# Inequality and Sovereign Default under Democracy

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**Abstract**

*Do differences in the inequality of income affect the likelihood that democratic governments decide not to honor their foreign debt contracts? I argue that sovereign default involves an intertemporal tradeoff between an immediate consumption boost and a future tax increase. Since a poorer voter internalizes less of the future cost of default, as the median is poorer, the majority's demand for default increases. Therefore, greater income inequality implies a higher default risk. I then present a signaling game that models strategic selection that a sovereign must go through to get to the default decision node. I show that sovereign default is most likely to actually occur when the level of income inequality is intermediate. The intuition is that sovereign default occurs when risky sovereigns successfully induce creditors to provide a loan, but the most risky ones are among those least able to do so. Empirical findings support the claim.*

***Keywords:*** *Sovereign debt, sovereign default, democracy, income inequality, strategic interaction, signaling game.*

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**Introduction**

Typically sovereign defaults occur during times of economic trouble, often triggered by large exogenous shocks (Tomz and Wright 2007). However, they are more than simply an economic event since honoring debt obligations by a borrowing government is often a matter of political will. The literature on sovereign debt suggests that defaulting governments have the technical ability to repay debts in most cases; what they often seem to lack is the incentive to do so (Drazen 1998; Panizza et al. 2009). What makes governments under economic distress more or less willing to repay their foreign debts? In particular, do differences in the inequality of income affect the likelihood that democratic governments decide not to honor their loan agreement with foreign creditors?

Political economists have emphasized various perils of ''distributional tug-of-war'' in democracies with extreme income inequality. Inequality and the resulting distributive politics hinder economic growth (Alesina and Rodrik 1994; Persson and Tabellini 1994), contribute to inflationary crises (Desai et al. 2003; Haggard and Kaufman 1995), and lead to massive capital flight (Alesina and Tabellini 1990; Mahon 1996). The underlying logic of these ''populist pathologies'' is that higher income inequality creates a greater political demand for redistributive policies, and opportunistic politicians catering to the (relatively poorer) median voter opt for short-sighted, distortionary policies. Similarly and with regard to sovereign default, Berg and Sachs (1988, 271) find that ''countries with high income inequality had a significant greater likelihood, *ceteris paribus*, of having rescheduled their debts than did countries with low income inequality.''

Besides Berg and Sachs (1988), however, the literature of sovereign default has been silent on income inequality. There are few empirical findings that relate the inequality of wealth and income to the propensity of sovereign default.[2] Most works tend to focus on a number of proximate financial covariates of default instead of delving into underlying causes (e.g., Manasse and Roubini 2009; Pescatori and Sy 2007). As to the political side of the story, the literature also tends to scratch the surface. In an attempt to account for political factors, many only include in a regression equation ''political risk'' indices, such as the International Country Risk Guides (ICRG) index, without asking why some countries are perceived riskier than others (e.g., Gelos et al. 2011; Haque et al. 2000). In this article, I revive the spirit of Berg and Sachs (1988)

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2   A recent, partial exception to this is Giordano and Tommasino (2011).

in the context of democracy and show in a novel way that income inequality indeed is at the root of sovereign default under democracy.

I do so in two steps. First, I argue that sovereign default serves as one form of redistributive policies. Default involves an intertemporal tradeoff between an immediate public consumption boost and a future tax increase. Since the poorer a voter is, the less she internalizes the future efficiency cost of default, the median voter is more likely to find such an intertemporal exchange in her favor as she is poorer relative to the average voter. The majority's demand for sovereign default, then, is greater as the income distribution becomes more skewed. Hence, the risk that a democratic government succumbs to the popular demand for default increases with income inequality.

Second, to derive empirical implications suitable for testing against data, I present a simple signaling game that models the strategic interactions between creditors and sovereigns. Default cannot be observed when it is believed to occur for sure because any rational creditors would not provide a loan in the first place to a sovereign who is going to default at any event. Recognizing this, I claim that there are two steps of strategic selection that a sovereign must go through to get to the point where it actually decides whether or not to default. First, sovereigns select themselves into ''requesting a loan'' by deciding whether or not to send a costly signal. Second, on observing the signal, creditors decide whether or not to lend to the signal-sending sovereign.

It turns out that, somewhat counter-intuitively, sovereign default is most likely to actually occur when the level of income inequality is intermediate if, in fact, higher income inequality implies a greater propensity to default. The intuition is that sovereign default occurs when ''risky'' sovereigns successfully induce creditors to provide a loan, but the most risky ones are among those least able to do so. In addition, the model also provides a prediction that the likelihood that a sovereign is left with no credit monotonically increases with income inequality. Statistical analyses of the incidence of sovereign default as well as that of zero credit access in a sample of democratic developing countries provide strong support for key empirical implications of the model.

### Democracy, Inequality, and Default

Political explanations of sovereign default are closely tied to the ''willingness-to-pay'' model. The model rests on two key features that distinguish sovereign

debt from ordinary one. First, debt repayment is rarely a question of the ability to pay. Borrowing countries generally do not default during good times, but with few exceptions, they choose not to pay even when the debt obligations are such an amount that "could clearly be repaid over the long horizon were there the political will to do so" (Bulow and Rogoff 1989, 156). Whether a borrowing government defaults or not is, at the margin, a political decision (Drazen 2002).

Second, unlike corporate debt contracts, strict means of repayment enforcement are typically unavailable for sovereign borrowing. To secure a debt obligation in case of private borrowing under domestic law, a lender often demands collateral for the loan, the right to which is subject to seizure by the lender in the event of default. When the borrower is the sovereign, however, collateral is largely irrelevant. Debtor assets that could be seized by the lender are worth only a small fraction of outstanding debt (Bulow and Rogoff 1989), and creditors cannot possibly obtain the right to assets within the debtor country (Panizza et al. 2009). Without a world government, sovereign debt contracts are far from enforceable (Tomz 2007).

Why then do borrowing governments make repayments on their foreign debt at all? To induce them to repay, lenders or any third parties must have some penalty devices with which to raise the cost of default high enough to outweigh its benefit. To enforce debt payment, lenders used to resort to "gunboat diplomacy" in the late 19th and early 20th centuries (Mitchener and Weidenmier 2010). Since World War II, lenders have organized trade sanctions on a defaulter (Rose 2005), and have conditioned their future lending decision on a sovereign's track record of repayments (Tomz 2007).

Consider the following simplified version of the willingness-to-pay model (Schultz and Weingast 2003). Suppose that a sovereign seeks a loan of value $L$ at an interest rate $i$, and that the lenders can impose a penalty $P$ in the event of default. Then, when it comes due, the sovereign must choose to repay the lenders $L(1 + i)$ or default and suffer the penalty $P$. It will honor the debt obligation if the cost of default $P$ is greater than its benefit, the windfall gain from its total outstanding debt $L(1 + i)$:

$$L(1 + i) < P. \qquad\qquad\qquad\qquad\qquad\qquad (1)$$

In other words, the sovereign is willing to pay if the inequality above holds.

How does domestic politics under democracy shape a sovereign's willingness to pay? Democratic institutions might make the sovereign willing to pay by raising the value of "political penalties" in the event of default (Schultz and Weingast 2003). Voters may share an interest with sovereign debt-holders in various ways. They

themselves may be debt-holders; they may have a great stake in trade or financial sectors whose interests will be harmed by the backlash of sovereign default (Alesina 1988; Alesina et al. 1992); or they may be inclined to punish the government for reneging on international agreements (Tomz 2005a). In short, high political costs of default for democratic governments might effectively discourage the incumbent politicians from reneging on their debt contracts.

The power of the public, however, can be, and is often, seen as a source of political risks (Desai et al. 2003). Democratic competition and mass mobilization may exacerbate untempered popular demands for distortionary public policy such as inflationary public spending. Politicians in democracy are vulnerable to popular pressure for current consumption, and hence, behave opportunistically by manipulating fiscal and monetary policy to appease voters (Alesina et al. 1997). In the mean time, a government's credibility to long-term commitments is often compromised, and sub-optimal outcomes such as macroeconomic instability ensue. Moreover, elected ''populist'' leaders might be induced to confiscate the assets of the unpopular ''oligarchs'' or those of foreigners to maximize their chances for reelection (Clague et al. 1996).

Given the fact that in a typical developing country, prominent lenders are foreigners who lack political power, it cannot be taken for granted that democratic institutions empower those who stand to benefit from committing to repaying vast outstanding debt at all costs (Saiegh 2005). Indeed, there is no shortage of examples in history of sovereign default that opportunistic politicians catering to the public's strong aversion to staggering debt burden opted for declaring a heroic default on foreign debt (Tomz 2005a 2007). Peru's Alan García is probably the best-known example. During his first presidency in the mid 1980s, he unilaterally declared that he would pay no more than 10 percent of the country's export earnings, which became known as the ''10 percent solution,'' a very confrontational, yet highly popular debt bargaining position (Aggarwal 1996, 393-399). Similarly, Argentina eventually defaulted on about $100 billion foreign debt in the last week of 2001 while angry citizens took the streets shouting, ''Don't pay the foreign debt.'' A leading populist candidate in the previous presidential election held in 1999, Eduardo Duhalde, had called for a suspension of debt payments as his campaign platform (Tomz 2005b). More recently, Rafael Correa, president of Ecuador and well known for his populist stance, said in 2006 at a news conference with Venezuelan president Hugo Chavez, ''If our moral duty to provide health, education and housing to our people impedes

us from paying debt, we won't hesitate two seconds [to default]'' (Kennedy and Bradley 2006). Later he made good on his promise when he declared a suspension of interest payments on the country's bonded debt in 2008, triggering one of the most recent sovereign defaults. A sovereign default can be politically rewarding for reelection-seeking politicians, especially during hard times.

What motivate elected politicians are reward and punishment at the polls. They should opt to default if doing so rewards them with reelection, and they should continue to pay in full if voters punish them for failing to do so. The majority's preference over sovereign default is, therefore, crucial in shaping a democratic government's willingness to pay. I argue that the majority's preference over default, in turn, is largely determined by the distribution of income.

The issue of sovereign default maps well into the rich-poor dimension because it implies an increase in public consumption financed by a future tax increase. To see why, note first that sovereign default involves both immediate windfall gains and considerable long-run costs. Failure to pay the total outstanding debt in full would bring the government lump-sum revenue that substitutes for the need to raise taxes or reduce spending (Alesina et al. 1992). The mean total external debt as a percentage of GDP is about 70 percent for all developing nations, and when they pay, they spend on average about 18 percent of their total earnings from exports for debt payments. For many highly indebted countries, the total external debt easily amounts to 200 percent or even to 300 percent of GDP. It is not uncommon that the total debt service exceeds 30 percent of export earnings (World Bank 2005). A default on outstanding debt would then generate instant revenue that amounts to 18 percent of export value at a minimum.

Sovereign default, on the other hand, is costly in the medium and long term. It is hard to estimate the effects of default on the economy as a whole because when a government defaults, usually situations are already in bad shape. However, a number of studies have suggested that a defaulting economy suffers overall output losses over the long run (Cohen 1992; De Paoli et al. 2006; Dooley 2000). In particular, it inflicts high costs on the defaulters in the future credit markets. Defaulting governments lose reputation, if they had any, and will have difficulty borrowing in the future (Borensztein and Panizza 2009). Their credit ratings will plunge in the event of default; so will their bonds prices, and the interest rates at which they can borrow will triple. As a result, they end up having to pay more for a dollar they borrow in the future than they would otherwise have had to.

Borrowing is an intertemporal tax smoothing instrument: Spending today with a loan and paying tomorrow (Barro 1979). Default is just another mechanism for intertemporal tax smoothing at the payment due date: Spending now again instead of repaying the debt and paying still later (Cohen 1982). Just like borrowing implies a future tax to repay the debt, default implies a higher future tax to pay the borrowing costs that are increased due to the default. Hence, voters' preferences over default are parallel to those over borrowing, which in turn boil down to the preferences over future tax rates. When considering default, voters must weigh the marginal current consumption benefit against the future deadweight loss due to higher tax rates.

As in the standard models of income taxation, it follows that the median income voter is more likely to prefer default to repayment as its income is farther away from the average income level (Meltzer and Richard 1981; Persson and Tabellini 2000). This is because the poorer a voter is, the less she internalizes the future efficiency cost of a higher tax to which she contributes only proportional to her income while enjoying the same unit of public consumption today. As Hatchondo and Martinez (2010, 296-297) succinctly put, ''a default is likely to be prevented as long as wealthier … citizens impose their will.'' Hence, as an increase in inequality implies that the gap between the median and the mean income levels is wider, the public demand for sovereign default should be greater with higher income inequality, making its government more prone to default.[3]

There are two other reasons why the poor are more likely to prefer default than the rich.[4] First, the poor benefit more from the increased current consumption than the rich. The immediate benefits of default, in practice, are often realized as waived costs of fiscal adjustment because default is considered as an option during bad times when there is no means other than drastic fiscal retrenchment to continue to repay the rapidly swelling outstanding debts (Haggard and Kaufman 1989). By deciding not to pay in full, the defaulting government could avoid costly austerity measures and honor its ''social contracts'' by keeping up the public spending pattern. The costs of fiscal adjustment fall disproportionately on the poor. Drastic government budget cuts harm those who are on public payrolls and hurt unemployed and poor citizens who rely heavily on public transfers and services (Haggard and Kaufman

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3   In a similar vein, Karayalçin and McCollister (2004) argue that inequality leads to popular pressures on the government to use foreign debt to finance a redistribution of income.

4   These two additional reasons the assumptions implicitly made above that government consumption is distributed equally and tax rates are proportional to income.

1992; Nelson 1990). Empirical studies of the effect of IMF stabilization programs have shown that they tended to further impoverish low-income families and reduce the labor's share of income (Pastor 1987; Vreeland 2002; 2003). Hence, with such costs waived, default benefits the poor more than the rich.[5]

Second, the poor tend to discount the future more heavily than the rich do. The rich, by definition, are endowed with more assets that generate future income streams such as land, financial assets, and human capital. As Alichi (2008, 4) argues, ''different individuals have different attitudes to their country's reputation in capital markets. Some care more than others about access to them as insurance against future bad shocks to the economy.'' Possessing these assets that promise future income streams makes the rich value more highly the future and more susceptible to the reputational costs caused by default. Hence, the perceived burden of future taxes is disproportionately higher on the rich.

In short, sovereign default implies an intertemporal tradeoff: An immediate public consumption financed by a future tax that is higher than it would otherwise have been, the overall effects of which are distributional from the rich to the poor. Since the majority's demand for such an intertemporal exchange is greater as the income distribution becomes more skewed, the risk that a democratic government succumbs to the popular demand for default increases with the income inequality.

### Modeling Strategic Selection

The discussion in the previous section suggests that the level of income equality is one of the observable characteristics of the borrowing country from which creditors can infer its willingness to pay. Creditors then can project the propensity to default of a given country based on its equality-related willingness to pay as shown in Figure 1. As greater willingness to pay, by definition, implies a less propensity to default, the probability of default should be monotonically decreasing with the level of income equality.

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5  Consistent with this argument, a survey conducted in Argentina, 2002, has shown that low-income people tended to prefer a suspension of debt payment (Tomz 2005b).
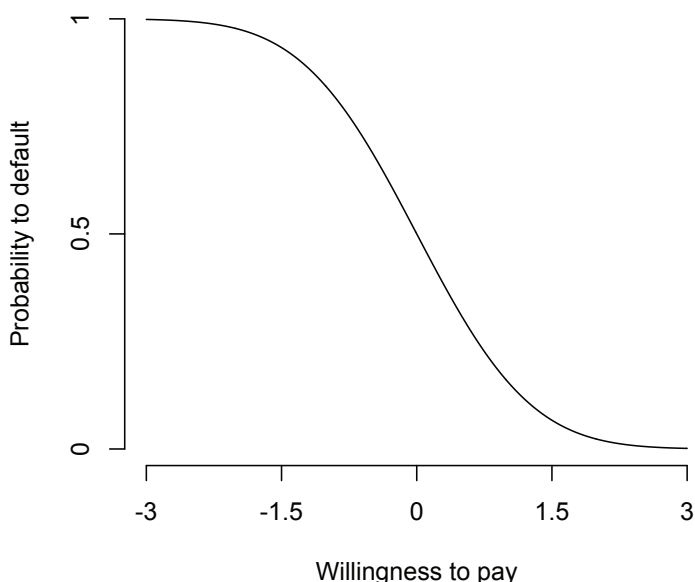
**Figure 1:** The Propensity to Sovereign Default

If this is true, however, can one observe this pattern in data on sovereign default? Consider a sovereign located in the far left of Figure 1. It is characterized by extreme income inequality, hence almost certain to default *ex ante*: Its probability to default is close to one. Why would then any rational creditors lend to the sovereign in the first place? In fact, the willingness-to-pay model of sovereign default suggests that no credit is provided more than a sovereign is believed to be willing to repay. If a sovereign prefers not to repay (i.e., $L(1 + i) > P$), it has no incentive to honor its promise to repay. If it has no incentive to carry out that promise, its promise is not credible, and no rational creditor would extend a loan in the first place. If the sovereign is denied access to credit, then it cannot actually default because it would not have a loan to default on. Therefore, one should not observe in sovereign default data such a monotonic relationship between observable characteristics of willingness to pay and the likelihood of actual default.

To predict what pattern is expected to emerge instead, I model strategic interactions between a sovereign and a bank as a signaling game with two-sided incomplete information (see Figure 2).[6] In the model, the sovereign is always seeking a

6  Aggarwal (1996) develops game-theoretic models of debt renegotiations to predict outcomes of debt rescheduling with an assumption that both sides know each other's payoffs. Tomz (2007), assuming incomplete

loan; in other words, a loan is a good even though it needs to repay. Its preference over default depends on its type. It prefers to repay if it is willing to pay, that is, if its payoff to repaying exceeds that to defaulting. The sovereign's decision on whether or not to default, however, can be made only when the bank has lent it a loan. The bank prefers to lend than to reject a loan request provided the loan is to be repaid, and it least prefers to extend a loan that will not be paid back. The bank must decide whether or not to lend upon the sovereign's request with a signal, and it does so by carefully investigating the sovereign's willingness to pay as well as its ability to do so. If the sovereign chooses not to request a loan, the status quo prevails.
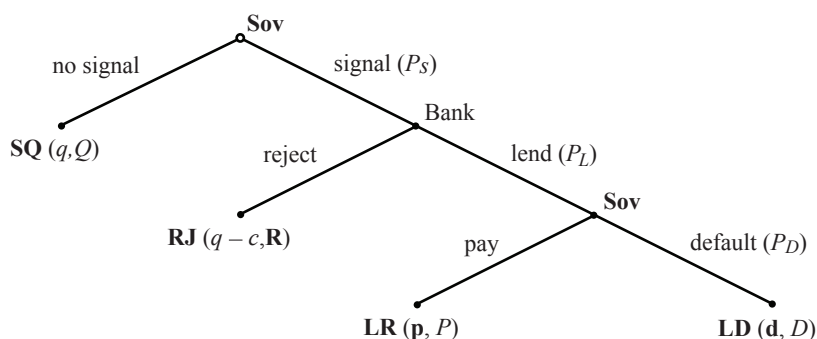


**Figure 2:** The Sovereign Default Game with Incomplete Information

The bank faces uncertainty regarding the sovereign's type: the bank is not sure how willing the sovereign is to pay.[7] Specifically, the bank knows only the probability distributions of the sovereign's payoffs to paying $(\mathbf{p} \sim N(\pi, \sigma^2))$ and to defaulting $(\mathbf{d} \sim N(\delta, \sigma^2))$, but not what their true values are. So the bank is, say, about 95 percent sure that the sovereign's true payoff to paying is in the range $(\pi - 2\sigma, \pi + 2\sigma)$, but not sure exactly where it is. It forms this prior belief, the mean values $\pi$ and $\delta$, in particular, from the sovereign's observable characteristics such as income inequality. On

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information, develops his reputational theory of sovereign debt to explain how a borrower's reputation forms and how reputation affects its incentive to repay. My goal is related but simpler: to derive predictions on how borrower's observable characteristics affect lending and default decisions.

7 It is true that creditors know, to some extent, which countries are ''risky'' and which ones are ''safe.'' There is a great deal of information on country risk that is publicly available. Creditors also have good reason to collect every piece of information on potential borrowers lest they incur a loss from default. However, it is also true that there always exists some degree of uncertainty in the real world, and this inherent uncertainty explains in part why in reality some creditors ''wrongly'' lent to a sovereign, which then defaulted. The assumption that creditors face uncertainty regarding how risky or safe the potential borrowing countries are, is innocuous, and perhaps, more realistic.

its part, the sovereign is also uncertain about the bank's payoff to loan rejection $(\mathbf{R} \sim N(\rho, \sigma^2))$.

The uncertainty faced by the bank gives the sovereign an incentive to represent or misrepresent its type. A sovereign of a willing-to-pay type should want the bank to know for sure that it is of a good type, and hence, has the incentive to send such a signal to the bank. A sovereign of an unwilling-to-pay type, on the other hand, might want to mimic the behavior of the good-type sovereign by sending the same signal, an attempt to mislead the bank to believe that it is of a good type as well. To the extent that any unwilling-to-pay types send the same signal, the signal does not carry any information. Then it is mere "cheap talk."

For a signal to be at least partially informative, it must be costly enough to be unaffordable to some bad types. There are a number of policy tools that governments have used as a costly signal: Signing an agreement with the IMF (Edwards 2006), liberalizing the capital account (Bartolini and Drazen 1997), signing international trade agreements or investment treaties (Elkins et al. 2006), granting the central bank independence (Pastor and Maxfield 1999), fixing the exchange rate to an anchor currency (Bernhard and Leblang 1999; Broz 2002), adopting inflation targeting policy, appointing a high-profile businessperson to the ministry of finance, and the like. These are policy tools at a government's disposal, and are used implicitly or explicitly to enhance the government's credibility in the eyes of international creditors and investors. What makes them a signal to the market is the "sovereignty cost" that they involve. By entering into an explicit international agreement or abandoning its policy autonomy, the government loses a great deal of policy-making authority that it could use to serve its interests otherwise. The fact that it has paid such an opportunity cost signals its commitment to behaving well in the global markets (Elkins et al. 2006; Vreeland 2003).

In the model, if the sovereign sends a signal to request a loan, but fails to induce the bank to lend, then it is left strictly worse off since it has only incurred the cost of the signal ($c > 0$). As such, the sovereign can be deterred from requesting a loan with a costly signal if its status quo payoff exceeds the expected payoff to signaling, which depends on the bank's lending probability ($p_L$), a probability that the bank will lend to the sovereign on observing that the sovereign has sent a costly signal. In other words, the sovereign pays the cost of sending a signal if $q < (1 - p_L)(q - c) + p_L \max(\mathbf{p}, \mathbf{d})$.

The bank, on the other hand, makes its lending decision upon the sovereign's

request by weighing its payoff to rejection against the lottery payoff from lending to a potentially risky sovereign, which depends on the bank's posterior belief about the sovereign's willingness to pay, or its default probability ($p_D$), a probability that the sovereign will default if a loan is provided given that it has sent a signal. That is, the bank lends to the sovereign if $\mathbf{R} < (1 - p_D)P + p_D D$. While the sovereign does not know what $\mathbf{R}$ is, it nonetheless knows the probability that this inequality holds, or $p_L$, and as explained, conditions its choice of signaling on this probability.

Since a higher $p_D$ implies a lower $p_L$, the sovereign's signaling probability ($p_S$), a probability that the sovereign sends a signal should also decrease with $p_D$. On the other hand, $p_D$, the conditional probability that the sovereign will default given that it has sent a signal, is proportional to the joint probability that it prefers to default ($\mathbf{p} < \mathbf{d}$) and it prefers to pay the signaling cost ($\max(\mathbf{p}, \mathbf{d}) > q + c(1-p_L)/p_L$). Given $p_L$, this joint probability is higher if the difference in the mean payoffs, ($\pi - \delta$), is farther below from zero. In words, the posterior probability that the signal-sending sovereign will default is higher if its observables suggest a priori that it is of a highly risky type. Then, a sovereign with a higher prior probability to default will have a lower probability of the bank's lending, and hence, will send a signal with a lower probability in the first place.

This is the logic behind the perfect Bayesian equilibrium (PBE) of the game.[8] Formally, given its posterior belief $p_D$, the bank lends to the sovereign if

$$\mathbf{R} < (1 - p_D)P + p_D D. \tag{2}$$

Since $\mathbf{R}$ is normally distributed, the probability that this inequality holds is

$$p_L = \Phi(pD_D + (1 - p_D)P - \rho), \tag{3}$$

where $\Phi$ is the standard normal cumulative distribution function (normalizing $\sigma$ equal to one).

Given its belief about the bank's strategy, $p_L$, in equilibrium, the sovereign signals if

$$q < (1 - p_L)(q - c) + p_L \max(\mathbf{p}, \mathbf{d}), \tag{4}$$

or

$$\max(\mathbf{p}, \mathbf{d}) > q + c(1 - p_L)/p_L. \tag{5}$$

The probability that the sovereign signals is

$$p_S = 1 - \Phi(q^* - \pi)\Phi(q^* - \delta), \tag{6}$$

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8   The following formalization is drawn from Lewis and Schultz (2003).

where $q^* = q + c(1-p_L)/p_L$.

The conditional probability that the sovereign will default given that it has sent a signal is

$$p_D = \text{Prob}[\mathbf{p} < \mathbf{d} \cap \max(\mathbf{p}, \mathbf{d}) > q^*]/ps, \tag{7}$$

or

$$p_D = \text{Prob}[\mathbf{p} < \mathbf{d} \cap \mathbf{d} > q^* ]/p_S. \tag{8}$$

With these equilibrium strategies, it is now possible to calculate each of the four outcome probabilities of the game, the status quo ($SQ$), signaling and rejecting ($RJ$), lending and repaying ($LR$), and lending and defaulting ($LD$) as follows:

$$\text{Prob}(SQ) = 1 - ps, \tag{9}$$

$$\text{Prob}(RJ) = p_S(1 - p_L), \tag{10}$$

$$\text{Prob}(LR) = p_S\, p_L\, (1 - p_D), \tag{11}$$

$$\text{Prob}(LD) = p_S\, p_L\, p_D \tag{12}$$

These are the probabilities that each outcome is observed in equilibrium. One expects to observe, for instance, $LD$, the outcome of lending and default, with a probability $p_S p_L p_D$. Note that the solution to the three equilibrium probabilities, $p_S$, $p_L$, and $p_D$, is not of a closed form: One solution is a function of the others. I thus performed simulations to solve this system of equations numerically. First I normalized the distributions of the three random payoffs ($\mathbf{p}$, $\mathbf{d}$, and $\mathbf{R}$) to the standard normal distribution. Then I assigned values to other fixed payoffs in such a way that is compatible with the payoff structure of the game. Specifically, I set $P$ to 3 and $D$ to -3 for the bank, and $q$ to $(\min(\pi, \delta) - 3)$ and $c$ to 0.5 for the sovereign. With this particular set of payoffs, the solution is the following: $p_S = 0.54$, $p_L = 0.72$, and $p_D = 0.30$. This solution is, in turn, translated into the four outcome probabilities as follows: $\text{Prob}(SQ) = 0.46$, $\text{Prob}(RJ) = 0.15$, $\text{Prob}(LR) = 0.27$, and $\text{Prob}(LD) = 0.12$. Thus, with the sovereign's mean payoffs to repayment and to default both set to zero, the probability that its default is actually observed is about 0.12.

As noted above, these outcome probabilities change as the sovereign's mean payoffs change. To see how those probabilities vary as a function of the sovereign's willingness to pay, I varied the mean of $\mathbf{p}$ from -4 to 4 while holding the others constant. The resulting comparative statics then should provide predictions about the outcomes of the game as a function of the mean value of willingness to pay, or the relative size of the mean payoff to repaying given the mean payoff to defaulting.

The simulation results are shown in Figure 3. The top-left panel is the probability of the status quo. It displays how the first step of strategic selection occurs. It shows

that the probability of self-screening decreases monotonically with the sovereign's mean willingness to pay. That is, the more willing-to-pay the sovereign is expected to be, the more likely it is to send a costly signal. Conversely, those sovereigns characterized by riskier factors to begin with are more likely to be deterred from sending a costly signal in the first place, hence to be left with no credit.
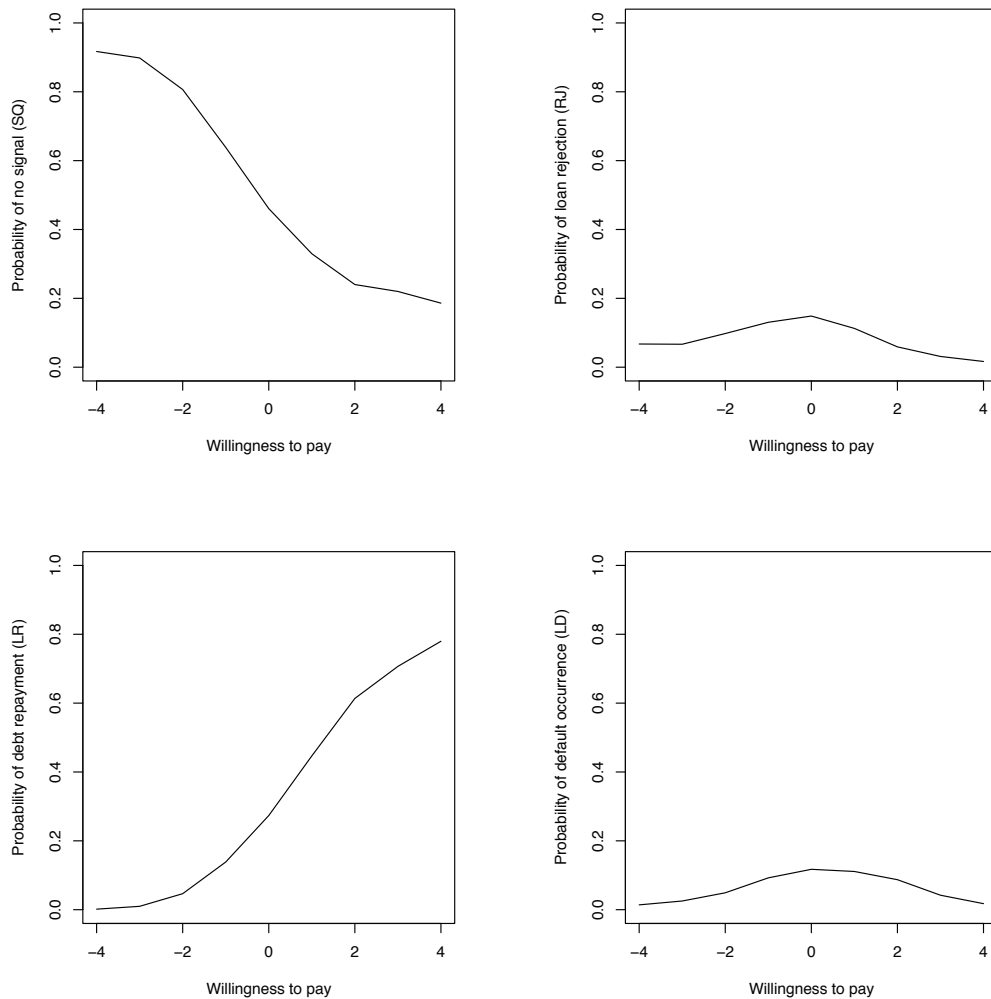


**Figure 3:** The Four Equilibrium Outcome Probabilities

The top-right panel describes the probability of rejecting a loan request. This regards the outcome of the second step of the strategic selection. It increases first

and then declines as the sovereign's mean willingness to pay increases. It goes up first because while the sovereign with a high-risk profile is increasingly more likely to request a loan by sending a signal, the bank tries to remain cautious in increasing its lending probability. It is not until there is a greater chance that the signal sender is in fact of a good type that this probability starts to decline.

At the bottom-left the probability that a sovereign debt repayment occurs is shown. It increases monotonically, but kicks in only after some point. No repayment is expected to be made by a high-risk profile sovereign because it is unlikely to signal in the first place, and even if it did, its request is likely to be rejected by the bank, and finally, even if it successfully induced the bank to lend, it is likely to be in fact of a risky type, hence no repayment. It increases with the mean willingness to pay because the sovereign is increasingly more likely to signal, more likely to get a loan, and more likely to repay as its risk profile improves.

Finally, the bottom-right panel displays the probability that a sovereign default occurs, the outcome of primary interest. A central feature of the pattern here is the non-monotonic relationship between the sovereign's mean willingness to pay and the probability of a default outcome. A sovereign with very low mean willingness to pay such as a democracy with extreme income inequality is very unlikely to actually default because it is very unlikely to send a costly signal in the first place. As the mean willingness to pay increases, it is more likely to request a loan expecting a higher lending probability. Yet there is a higher chance that the sovereign in fact prefers to default until the mean willingness to pay turns positive. Thus, the default probability goes up first. However, it then declines as the sovereign is increasingly more likely to be of a good type.

Note that as the mean willingness to pay approaches the center of the distribution where the bank believes with about a 50-50 chance that the sovereign is willing to pay, the uncertainty on the bank's part is the greatest. Here, the probability that a default occurs is the highest because the unwilling-to-pay type is most likely to succeed in inducing the bank to provide a loan. This makes sense intuitively. Sovereign defaults occur when ''risky'' sovereigns successfully induce creditors to lend, but the most risky ones are those who are unambiguously risky to the creditors, and hence are among those least able to mislead the creditors. Somewhat risky sovereigns, in contrast, are those who pose the greatest uncertainty to the creditors, and hence, are most likely to lead the creditors to ''wrongly'' extend a loan.

There is a good deal of impressionistic evidence that is supportive of this claim.

Argentina is a country with relatively moderate income inequality with an average Gini of 46.3 and one of the few countries that have enjoyed consistent access to credit market. Yet it has defaulted more than two times as often as others have. Its neighboring Paraguay, on the other hand, is characterized by more extreme inequality with an average Gini of 55.0 and has suffered from consistent lack of access to private credit presumably due to the lack of credibility. Not surprisingly, Paraguay has not defaulted once. Still another neighbor, Uruguay, has a relatively equal income distribution with an average Gini of 42.9, by Latin American standards, and has had quite consistent access to private capital, and yet never defaulted at least until 2003. A similar triplet can be found in sub-Saharan Africa. Madagascar with moderate income inequality with an average Gini of 50.2 has been one of the few countries in the region that have occasionally had access to private capital, and yet has frequently defaulted about three times more often than average countries have. The Gambia, a country with extreme inequality with an average Gini of 71.0, has never had access to credit, and has never defaulted. Mauritius, on the other hand, has a relatively equal income distribution with an average Gini of 39.1, and has frequently had access to credit, but has not defaulted yet.[9]

In short, sovereign default is most likely to be observed when the mean willingness to pay of a sovereign is at the intermediate level. That is, both highly unequal and highly equal democracies are less likely to actually default than democracies with moderate income inequality. While highly equal democracies prefer not to default, highly unequal ones cannot secure a loan to default on. This is the central prediction of the model, and I now turn to statistical analysis to test this hypothesis.

### Data and Analysis

I test the central prediction of the model as depicted at the bottom-right panel of Figure 3 by examining the impact of income inequality on the probability of default occurrence in 48 developing democracies between 1970 and 2009.[10] Data on default and other debt indicators are all from the World Bank's Global Development Finance (GDF). Data on economic controls are from the World Bank's World Development

9  The information on countries' market access history is from Gelos et al. (2011). They construct the data from Capital Data (Bondware and Loanware), which is not publicly available.

10 Ideally, one could estimate the effect of income inequality on default using a two-stage selection model, in which the access to credit is directly modeled as the selection process. This, however, requires data on sovereign debts contract-by-contract. Without such data, no options seem feasible other than shooting for the pattern that should emerge from the selection.

Indicators (WDI). I treat a country-year as democracy if its *Polity2* score in the Polity IV dataset (Marshall and Jaggers 2010) is zero or higher. For a robustness check, however, I also employ +6 as well as -6 for the cutoff points. My sample includes all cases for which complete data were available. A full list of countries and years is provided in Appendix A.

### Dependent Variable: Default

To determine when a sovereign defaulted, I employ a definition of sovereign default commonly used by economists (e.g., Reinhart et al. 2003): Default occurs when a country fails to meet principal or interest payment on the due date or when it restructures its external debt. This definition of sovereign default is also largely consistent with the criteria that leading rating agencies employ to define default. Moody's Investors Service (1999), for instance, defines default as ''(1) any missed or delayed payment of interest and/or principal or (2) any exchange where the debtor offers the creditor a new contract that amounts to a diminished financial obligation or (3) where the exchange has the apparent purpose of helping the borrower avoid default.'' In short, the accumulation of debt payment arrears and a rescheduling arrangement are the two indicators of whether a sovereign defaults or not.

More precisely, *Default4050*, the dependent variable, takes one if the increase in the stock of total arrears exceeds 4 percent of total debt from private creditors[11] or if the total amount of debt rescheduled exceeds 5 percent of total debt from private creditors unless the stock of total arrears decreases by more than the amount of debt rescheduled in the same year, and zero otherwise.[12] To make sure that results are not driven by a particular choice of default thresholds, I employ two additional thresholds. *Default2025* has thresholds of 2 percent for arrears and 2.5 percent for rescheduled debt, and *Default6075* has 6 percent and 7.5 percent for each. In the sample, about 25.4 percent of country-years are coded as default for Default4050. The corresponding numbers are 31.0 percent and 20.5 percent for Default2025 and Default6075, respectively.

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11 I focus on default on private debt (from commercial banks and bonds) as opposed to official debt because official creditors such as international financial institutions might not act as a pure creditor seeking profits from lending business and might be affected by some 'political' considerations (Stone 2004).

12 Note that the threshold is applied to a change of arrears. As Peter (2002) suggests, this flow-based operationalization better captures yearly variations in debt repayment behaviors. A new default occurs whenever there is a large (four percent or greater) increase in arrears.

### Independent Variable: Equality

To facilitate interpretation, I use, as a measure of an income distribution, *Equality*, which is simply calculated as (100 - Gini index). It represents, according to my theory, a sovereign's mean willingness to pay, or one key factor from which potential creditors infer a sovereign's willingness to pay. To fit the inverted-U shaped relationship, I include its square term, $Equality^2$, the coefficient on which should be significantly smaller than zero if the results are to be supportive of my prediction.

The Gini index of income inequality is taken from the Standardized World Income Inequality Database (SWIID). The database standardizes the United Nations University's World Income Inequality Database (WIID) using as the standard the Luxembourg Income Study (LIS) data to maximize comparability for the largest possible sample of countries and years (Solt 2009). It provides Gini indices of both gross and net income inequality for 153 countries. I use gross income Gini to capture the degree of potential demands for income redistribution in a country. The sample mean of Gini index is 47.7 while the minimum is 24.1 and the maximum is 77.3.

### Control Variables

In addition to income inequality, I include a host of control variables. First, the level of indebtedness (*Total debt*), measured as the ratio of total outstanding external debt to GDP, may be an indication of how willing a sovereign is to pay. Many heavily indebted countries borrowed foreign debts mostly by way of bilateral or multilateral official lending and accumulated them over time. Heavy indebtedness is indeed a sign of the lack of willingness as well as the inability to pay (Easterly 2002).

Second, economic development, measured by *GDP per capita*, may affect a sovereign's willingness to pay just like how income distribution affects it. As a country becomes richer, the majority may prefer not to incur long-run costs of default than to boost immediate consumption. Third, greater trade openness (*Trade*) may also make a sovereign more willing to pay (Lane 1999; Rose and Spiegel 2004). In the event of default, creditors might block trade-related short-term credit and even impose trade embargoes. Hence, the more trade-dependent a country is, the higher the costs of default might be.[13] I also include a measure of political competitiveness, *Democracy*, to see if there is any "democraticness" effect on default among democracies. The

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13 The relationship between trade and default is subject to a debate, however. For instance, Tomz (2007) argues that trade sanctions are not an effective punishment tool because they require all major trade partners of a defaulting country to co-operate in forgoing profits from trade.

more democratic a democracy is, the less likely it might commit a default.

I include several standard liquidity indicators for controls as well. *GDP growth* is included to control for business cycle that might affect the sovereign's ability to pay. The ratio of short-term debt to reserves (*Short-term debt*) and the amount of international reserves (*Reserves*) are included as indicators of potential debt servicing difficulties in the short run (Detragiache and Spilimbergo 2001; Edwards 1984). The U.S. interest rate (*US interest rate*) is added as a proxy for global liquidity.[14] The summary statistics of the variables used in this analysis is provided in Appendix B.

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14 I checked multicollinearity of the models by calculating variance influence factors (VIFs). The mean VIFs are around 3 indicating the absence of the problem. To the extent that the variables are collinear, the main source of the problem is Democracy, whose VIF is quite high around 9. Running regressions omitting Democracy reduces VIFs further down to 2 without causing changes to the main findings.

**Results**

I estimate the effect of income inequality on the incidence of sovereign default using logistic regression. The regression results are reported in Table 1.

**Table 1:** Income equality and the incidence of sovereign default

| | (1) Fixed-effects | (2) Random-effects |
|---|---|---|
| Democracy | 0.12* (0.06) | 0.08 (0.06) |
| Equality | 0.03 (0.03) | 0.04** (0.02) |
| Equality$^2$ | -0.004** (0.002) | -0.003** (0.002) |
| Total debt | 0.50* (0.29) | 0.43* (0.24) |
| GDP per capita | -1.3*** (0.43) | -5.2*** (0.18) |
| Trade | 0.002 (0.007) | -0.005 (0.005) |
| GDP growth | 0.003 (0.02) | -0.005 (0.02) |
| Reserves | -0.05** (0.02) | -0.03* (0.02) |
| Short-term debt | 0.54 (0.64) | 1.3* (0.68) |
| US interest rate | 0.10** (0.05) | 0.11** (0.04) |
| Eastern Europe | | 1.84** (0.94) |
| Latin America | | 2.07** (0.95) |
| Sub-Saharan Africa | | 1.26 (0.88) |
| South Asia | | -1.50 (1.24) |
| Constant | | -3.6*** (1.0) |
| Observations | 804 | 1198 |
| Countries | 48 | 79 |
| Note: Logistic regressions. Standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.01. | | |

Model 1 tests a model of Default4050 using fixed-effects while Model 2 uses random-effects. I performed Hausman tests, and its results indicate that fixed-effects models should be used. On the other hand, fixed-effects in a logistic model may suffer from a sample selection bias as cases with no varying dependent variable are deleted from the sample. The results from both methods, however, look very similar across the board, assuring that the sample using fixed-effects models does not systematically differ from that using random-effects models.

Throughout the models, the controls also generally have the expected signs when they carry some significance. Not surprisingly, the level of outstanding external debt scaled by GDP is associated with a greater probability of default. GDP per capita turns out to be highly significant suggesting that a richer developing country has a greater incentive to pay back its debt on time than a poorer one. More reserves, an indication of a greater ability to pay, often mean a less likelihood of default while more short-term debt tends to put a greater strain on a country's balance of payments during a debt crisis. When the credit is tight in the global North, measured by the U.S. interest rate, developing countries likely have harder time avoiding sovereign default.

Trade and GDP growth, however, do not seem to matter much in the likelihood of default. Democracy, on the other hand, tends to be positively related with default to the extent that it is significant. Perhaps, greater electoral competition, political participation, and checks and balances, by making the government more transparent in its ability to pay, may enable the government to default without suffering as much reputational costs as less democratic, less transparent governments have to (Kim and O'Neill, forthcoming).[15]

Regarding the variables of ''willingness-to-pay,'' the results for Equality are consistent throughout the regressions. As expected, the coefficient for its square term is negative and highly significant, indicating that its relationship to the probability of default is of an inverted U-shape. Figure 4 depicts the predicted probability of de-

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15 I also included additional controls. One might argue that a government's ideology matters in that governments of the left tend to be nationalist and populist with regard to foreign capital and, therefore, are more likely to default on foreign debt. Thus, I added dummies for Right and Center governments using a governing party's ideology measure, taken from the Database of Political Institutions (DPI; Beck et al. 2001). Both of the coefficients were negative suggesting that governments of the Center and Right are less likely to default than those of the Left. But they were not significant throughout the models. I also added the log of GDP to account for the size of an economy, the terms of trade variable to account for the size of exogenous shocks, and the ratio of interest payments to exports. The main results were not affected by these additional controls.

fault as a function of Equality holding all others at their means based on regression 1. As shown, the predicted pattern from the theoretical model is nicely recovered in the empirical model. Democracies with the intermediate level of income inequality have a substantially higher chance to default than those with extreme inequality and those with a relatively equal income distribution. The expected probability, when Equality is around 42 (or a Gini index of 58), just below the mean, is about 0.20, or 20 percent of the time. It deceases substantially as Equality moves in either direction. If Equality is down one standard deviation below the mean (35 or a Gini index of 65), the probability of default is predicted to decrease to 0.17, or 17 percent of the time. With Equality down further to two standard deviations below the mean, the probability of default goes down to 0.05, a 75.0 percent decline. The same is true when Equality moves in the other direction. If it increases by one standard deviation (55 or a Gini index of 45), the predicted probability goes down to 0.1, or 10 percent of the time, and with the two standard deviation increase in Equality, the probability decreases to 0.03, a significant reduction.
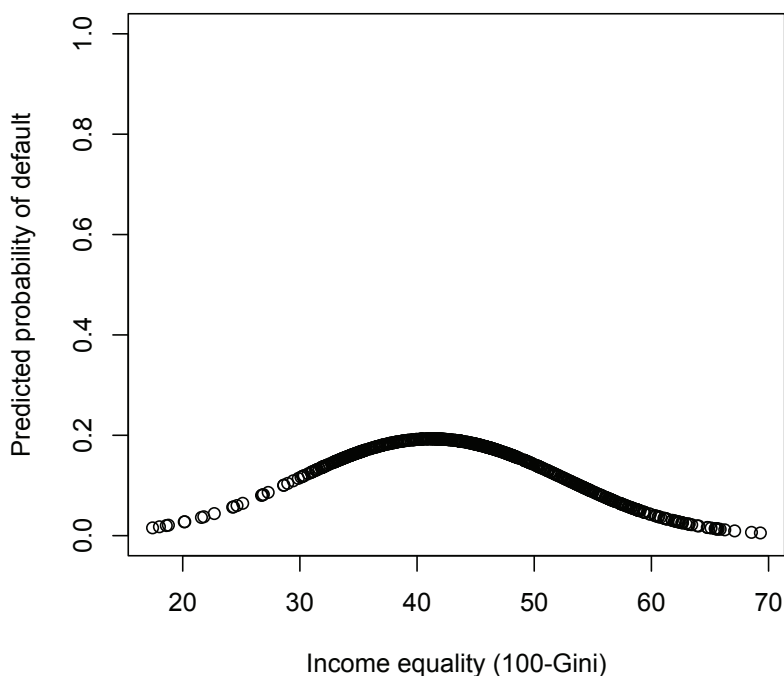


**Figure 4:** The Predicted Probability of Sovereign Default

To check the robustness of the results, I estimate models with lower and higher cutoff points for democracy. As shown in Table 2, the results are consistent across

models. The coefficient on Equality[2] remains correctly signed and significant at the 0.05 significance level in Models 3 and 4. This consistency across different thresholds both for democracy and default lends further confidence to the main empirical findings about the relationship between income inequality and sovereign default. Models 5 and 6 employ less and more stringent definitions of default, Default2025 and Default6075. The results fall short of the conventional level of significance, yet its sign and magnitude remain nearly identical.[16]

**Table 2:** Robustness checks

| | (3) poltiy2 ≥ -6 | (4) polity2 ≥ 6 | (5) Default2025 | (6) Default6075 |
|---|---|---|---|---|
| Democracy | 0.02 | 0.27 | 0.09 | 0.13* |
| | (0.02) | (0.16) | (0.06) | (0.07) |
| Equality | 0.03 | 0.03 | 0.04 | 0.02 |
| | (0.02) | (0.03) | (0.03) | (0.03) |
| Equality[2] | -0.003** | -0.005** | -0.002 | -0.003 |
| | (0.001) | (0.002) | (0.002) | (0.002) |
| Total debt | 0.70*** | 0.63* | 0.81*** | 0.69* |
| | (0.24) | (0.34) | (0.30) | (0.39) |
| GDP per capita | -1.1*** | -1.2*** | -1.2*** | -1.6*** |
| | (0.36) | (0.43) | (0.36) | (0.50) |
| Trade | -0.002 | 0.006 | -0.001 | 0.005 |
| | (0.006) | (0.008) | (0.007) | (0.008) |
| GDP growth | -0.009 | -0.001 | 0.01 | -0.02 |
| | (0.01) | (0.024) | (0.02) | (0.02) |
| Reserves | -0.033** | -0.054 | -0.05*** | -0.05** |
| | (0.017) | (0.023) | (0.02) | (0.03) |
| Short-term debt | 0.07** | 0.03 | 0.02 | 0.05 |
| | (0.03) | (0.07) | (0.06) | (0.06) |
| US interest rate | -0.02 | 0.16*** | 0.07* | 0.07 |
| | (0.04) | (0.122) | (0.04) | (0.05) |
| Observations | 1144 | 574 | 884 | 757 |
| Countries | 67 | 34 | 52 | 45 |
| Note: Logistic regressions with fixed-effects. Standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.01. | | | | |

16 I also performed a full-out Leamer-type specification test using *rcheck* command in *Stata 12* to see how sensitive the main results are to additions and omissions of the variables in the right-hand side of the equation. Of all possible permutations, the coefficient for Equality[2] is negative 100 percent of the time, and significantly so at the 0.05 level about 61 percent of the time, indicating that the main results are quite robust to different specifications.

**Inequality and Zero Access to Credit**

Sovereign default occurs most likely when income inequality is at the intermediate level. This finding is a necessary piece of evidence to support my theory, but hardly a sufficient one. There might be other reasons why this non-monotonic relationship exists in the data. One additional testable implication of the model regards the probability that a sovereign is denied access to credit. This outcome can be observed either because the sovereign opts not to send a costly signal or because the bank refuses to lend the sovereign that has requested a loan. In practice, there is no way to test each outcome separately because measuring who sent a costly signal and when it did is not obvious. However, it is possible to predict and test the joint probability that a sovereign receives no credit for either reason.

Figure 5 depicts the probability of zero access to credit as a function of the mean willingness to pay. This is just the sum of the two probabilities at the top panels in Figure 3. It shows that the probability of zero access to credit decreases monotonically with the mean willingness to pay. In other words, the greater the inequality of income, the more likely the sovereign has no access to credit. This explains why democracies with extreme income inequality are less likely to actually default than those with moderate income inequality. They appear more "risky," and so they are "less often" given access to credit, hence, less likely to commit a default.
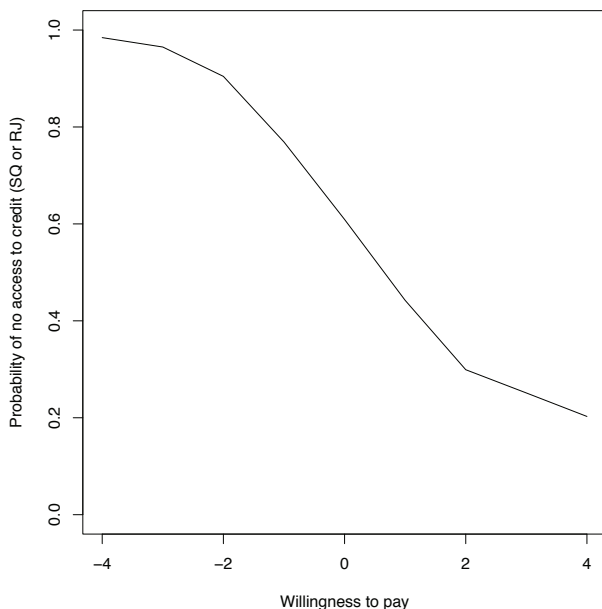


**Figure 5:** The Probability of Zero Access to Credit

I test this prediction on the probability of zero access to credit using data on the average interest rates charged by private lenders in a given year taken from GDF. The level of interest rate reflects a country's default risk. As a country is perceived riskier, it will have to pay a higher interest rate to compensate investors for a greater likelihood of default. As noted earlier, however, when a country seems too risky, private lenders would find no level of interest rate that could offset the risks involved, and hence, a credit rationing would have a bite. In such a case, high risky countries would be left with no private credit, and their interest rates would not be observed. Then, a positive interest rate charged to a given country in a given year indicates that it did have access to private credit for that year, and the lack thereof indicates otherwise, that is, it failed to have access to credit.[17] The minimum observed interest rate is 5.05 and the maximum is 17.9 while its mean is about 6.5 in the sample. The proportion of having an observed interest rate is 84.2 percent of the total 568 country-years in the sample. The remaining 15.8 percent (90 country-years) is rationed out of the private credit markets.

Note that predicting yearly fluctuations of the incidence of zero credit access based on country risk profiles is not the most appropriate way to test the hypothesis. Rather, the primary task here is to show if the level of income inequality helps to predict long-run frequencies of countries' credit accessibility. To capture this average behavior over the long run, I divide the sample period into seven non-overlapping five-year sub-periods and construct the dependent variable, *Zero access*, as the proportion of years of zero credit access in a given sub-period. It ranges from zero to one, with one indicating no access to credit all the time in a five-year period. To take the upper and lower censoring into account, I run tobit regressions. For a robustness check, however, I estimate two alternative model specifications as well. First, I take ten-year average measures over three ten-year sub-periods and run tobit regressions. Second, I take the entire sample period and run tobit regressions of cross-sections to see if greater income inequality is associated with more frequent zero access to credit on average.

In estimating the effect of income inequality on zero credit access, I include a number of control variables. *Democracy* is included to control for the level of democracy, *GDP per capita* is for the level of economic development, *log(GDP)*, the

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17 This corresponds to the first-stage selection-equation of a Heckman selection model of interest rates, in which the probability of having observations is first estimated, and then the level of interest rates is estimated taking into account the selection hazards.

logarithm of GDP, is for the size of the economy, *Trade* is for the effect of trade dependency, and *Total debt*, the level of indebtedness, is for the effect of the amount of outstanding external debt. To account for the debt burden, I also include *Interest payments*, the ratio of interest payments to exports, *Short-term debt*, the ratio of short-term debt to total debt, and *Debt service*, the ratio of total debt payments to exports. *Concessional debt*, the ratio of concessional debt to total debt, is also intended to capture its substitution effect on ordinary private credit. As a proxy for the variations of global liquidity, *US interest rate* is included. In addition, I added *Default history*, an indicator of whether a country has defaulted in the past five years. Finally, regional dummies are included.

The results of tobit regressions are reported in Table 3. Equality is significant and signed as expected across models. The results confirm the claim that the more equal a country's income distribution is, the less often it experiences zero credit access.

**Table 3**: Income inequality and zero access to credit

| | (7) Five year | (8) Ten year | (9) All year |
|---|---|---|---|
| Zero acess$_{t-1}$ | 0.501*** (0.194) | 0.179 (0.150) | |
| Democracy | -0.033 (0.049) | -0.120*** (0.032) | -0.007 (0.007) |
| Equality | -0.016** (0.008) | -0.012** (0.006) | -0.008** (0.004) |
| GDP per capita | 0.10* (0.04) | 0.14*** (0.03) | 0.30 (0.20) |
| Default history | 0.116 (0.143) | 0.080 (0.123) | -0.172 (0.108) |
| Trade | -0.003 (0.003) | -0.003 (0.002) | -0.001 (0.001) |
| log GDP | -0.219*** (0.063) | -0.263*** (0.059) | -0.060** (0.023) |
| GDP growth | 0.013 (0.019) | -0.002 (0.024) | 0.011 (0.011) |
| Export growth | 0.835 (0.631) | 1.004 (1.127) | -0.870 (0.641) |
| Total debt | 0.002 (0.001) | -0.372 (0.709) | 0.382 (0.612) |
| Interest payments | 0.004 (0.024) | 0.045 (0.032) | 0.035** (0.016) |
| Short-term debt | 0.001 (0.005) | -0.001 (0.006) | 0.003 (0.003) |
| Debt service | -0.245 (0.929) | -1.495 (1.365) | -2.226*** (0.709) |
| Concessional debt | 0.002 (0.004) | 0.002 (0.003) | 0.004* (0.002) |
| US interest rate | -0.096** (0.039) | -0.235*** (0.081) | 0.080 (0.396) |
| Constant | 5.666*** (1.762) | 9.179*** (1.787) | 2.099 (1.773) |
| Observations | 130 | 48 | 60 |
| Countries | 51 | 38 | 60 |
| Note: tobit regressions with random-effects. Standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.01. | | | |

Substantively, its impact seems non-trivial. From the estimates of tobit regressions, one can infer that a 10-point increase in the Gini index leads to a substantial decrease in credit access, an 8 percent reduction at least (Model 9) to a 16 percent

reduction at most (Model 7). This implies that countries with extreme income inequality (with a Gini index greater than 75) may find the opportunity to have private credit 16-32 percent less often than countries with the mean income inequality presumably because they are believed to be more likely to default. To the extent that they are as many times more likely to go without a loan, they have fewer chances to default.

### Conclusion

Political economists have long argued that an increase in political participation and electoral competition in the context of extreme income inequality complicate matters of macroeconomic stability and imply various economic pathologies characterized by short-sighted, distortionary policies at the expense of long-term stability. Theoretically, sovereign default is one such pathology that is likely to result from the redistributive politics in democracies with a skewed income distribution. Empirical studies, however, have generally failed to demonstrate that income inequality is a key risk factor of sovereign default under democracy. The missing key is that if the theory is true, then one cannot observe its predicted patterns in data because creditors should also know that higher income inequality implies a greater risk and should act accordingly.

Using a simple signaling game, I model how rational creditors and sovereigns interact strategically and show that if the theory is true, then empirically one should observe sovereign default most often when income inequality is not the greatest, but at the intermediate level. My model also shows that this is because countries with higher income inequality are more likely denied access to credit in the first place. I found consistent and robust support for the model's predictions. Countries with a Gini index of above 65 are at least 8 percent more likely to lack access to credit and at least 17 percent less likely to actually default than those with a Gini index of around 55, which are, in turn, more likely to default, while less likely to have access to credit, than those with less inequality. In short, the empirical implications that the model generates are unique, and the empirical results that support the predictions are robust. My analysis suggests that income inequality is, in fact, a key factor in sovereign default risk.

My analysis is not without limitation, however. Most of all, the global sovereign credit markets have undergone significant changes in the late 1990s. Most notably, commercial banks, once the predominant private creditors, now gave way to fund

managers, institutional investors, and individual creditors who are acting more or less without explicit coordination among them. In my model, a lending decision is assumed to be made as if it is made by one actor. This assumption is innocuous if commercial banks are the major creditors since they often organize themselves into a syndicate. For the new reality, this assumption may or may not be sustainable. Whether we entered a truly new world is an empirical question that can only be answered with new data. My findings, in this sense, need to stand the test of time.

Nevertheless, my results have a couple of implications for our understanding of sovereign risk and global capital. First, since the 1980s, the problems of sovereign default have persisted, and this seems not to have been resolved despite the wave of democratization, but in part because of that. When the distribution of income is relatively equal so that the decisive median voter shares a stake in the longer-run health of the economy, democracy might help the government make credible commitments to honoring its contracts. As the income distribution becomes more skewed, however, democratic governments tend to be associated with more public vices than virtues. They might even become ''inefficient, corrupt, shortsighted, irresponsible, dominated by special interests, and incapable of adopting policies demanded by the public good'' as Huntington (1991, 10) might claim. This suggests the importance of active government's role in addressing gross income inequality in many developing countries for their democracies to do more good than harm to their economies.

Second, this study demonstrates that modeling strategic interaction can be crucial for some research questions in making correct predictions. Many outcomes of interest in international political economy are often an outcome of joint events, each of which involves strategic interactions between actors. Sovereign lending and default analyzed here is only one example. There are other cases to which essentially the same model can apply. For instance, foreign investors may decide to invest in a host country on observing that the country has signed a bilateral investment treaty (BIT) with an important capital exporting country. Expecting this effect, a risky government might want to pay the sovereignty costs associated with signing such a treaty in the hopes that it will bring new foreign investments that it could then exploit. Anticipating this, on observing such a treaty, foreign investors might increase investments only when the host has a sufficiently good risk profile. Then, signing a BIT might not necessarily increase FDI inflows to the country. Rather, it might depend on the country's observable characteristics from which investors infer its type. This

might explain why empirical studies have produced mixed results as they failed to specify the interaction between a host country's characteristics and whether it has signed a BIT (e.g., Kerner 2009). In this way, modeling strategic interaction can help us derive proper empirical implications that are otherwise elusive.

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**Appendix A:** List of Country-Years in Sample

| Countries | Years | Countries | Years |
|-----------|-------|-----------|-------|
| Albania | 1996-2005 | Indonesia | 1999-2009 |
| Argentina | 1983-2009 | Jamaica | 1970-97 |
| Belarus | 1994-95 | Kenya | 2002-05 |
| Bolivia | 1983-2007 | Macedonia, FYR | 1993-2007 |
| Botswana | 1981-2005 | Madagascar | 1991-2005 |
| Brazil | 1985-2008 | Malawi | 1994-2005 |
| Bulgaria | 1991-2008 | Mali | 1991-2006 |
| Burkina Faso | 2001-03 | Moldova | 1992-2007 |
| Burundi | 2001-06 | Mozambique | 1996-2005 |
| Cambodia | 1994-2004 | Nicaragua | 1992-2005 |
| Colombia | 1970-2006 | Niger | 1992-2005 |
| Costa Rica | 1971-2009 | Nigeria | 1999-2004 |
| Cote d'Ivoire | 2000-02 | Pakistan | 1970-1998 |
| Djibouti | 1999-2005 | Panama | 1989-2007 |
| Dominican Republic | 1986-2007 | Paraguay | 1990-2008 |
| Ecuador | 1987-2008 | Peru | 1981-2008 |
| El Salvador | 1981-2005 | Philippines | 1986-2006 |
| Ethiopia | 1991-2005 | Russian Federation | 1993-2009 |
| Georgia | 1995-2005 | Serbia | 2000-2007 |
| Ghana | 1996-2006 | Sierra Leone | 1996-2005 |
| Guatemala | 1986-2006 | Sri Lanka | 1979-2002 |
| Guinea-Bissau | 1994-2002 | Ukraine | 1992-2007 |
| Guyana | 1992-99 | Venezuela, RB | 1970-2007 |
| Honduras | 1983-2007 | Zambia | 1991-2005 |

**Appendix B:** Summary Statistics of Variables Used in Analysis

| Variable | Mean | Std. Dev. | Min | Max |
|----------|------|-----------|-----|-----|
| Default4050 | 0.25 | 0.44 | 0 | 1 |
| Democracy (polity2) | 6.6 | 2.5 | 0 | 10 |
| Gini (gross income) | 47.7 | 8.0 | 24.1 | 77.3 |
| Total external debt (% of GDP) | 0.82 | 2.6 | 0.01 | 70.8 |
| GDP per cap (in thousand) | 1.9 | 1.8 | 0.10 | 9.9 |
| Trade (% of GDP) | 68.3 | 35.4 | 10.8 | 280.4 |
| GDP growth rate | 3.4 | 5.3 | -30.9 | 27.5 |
| Reserves (in billion) | 7.8 | 32.9 | 0.002 | 478.8 |
| Short-term debt (% of reserves) | 102.0 | 187.6 | 0 | 3294.5 |
| US interest rate | 7.7 | 2.5 | 3.3 | 18.9 |