Mixed Signals: Crisis Lending and Capital Markets

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Abstract

We analyze a formal model of crisis lending that incorporates bargaining, compliance and enforcement, and show that the effect of new crisis lending announcements on capital markets depends on the lender's political motivations. There are conditions under which lending reduces the risk of a deepening crisis and reduces the risk premium demanded by market actors. On the other hand, the political interests that make lenders willing to lend weaken the credibility of commitments to reform, and the act of accepting an agreement reveals unfavorable information about the state of the borrower's economy. The net "catalytic" effect on the price of private borrowing depends on whether these effects dominate the beneficial effects of the liquidity the loan provides. Decomposing the contradictory effects of crisis lending provides an explanation for the discrepant empirical findings in the literature about market reactions, especially with regard to IMF programs. We test the implications of our theory by examining how sovereign bond yields are affected by IMF program announcements, loan size, the scope of conditions attached to loans, and measures of the geopolitical interests of the United States, a key IMF principal.

1. Introduction

Crisis lending is intended to restore confidence in capital markets. Efforts to shore up the euro zone have focused on conditional lending to reassure investors in sovereign bonds. The International Monetary Fund has long claimed that its lending acts as a "seal of approval" on national economic policies, which catalyzes private capital flows.[1] The evidence about whether crisis lending succeeds in restoring market confidence, however, is mixed. A likely explanation for the mixed findings is that the political incentives to engage in crisis lending lead to multiple countervailing effects, and quantitative studies of market reactions to crisis lending have not captured all of the mechanisms. International lending is a political decision, which results from bargaining between the borrower and the lender, and its terms depend on the parties' relative bargaining power and the quality of their relationship. Furthermore, the inferences that private investors draw from observing crisis lending depend on what new information it reveals, which in turn depends on this bargaining process.

The recent debt crisis in the euro zone illustrates the countervailing effects of crisis lending on the calculations of private actors. When multilateral actors lend to Greece, for example, the infusion of liquidity reduces the short-term risk of involuntary default, which should reassure bond holders. In addition, any new commitments that Greece makes to undertake fiscal reforms as a condition for receiving the loan should improve its prospects for long-term solvency. On the other hand, the Greek decision to accept a bailout reveals information about the severity of the crisis. The fact that the government is willing to accept a particular deal reveals private information, because governments that were more confident about the future would hold out for more generous terms. As a result, there is adverse selection into the set of countries that participate in IMF programs.[2] Finally, the capital market must make an assessment of how likely the promised reforms are to be implemented. Since powerful or well-connected countries are treated more leniently when they fail to comply with conditions (Stone 2002; 2004), investors expect them to be less likely to comply.

[1] E.g. Rodrik (1995) and Fischer (1999) argue that multilateral lending can provide a seal of "good health" to markets. Gray 2009 and Bauer, Cruz, and Graham 2012 test this hypothesis.

[2] Bas and Stone 2014.

We analyze a game-theoretic model in order to untangle these countervailing effects. We model interactions between a lender of last resort, a borrowing-country government, and a representative private investor, and we introduce three theoretical innovations. First, the model encompasses (1) bargaining over the terms of a loan program, (2) implementation and enforcement of conditionality, and (3) the reactions of market actors, allowing these three processes that are generally treated in isolation to affect one another.[3] Second, it introduces private information on the part of the government of the borrowing country, which makes possible bargaining failure and adverse selection of borrowers.[4] Third, the probability of a crisis and equilibrium interest rates affect each other, which allows for the possibility of self-fulfilling expectations. This setup allows market actors to be sophisticated about the variety of mechanisms by which crisis lending affects the probability of repayment.

Lender motivations play an important role in these calculations, so we allow for the possibility that the lender is biased in favor of particular loan recipients. For example, EU lending to Greece reflects the priority of maintaining political and economic union in Europe. Greece is critical because the fiscal vulnerabilities in Spain, Italy and other countries raise the risk that a default in one euro country could lead to rapid contagion. Moreover, Greece is important because German and French banks are heavily exposed to Greek debt, so a Greek default might lead to a banking crisis in the core countries. Consequently, creditors are anxious to make a deal. These considerations should be reflected in the bargaining over loan terms: Greece should receive more generous loans than less pivotal countries facing similar circumstances, and the conditions attached to the loans should be less rigorous. For the same reasons, future enforcement of those conditions is expected to be lax, which undermines the reassurance that conditionality provides. Thus, strategic importance influences the terms of loan packages through several channels that can have countervailing effects on the reactions

[3] We assume that market actors are informed about the conditions attached to loans. Data on IMF conditionality were not publicly released until recently, but a determined observer has always been able to obtain this information.

[4] The market and the lender are not fully informed about the underlying state of the borrowing country's economy. As Blustein (2001) and reports by the Independent Evaluation Office of the IMF document, even multilateral financial institutions like the IMF have often been as much "in the dark" as market actors regarding detailed information about a country's Central Bank reserves and liabilities and about the solvency of the banking sector.

of capital market participants.

Our theoretical analysis indicates that the effect of crisis lending on market expectations depends on bargaining, so we are unlikely to observe a straightforward "catalytic" effect. Because of adverse selection, we expect the effect of new lending announcements to be harmful to the investment climate, once we control for the salutary effects of liquidity and conditionality. Furthermore, we expect lending to have less beneficial effects in countries that are especially favored by lenders of last resort. On the other hand, liquidity and conditionality should improve the investment climate and lower interest rates—and countries that are the favorites of lenders should receive more of the former and less of the latter. The net effects of crisis lending should depend on the various elasticities involved, so we make no predictions about them; but the mechanisms predicted by the model are straightforward and amenable to quantitative testing. We test these hypotheses using data from the IMF's Monitoring of Agreements (MONA) database for the period 1992-2002, and we find support for the predictions of the model.

Our central empirical finding concerns the distinctiveness of countries that are geopolitically or economically important to the United States. These countries are offered larger loans, on softer terms, and with less rigorous enforcement of conditionality, and the perverse effect is that crisis lending is least effective, in terms of lowering bond yields, in the countries of greatest importance. The net effect of lending can reduce or increase bond yields, depending on the relative weights of the countervailing influences of the liquidity, adverse selection, and moral hazard effects. Crisis lending causes market confidence to deteriorate when there is substantial ex ante uncertainty and the borrowing country is politically or economically important.[5] This suggests that design features of IOs that may be necessary to secure the "buy in" of major powers, such as the IMF governance structure that allows key shareholders to exert informal influence over lending decisions, can have unintended consequences that undermine their effectiveness (Stone 2011).

[5]In the model, borrowers and lenders are willing to engage in transactions that increase bond yields, because under some circumstances loans that reduce the probability of a crisis nevertheless lead the market agent to revise her estimate of the probability of a crisis upwards.

2. Market Reactions to Crisis Lending

Sovereign crisis lending initiatives aim to provide immediate liquidity and reassure market actors. The lender of last resort may be an individual government, a "pivotal" or critical member of an international financial institution, or even a large financial institution with incentives to engage in defensive lending in the face of a crisis. Although we focus our empirical analysis on IMF programs, our theoretical analysis holds insights for a range of crisis-lending relationships. Crisis lenders typically impose conditionality. For instance, in 1931 the banker J.P. Morgan offered a crisis loan to Great Britain containing fiscal conditionality that caused the Labor government at the time to collapse (Ahamed 2009, 426-28). The Bank of International Settlements extended credit to Austria and Germany in 1931 in an effort to stem a spreading banking crisis, and demanded far-reaching policy changes in return. More recently, the U.S. government provided extraordinary financing to Mexico in 1982 and again in 1995, both times demanding considerable policy concessions. The Paris Club and London Club have engaged in debt rescheduling to alleviate financial crises and restore investor confidence, and, as noted above, the European Central Bank and European Commission have taken on a crisis lending role in the current European financial crisis. In each of these cases, a lender with significant economic or political interest in a country in crisis extended a loan, typically with reforms attached, in an effort to forestall a deepening economic crisis and restore investor confidence.

The effectiveness of IMF programs in catalyzing private capital flows has received considerable attention in the economics literature (Bird and Rowlands 2002; Brune et al. 2004; Edwards 2005; Mody and Saravia 2003; Eichengreen et al. 2007).[6] Restoring investor confidence is a key element of the IMF mission and a critical component in evaluating whether IMF programs are beneficial for participating countries. Yet empirical research on the catalytic effect displays mixed findings. For instance, correcting for selection, Edwards (2006) finds that IMF programs generate net outflows of portfolio investment, and Jensen (2004) finds a similar effect for foreign direct investment. Mody and Saravia (2003) find a posi-

[6] See Steinwand and Stone 2008 for a review.

tive effect of IMF programs only in cases of intermediate financial risk, which the authors characterize as instances when IMF programs are viewed as joint commitments between a government and the IMF. Eichengreen and Mody (2000) find evidence that IMF lending decreases bond spreads, while Cottarelli and Giannini (2002) find little evidence that IMF interventions catalyze investment. It is clear that catalytic effects vary considerably across types of countries, but there is little consensus about the systematic sources of this variation.[7] To date, the question of how IMF programs influence international markets has not been studied with sensitivity to international politics.

Cross-national empirical research confirms that international politics influences multilateral lending decisions. For instance, the interests of the United States have been shown to exert a broad influence over IMF lending, including the likelihood of receiving an IMF program (Thacker 1999), loan size and conditions (Stone 2008, 2011, Copelovitch 2010), and the credibility of IMF conditions (Stone 2002, 2004, 2011, Dreher et al. 2009b). Expectations of lax enforcement may raise fears of moral hazard as well (Stone 2004; Dreher and Vaubel 2004; Vaubel 1983). Similarly, temporary membership in the UN Security Council or significance to U.S. foreign policy can affect the disbursement of World Bank loans (Dreher et al. 2009a, Kilby 2009). Extant work has not examined whether this influence affects the responses of private capital markets to lending, however.

The model that we present in the next section is designed to decompose the countervailing effects of crisis lending that operate through the channels of liquidity, conditionality, adverse selection and enforcement, and to examine how these mechanisms are affected by the political relationship between the borrower and the lender. The model is an infinitely repeated game between a lender of last resort, a government managing an economy under stress, and a representative market actor. In each period, the lender may offer a loan and a package of associated policy conditions to be implemented by the borrower. The government may accept or reject the package; moreover, the government is free to renege on its policy commitments while accepting the loan. The model thus captures the borrower's time consistency problem.

[7] Another possible reason for discrepant findings is that different studies have different types of catalysis in mind. Some focus on FDI while others focus on portfolio investment, and some focus on indicators of country risk, like bond yields, while others focus on investment flows.

The market actor sets the interest rate after observing the interaction between the lender and the government, so that in expectation the bond yield is high enough to compensate for sovereign risk. Finally, a financial crisis may occur stochastically at the end of any period, with a probability that is a function of the market interest rate, in addition to the state of the economy, realized loan size, and the level of reforms implemented. In the equilibrium that we study, the lender punishes defection by denying the government access to its funds in the future periods; however, it restores the country to good standing if the government subsequently implements a package of compensatory reforms. We allow the lender to place different weights on outcomes in different countries, and we examine the implications of this bias for the reactions of the capital market to a loan agreement.

Our analysis of the model shows that, first, crisis lending programs are heterogeneous treatments. Thus, empirical studies that estimate a uniform effect of such diverse treatments will be misspecified—in principle, the effect of crisis lending programs should be conditional on their terms. Consequently, in the empirical analysis that follows, we control for conditionality and financing when we investigate the effect of program participation. Second, our model shows how the effects of lending programs depend on the political biases of the lenders. Influential borrowers are less likely to fully implement the contracted conditions because they anticipate that rigorous enforcement is not credible. Our empirical analysis therefore takes into account this influence.

3. Model

In this section we present an infinitely repeated three-player game that captures the strategic interaction between a lender L, a borrowing government, G, and a representative market actor, M.[8] In each period, first, nature draws G's type, $\theta \in \{\theta_1, \theta_2\}$, where $0 \leq \theta_1 < \theta_2 \leq 1$,

[8]In the online appendix we consider a simpler one-period game with two stages. We compare the results from the one-period game with the results from our infinite game and show that the simpler version does not produce the more realistic results that the latter produces. This is because we could not incorporate three key features into the one-period game due to tractability: the probability of crisis as a function of the interest payment, endogenous punishment mechanism for the lender, and non-degenerate updating for the market actor about the government's type.

$Pr(\theta = \theta_1) = \pi_1$ and $Pr(\theta = \theta_2) = \pi_2 = 1 - \pi_1$.[9] G learns its type, but L and M do not. Second, L offers a loan agreement to G, (s, x), where $s \in [0, \bar{s}]$ is the size of the loan and $x \in [0, \bar{x}]$ is the level of reforms, or conditionality, required in exchange for the loan. Third, G observes a choice-specific shock to its utility and makes a pair of decision about whether to accept s and x, i.e., $(d_s, d_x) \in \{(0,0), (0,1), (1,0), (1,1)\}$, where 1 represents acceptance, and 0 rejection.[10] Fourth, M updates G's type after observing the interaction between L and G, and sets the interest rate r in a competitive market. At the end of each period, the economy may experience a crisis with the probability, $p(s, x, \theta, r)$.[11] The stage game is repeated infinitely, with G and L discounting their future payoffs by δ_G and δ_L, respectively.

We now specify the actors' payoffs. Let $x_G = xd_x$ and $s_G = sd_s$ denote the actual level of reforms and loan size based on G's choice, and let $\beta \in [0, \bar{\beta}]$, where $\bar{\beta} < 1$, denote G's political importance to L. Then, L's utility function for each period is as follows:

$$u_L(s, x; d_x, d_s, r; \beta, \theta) = -c(1 - \beta)s_G - (1 + \beta)p(s_G, x_G, r; \theta), \tag{1}$$

where c is a unit opportunity cost of the loan for L. The geopolitical importance of G influences L's lending decision in two ways: higher β gives L a direct incentive to increase the size of a loan, and it also amplifies the negative effect of a crisis, thus providing L an additional incentive to lend to G.

We assume that G draws a positive benefit from the loan itself, but pays political costs for implementing the conditionality. Moreover, to capture that idea that L cannot fully predict G's decision in each period, we introduce a vector of *i.i.d* choice-specific shocks, $\epsilon = [\epsilon(0,0), \epsilon(0,1), \epsilon(1,0), \epsilon(1,1)]$, to G's utility function. G observes the realization of ϵ, while L only knows the distribution of ϵ. Thus, G's utility function for each period is as follows:

$$u_G(\theta, \epsilon; d_x, d_s; s, x, r) \quad = \quad -bx_G - p(s_G, x_G, r; \theta) + \epsilon(d_x, d_s), \tag{2}$$

where b is a unit cost of G implementing reforms. The choice-specific random shock, $\epsilon(d_x, d_s)$, captures short-term fluctuations in political constraints known only to the government.

[9] For convenience, we will sometimes refer to θ_1 as a good economy, and θ_2 as a bad economy.

[10] For example, accepting the loan but not implementing the conditionality would be (1,0).

[11] See appendix for the details of the crisis probability function.

Finally, the expected return for a risk neutral M is as follows: [12]

$$u_M(r; s, x, d_s, \underline{v}) = [1 - \bar{p}(s, x, d_s, r)]r - \bar{p}(s, x, d_s, r) - \underline{v}, \tag{3}$$

where $\underline{v}$ is the transaction cost in percentage, and $\bar{p}(s, x, d_s, r) = \mathbb{E}\{p(s_G, x_G, r, \theta)|s, x, d_s, r\}$ is the expected crisis probability w.r.t. d_x and θ, given the observables (s, x) and d_s and the competitive interest rate, r.

This is a game of incomplete information, and we solve for a perfect Bayesian equilibrium (PBE). As is generally true for infinitely repeated games, our model has numerous equilibria. Informed by our empirical observations, we focus on a class of equilibria where L adopts a limited punishment strategy for defection, and within this class, we solve for the best equilibrium from L's perspective. We explain in more detail our equilibrium selection in the next section.

4. Equilibrium Results

To facilitate the explanation of the equilibrium results, we define a punishment phase and a bargaining phase. A punishment phase begins if G did not comply with its agreement with L in the previous period; otherwise, G is in good standing, and the period takes place in a bargaining phase. Each phase may include multiple periods.

In selecting the equilibrium, we consider the following punishment strategy for L: if G defects after signing an agreement accompanied by a conditionality of $x_b^*(\beta)$, then the game enters a punishment phase in which L offers $s = 0$ until G has implemented a threshold level of reform, $x_p^*(\beta)$. Withholding credit for a long period of time is costly to L, and this cost is magnified when L faces a politically important country, so the optimal threshold is a function of β. The following proposition characterizes an equilibrium in which L adopts such a limited punishment strategy, offering two levels of conditionality contingent on G's compliance behavior.

Proposition 1. *Under a set of natural restrictions on the parameters, there exists a perfect*

[12] Without loss of generality, we use per unit profit to represent M's utility.

Bayesian equilibrium to the game with the following equilibrium strategies:[13]

(1) The game begins in a bargaining phase. If the game is in a bargaining phase, L offers G a bundle, $(s_b^*(\beta), x_b^*(\beta))$; if G does not implement reforms after accepting a loan, then the game enters a punishment phase where L offers G a bundle, $(0, x_p^*(\beta))$. The punishment phase lasts until G chooses to implement $x_p^*(\beta)$ in some period. L's choice of $s_b^*(\beta)$, $x_b^*(\beta)$ and $x_p^*(\beta)$ maximizes L's expected lifetime utility on the equilibrium path.

(2) In any period, for all histories in which L has not deviated from its strategy in (1), G chooses (d_x, d_s) to optimize its expected lifetime utility. If L has deviated, G chooses (d_x, d_s) to optimize its one-period expected utility, and L offers $(s_o, x_o) = (0, 0)$ in all future periods.

(3) In any period, M updates about G's type after observing the outcome of the interaction between L and G, and then chooses $r^*(\beta)$ to clear the current period loan market.

The proof of the proposition is in the appendix. There exist multiple equilibria that are similar to the one in Proposition 1, in which L plays a punishment strategy that allows the borrower to return to good standing by implementing some level of conditionality in the future. However, Proposition 1 identifies among them the optimal equilibrium from L's point of view. That is, $s_b^*(\beta)$, $x_b^*(\beta)$ and $x_p^*(\beta)$ maximize L's total utility.

To analyze the comparative statics of the equilibrium, we adopt a computational approach because the complexity of the model does not allow us to derive the relationships analytically. The parameters of the model are calibrated to match some aspects of the empirical data; however, our model produces significant new predictions. To examine the robustness of the results, we have perturbed the parameters around their benchmark values, and we find that the qualitative relationships do not change. Below we show several findings that center around the relationship between our key parameter β and the choices made by G, L and M in equilibrium.

The Lender's Behavior in Equilibrium

Figure 1 shows how β affects x_b^*, the level of conditionality when G is in good standing,

[13] See Assumptions 1 and 2 in the appendix.

and x_p^*, the level of conditionality required to return to good standing when G is in a punishment phase. It shows that when s reaches its ceiling, $\bar{s}$, both x_b^* and x_p^* are decreasing in β.[14] Moreover, x_b^* steadily decreases while x_p^* remains constant until about $\beta = 0.4$ and then decreases sharply. In other words, the lender's incentives to provide support erode the substantive policy commitments that the government is epected to meet and make the lender more forgiving when the borrower has reneged. For a broad range of β, the lender holds the borrower to a higher standard after defecting ($x_p^* > x_b^*$), but for very important borrowers the standards for returning to good standing are lower than the initial level of conditionality ($x_p^* < x_b^*$).

Note that x_b^* and x_p^* have countervailing effects on the probability that a government reneges on its policy commitments after accepting a loan. On the one hand, x_b^* measures the cost of implementing the conditions tied to L's loan, so less conditionality, or smaller x_b^*, makes it less attractive to defect. On the other hand, a smaller x_p^* reduces the future cost of returning to good standing after reneging, which makes defection a more attractive option in the present for G.

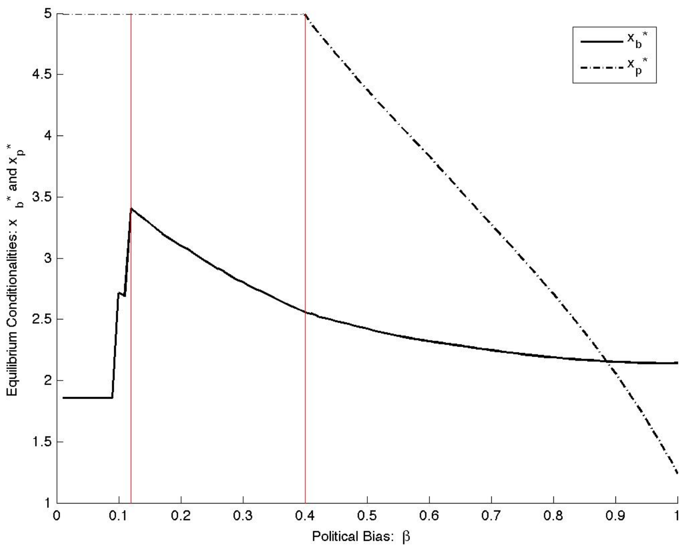

Figure 1: The Effect of Political Bias on the Equilibrium Conditionality x_b and x_p

[14]In the numerical results presented, we choose the budget constraint to be $\bar{s} = 0.2$, which is sufficiently small compared with $\theta_2 = 1.5$, so that L lends the maximum amount to a country with a $\beta > 0.12$.

The Government's Behavior in Equilibrium

Figures 2 and 3 demonstrate G's behavior in equilibrium. Figure 2 shows the relationship between β and G's probability of accepting a loan. First, given any state of the economy, θ, countries with larger β are more likely to accept L's offer. Second, given a value of β, G is more likely to accept an offer if the state of the economy is unfavorable (θ_2), because it has greater need for funds in order to stave off involuntary default. This logic drives the adverse selection effect: countries that accept IMF offers, on average, are worse candidates for investment than countries that reject them. We will elaborate this point as we discuss how market actors update their beliefs about θ.

Figure 3 plots the probability of reneging on promises to implement economic reforms (after accepting a crisis loan) against β. For both types of economies, the probabilities first decrease and then increase in the region where $s = \bar{s}$. The decrease results from the fact that the equilibrium conditionality in the bargaining phase, x_b^*, decreases steadily, while the conditionality in the punishment phase, x_p^*, remains high initially (see Figure 2). Once x_p^* begins to decrease, the incentive to defect increases for more influential countries because they incur smaller costs from defecting. This reflects a moral hazard problem for this set of countries because they know that they can get back to good standing with relative ease. Moreover, the figure shows that governments with good economies that enter into agreements are more likely to defect, although they are less likely to sign the agreements in the the first place. The moral hazard problem is most severe for governments with economies that are not in severe crisis.

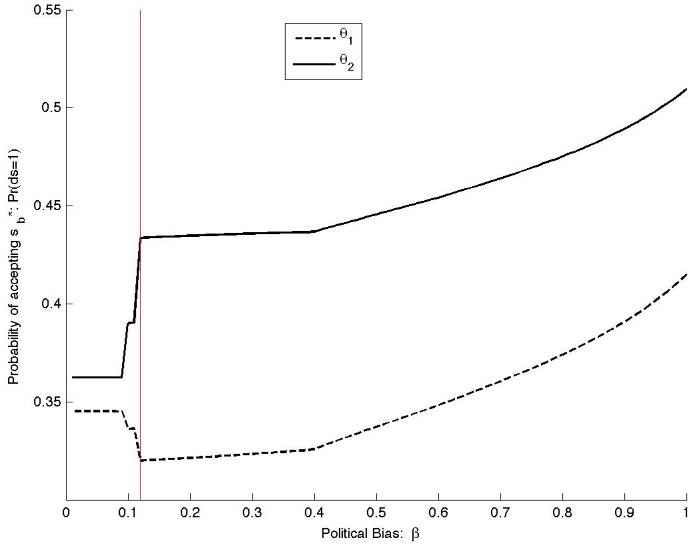

Figure 2: The Effect of Political Bias on the Probability of Accepting a Loan Agreement

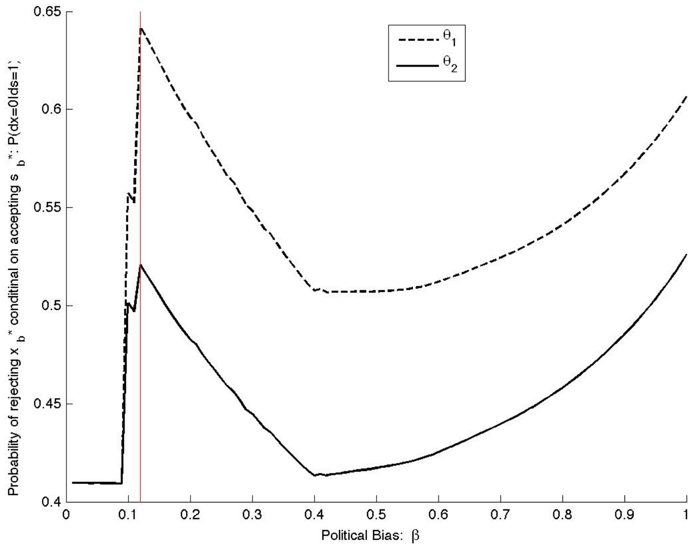

Figure 3: The Effect of Political Bias on the Probability of Defection Conditional on Accepting a Loan Agreement

Market Actors' Response in Equilibrium

Figure 4 shows how the market actor updates its belief about G's initial economic conditions after observing that G accepts a loan agreement. For all β, M updates its beliefs to put more weight on the possibility that economic conditions are unfavorable when it observes that G has accepted a loan. This is due to adverse selection: countries with more favorable economic fundamentals are more likely to reject any given offer. Note that when s is already at $\bar{s}$, the difference in the beliefs becomes smaller as β increases, because as a country becomes more important, the terms of L's offer become more favorable; as a result, more and more good economies will accept the offer, allowing M to infer less about the characteristics of countries that accept offers.

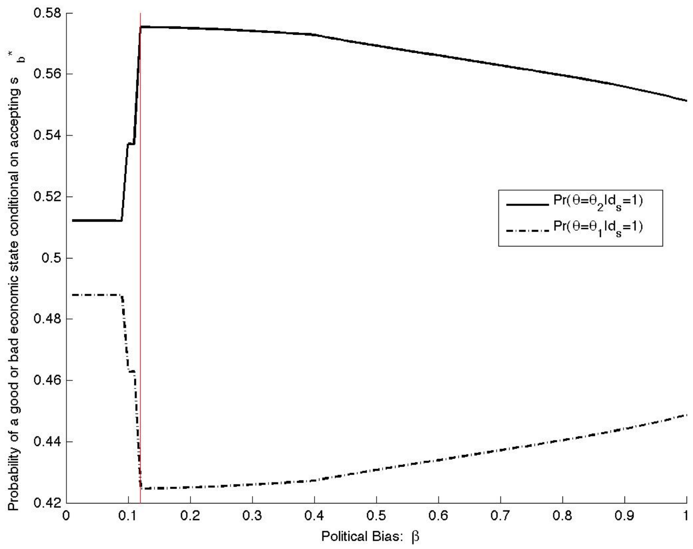

Figure 4: M's Posterior Beliefs about θ Conditional on G Accepting A Loan

The Effect of Political Bias on the Equilibrium Interest Rate

Figure 5 illustrates the *total* effect of β on the market equilibrium interest rates when a country accepts a loan (r_{acc} in the figure), which represents the net effect of the consequences of bias that operate through liquidity, conditionality, and implementation. There are two regimes separated by the vertical line. The increase in liquidity, s_b^*, as a function of political bias, drives the downward slope in the first regime, while the declining level of conditionality, x_b^* and x_p^*, drive the upward slope in the second regime. In other words, for countries with small β, the liquidity effect from larger loans reduces the interest rates that they pay to private lenders. Once this effect ceases to operate, however, the facts that important countries are asked to implement less conditionality and are less likely carry to out their commitments drive up interest rates for important countries.

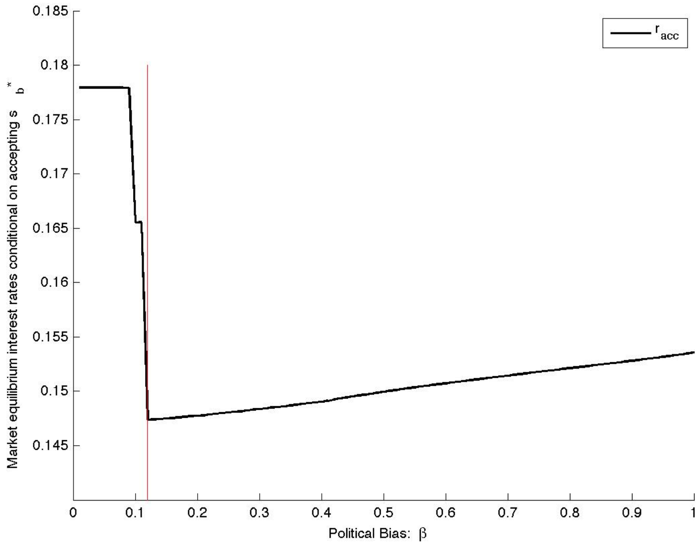

Figure 5: The Total Effect of β on Equilibrium Interest Rates

The Catalytic Effect of Crisis Lending?

Our analysis suggests that there is no definitive answer to the question of whether crisis lending increases or decreases equilibrium interest rates on average, i.e., whether there is a catalytic effect of crisis lending. This is because there are several mechanisms operating that have countervailing effects. Intuitively, lending can only be harmful in our model because of the adverse selection effect; liquidity is unambiguously beneficial, and conditionality is helpful to the extent that it is implemented, and it will not increase interest rates even if not implemented. The magnitude of the adverse selection effect depends on how much difference there is between the favorable and unfavorable economic states of the world. To illustrate this, Figure 6 plots the equilibrium interest rate for countries that accept and reject crisis lending packages as a function of the *ex ante* uncertainty about the state of the economy, $\mathrm{Var}(\theta)$, while holding our other parameters constant.[15] When the uncertainty is small, the net effect of lending is to reduce interest rates. As uncertainty increases, the fact that bad economies (good economies) are more likely to accept (reject) loans makes the problem of adverse selection more severe, and thus its negative effect on the beliefs of the market actors dominates the positive effects of liquidity and conditionality. The net effect of lending

[15]We hold the mean of θ constant while changing the spread between θ_1 and θ_2 for Figure 6.

becomes to increase interest rates.

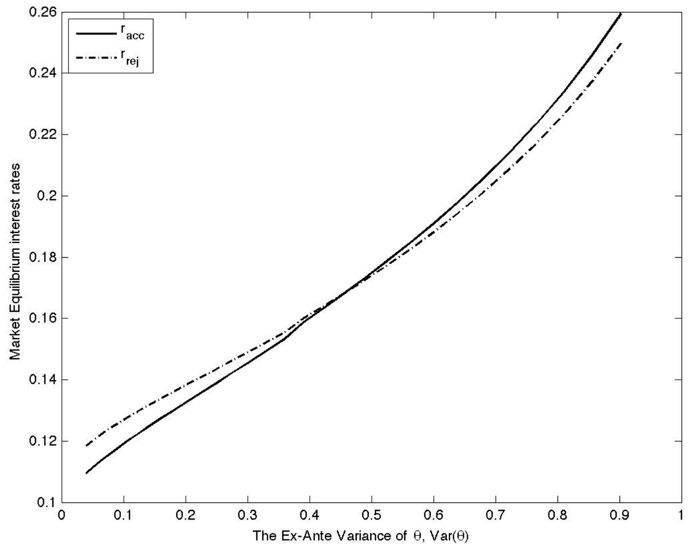

Figure 6: The Effect of the Uncertainty of θ on the Equilibrium Interest Rates

Given these theoretical findings, our empirical analysis focuses on disaggregating and testing the several mechanisms that we have identified by which crisis lending affects interest rates, rather than seeking to identify an average effect of lending per se.

5. Empirical Implications

In this section we investigate the empirical implications of our theoretical results. Our theoretical model focuses on the effects of crisis lending on short-term borrowing costs, so we focus empirically on sovereign bond yields. Our model leads to hypotheses about the political determinants of loan size and conditions, and the effects of loan size, conditionality and lender bias on equilibrium interest rates. We distinguish between three categories of effects: bargaining, adverse selection, and moral hazard.

Our first set of hypotheses deals with the effect of bargaining on loan terms. The lender's political bias on behalf of the borrower has a monotonically increasing effect on equilibrium loan size, and for most of the parameter space has a decreasing effect on loan conditionality.

H1 (Bargaining and Loan Terms): Political bias is associated with lower conditionality *and higher liquidity.*

Loan terms, in turn, influence the market interest rate, because they have direct effects on the probability of a financial crisis. Increased liquidity—an expanded crisis loan—decreases the probability of a crisis, all else equal, so it decreases the interest premium. Similarly, increased conditionality reduces the probability of a crisis, because implementing economic reforms reduces the size of the financing gap that must be filled by the private sector. Consequently, conditionality reduces the equilibrium market interest rate. Our model predicts that more conditionality and larger loans will depress interest rates.

H2 (Loan size and interest rates): Larger crisis loans are associated with lower interest rates.

H3 (Conditionality and interest rates): Higher conditionality is associated with lower interest rates.

Crisis lending is not randomly distributed, so the class of countries that negotiate crisis loans differs systematically from the population of non-participants (Vreeland 2003). In our model, governments have private information about the health of their economies, which influences the return private market actors can expect. Specifically, governments that face weaker economic fundamentals have stronger incentives to accept a loan, so countries that accept lending packages reveal themselves to be in worse circumstances than the average country without a loan, and thus, on average, more prone to subsequent crisis. This is the adverse selection effect we have referred to above. Therefore, after controlling for the effects of loan size and conditionality, we expect the onset of a loan to generate increased interest rates.

H4 (Adverse selection): Crisis lending announcements are associated with higher interest rates, controlling for conditionality and amount of financing.

Our model assumes that it is more costly for lenders to deny support to politically influential borrowers, which reduces the sanctions that influential borrowers face when they renege on their commitments to implement reforms. This can be expressed in the expected duration of the punishment phase, which is lower for influential countries, because they are offered less onerous terms for returning to good standing. As Figure 1 illustrates, it is optimal for the lender to offer influential countries less arduous sets of policy reforms during a punishment phase. As a result, the expected cost of punishment is lower for influential countries, which implies that their incentives to comply with conditionality are weaker, as illustrated by Figure 3.[16] Influential countries implement a lower proportion of their policy commitments, so they are more subject to financial crises, and consequently they pay higher risk premia. In our model, this effect is present only for countries participating in conditional lending programs, because we model capital markets as fully liquid. However, if the model were extended to allow for long-term lending, this effect would be present for influential countries regardless of whether they were currently participating in a conditional lending program. In either case, however, the effect should be strongest for countries that are currently participating, because future participation is discounted and uncertain.

H5 (Moral hazard): Political bias exerts an upward pressure on equilibrium interest rates, and this effect is strongest for countries that are crisis borrowers.

6. Research Design

To capitalize on data availability and a comparable set of cases of lending, we focus on crisis lending by the International Monetary Fund, using data drawn from the IMF's Monitoring of Agreements Database (MONA). The data span the period from 1992 to 2002 and cover the 66 countries that were not members of the OECD and for which data on bond yields were available from IFS. Our dependent variable is the nominal yield of short-term sovereign bonds issued in home country currency and measured at the end of each month.[17] Our quan-

[16]Figure 3 shows a non-monotonic effect, because more important countries receive larger loans on less onerous terms, but also face less rigorous enforcement. Controlling for liquidity and conditionality, however, the model predicts less compliance as countries become more important. To separate these contradictory effects, we focus on the region where the loan size reaches the budget constraint, which effectively holds the size of the loan constant.

[17]Our empirical analysis thus speaks to the short-term (within one month) reaction of financial market actors, as opposed to longer term flows like FDI, or lagged effects of lending on investment inflows. While we recognize that these are also important measures of market catalysis, we focus here on short term perceptions that might influence future crisis dynamics, as interest rates for sovereign debt can either substantially ease or exacerbate economic crises.

tities of interest are the effect of new program announcements, conditional on measures of U.S. influence over the IMF, the effects of those measures of influence when a new program is announced, and the effects of conditionality and loan size. We treat conditionality and loan size as endogenous.[18] We use a dummy variable for a month in which a new program is announced to capture the short-term effects of new program announcements. Any information contained in the lending decision should be reflected in this short-term effect. To capture conditional effects, we regress interest rates on the new program dummy, influence variables × new program, influence variables × no new program, conditionality and loan size, and controls.[19]

Measures of U.S. Influence

Our theory does not provide guidance about which particular interests motivate the United States to interfere in IMF program design, so we take an eclectic approach and allow for a range of variables to exert effects that reflect alternative interests. Following extant studies (e.g. Thacker 1999, Stone 2004, Oakley and Yackee 2006), we operationalize U.S. interests in terms of similarity of the borrowing country with the United States in alliance portfolios and UN General Assembly voting patterns, and U.S. bank exposure in recipient countries (Copelovitch 2010, Stone 2011).[20]

[18]To our knowledge, this is the first empirical analysis to control for both loan size and number of conditions and treat loan terms as endogenous in a study of the effects of loan programs on bond yields. Barro and Lee (2001) control for endogeneity and Dreher (2006) controls for both endogeneity and conditionality, but both study economic growth rather than bond yields.

[19]We do not employ a Heckman type selection model in our empirical analysis. Our theoretical model suggests that selection effects on the estimates of other covariates should not be a first-order concern. In Heckmans model, there is a single player with private information, so that both her decision and the error term are correlated with her private information. In contrast, in our model, the private information partially determining program participation and the second stage error term belong to two different players (i.e, the borrowing government and the market actor). Consequently, the independence assumption is much weaker after we control for the set of publicly known information (i.e., control variables) in the empirical analysis.

[20]We also tested for effects of U.S. foreign aid and U.S. exports, but those variables did not yield significant results, so they are not included in the specifications that we report below.

Instrumental Variables

The model indicates that IMF conditionality, loan size, and market responses are endogenous to U.S. interests, so we adopt an instrumental variables approach. The validity of instrumental-variables analysis depends on the strength and exogeneity of the instruments. We use the following instrumental variables, which are correlated with loan size and conditionality, but are not strongly correlated with bond yields. We have argued that conditionality and loan size are endogenous to our measures of U.S. influence; our theoretical model predicts that countries with a high "β" are more likely to receive loans, and those loans are, on average, larger and have fewer conditions. Therefore, the exogeneity of instruments is important with respect to our measures of U.S. influence. These instruments can be thought of as non-political determinants of IMF program terms, theoretically and empirically separate from the geopolitical concerns in which we are interested. The instruments collectively pass the Sargan test of overidentifying restrictions. For more information on the first stage predictive power of these instruments and the stability of our core results to one-by-one exclusions, see our online Appendix.[21]

Number of countries participating: Przeworski and Vreeland (2000, 2001) and Vreeland (2003) argue that the IMF becomes reluctant to lend when its resources are stretched thin because of the need to hold something in reserve for future crises. This might lead the Fund to make smaller loans or extract more extensive conditionality in return for scarce funds. Alternatively, the number of countries participating in IMF programs might be an index for systemic vulnerabilities that magnify the risks of contagion. This could lead the IMF to offer more generous lending terms, including larger loans and

[21]Empirically, the highest correlation between our instrumental variables and treasury bill rates is $\rho = .17$ for the case of total outstanding commitments, followed by $\rho = .14$ for countries with extended IMF program commitments. These instruments are not highly correlated with our measures of U.S. influence, which theoretically drive loan size and conditionality. The highest correlation between affinity scores and any instrument is $\rho = .15$ for number of countries participating, which is perhaps the least likely of our instruments to have a causal association with a particular country's affinity score with the U.S. U.S. commercial bank exposure is also not strongly correlated with any of our instruments ($\rho < .02$), with the exception of its moderate correlation of $\rho = .15$ with the ratio of prior IMF commitments to IMF quota. Alliance similarity with the U.S. is not strongly correlated with any instrument. The results that follow are robust to the one-by-one exclusion of each instrument (the results are in the on-line appendix).

more limited conditionality.

Ratio of Prior commitments of IMF financing to IMF Quota: The IMF has formal rules about access to credit measured in terms of multiples of a country's contributed quota. These rules can be waived, but the Executive Board is reluctant to extend credit substantially beyond previous precedents. To the extent that quotas represent constraints on IMF lending, previous commitments reduce the amount of credit available, and should reduce the size of new lending arrangements. Alternatively, the defensive lending hypothesis holds that countries that owe substantial amounts to the IMF may more easily qualify for additional credits because the Fund seeks to prevent any of its debtors from going into default. We find support for the hypothesis that prior commitments constrain new credits, and not for defensive lending.

Extended program: This is a dummy variable that codes arrangements that are designed to be disbursed over more than one year, including the EFF, ESAF, and PRGF. Such programs are typically intended to follow successful Stand-By arrangements and deepen structural reforms, so they typically involve more extensive conditionality and larger commitments of financing.

These instruments consistently satisfy the benchmarks commonly recommended in the literature to identify strong instruments.[22]

Control Variables

We use a common set of controls, including our three measures of U.S. influence interacted with a dummy for months in which there is no new program announcement (alliance patterns, UN voting patterns, and U.S. bank exposure). We control for economic variables that are correlated with interest rates and the terms of crisis lending (foreign debt, GDP per capita,

[22]The inclusion of these instruments in our instrumental variables regressions below consistently yields first-stage F statistics of over 119 and 611 for our equations predicting loan size and conditionality, respectively, which is well over the threshold of 10 suggested by Staiger and Stock (1997). The ratio of prior IMF commitments to IMF quota is a statistically significant predictor of loan size and number of conditions; number of countries currently under IMF programs and extended commitments are strong predictors of number of conditions, but not of loan size.

reserves as a share of GDP, population). In addition, we control for missing data, which is a measure derived from a principal components analysis of the missingness of 19 time series reported by member countries to the IMF. Countries that fail to report these data are likely to have low administrative capacity, and this is associated with higher conditionality and higher interest rates. IMF standing is a measure of past non-performance of conditionality, which is derived from a 12-month moving average of a dummy variable that measures whether a country has an IMF program that is suspended for non-performance. Past non-performance is associated with additional conditionality and higher interest rates.

Results

The results of three models are presented in Table 1 below. The first model uses OLS to provide a baseline for comparison, and the second and third use instrumental variables (2SLS) to model the endogeneity of conditionality and the size of IMF lending facilities predicted by our model. The second model allows for cross-sectional and time series variation, and the third uses country fixed effects to focus on over-time variation within countries.[23] It is important to control for fixed effects for several reasons in this particular analysis; for example, this prevents country heterogeneity in the size of bond markets across countries from biasing the results.[24] The results are broadly consistent across the three models, but there are important differences that we highlight below. The coefficient of IMF program initiation is statistically insignificant in the first model when the three U.S. influence variables take a value of zero, but is significantly associated with higher interest rates in the two-stage and fixed-effects specifications, just as the adverse selection hypothesis suggests. As we will see below when we interpret the conditional effects, however, IMF program initiation

[23]We also estimated models including year fixed effects, which are included in the online appendix, as well as more restricted models with dummy variables for years in which a notable financial crisis occurred, and our substantive results remained unchanged. Details are available from the authors.

[24]A related argument is that perhaps bond supply rationing drives bond yields (e.g. Stiglitz and Blinder 1983). We are confident that our results are not driven by supply rationing for several reasons. First, cross-national heterogeneity in supply strategies will largely be controlled for by country fixed effects. Second, within-country bond rationing is unlikely to occur during economic crises, when governments want to prevent skyrocketing interest rates. Third, there is not a compelling reason to think that supply rationing would be systematically linked to our right hand side variables, and as such the omission of a bond supply control is unlikely to generate bias in coefficient estimates (although it may reduce the model's overall explanatory power).

is statistically significant in all three models across most of the range of the U.S. influence variables. Note that this variable measures the short-term effect of initiating a new IMF program, which is our theoretical quantity of interest, not the steady-state effect of having an IMF program.

In the 2SLS estimates we focus on the second-stage estimates that predict interest rates; the first-stage estimates (presented in Table 3) confirm our theoretical expectation that political importance increases loan size but depresses the number of conditions attached to a loan, as H1 predicts. IMF credit is measured as the monthly change in aggregate IMF commitments in the month in which a new program is introduced, so it represents a short-term effect. The effect is substantively and statistically insignificant in the baseline OLS model. In the second model, which treats the loan amount as endogenous, however, IMF credit is highly significant, and is estimated to reduce interest rates, as H2 anticipates. This variable is measured in millions of SDRs, so a coefficient of -0.03 means that a one standard deviation increase in IMF credit for countries receiving IMF loans (equivalent to roughly 1.4 billion SDRs) generates a decrease of 44 percentage points. The coefficient remains highly significant with a nearly identical substantive effect in the fixed-effects specification. Countries experience greater gains in investor confidence, all else equal, when they receive larger infusions of IMF credit, and the effects can be substantial.

The estimated effect of conditionality on bond yields differs across the three models, but does so in a way that makes us confident in our interpretation of the results. The OLS estimate indicates that conditionality, contrary to theory, increases bond yields. However, when we model the endogeneity of conditionality, as well as when we control for fixed effects that capture a wide range of country-level variables that affect both conditionality and credit-worthiness, the result is reversed. Focusing on the 2SLS results with fixed effects, it is clear that when a particular country is subject to more conditionality, its interest rates are lower, as predicted by H3. The results indicate that conditionality has a substantial depressing effect on bond yields. Conditionality is measured as a count of types of conditions contained in a particular program review, ranging from 0 to 19 and averaging almost 6, so conditionality is estimated to depress bond yields under IMF programs by just over 7.2 percentage points

Table 1: Effect of IMF Program Initiation and U.S. Influence on Bond Yields

	OLS		2SLS		2SLS (Fixed Effects)	
	Coefficient (std. error)	p-value	Coefficient (std. error)	p-value	Coefficient (std. error)	p-value
IMF Program Initiation	0.94 (5.80)	0.87	15.82 (6.10)	0.00	14.97 (6.06)	0.00
IMF Credit	1.06 (0.72)	0.14	-0.03 (0.01)	0.00	-0.03 (0.01)	0.00
Number of Conditions	0.68 (0.07)	0.00	-1.02 (0.13)	0.01	-1.20 (0.13)	0.00
New IMF Program						
Alliance portfolio	5.17 (12.73)	0.69	9.25 (13.48)	0.493	43.88 (14.11)	0.00
UN Voting	35.22 (6.01)	0.00	16.85 (6.16)	0.01	15.40 (6.14)	0.01
U.S. Bank Exposure	-97.51 (104.86)	0.35	1907.328 (473.32)	0.00	1931.70 (471.28)	0.00
No New Program						
Alliance portfolio	-15.86 (1.15)	0.00	9.73 (4.16)	0.02	42.65 (5.90)	0.00
UN Voting	5.27 (0.67)	0.00	6.30 (0.96)	0.00	5.25 (0.98)	0.00
U.S. Bank Exposure	7.71 (14.09)	0.59	38.94 (24.43)	0.11	85.47 (28.34)	0.00
Control Variables						
Population	-0.13 (0.01)	0.00	-0.004 (0.04)	0.918	0.36 (0.10)	0.00
Foreign Debt	.33 (0.02)	0.00	0.179 (0.065))	0.01	0.36 (0.09)	0.00
GDP per capita	-0.61 (0.06)	0.00	-0.10 (0.02)	0.00	-.113 (0.03)	0.00
Reserves/GDP	-24.32 (1.89)	0.00	-40.0 (3.70)	0.00	-47.39 (3.92)	0.00
Missing Data	8.27 (1.57)	0.00	9.07 (1.84)	0.00	8.43 (1.86)	0.00
IMF Standing	2.63 (0.90)	0.00	-2.92 (1.24)	0.02	-3.39 (1.24)	0.01
Constant	26.93 (0.74)	0.00	22.10 (2.41)	0.00	-1.64 (3.50)	0.638
Fixed Effects						
F test of fixed effects					42.53	0.00
number of obs	8,373		8,373		8,373	
rho (variance due to fixed effects)					0.66	

on average. A one standard-deviation increase in conditionality, or 3.6 more conditions, is sufficient to depress interest rates by another 4.32 percentage points.

The results for our three measures of U.S. influence generally support the model's prediction that bias increases bond yields, as H5 predicts. The results strengthen when we control for endogeneity and become uniformly significant across measures of influence when we also control for country fixed effects. The similarity in alliance portfolios has a consistently positive coefficient, but is only significant when we control for fixed effects. This suggests that the variation in alliance commitments that is important is taking place within countries over time, for example, as East European countries dropped out of the Warsaw Pact and joined NATO. In the fixed-effects specification, increasing alliance similarity with the United States by one standard deviation is estimated to increase interest rates by 2.3 percent in the month of a new IMF program announcement. To put this result in context, the alliance similarity between the United States and Poland increased by 65 percent of one standard deviation in this sample between 1990 and 2000. UN voting similarity also has consistently positive coefficients, which are significant in the OLS, 2SLS, and 2SLS with fixed effects specifications. The estimated marginal effect of increasing voting similarity with the United States by one standard deviation is to increase interest rates by just under 5 percent in the month of a program announcement. These increases represent direct effects, estimated after controlling for the indirect effects of political influence through liquidity and conditionality.

The exposure of U.S. banks to particular countries tells a similar story. The OLS coefficient is negative. However, modeling the endogeneity of conditionality and IMF credit reverses the effect, and shows that countries that are important to U.S. banks pay much higher interest rates when they receive new IMF programs. Examining the results of the reduced-form equations makes clear why endogeneity plays an important role in the interpretation of these effects (See Table 3.) The exposure of U.S. banks plays a major role in explaining the size of IMF loans to particular countries, and IMF credit in turn reduces interest rates. When we control for the indirect effect of bank exposure that operates through IMF credit, we find that the direct effect of U.S. bank exposure (which our model attributes to the moral hazard effect) is to substantially increase interest rates. On average, this effect increases interest rates by 7.7 percent. Increasing the exposure of U.S. banks by one standard deviation increases interest rates by an estimated 29 percent. One standard deviation is a bit under 2 percent of total U.S. foreign bank assets, so it is not near the high water mark set by Mexico in 1995 of 18 percent. This is approximately the level reached by Colombia in the early 1990s, and Greece, the Philippines, South Korea, South Africa and Venezuela in the late 1990s. This effect is stronger in the model with fixed effects, indicating that cross-country variation masked some of the effects due to over-time variation within particular countries.

Our theory does not make predictions about the effect of U.S. influence variables when no new program has been announced, because the model includes the simplifying assumption that interest rates are recontracted every period. We include these variables as controls, in order to isolate the short-term effects of the same variables during new program initiation months. However, we conjecture that a richer model that allowed bonds to have longer maturities would generate expectations for these variables that are similar to the ones our model generates during announcement months, but that the effects should be smaller. Our intuition is that variations in IMF credibility should affect borrowers with on-going programs and non-borrowers as well as new borrowers, because resorting to IMF financing is always part of the game tree for developing countries and emerging markets. The effects should be smaller, however, because future program participation would be uncertain and discounted for current non-participants. This is akin to to anticipation of moral hazard even for countries that are not IMF program participants in the current month, but may nonetheless be politically important and encounter crisis conditions in the future. Four of the six hypothesis tests that we perform with models that account for endogeneity support this hypothesis. Similarity of alliance portfolios with the United States has essentially the same effect when there is no new program as when there is a new program announcement in the two-stage least squares specification with fixed effects. Similarity of UN voting records has significant effects that raise bond yields, although the effects when a country does not have a new program announcement are only 34 percent as large as when a new program is announced.[25] Bank exposure has statistically significant effects that are 4.4 percent as large when there is no new program as when there is a program announcement. These results broadly support our conjecture. Our control variables have the expected effects. Foreign debt increases bond yields, richer countries pay lower interest rates, central bank reserves lower interest rates, and missing data increases interest rates.

Because the interpretation of interaction effects is not straightforward, Table 2 presents the conditional effects of announcing a new IMF program with U.S. influence measures fixed at their means and at one standard deviation above their means. The effect of initiating a new IMF program is highly significant in the 2SLS equations when all three U.S. influence measures are fixed at their mean, and extracts a risk premium of 25.65 percentage points (the 95% confidence interval of the effect runs from 17.23 to 34.08 percentage points). The effects are stronger in the fixed effects specification, and the effects become stronger still when the U.S. influence measures are increased. Increasing alliance similarity with the United States by one standard deviation increases the estimated coefficient by 20 percent, and the estimated effect of a new program is approximately 14 percent greater in countries that vote in alignment with the United States in the UN to a degree that puts them one standard deviation above the mean.

What is the total effect of political influence on bond yields for IMF program participants? In other words, what is the cumulative effect of our measures of U.S. influence on bond yields, both operating directly and indirectly through IMF credit and conditionality? Table 3 displays the results of model 3, but now with first stage estimates reported. By adding the coefficients of U.S. influence across the stages, we can estimate the aggregate, or net effect as it operates through increasing loan size, decreasing conditionality, and the direct moral hazard and adverse selection effects. Consider the loan that the IMF extended to Russia to counter a crisis of confidence in the sovereign bond market in July 1998. At the time, Russia's alliance profile and UN voting profiles vis-a-vis the United States were close to their average levels, so they are estimated to have had no substantial effects on the terms of the loan, but Russia's share of U.S. bank lending had risen over the previous two

[25] The difference in coefficients is not statistically significant.

Table 2: Conditional Effects of New IMF Program Announcements

	OLS		2SLS		2SLS (Fixed Effects)	
	Coefficient (std. error)	p-value	Coefficient (std. error)	p-value	Coefficient (std. error)	p-value
All variables at their means	-0.02 (1.87)	0.99	25.65 (4.30)	0.00	41.05 (4.72)	0.00
Alliance S-score 1 std. dev. above mean	0.96 (3.25)	0.77	27.41 (5.37)	0.00	49.39 (6.05)	0.00
UN Voting S-score 1 std. dev. above mean	12.98 (2.94)	0.00	31.88 (4.62)	0.00	46.73 (5.00)	0.00
US Bank exposure 1 std. dev. above mean	-1.41 (2.37)	0.55	52.83 (10.40)	0.00	68.57 (10.54)	0.00

years to almost five percent of total foreign assets (approximately 3% above the mean for Russia in this sample). Under U.S. pressure, the IMF scrambled to assemble its largest loan to Russia, activating its General Arrangements to Borrow in order to secure the necessary resources. This in turn required U.S. Congressional action, prompting Treasury Secretary Robert Rubin to write to House Speaker Newt Gingrich, '"Our interest in successful political and economic reform in Russia is compelling. A collapse of the ruble would undoubtedly strengthen Russian opponents of reform, who include ultra-nationalists and Communists."[26] According to model 3, the scale of U.S. bank exposure is estimated to have boosted the size of the IMF loan to Russia by 1.65 billion SDRs, or approximately 26 percent of the 6.3 billion SDRs that the IMF committed.[27] The portion of the size of the loan attributed to U.S. bank exposure, in turn, is estimated to have depressed bond yields by 54 points. On the other hand, the large scale of U.S. bank exposure is estimated to have had a *direct* effect of raising Russian bond yields by 58 percentage points, which is attributable to moral hazard. In addition, program initiation is estimated to have raised the premium on Russian bonds

[26]Cited in Stone (2002), 155.

[27]The 17.1 billion dollar headline figure announced at the time included loans from the World Bank and Japan.

by another 15 percentage points, which is attributable to adverse selection. The net effect of political influence, as measured through U.S. bank exposure, is thus estimated to be 19 percentage points.

Capital markets initially reacted to the loan announcement with some optimism, and Russian bond yields declined in anticipation of the loan package announcement. Yet shortly after the announcement, bond yields began to rise to crisis levels, reaching 75 percent by early August—25 points above the Russian average treasury bill rate for the sample—and soared to 150 percent by the middle of August as it became clear that the Russian government was considering default (Sturzenegger and Zettelmeyer 2006, 98). Amid increasing market panic, Russia defaulted on some obligations, suspended inter-bank payments and devalued the ruble in late August. The dynamics driving investor expectations during the crisis were complex, but our theoretical model suggests that the terms of the bailout may have signaled that first, the extent of the Russian crisis was larger than anticipated, and second, the importance of the Russian economy to IMF principals was such that it could acquire bailout funding without implementing the longer-term structural reforms necessary to return to fiscal solvency. Indeed, although the July program included a far-reaching set of reforms intended to restore fiscal solvency, signals began to leak out within days of signing the accord that the Russian government did not seriously intend to implement them. As Blustein puts it, "during the 1990s, the Russians had usually heard 'yes' when it came to seeking aid from the IMF, to the point that the mantra 'too big and too nuclear to fail' pervaded attitudes of many market participants about the country" (2001, 238). Russia's geopolitical and economic importance created a perception that it would continue to receive IMF funding, making the ultimate decision of the IMF to allow default a surprise for many. At the same time, however, perceptions of geopolitical importance created concerns about the underlying state of the Russian economy and fears about future crises. These concerns created a self-fulfilling prophecy as the combination of rising bond yields, capital flight, and bank runs drove the economy into collapse. Blustein concludes that "it is reasonable to wonder whether Russia was set up for the colossal letdown of 1998 because it had been told 'yes' too many times in the past" (2001, 239).

Table 3: Fixed Effects IV Regression

Variable	IMF Credit	Conditions	Bond Yields
IMF Program Initiation	154.65 (89.10)	2.30** (0.65)	14.97* (6.06)
IMF Credit	–	–	-0.03** (0.01)
Number of Conditions	–	–	-1.20** (.13)
New IMF Program			
Alliance Portfolio	-6.27 (219.40)	0.47 (1.61)	43.87** (14.11)
UN Voting Affinity	-102.16 (92.8)	-2.44** (0.68)	15.40* (6.14)
US Bank Exposure	54892.73** (1514.65)	13.75 (11.13)	1931.70** (471.28)
No New IMF Program			
Alliance Portfolio	-44.45 (98.38)	0.55 (0.72)	42.65** (5.9)
UN Voting Affinity	0.36 (15.15)	0.05 (0.11)	5.38** (0.98)
US Bank Exposure	1221.252** (401.61)	-13.25** (2.94)	85.47** (26.34)
Control Variables			
Population	1.50 (1.60)	0.13** (0.01)	0.36** (0.10)
Foreign Debt	1.10 (1.37)	0.09** (0.01)	0.347** (.09)
GDP per Capita	2.74 (5.33)	-0.11** (0.04)	-1.14** (0.31)
Reserves/GDP	-37.01 (62.75)	-1.13* (0.45)	-47.39** (3.92)
Missing Data	23.54 (28.40)	.164 (0.21)	8.43** (1.86)
IMF Standing	-61.88** (15.85)	1.63** (0.12)	-3.39** (1.24)
Instruments			
Number of countries	-0.17 (0.31)	0.01** (0.002)	–
Extended Program	44.83** (11.61)	4.57** (0.09)	–
Commitments/ Quota	-44.09** (6.29)	0.61** (0.05)	–
Constant	-8.44 (56.96)	-2.89** (0.42)	-1.64 (3.49)
n = 8337			
F	127.47**	447.32**	–
χ^2			810.60**

**Signficant at the .01 level. *Significant at the .05 level. Standard errors in parentheses.

In summary, we find several pieces of evidence that support our model. We find that conditionality decreases and the scale of financing increases with some of our measures of IMF bias, as hypothesized. We also find that conditionality and liquidity exert strong depressing effects on bond yields. We find robust direct effects of measures of U.S. influence—alliances, UN voting patterns, and U.S. bank exposure—on the yields of sovereign bonds, which are consistent with the moral hazard hypothesis that countries that enjoy privileged access to U.S. decision makers pay additional risk premia. We find that the initiation of new IMF programs is associated with an increase in the risk premium, controlling for conditionality and loan size, and that the risk premium increases more sharply in the presence of U.S. influence. These results hold in models that treat conditionality and loan size as endogenous variables, as the theory specifies is appropriate, and in a model with country fixed effects.

7. Conclusion

Here we return to our original motivation: how does multilateral lending affect financial market reactions? As we noted at the outset, extant findings are quite mixed, and our theoretical and empirical analysis shows one compelling reason for inconsistencies across different research designs. Namely, multilateral crisis lending affects markets not in one, simple way, but through multiple and often countervailing mechanisms: liquidity and conditionality effects that are a function of the political importance of the borrower; adverse selection, which can result in a negative market response to new program announcements; and concern over lax enforcement, which is related to the political relationship between the borrowing country and the lender. Which of these effects dominates in a given case depends the strategic interaction of the lender, the borrower, and market observers.

Our theoretical model incorporates the key characteristics of the IMF lending process, including bargaining over the terms of IMF programs, the borrowing government's private information, and the effect of borrowing costs on the probability of a crisis. The model allows us to make predictions about the relationship between the political interest of the IMF—which we interpret as pressure to lend to countries that are important to the IMF's leading shareholder, the United States—and the scale of financing, the associated conditionality, the enforcement of conditionality, the probability of a financial crisis, and equilibrium exchange rates. The model's results suggest that IMF lending can catalyze private capital flows under some circumstances, but that catalytic effects are highly contextual. We test the mechanisms posited in the model, and the empirical findings support them unambiguously. Our empirical results indicate that the net effect of IMF lending depends on the borrower's access to U.S. influence, and that the greater the access, the worse the consequences.

Our empirical results can be read as qualified support for the practice of conditional lending, since we find that increasing the scope of conditionality reduces the yield on government bonds. This indicates that market actors believe that the reforms promoted by the IMF improve the probability that they will be repaid. Since the success of the Fund at managing financial crises and limiting international contagion depends upon the perception that its programs are successful, this suggests that rather than implementing plans to streamline conditionality, it might better serve its purposes by expanding it. In addition, we find that larger IMF loans are more effective at stemming capital flight than smaller ones, all else equal.

On the other hand, we find evidence that the net effect of announcing a new program, controlling for the effects of liquidity and conditionality, is to raise the cost of borrowing. This indicates that on average, program announcements do not serve as seals of approval, but rather reveal that the government's financial situation is insecure. Furthermore, we find that the negative effect of announcing a program on market confidence increases when the borrowing country is important to U.S. foreign policy. This is consistent with the finding of our model that enforcement of conditionality is less rigorous for influential borrowers, which consequently are less likely to implement conditionality, and more likely to suffer financial crises. In addition, this interpretation is consistent with the finding that measures of U.S. interest in potential borrowing countries are directly associated with higher bond yields, and that these effects are greatest when a new program is announced.

In combination, the theoretical model and the empirical estimates provide a clear picture of the effects of informal influence on capital markets. When borrowing countries are able to draw on U.S. influence, conditionality is reduced but liquidity is increased. These effects can work at cross-purposes: markets tend to respond positively to increased liquidity but negatively to reduced conditionality. When informal influence is at its peak and uncertainty about economic fundamentals is substantial, our analysis suggests that the announcement of a new IMF program leads to capital flight. This study therefore provides an example of the broader trade-off involved in governance arrangements that allow powerful countries to exert informal influence in exchange for "buy-in" to multilateral institutions. Such arrangements exacerbate the time consistency problems that powerful states face, frequently leading to unintended policy outcomes. In this case, it can be precisely the countries that the United States most wants to help to avoid financial crises that are able to derive the least benefit from IMF involvement.

Appendix

The appendix is organized as follows. **A1** describes how M updates about G's type, which affects the equilibrium interest rate that M sets. We then solve for G's optimal choice given L's equilibrium strategy in Proposition 1. **A2** proves Proposition 1.

A1. Partial Equilibrium Analysis

In this section, we first show that the equilibrium interest rate can be expressed as a function of M's observables, (s, x) and d_s.

Because we assume a competitive international loan market, M's problem is to choose an interest rate that satisfies the following condition:

$$[1 - \bar{p}(s, x, d_s, r)]r - \bar{p}(s, x, d_s, r) - \underline{v} = 0. \tag{4}$$

The expected crisis probability in eq (4), $\bar{p}(s, x, d_s, r)$ conditional on M's observables, is updated according to the Bayes Rule:

$$\begin{aligned}
\bar{p}(s, x, d_s, r) &= \mathbb{E}\{p(sd_s, xd_x, r, \theta)|s, x, d_s, r\} \\
&= \sum_{\theta \in \{\theta_1, \theta_2\}} \sum_{d_x \in \{0,1\}} p(sd_s, xd_x, r, \theta) Pr(\theta, d_x|s, x, d_s, r) \\
&= \frac{\sum_{\theta \in \{\theta_1, \theta_2\}} \sum_{d_x \in \{0,1\}} p(sd_s, xd_x, r, \theta) Pr(d_x, d_s|\theta, s, x, r) Pr(\theta)}{\sum_{\theta \in \{\theta_1, \theta_2\}} \sum_{d_x \in \{0,1\}} Pr(d_x, d_s|\theta, s, x, r) Pr(\theta)},
\end{aligned} \tag{5}$$

where $Pr(d_x, d_s|\theta, s, x, r)$ is G's probability of choosing (d_x, d_s), given θ, (s, x), and r.

From eq (4) we can solve for $r = r(d_s; s, x)$. We then substitute $r = r(d_s; s, x)$ into $p(sd_s, xd_x, r; \theta)$. We then can rewrite the crisis probability as $p(sd_s, xd_x; \theta)$.

Now we turn to G's problem. On the equilibrium path, L offers a time invariant plan: (s_b, x_b) in the bargaining phase, and $(0, x_p)$ in the punishment phase. Given the plan, G maximizes its expected value function by choosing (d_x, d_s) in each period. Moreover, G's current choice determines the phase (state) of the next period game, which in turn defines the period's action space, G's problem is a Markov Decision Process (Rust 1994).

Because G has complete information about the shock to its economy, ϵ, it makes a deterministic decision about (d_x, d_s) in equilibrium. On the other hand, L does not know ϵ and θ, therefore, L derives a set of conditional choice probabilities about G's decision.

Let $I_p \in \{0, 1\}$ be an indicator of the phase of the game, where 0 represents the bargaining phase, and 1 the punishment phase. Define $\mathcal{A}_G(I_p)$ as the action space of G in phase I_p:

$\mathcal{A}_G(0) = \{(0,0),(0,1),(1,0),(1,1)\}$ and $\mathcal{A}_G(1) = \{(0,0),(1,0)\}$. In addition, given ϵ, define G's value function, $V_G(.)$, as:[28]

$$V_G(I_p, \theta, \epsilon) = \max_{(d_x,d_s)\in\mathcal{A}_G(I_p)} [v_G(I_p, \theta; d_x, d_s) + \epsilon(d_x, d_s)], \tag{6}$$

where the choice-specific value function, $v_G(.)$, is given by:

$$v_G(I_p, \theta; d_x, d_s) = \bar{u}_G(I_p, \theta; d_x, d_s) + \delta_G \sum_{\theta'} \sum_{I'_p} [\int V_G(I'_p, \theta', \epsilon')\phi(\epsilon')d\epsilon'] Pr(I'_p | I_p; d_x, d_s) Pr(\theta'). \tag{7}$$

Here, $\bar{u}_G(\theta; d_x, d_s)$ is an abbreviation for $\bar{u}_G(\theta; d_x, d_s; s_b \times I_p, x_b \times (1 - I_p) + x_p \times I_p, r)$ and the superscript on the RHS denotes the next period.

Equations (6) and (7) define a contraction mapping operator (Rust 1994); therefore, the choice-specific value function, $v_G(I_p, \theta; d_x, d_s)$, can be solved by value function iteration. This means G's optimal choice on the equilibrium path can be expressed as:

$$(d_x^{on}, d_s^{on}) = \arg \max_{(d_x,d_s)\in\mathcal{A}_G(I_p)} [v_G(I_p, \theta; d_x, d_s) + \epsilon(d_x, d_s)]. \tag{8}$$

Assume that ϵ has a multivariate extreme-value (Type-I) distribution. Then, from L's perspective, given state (I_p, θ), G will choose the action (d_x, d_s) with the following probabilities:

$$\begin{aligned} & Pr(d_x, d_s | I_p, \theta) \\ = \; & Pr\{v_G(I_p, \theta; d_x, d_s) + \epsilon(d_x, d_s) \geq v_G(I_p, \theta; \tilde{d}_x, \tilde{d}_s) + \epsilon(\tilde{d}_x, \tilde{d}_s), \forall (\tilde{d}_x, \tilde{d}_s) \in \mathcal{A}_G(I_p) | I_p, \theta\} \\ = \; & \frac{\exp[v_G(I_p, \theta; d_x, d_s)]}{\sum_{(\tilde{d}_x,\tilde{d}_s)\in\mathcal{A}_G(I_p)} \exp[v_G(I_p, \theta; \tilde{d}_x, \tilde{d}_s)]} \end{aligned} \tag{9}$$

Using the probabilities L can calculate its expected utility from offering an arbitrary pair of (s, x) to G, and then find the optimum in equilbrium.

Off the equilibrium path, L makes an offer, (s_o, x_o), which is independent of history. Given (s_o, x_o), G's optimal choice off the equilibrium path is:

$$(d_x^{off}, d_s^{off}) = \arg \max_{(d_x,d_s)\in\mathcal{A}_G(I_p)} [\bar{u}_G(\theta; d_x, d_s) + \epsilon(d_x, d_s)], \tag{10}$$

and from L's perspective G's choice probabilities conditional on θ is:

$$Pr(d_x, d_s | \theta) = \frac{\exp[\bar{u}_G(\theta; d_x, d_s)]}{\sum_{(\tilde{d}_x,\tilde{d}_s)\in\mathcal{A}_G(I_p)} \exp[\bar{u}_G(\theta; \tilde{d}_x, \tilde{d}_s)]} \tag{11}$$

[28]Note that although (s_b, x_b, x_p) are the state variables in G's problem, we suppress the notations in the equations because they are parameters for the analysis of G's equilibrium strategy.

A2. Proof of Proposition 1

We first prove Lemma 1, which shows that given G's equilibrium strategy L has no incentive to deviate from the equilbrium path. In addition, it shows how L will behave off the equilibrium path, given G's equilibrium strategy.

Assumption 1: $-\frac{\partial^2 p(s,x;\theta)}{\partial s^2} \leq 0$ for all $x \in [0,\bar{x}]$, $s \in [0,\bar{s}]$, and $\theta \in \{\theta_1, \theta_2\}$. That is, the marginal crisis reducing effect of s decreases as s increases.

Assumption 2: $c \geq \frac{1+\beta}{1-\beta}\bar{c}$ for all $\beta \in [0,\bar{\beta}]$ and $\theta \in \{\theta_1,\theta_2\}$ where $\bar{c} = \arg\max_{x\in[0,\bar{x}]} \left\{ \frac{e^{-bx}}{1+e^{-bx}} \left(-\frac{\partial p(s,x;\theta)}{\partial s}|_{s=0}\right) + \frac{1}{1+e^{-bx}}\left(-\frac{\partial p(s,0;\theta)}{\partial s}|_{s=0}\right)\right\}$. That is, the unit cost of loan, c, is sufficiently large.

Lemma 1. *Suppose assumptions 1 and 2 are satisfied, and b is sufficiently large. Then, given G's off-the-equilibrium-path strategy, offering $(s_o, x_o) = (0,0)$ weakly dominates all other offers off the equilibrium path for L.*

Proof. Let $Eu_L(s,x;\theta) = \sum_{(d'_x,d'_s)} Pr(d'_x, d'_s|s,x;\theta)u_L(d'_x x, d'_s s;\theta)$ be L's expected one-period utility conditional on θ, and $Eu_L(s,x) = \sum_{\theta\in\{\theta_1,\theta_2\}} \pi(\theta)Eu_L(s,x;\theta)$ be L's unconditional utility. To show L's optimal strategy is $(s,x) = (0,0)$ off the equilibrium path, it suffices to verify that $Eu_L(s,x;\theta)$ is decreasing in s for any $x \in [0,\bar{x}]$ and $\theta \in \{\theta_1,\theta_2\}$, if assumptions 1 and 2 hold.

First, consider a change from $(0,x)$ to (s,x), where $s > 0$. We show that $Eu_L(0,x;\theta) - Eu_L(s,x;\theta) \geq 0$.

$$\begin{aligned}
& Eu_L(0,x;\theta) - Eu_L(s,x;\theta) \\
= \; & [Pr(0,0|0,x,\theta)u_L(0,0;\theta) - Pr(0,0|s,x,\theta)u_L(0,0;\theta)] \\
& +[Pr(1,0|0,x,\theta)u_L(0,0;\theta) - Pr(1,0|s,x,\theta)u_L(0,x;\theta)] \\
& +[Pr(0,1|0,x,\theta)u_L(0,0;\theta) - Pr(0,1|s,x,\theta)u_L(s,0;\theta)] \\
& +[Pr(1,1|0,x,\theta)u_L(0,0;\theta) - Pr(1,1|s,x,\theta)u_L(s,x;\theta)]
\end{aligned}$$

Using $u_L(0,x;\theta) = u_L(0,0;\theta)$ and eq(11) to simplify the above equation, we have

$$\begin{aligned}
& Eu_L(0,x;\theta) - Eu_L(s,x;\theta) \\
= \; & Pr(0,1|s,x,\theta)[u_L(0,0;\theta) - u_L(s,0;\theta)] - Pr(1,1|s,x,\theta)[u_L(s,x;\theta) - u_L(0,0;\theta)] \\
= \; & \beta \frac{e^{-p(s,0;\theta)}[-p(0,0,\theta) + \bar{c}s + p(s,0;\theta)] - e^{-bx-p(s,x;\theta)}[-\bar{c}s - p(s,x;\theta) + p(0,0;\theta)]}{e^{-p(0,0;\theta)} + e^{-p(s,0;\theta)} + e^{-bx-p(0,x;\theta)} + e^{-bx-p(s,x;\theta)}},
\end{aligned}$$

where $\bar{c} = \frac{(1-\beta)c}{1+\beta}$.

Since the denominator in the above equality is strictly positive, to show $Eu_L(0, x; \theta) - Eu_L(s, x; \theta) \geq 0$, we only need to show

$$e^{-p(s,0;\theta)}[-p(0,0,\theta) + \bar{c} + p(s,0;\theta)] - e^{-bx-p(s,x;\theta)}[-\bar{c}s - p(s,x;\theta) + p(0,0;\theta)] \geq 0,$$

which is equivalent to

$$\bar{c} \geq \frac{e^{-bx-p(s,x;\theta)}[p(0,0,\theta) - p(s,x;\theta)] + e^{-p(s,0;\theta)}[p(0,0,\theta) - p(s,0,\theta)]}{s[e^{-p(s,0;\theta)} + e^{-bx-p(s,x;\theta)}]} \tag{12}$$

If **Assumption 1** is satisfied and the unit cost of implementing the reforms, b, is sufficiently large, then the supremum of the RHS of eq (12) is attained as s converges to 0. That is,

$$\begin{aligned} \sup_{s\in[0,\bar{s}]} \{RHS\ of\ eq(12)\} &= \lim_{s\to 0} \frac{e^{-bx-p(s,x;\theta)}[p(0,0,\theta) - p(s,x;\theta)] + e^{-p(s,0;\theta)}[p(0,0,\theta) - p(s,0,\theta)]}{s[e^{-p(s,0;\theta)} + e^{-bx-p(s,x;\theta)}]} \\ &= \frac{e^{-bx}}{1+e^{-bx}}\left(-\frac{\partial p(s,x;\theta)}{\partial s}|_{s=0}\right) + \frac{1}{1+e^{-bx}}\left(-\frac{\partial p(s,0;\theta)}{\partial s}|_{s=0}\right), \end{aligned} \tag{13}$$

where the last equality is obtained by applying Hopital's rule.

Now we allow x to vary. Then a sufficient condition for $Eu_L(0, x; \theta) - Eu_L(s, x; \theta) \geq 0$ is

$$c \geq \frac{1+\beta}{1-\beta}\bar{c} \tag{14}$$

for all $\beta \in [0, \bar{\beta}]$ and $\theta \in \{\theta_1, \theta_2\}$ where $\bar{c} = \arg\max_{x\in[0,\bar{x}]} \left\{\frac{e^{-bx}}{1+e^{-bx}}\left(-\frac{\partial p(s,x;\theta)}{\partial s}|_{s=0}\right) + \frac{1}{1+e^{-bx}}\left(-\frac{\partial p(s,0;\theta)}{\partial s}|_{s=0}\right)\right\}$.
□

Now we turn to the proof of Proposition 1.

Proof. ***G*'s equilibrium strategy**

On the equilibrium path, G cannot influence L's strategy by deviating from its equilibrium strategy, because L cannot observe ϵ and thus cannot detect whether G deviated. Consequently, G simply optimizes its expected value function given L's offer on the equilibrium path.

Since off the equilibrium path, L makes an offer, (s_o, x_o), which is independent of history, it follows that G's choice does not have any inter-temporal effect. Thus it is optimal for G to maximize its one-period utility.

L's equilibrium strategy

We first show that L's strategy off the equilibrium path is the best response to G's strategy off the equilibrium path. We then show that L has no incentive to deviate from the equilibrium path.[29]

Off the equilibrium path, given that G maximizes its one-period utility in any period, L could at best choose an offer (s, x) that maximizes its one-period payoff. Lemma 1 shows that if the unit cost of loan, c, is sufficiently large and the marginal crisis reducing effect of s decreases as s increases, then L's optimal offer in this case is $(s_o, x_o) = (0, 0)$. Note that when L offers $(0, 0)$, it will receive an expected one-period payoff of $\underline{u}_L \equiv \sum_{i=1}^{2} \pi(\theta_i) u_L(s = 0, x = 0; \theta_i)$ in every period.

On the equilibrium path: since the option of offering $(0, 0)$ is still available, L can guarantee a payoff of $\underline{u}_L$ defined above in each period by offering $(0, 0)$. It follows that L has no incentive to deviate from the equilibrium path. Below we show how L determines the optimal offer $(s_b^*(\beta), x_b^*(\beta))$ for the bargaining phase, and $x_p^*(\beta)$ for the punishment phase.

Using the conditional choice probabilities of G's decision, $Pr(d_x, d_s|I_p, \theta)$, in eq (9), L maximizes its value function w.r.t. s_b, x_b and x_p. Let $V^L(I_p, \theta)$ denote L's value function conditional on the observable state I_p and the unobservable state θ. Since both I_p and θ are binary variables, V^L can be represented by a 4×1 column vector, $V^L = (V_{01}^L, V_{02}^L, V_{11}^L, V_{12}^L)'$, where V_{ij}^L is L's value function when $I_p = i$ and $\theta = \theta_j$ for $i \in \{0, 1\}$, $j \in \{1, 2\}$. Then, by definition, V^L solves the following linear system of equations:

$$V^L = Eu^L + \delta_L \mathcal{P}^L V^L \tag{15}$$

Here, $\mathcal{P}^L$ is a 4×4 transition probability matrix, where $\mathcal{P}_{2i+m,2j+n}^L$ denotes the probability for G to transit from $I_p = i$ and $\theta = \theta_m$ to $I_p' = j$ and $\theta' = \theta_n$ for $m, n \in \{1, 2\}$. In addition, $Eu^L = (Eu_{01}^L, Eu_{02}^L, Eu_{11}^L, Eu_{12}^L)'$ is a column vector of L's current expected utility, where Eu_{ij}^L is L's current period expected utility when $I_p = i$ and $\theta = \theta_j$ for $i \in \{0, 1\}$, $j \in \{1, 2\}$. Accordingly, Eu_{ij}^L is given by:

$$Eu_{ij}^L = \sum_{(\tilde{d}_x, \tilde{d}_s) \in \mathcal{A}_G(I_p = i)} Pr(d_x, d_s | I_p = i, \theta = \theta_j) \times u_L(s, x; d_x, d_s, r; \beta, \theta = \theta_j) \tag{16}$$

Since L cannot observe θ when making an offer, it follows from eq (15) that L's objective function is:

$$\max_{(s_b, x_b, x_p)} \sum_{j \in \{1,2\}} \pi_i V_{0j}^L. \tag{17}$$

[29] Note that in this game there is no Bayesian updating for L since θ and ϵ are independently drawn in each period. L calculates its expected utility using the stationary distributions of θ and ϵ.

The solution of the maximization problem gives us $s_b^*(\beta)$, $x_b^*(\beta)$ and $x_p^*(\beta)$.[30] We then obtain the equilibrium interest rates given by eq (4), and the equilibrium choice probabilities given by eq (9). $\square$

[30]In drawing the figures in the main text, we employed a computational approach. The details of the method are provided in the online appendix.

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