receive financial support directly from creditors.

Private arrears (1.65, 9.21, 0, 137). The amount of interest arrears a country owes to private creditors, in $US millions. If a country owes interest to private creditors, then it will be more likely to sign an IMF program since it will need IMF support for rescheduling its private debt.