How to Predict IMF Lending? An ML Approach to IMF Loans and Conditionality

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The significance of international organizations in fostering cooperation between countries is widely recognized. Their reputation for neutrality, specialized knowledge, and organizational capabilities endows them with substantial sway in global and national political arenas ((Abbott and Snidal 1998; Barnett and Finnemore 1999; Finnemore and Sikkink 1998; Krasner 1982). Focusing on the IMF, this article aims to enhance our understanding of why IOs treat borrowing countries differently.

We argue that ...

Previous studies of IMF lending have examined the importance of G5 commercial interests in borrowing countries (Breen 2014; Copelovitch 2010a; b). Our argument contributes to this conversation by showing that ...

We organize our article in the following manner. We begin with a discussion of IMF loans and present our theoretical framework with two testable hypotheses. ...

G5 Countries and the IMF: International Migration Fund

Why does the IMF favor some countries over others?[1] Given the significant economic, social, and political implications of IMF lending, the Fund's behavior has been a popular academic research topic and the subject of heated policy debates. At the center of the Fund's influence lies the Executive Board (EB).[2] The EB—chaired by the Managing Director of the Fund—consists of 24 Executive Directors. The G5 countries—the five largest contributors

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[1]Most loan requests to the IMF are granted in some amount as long as the requester is the legitimate government of an IMF member country. By "favoring," we refer to larger loans or fewer conditions attached to the loans.

[2]Executive boards of international organizations generally serve four primary roles—performance police, strategic thinker, political counterweight, and democratic forum (Martinez-Diaz 2009, p. 86). The IMF's Executive Board is generally seen as a strategic thinker and a democratic forum while it is less equipped for acting as a performance police (Martinez-Diaz 2009, p. 91).

to the IMF (i.e., the US, the UK, France, Germany, and Japan)—appoint their own Executive Directors, who are expected to be accountable to the IMF, rather than their home country.[3] Yet this has proven more of a principle than a hard-and-fast rule since countries like "the United States and the United Kingdom, have not consistently abided by this model" (Momani 2010, p. 165). In fact, the EB seating arrangements provide the G5 countries with substantial power on the Board, which they use to advance their own national interests.

Given the G5 seats on the EB and their unrivaled voting power, state-centric approaches of the IMF literature highlight the preferences of the powerful G5 states, particularly the US, in explaining the variation in IMF conditionality. In this context, the "informal governance" argument emphasizes the US influence when the Fund lends to countries that are politically important for the U.S. (Stone 2008). By the same token, it has been found that countries of political importance, measured by temporary membership of the UN Security Council receive softer conditionality from the IMF (Dreher, Sturm, and Vreeland 2015). Similarly, closer allies of the US, when measured by the voting pattern in the UN General Assembly, receive fewer conditions (Dreher and Jensen 2007).

We on the other hand posit that more favorable IMF programs are associated with :

H1: *The IMF grants larger loans to borrowing countries when their political system is less fragmented*

H2: *The IMF grants larger loans to borrowing countries when the IMF Executive Board is more content with the program design.*

H3: *The IMF grants less stringent conditions to borrowing countries when there is a less fragmented political system.*

H4: *The IMF grants less stringent conditions to borrowing countries when the IMF Executive Board is less discontent with the program design.*

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[3]China, Saudi Arabia, and Russia also have their own seats, while the rest of the seats are elected by separate constituencies formed by the remaining member states.

H5: *The IMF grants more stringent conditions to borrowing countries when the scope of the economic crisis is larger.*

Research Design

To assess our arguments, we utilize the data on IMF conditionality from Kentikelenis, Stubbs, and King (2016). The data are sourced from internal IMF documents—including IMF staff reports, the Letters of Intent (LoI) of borrowing countries, and Memoranda of Economic and Financial Policies (MEFPs)—that collectively contain detailed information on IMF program approvals, conditionality, and policy implementation. This allows us to analyze the Fund's behavior at different phases of an IMF program. Specifically, we assess the favorability of IMF lending along two variables: (1) loan size; and (2) types of policy conditions imposed by the IMF. We transform the original data into country-year observations. Our loan dataset includes a total of 725 observations with 118 borrowing countries while our conditionality/waiver dataset contains 705 observations and 114 borrowing countries.[4]

Dependent Variables

The empirical analysis focuses on two outcomes of interest. Our first dependent variable is the natural log of the total loan disbursement amount (in millions SDR) agreed in year *t*. For programs with multiple loan arrangements, we add individual loans together. It is important to note that loan size is agreed *ex ante* between the Fund's EB and the borrowing country at the onset of a program. Thus, our measure assuages the reverse causal mechanism through which loan disbursement size affects emigration out of the borrowing country, which could bias the main estimates.

[4]Given the limited availability of the explanatory variables, we lose some observations depending on the model specification.

Scholars have used loan per quota to account for the country's influence or "entitlement" within the Fund (Stone 2008; Copelovitch 2010b). This measure is a more appropriate indicator of loan size for studies linking IMF lending to other geopolitical issues, especially when scholars want to investigate loan size in reference to multiple economic indicators of a borrowing country.[5] However, we focus primarily on loan size since we want to measure the loan amount that would reduce short-term migration pressure regardless of the degree of "entitlement." We address the scaling issue of this loan variable by incorporating the size of the borrowing economy and its population as covariates.

We next analyze policy conditions that are explicitly defined in a borrowing country's MEFP, which is attached to that country's Letter of Intent at the onset of an IMF program.

Independent Variables

1. Fragmentation measure 2. GDP growth 3. EB discontent

Controls

Previous research supports that allies of major IMF shareholders are likely to receive larger IMF loans, and the number of conditionality imposed on them is expected to be lower than in the case of non-allies. Countries may ally for a variety of reasons—such as sharing similar cultural attributes, geographic proximity, or common interests—that may also be correlated with international migration flows. In addition, allied states with more cordial relations could be more willing to permit free movement of individuals between them than otherwise. We therefore control for common security interests by including a dummy variable for whether the borrowing country is a formal ally with any G5 country. These data come from the Correlates of War (COW) Formal Alliance dataset.

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[5]The IMF quota formula is a weighted average of GDP (weight of 50 percent), openness (30 percent), economic variability (15 percent), and international reserves (5 percent).

The commercial relationships between G5 members and IMF borrowers are also important. Countries vital to G5 economic interests, such as those that constitute large export markets, can receive more favorable treatment since the negative effects of austere policy conditions can reverberate to foreign countries when economic interdependence is high. At the same time, migration flows may rise between countries that are economically connected, as result of the freer flow of information and growing familiarity between the host and home countries.[6] We account for shared commercial interests by controlling for the borrowing country's total imports (logged) and total exports (logged) vis-à-vis the G5 countries.[7]

To account for the political institutions of the borrowing country, we control for the level of democracy using the borrowing country's Polity score V.[8] Our last set of controls are standard macroeconomic measures of the IMF borrowing country. These include GDP (log) and population (log).[9] Annual GDP growth is also included as an constituent term for testing the conditional relationship between *EB* and IMF lending behavior.

Statistical Models

For the analysis of IMF loan size, we first estimate the following ordinary least squares (OLS) model with standard errors clustered on borrowing country j:

$$ln(Loan\ Size)_{j,t} = \beta_0 + \beta_1 EB_{j,t-1} + \beta_2 GDP\ Growth_{j,t}$$

$$+\beta_3 EB_{j,t-1} \times GDP\ Growth_{j,t-1} + \gamma \mathbf{X_{j,t-1}} + \eta_j + \theta_t + \varepsilon_{j,t}$$

where EB_j is the EB discontent measure, $\mathbf{X_j}$ is a vector of controls, η_j denotes borrowing

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[6]For a review of this vast literature, see Genc, Gheasi, Nijkamp et al. (2012).

[7]These data also come from the Correlates of War International Trade dataset.

[8]Democracies secure softer loan conditions than nondemocracies (Caraway, Rickard, and Anner 2012).

[9]Data for GDP and population are obtained from the Penn World Tables.

country fixed effects, and θ_t denotes year fixed effects. Country fixed effects control for time-invariant factors that are specific to borrowing countries. Year fixed effects control for annual time trends and omitted system-level variables, such as commodity price shocks or global economic crises. All explanatory variables are lagged by one year to account for the sequential nature of the causal chain and to address the potential problem of simultaneous causality when a loan is disbursed in the same year an agreement is reached. This holds with the exception of *GDP Growth*, which proxies possible current economic crisis.

Our conditional hypothesis does not have a clear ex-ante prediction for the sign of β_1 because it is the coefficient of EB when the growth rate is held at zero. Nevertheless, we expect β_1 to be negative and significant since we believe that a growth rate of zero should be sufficient to heighten concerns among EB policymakers and the Fund. Because conditions and condition waivers are count variables, we use a negative binomial model for estimating both policy conditions and condition waivers with standard errors clustered on borrowing country j. The control variables in these models are identical to those in our loan models. In the conditionality models, we predict the coefficient on EB to be positive.

Empirical Findings

The final dataset used to analyse the effect of the IMF executive board (EB) sentiment on conditionalities and loans amount includes 112 countries for the period 1983-2015 as far as the main independent and dependent variables are concerned, while 89 countries for the period 1983-2012 are taken into account when including controls in the empirical analysis.

Table 1 below shows the results for the effect of our main independent variables on IMF conditionalities. The EB sentiment is defined as the number of positive sentences in each meeting minute minus the number of negative sentences, then divided by the total number of sentences (to control for the total length of the meeting). It can be noticed that EB sentiment strongly affects the number of conditionalities that the EB imposes on the

borrowing country, while there is no strong evidence with regard of the loan amount. An increase in the positive sentences during the EB meeting decreases the expected number of conditionalities by 0.486. In particular, significant effect of EB sentiment is detected for external and financial sector, as well as for tax related requirements. The effect on total number of conditionalities is even stronger when GDP is growing and, hence, there should be better economic conditions. Finally, GDP growth seems to be positively correlated with the loan amount, implying that when the borrowing country features a better economic phase it needs a lower amount of credit, while political fragmentation is found to be relevant neither for the number of conditionalities nor for the loan amount.

These results seem to be robust for several controls that we listed above, as it can be seen in Table 2. Again, EB positive sentiment decreases the number of conditionalities, in particular in the external and financial sector, with a stronger effect in periods of economic growth. Also GDP growth presents a direct negative effect on the number of conditionalities in the external and financial sector. Finally, political fragmentation is found to have an increasing effect on the total number of conditionalities when interacted with EB sentiment.

Table 1: Effect of IMF Executive Board Sentiment on Number of Conditionalities and Loans Amount

Dep. Var.	Total Number	External	Financial	Tax Issues	Loans Amount
EB Sentiment$_{t-1}$	-0.486**	-0.980**	-0.707**	-1.387**	0.172
	(0.236)	(0.476)	(0.325)	(0.643)	(0.434)
Pol. Fragmentation$_{t-1}$	0.0189	-0.0257	0.0182	0.0104	0.0157
	(0.0145)	(0.0247)	(0.0212)	(0.0372)	(0.0272)
Δ% *GDP$_t$*	0.00344	-0.00930	-0.00913	0.00695	-0.0197**
	(0.00498)	(0.00957)	(0.00681)	(0.0123)	(0.00892)
Δ% *GDP$_{t-1}$* * *EB$_{t-1}$*	-0.0451*	-0.0248	-0.0397	0.00959	-0.0895+
	(0.0271)	(0.0600)	(0.0376)	(0.0666)	(0.0566)
Constant	1.718***	-0.0576	2.735***	-15.00	4.690***
	(0.187)	(0.467)	(0.390)	(806.1)	(0.201)
Observations	369	392	369	336	392
R-squared					0.32

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$. Results based on negative binomial regressions for number of conditionalities, while they are based on OLS regression for loans amount.

Table 2: Effect of IMF Executive Board Sentiment on Number of Conditionalities, Including Controls

Dep. Var.	Total Number	External	Financial
EB Sentiment$_{t-1}$	-0.940**	-1.343+	-1.269**
	(0.427)	(0.899)	(0.571)
Pol. Fragmentation$_{t-1}$	-0.0573*	-0.0989*	-0.0587*
	(0.0313)	(0.0550)	(0.0348)
Δ% GDP$_t$	0.000535	-0.0210*	-0.0225***
	(0.00605)	(0.0115)	(0.00763)
Δ% GDP$_{t-1}$ * EB$_{t-1}$	-0.109**	-0.0552	-0.0646
	(0.0459)	(0.0991)	(0.0631)
Pol. Fragmentation$_{t-1}$ * EB$_{t-1}$	0.358***	0.0819	0.193
	(0.132)	(0.300)	(0.183)
G5 Ally$_{t-1}$	0.0821	-0.0426	0.0696
	(0.143)	(0.101)	(0.0604)
G5 Trade$_{t-1}$	2.18e-06	-2.16e-06	-2.04e-06
	(2.68e-06)	(3.59e-06)	(2.36e-06)
GDP Capita$_{t-1}$	-3.44e-05	-9.48e-05**	-4.32e-05**
	(3.68e-05)	(3.86e-05)	(2.05e-05)
Population$_{t-1}$	-3.83e-09	1.51e-09**	1.30e-09***
	(3.39e-09)	(5.97e-10)	(4.56e-10)
PolityV$_{t-1}$	0.0103	0.0136	0.00996
	(0.0102)	(0.0117)	(0.00759)
Constant	1.974***	0.135	1.274***
	(0.238)	(0.583)	(0.325)
Observations	276	296	296

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$.

Results based on negative binomial regressions.

References

Abbott, Kenneth W, and Duncan Snidal. 1998. Why States Act through Formal International Organizations. *Journal of Conflict Resolution* 42 (1):3–32.

Barnett, Michael N, and Martha Finnemore. 1999. The Politics, Power, and Pathologies of International Organizations. *International Organization* 53 (4):699–732.

Breen, Michael. 2014. IMF Conditionality and the Economic Exposure of Its Shareholders. *European Journal of International Relations* 20 (2):416–436.

Caraway, Teri L., Stephanie J. Rickard, and Mark S. Anner. 2012. International Negotiations and Domestic Politics: The Case of IMF Labor Market Conditionality. *International Organization* 66 (1):27–61.

Copelovitch, Mark S. 2010a. *The International Monetary Fund in the Global Economy: Banks, Bonds, and Bailouts*. Cambridge University Press.

Copelovitch, Mark S. 2010b. Master or Servant? Common Agency and the Political Economy of IMF Lending. *International Studies Quarterly* 54 (1):49–77.

Dreher, Axel, and Nathan M Jensen. 2007. Independent Actor or Agent? An Empirical Analysis of the Impact of US Interests on International Monetary Fund Conditions. *The Journal of Law and Economics* 50 (1):105–124.

Dreher, Axel, Jan-Egbert Sturm, and James Raymond Vreeland. 2015. Politics and IMF conditionality. *Journal of Conflict Resolution* 59 (1):120–148.

Finnemore, Martha, and Kathryn Sikkink. 1998. International Norm Dynamics and Political Change. *International Organization* 52 (4):887–917.

Genc, Murat, Masood Gheasi, Peter Nijkamp, and Jacques Poot. 2012. *The impact of immigration on international trade: a meta-analysis*, 301–337. Cheltenham, UK: Edward Elgar Publishing.

Kentikelenis, Alexander E., Thomas H. Stubbs, and Lawrence P. King. 2016. IMF Conditionality and Development Policy Space, 1985–2014. *Review of International Political Economy* 23 (4):543–582.

Krasner, Stephen D. 1982. Regimes and the Limits of Realism: Regimes as Autonomous Variables. *International Organization* 36 (2):497–510.

Martinez-Diaz, Leonardo. 2009. Executive Boards in International Organizations. *Studies of IMF Governance* 82.

Momani, Bessma. 2010. Canada's IMF executive director. *Canadian Public Administration* 53 (2):163–182.

Stone, Randall W. 2008. The Scope of IMF Conditionality. *International Organization* 62 (4):589–620.