Sovereign Debt and Moral Hazard: The Role of Collective Action and Contractual Uncertainty

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Abstract

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Keywords: Sovereign debt, pari passu clauses, collective action, strategic bargaining

JEL Classifications: C72, D78, F34

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Abstract

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" ... so that the door might not be shut in the face of borrowers."

– Babylonian Talmud

1 Introduction

The *pari passu* clause is one of the most common, most commented upon, and most controversial clauses in sovereign debt contracts. The clause, a version of which is included in the vast majority of unsecured sovereign bonds (Gulati and Scott 2013; p. 187), provides that the bonds shall rank equally or *pari passu* with other unsecured debt of the sovereign. According to some interpretations, the clause prohibits a sovereign borrower from selectively paying one group of creditors and not paying others. The *pari passu* clause has drawn considerable public attention in the wake of high-stakes litigation brought by creditors against the Republic of Argentina.

Although corporate debt agreements occasionally include similar provisions, the *pari passu* clause has special significance in sovereign bond contracts. This special significance owes to the fact that payment obligations of sovereign states are notoriously difficult to enforce: sovereigns cannot be forced into bankruptcy and often hold few non-domestic assets that creditors can attach. Creditors may consequently face difficulties collecting their debt even if their right to payment is clear (Bulow and Rogoff 1989a).

When a sovereign debtor is unable to pay its creditors, it often proposes to exchange its outstanding debt for new debt with less onerous payment terms (such as a lower principal amount or interest rate). Whereas some creditors fearing an imminent default may agree to reduce their debt (Consenting Creditors), other creditors may hold out by retaining their original bonds (Holdout Creditors).

So-called collective action clauses, which in principle empower a supermajority of creditors to bind all creditors to changes in payment terms, in practice do not solve the holdout problem because such changes often require a supermajority of each bond issue and Holdout Creditors can typically accumulate a blocking minority in one or more issues (Buchheit et al. 2013; Weidemaier 2013). Given the difficulty of imposing legally binding changes in payment terms on Holdout Creditors without their consent, a sovereign debtor may threaten to ignore its contractual obligations and pay nothing to Holdout Creditors to induce creditors to consent to the proposed restructuring.

Arguably, the purpose of the *pari passu* clause is to prohibit such discrimination between Consenting and Holdout Creditors. If the *pari passu* clause prohibited discrimination, sovereign debtors would be barred from paying Consenting Creditors their renegotiated (reduced) debt without paying Holdout Creditors their original (full) debt.[1] If Holdout Creditors had to be paid in full, however, more creditors may hold out in the hope of recovering their entire debt, thereby rendering it more difficult for distressed countries' to effect a restructuring.

Whether the *pari passu* clause in fact prohibits discrimination between Consenting and Holdout Creditors is subject to substantial controversy. Many commentators have argued, based on historical and policy considerations, that the clause merely prohibits *de jure* creditor discrimination such as creating a legally-senior class of creditors (e.g., Gulati and Klee 2001; Buchheit and Pam 2004). Others have presented arguments that the clause should also apply to *de facto* discrimination among creditors (Semkow 1984; Bratton 2004). Most commentators, including many who have taken a position on the interpretation of the clause, concede that its meaning is not clear. For example, Buchheit and Pam (2004) described the clause as possessing a "measure of opacity"; Montelore (2013) described it as "obscure"; and Weidemaier, Scott, and Gulati (2013) remarked that "it is fair to say that no one really knows what the *pari passu* clause means, something that even eminent practitioners have long acknowledged." Moreover, several commentators puzzled about the persistence of ambiguously-phrased clauses and the failure of contracting parties to clarify them despite ongoing disputes over their scope and meaning (e.g., Gulati and Scott 2013; Buchheit and Martos 2014; Goss 2014).

As if to compound the confusion, the *pari passu* clause comes in at least three different formulations, each entailing a different likelihood of being interpreted "broadly" to prohibit *de facto* discrimination (Gulati and Scott 2013, p. 187; Weidemaier 2013). Some

[1] The potency of a *pari passu* clause to prohibit creditor discrimination (when it does) lies in its enforceability. A sovereign debtor that wishes to pay Consenting Creditors in violation of a *pari passu* clause must often process payments through financial intermediaries like banks and trustees. Holdout Creditors can enforce a *pari passu* clause by enjoining such intermediaries from processing payments to Consenting Creditors.

clauses specify only that the bonds must rank equally or *pari passu* with other debt; other clauses specifically provide that the payment obligations rank equally or *pari passu* with other debt; and a third version further requires that the bonds be paid in accordance with their equal or *pari passu* ranking.

Two court rulings that sided with holdout creditors—one by a Court of Appeals in Belgium in 2000 and another by the Second Circuit Court of Appeals in New York in 2012—dispelled the notion that the clause is universally understood to permit *de facto* discrimination. Yet because they involved idiosyncratic circumstances, these rulings provide only limited guidance for the resolution of future disputes: *see*, e.g., Gulati and Klee 2001; Ku 2014; Alfaro 2015. Thus, there is continued uncertainty over how future courts will interpret the different versions of the *pari passu* clause.[2]

In this paper, we present a four-period model of sovereign debt that sheds light on the variety of *pari passu* clauses. We consider a sovereign (Country) and a continuum of creditors (Creditors) that negotiate in the first period a loan amount and a probability that a *pari passu* clause will be interpreted to prohibit *de facto* discrimination. In the second period, Country must choose a policy from a set of policies, where each policy entails a different probability of failure and a riskier policy yields a higher payout upon success. In the third period, the payout of Country's chosen policy is realized. If the policy succeeds, its payout is sufficient to pay off Creditor's debt. If the policy fails, by contrast, the policy's realized payout falls short of Country's debt. While Creditors can observe whether the policy succeeded or failed, the realized payout of a failed policy is private information to Country and Creditors only know the payout distribution. Restructuring negotiations under asymmetric information follow in the shadow of the probability that the *pari passu* clause will be interpreted broadly. In the fourth period, if Country did not previously pay all Creditors, the interpretation of the *pari passu* clause is realized and Country either makes payments consistent with the realized interpretation or defaults.

To model the equilibrium outcome of the restructuring negotiations following a policy

[2]The 2000 decision was preliminary, rendered on an *ex parte* motion, and involved a foreign court interpreting New York Law. The 2012 decision was based, in part, on equitable considerations and on Argentina's enactment of the Lock Law which may have violated even a narrow interpretation of the *pari passu* clause. The Second Circuit Court of Appeals in NML Capital, Ltd. v. Argentina (2012) specifically noted that it did not decide whether "any non-payment that is coupled with payment on other debt" would breach the *pari passu* clause (f.n. 16); *see also* White Hawthorne, LLC v. Republic of Argentina (2016) (refusing to prohibit *de facto* discrimination against certain holdout creditors).

failure, we assume that a fraction of (Consenting) Creditors can make Country a take-it-or-leave-it payment demand requiring that Country pays them a reduced debt amount. We call the fraction of Consenting Creditors out of all creditors the *participation rate*. The complementary fraction of (Holdout) Creditors retains their original debt. Country cannot pay Creditors more than its realized policy payout and, if the *pari passu* clause is interpreted broadly, may not pay Consenting Creditors their restructured debt without paying Holdout Creditors their debt in full.

If Country fails to pay off Creditors in accordance with the realized interpretation of the *pari passu* clause, Country defaults and incurs either reduced or full default costs and unpaid Creditors receive nothing. More specifically, Country incurs full default costs if it does not pay any creditors; and reduced default costs if it pays Consenting Creditors, but not Holdout Creditors, which Country may do if the clause is interpreted narrowly.

Our model is a stylized version of Argentina's 2001 default. After that default, one group of creditors agreed to restructured payment terms and another group held out. The first group was initially paid on the agreed-upon terms while holdout creditors received no payment. But once the holdout creditors prevailed in court on their interpretation of the *pari passu* clause, Argentina faced the choice of not paying either group of creditors or paying both. The Argentinian government under President Kirchner decided to stop payment to all creditors, resulting in a second default in 2014. But after his election in 2015, President Marci made a deal with the holdout creditors that offered them close to full payment and resumed payment to the creditors who had consented to the restructuring.

Our setup is intended to capture the effect of restructuring negotiations on Country's choice of policy and thereby on the optimal design of a loan agreement. In particular, the first-period loan negotiations are conducted in the shadow of Country's anticipated choice of policy in the second period, which is shaped by the expected outcome of the restructuring negotiations in the third period. In the presence of weak contractual enforcement of Country's payment obligations, the design of restructuring negotiations through a *pari passu* clause can be a key instrument for curbing Country's moral hazard.

For a given probability that the *pari passu* clause will be interpreted broadly and a given degree of information asymmetry between Country and Creditors, an equilibrium consists of a payment demand and a participation rate such that neither Creditors nor Country can profitably deviate from their equilibrium strategies. In particular, Consenting Creditors' payment demand maximizes their expected recovery, no creditor has incentives to deviate from his equilibrium strategy (consent or hold out), and Country responds optimally to Consenting Creditor's payment demand and the participation rate.

Our model brings to the fore the significance of uncertainty embedded in the *pari passu* clause for the outcome of restructuring negotiations. By varying the probability that a *pari passu* clause will be interpreted broadly, Country and Creditors can calibrate Country's expected total costs given a policy failure: the sum of Country's payments to Creditors plus default costs in case Country's policy fails. A higher probability of costly default given a policy failure in turn induces Country to choose a safer policy and increases the equilibrium loan amount. A pari passu clause improves Country's welfare if the combined increase in the policy payout and the benefit from a higher loan amount outweighs the increase in expected default costs.

To see how a pari passu clause shapes Creditors' incentives during restructuring negotiations, observe that a stronger clause (i.e., one that is more likely to be interpreted broadly) produces stronger incentives to hold out. As more creditors hold out and the participation rate decreases, Consenting Creditors lower their payment demand. In equilibrium, as the *pari passu* clause becomes stronger, (i) Country is less likely to meet its payment obligations to Consenting and Holdout Creditors and (ii) Country's expected total costs upon a policy failure increase.

Asymmetric information is essential for the *pari passu* clause to produce this dynamic whereby Country's expected total costs given a policy failure gradually increase with the strength of the *pari passu* clause. If the degree of information asymmetry between Country and Creditors is sufficiently low, Consenting Creditors' optimal payment demand is one where Country either never defaults irrespective of the interpretation of the clause or fails to equilibrate and thereby precipitates certain default given a broad interpretation of the clause. It consequently takes a sufficiently high degree of information asymmetry for a *pari passu* clause to give rise to equilibria involving an interior probability of Country's default.

More generally, for a sufficiently high degree of information asymmetry regarding sovereigns' ability to pay, a *pari passu* clause is a renegotiation-proof stochastic mechanism for producing *limited* holdout incentives, which strengthen creditors' bargaining position against their (ex post) collective interest while imposing relatively modest default costs in the event of policy failure. The benefit of perturbing the restructuring process stems from the fact that renegotiation distorts sovereigns' interim (non-contractible) investment decisions. By ramping up the costs of failure to pay creditors' debt in full, a pari passu clause aligns sovereigns' interim investment incentives. The optimal strength of a pari passu clause accordingly depends on the benefits from reducing sovereign moral hazard as compared to the associated default costs.[3]

Prior Literature:

Our paper builds on an extensive literature on sovereign debt. One branch of this literature has studied sovereign incentives to repay creditors. Beginning with Eaton and Gersovitz's (1981) seminal paper, a large body of work has identified various reputational, financial, and legal mechanisms that substitute for direct legal enforcement of sovereigns' underlying payment obligations (Grossman and Van Huyck 1988; Bulow and Rogoff 1989b; Fernandez and Rosenthal 1990; Cole and Kehoe 1995; Eaton 1996; Panizza et al. 2009; Chabot and Santarosa 2017).

A related strand of literature has investigated the process and outcome of sovereign debt renegotiations. Bulow and Rogoff (1989b) studied a dynamic model of such debt renegotiations and Fernandez and Fernandez (2007) considered a one-time renegotiation coupled with the possibility of sovereign strategic default. More closely related to our paper are Atkeson (1991), Schwartz and Zurita (1992), and Boot and Kanatas (1995), who examined different forms of moral hazard created by the restructuring of sovereign debt.[4]

Another pertinent literature has explored the nature and consequences of collective action problems among creditors during sovereign debt renegotiations. Buchheit and Gulati (2000) and Schwarcz (2000), among others, have examined the holdout problem and the associated difficulties in renegotiating sovereign debt. Bolton and Jeanne (2007)

[3]Other papers have suggested that credit default swaps play a similar role both in private and sovereign debt contracts (Bolton and Oehmke 2011; Sambalaibat 2012).

[4]In addition to the classic moral hazard problem underlying a sovereign debtor's choice of policy, other related forms of moral hazard impinge on a sovereign debtor's choice to seek a restructuring and on creditors' choice to lend given the possibility of bailout by international institutions (Buchheit et al. 2013).

present a model in which competition among creditors can result in sovereign debt that is excessively difficult to renegotiate. Ghosal and Thampanishvon (2013) argue that strengthening collective action away from unanimity can reduce the holdout problem but aggravate moral hazard.

Most of the literature on *pari passu* clauses has centered on the interpretation of the clause (Semkow 1984; Wood 1995; Gulati and Klee 2001; Bratton 2004; Buchheit and Pam 2004; Choi and Gulati 2006), on discussions of the case law (Gulati and Klee 2001; Montelore, 2013; Weidemaier 2013; Ku 2014; Alfaro 2015; Tsang 2015), and on empirical investigation of the prevalence of various versions of the clause (Gulati and Scott 2013; Weidemaier, Scott and Gulati 2013). Prior work has noted that a broad reading of the *pari passu* clause that prohibits *de facto* discrimination can inhibit consensual restructurings (Gulati and Klee 2001) and may reduce sovereign moral hazard (Bratton 2004), but has neither provided a formal account of these effects nor considered the joint role of contractual uncertainty and asymmetric information in producing them.

More broadly, our paper is related to the literature on the design of incentive-compatible mechanisms. A general problem of designing such mechanisms is the distorting effect of ex post renegotiation on ex ante incentives (Aghion, Dewatripont, and Rey 1994; Evans 2012; Neeman and Pavlov 2013; Bolton and Scharfstein 1996). This paper suggests that the *pari passu* clause is a widely-used mechanism that exploits a collective action problem among creditors to inhibit ex post renegotiation of a sovereign debtor's obligations. It thereby contributes to the literature on contractual incompleteness, which has typically attributed vagueness or unspecificity of contract terms to transaction costs or bounded rationality (see, e.g., Hart and Moore 1999). In our model, contractual uncertainty is efficiency-enhancing and strategic, as in Spier (1992) and Bernheim and Whinston (1998).

The paper is organized as follows. Section 2 sets up the model and classifies equilibria. Section 3 derives the equilibrium outcomes. Section 4 characterizes the optimal strength of a *pari passu* clause. Section 5 concludes. An Online Appendix contains further extensions.

2 Model

2.1 Setup

We consider a four-period game between a country (Country) and a unit mass of identical competitive creditors (Creditors). Both Country and Creditors are risk-neutral and the market interest rate is zero.

In **period 0**, Creditors lend Country $k \leq 1$ in exchange of Country's commitment to repay Creditors 1 in period 2. As will be clear soon, Country cannot commit to pay back more than 1. The loan amount is determined such that Creditors break even in expectation. The loan proceeds may service Country's internal debt, facilitate transfer payments or fund government spending. Let $V(k)$ denote the value of the loan to Country, where V is strictly increasing and concave ($V'(\cdot) > 0$ and $V''(\cdot) \leq 0$).

The loan further includes per Country's and Creditors' choice a *pari passu* clause (Clause) along with a probability $w \in [0, 1]$ that the Clause will be interpreted "broadly" to prohibit *de facto* discrimination. The parameter w represents the Clause's strength: a higher w stands for a formulation whereby a court in period 3 is more likely to hold that Country may not pay some Creditors and not others; the parameter w thus generalizes by continuous extrapolation the three main types of "off the rack" *pari passu* clauses commonly observed in sovereign debt contracts, each involving a different level of uncertainty. Our insights carry over straightforwardly to the case in which the domain of w is discrete.

In **period 1**, Country must choose a policy $p \in (0, 1]$. We think of a policy as any fiscal or monetary measure designed to produce a long-term fiscal payout such as tax, pension or currency reform.[5] A policy p succeeds with probability p and fails with the complementary probability. If a policy p succeeds, it yields a payout of $r(p)$, where $r(1) > 1$, which is strictly decreasing and concave ($r'(\cdot) < 0$ and $r''(\cdot) \leq 0$). A lower p accordingly represents a policy that is more likely to fail but yields a higher payout if it succeeds. If the policy fails, its payout (independent of p) is a uniform random variable with mean $\mu = 3/4$ and Country-specific support $[\underline{s}, \overline{s}]$, where $s \equiv \overline{s} - \underline{s} \in (0, 1/2]$.

[5] Consistent with actual observed provisions in sovereign private debt (as opposed to IMF debt), sovereigns cannot commit to undertake certain macroeconomic policies due to political and institutional constraints.

The realized policy payout is the maximum amount Country is able to pay Creditors in subsequent periods. Let $R(p) \equiv pr(p) + (1-p)\mu$ denote policy p's expected payout.

In **period 2**, the *observable* outcome – success or failure – of Country's chosen policy is realized. The realized value of the policy payout, however, is private information to Country. Country, furthermore, cannot pay Creditors more than its realized policy payout. We assume that a fraction α of Creditors, called Consenting Creditors, make Country a take-it-or-leave-it payment demand of $d \in (0, \alpha]$, where α represents the fraction of Creditors participating in the demand (i.e., the fraction of Consenting Creditors out of all Creditors). The non-participating creditors, called Holdout Creditors, retain their original debt with an aggregate claim of $1 - \alpha$. If $d < \alpha$, Consenting Creditors agree to a restructuring in which they receive partial payment in satisfaction of their debt.

If all Creditors make a demand d which Country accepts, Country pays Creditors d and the game ends. If Country rejects Creditors' demand, Country incurs reputational or financial default costs of 1 and Creditors obtain nothing.[6] Country's default costs stem, for example, from reduced access to capital markets, higher borrowing costs, or depressed international trade.[7] Finally, if a fraction $\alpha < 1$ of Creditors make a demand $d < \alpha$, the game proceeds to Period 3.[8]

In **period 3**, the interpretation of the Clause is realized. If the Clause is interpreted narrowly, Country may either (i) pay no creditor and incur default costs of 1; (ii) pay d to Consenting Creditors and nothing to Holdout Creditors and incur reduced default costs of $\tau(\alpha)$, where $\tau(\alpha) < 1-\alpha$ and $\tau'(\alpha) < 0$; or (iii) pay d to Consenting Creditors and $1 - \alpha$ to Holdout Creditors and incur no default costs. Country's default costs in case it pays Consenting Creditors alone are reduced because Country has reached a restructuring agreement with a fraction α of its creditors and made payment in accordance with the agreement.[9] Note that, because reduced default costs are lower than $1 - \alpha$, if Country

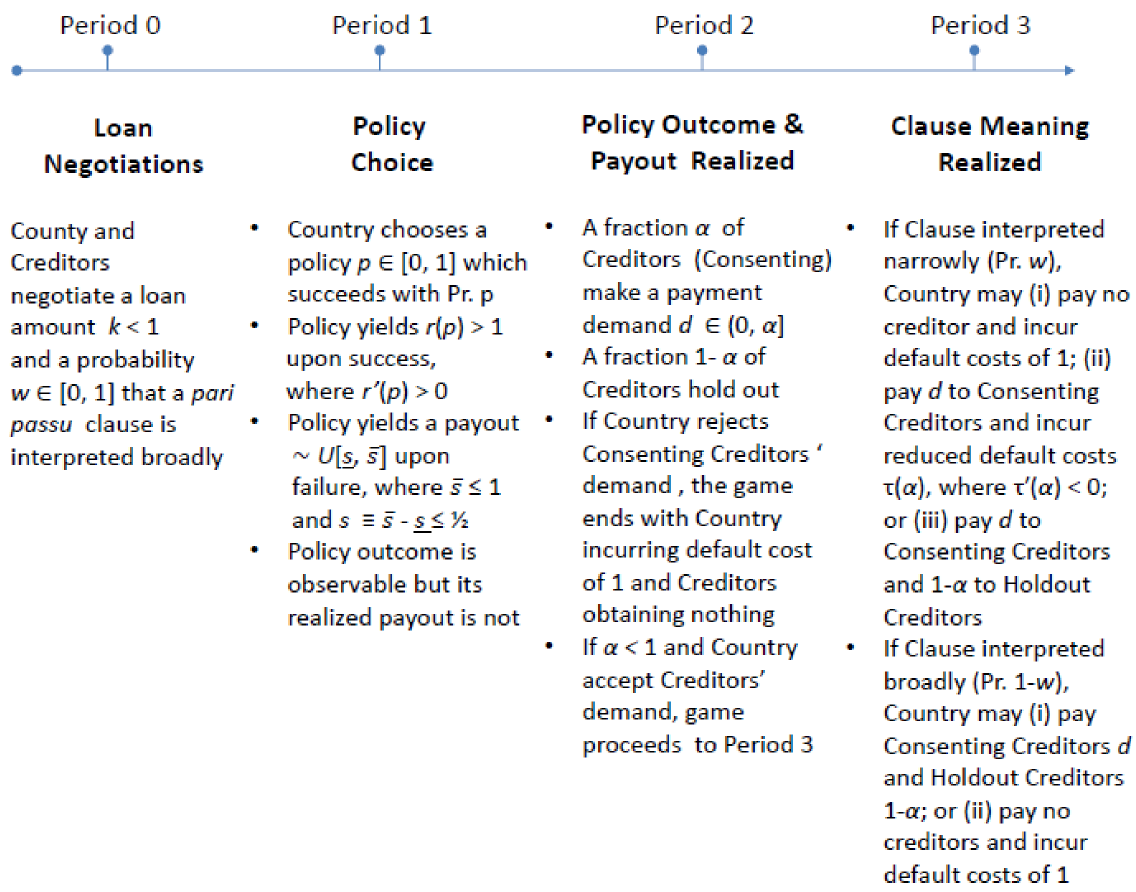
[6] We assume that an indifferent Country would rather pay off Creditors than incur default costs and that if no creditors make a demand Country must either pay creditors in full or incur default costs of 1.

[7] For a survey of empirical studies on the myriad sources of sovereign default costs, see Tomz and Wright 2013 (Chapter 4.7).

[8] A demand $d = \alpha$ by a fraction of creditors amounts to a demand $d = 1$ by all creditors.

[9] That countries that reach restructuring agreements with less-than-full creditor participation still suffer lower, but non-zero, default costs is indicated by the fact that countries enter into such agreements and the experience of countries like Argentina whose economic activities were hampered by the need to evade the collection efforts of holdout creditors (*see* Weisenthal 2012).

Figure 1: Timeline



reaches an agreement with Consenting Creditors, Country prefers to incur reduced default costs to voluntarily paying Holdout Creditors in full.

If the Clause is interpreted broadly, by contrast, Country may not discriminate between Consenting and Holdout Creditors. Country may either (i) pay Consenting Creditors d and Holdout Creditors in full $(1 - \alpha)$ and incur no default costs; or (ii) pay no creditors and incur default costs of 1.

This setup is intended to capture two essential features of sovereign debt. The first is the non-contractability of Country's choice of policy, a choice captured by the probability p in our model. Country's choice of policy in turn affects both Country's payout and probability of default. The second essential feature of sovereign debt our model captures is the potential asymmetric information underlying restructuring negotiations in case of a policy failure, whose magnitude is represented by the support s of Country's failed policy payout. This information asymmetry can be interpreted as a measure of economic and political transparency. The more transparent Country is, the less uncertainty Creditors face during restructuring negotiations. An alternative interpretation of the realized payout of a failed policy is the maximum amount that Country's government is politically willing to pay Creditors rather than default, which amount is lower in the event of a policy failure than a policy success.

2.2 Equilibria

We begin by defining and classifying equilibria and then fleshing out the equilibrium payment demand and participation rate.

Definition 1 (equilibrium) *An equilibrium is a pair of a participation rate (α) and a payment demand (d) such that:*

(i) The payment demand maximizes Consenting Creditors' recovery given the participation rate and Country's optimal response in periods 2 and 3;

(ii) No creditor can profitably switch position (consent or hold out) given the payment demand, the participation rate, and Country's optimal response in periods 2 and 3.

(iii) Country maximizes its payoff in response to Consenting Creditor's payment demand, the participation rate, and the realized interpretation of the Clause.

We think of an equilibrium as a summary of a protracted sequential process in which creditors decide the terms of and their participation in a payment demand after observing other creditors' decision. An equilibrium is a stationary outcome in which no creditor has incentives to change his decision and Country maximizes its payoff given creditors' decisions.

Two types of equilibria emerge in our setup: a full-participation equilibrium, in which all Creditors participate ($\alpha = 1$); and a partial-participation equilibrium, in which some Creditors participate and others hold out ($\alpha < 1$). Under either a full- or partial-participation equilibrium, Country maximizes its payoff given α and d. Under a full-participation equilibrium, Creditors' demand d maximizes their expected recovery given Country's strategy, where Creditors' recovery rate is greater than any deviant holdout creditors' recovery rate. Under a partial-participation equilibrium, Consenting Creditors' demand d maximize their expected recovery given Country's strategy, where Consenting Creditors' recovery rate is equal to Holdout Creditor's recovery rate.

3 Equilibrium Outcomes

3.1 Full-participation equilibria

3.1.1 Policy success

Consider the case in which Country's policy succeeds in period 2. Because Creditors observe the outcome of Country's policy, all Creditors make a maximum demand of 1, which Country always accepts.

Proposition 1 (full-participation equilibrium - policy success) *If Country's policy succeeds, then for any w there exists a unique full-participation equilibrium in which Creditors make a payment demand of* 1*, which Country always accepts.*

Given that Country's policy succeeds, Country accepts any full-participation demand equal to or lower than 1 because rejecting the demand costs Country 1 in default costs. Therefore, if all Creditors participate, they maximize their recovery by making a payment demand of 1, the highest demand they can make. For a similar reason, there does not exist a partial participation equilibrium in which some Creditors make a payment demand of $d < a$ and other Creditors hold out because any such demand fails to maximize Consenting Creditors' recovery.

3.1.2 Policy failure

Suppose that Country's policy fails in period 2. Given the distribution of Country's failed policy payout and for $w \leq \underline{s}$, all Creditors participate and make a payment demand equal to the lower bound of Country's policy payout ($\underline{s}$), which Country always accepts. Country thus never defaults and its payment to Creditors in case of a policy failure is $\underline{s}$.

Proposition 2 (full-participation equilibrium - policy failure) *If Country's policy fails, then if and only if $w \in [0, \underline{s}]$ there exists a dominant full-participation equilibrium in which Creditors make a payment demand of $\underline{s}$, which Country always accepts (Area A in Figure 2).*

PROOF. See the Appendix.

Given that all Creditors participate, their optimal payment demand is $\underline{s}$ irrespective of w. To see why, note that Country always accepts a full-participation demand of $d \leq \underline{s}$ and always rejects a full-participation demand of $d > \overline{s}$. Creditors therefore choose a demand $d \in [\underline{s}, \overline{s})$ to maximize their expected recovery of

$$d \times P_{nd}(d, s), \tag{1}$$

where $P_{nd}(d, s) = (\overline{s} - d)/s \in (0, 1]$ is the probability that Country does not default as a function of Creditors' demand. Because Creditors' expected recovery decreases with d for $d \in (\underline{s}, \overline{s})$, Creditors' optimal demand is $\underline{s}$.[10] The information asymmetry between Country and Creditors thus prompts Creditors to make a riskless payment demand, which ensures that Country never defaults. Because Country always accepts Creditors' demand, Creditors' recovery rate is $\underline{s}$. By contrast, holding out yields a recovery rate less than w, the probability that the Clause will be accorded a broad interpretation. More specifically, if the Clause is interpreted narrowly, Country will incur reduced default costs of $\tau(a) < 1 - a$ rather than pay Holdout Creditors in full. Holdout Creditors will therefore only be paid if the Clause is interpreted broadly. Because holding out yields a lower recovery rate than consenting, no creditor has incentives to deviate to holding out.

A full-participation equilibrium that yields Creditors a recovery rate of $\underline{s}$ is a dominant equilibrium because, under any partial-participation equilibrium, Holdout Creditors' recovery rate is capped at w and because Consenting Creditors' recovery rate cannot be higher than Holdout Creditors' recovery rate. For $w \in [0, \underline{s}]$, therefore, both Consenting and Holdout Creditors obtain a higher recovery rate under a full-participation equilibrium than under a partial-participation equilibrium.[11]

[10] The derivative of $d \times P_{nd}(d, s)$ with respect to d is $(\overline{s} - 2d)/s < 0$ for $d \in (\underline{s}, \overline{s})$ because $\underline{s} \geq \overline{s}/2$.

[11] As we show in Proposition 1A in the Online Appendix, for $w \in [\widehat{w}(s), \underline{s})$ there exists a partial-participation equilibrium in which Consenting Creditors make a no-default demand and both Consenting and Holdout Creditors' equilibrium recovery rate is w.

There does not exist a full-participation equilibrium for $w \in (\underline{s}, 1]$ because, given that all other Creditors participate and make a payment demand of $\underline{s}$, an infinitesimal mass of consenting creditors can profitably deviate to holding out. In the limit, as the deviating mass approaches zero, Country's probability of not defaulting given a broad interpretation of the Clause tends to 1. The deviating creditors' recovery rate would consequently be arbitrarily close to w and thus higher than their (putative) equilibrium recovery rate of $\underline{s}$. These holdout incentives in turn disrupt a full-participation equilibrium.

3.2 Partial-Participation Equilibria

3.2.1 Equilibrium conditions

We now turn to partial-participation equilibria in which some creditors participate while others hold out. Consider first Country's optimal response to Creditors' demand and participation rate in period 3. If the Clause is interpreted narrowly, Country pays d to Consenting Creditors alone if Country's realized policy payout is greater than or equal to d. Country would rather pay Consenting Creditors than fully default because a full default costs Country 1 whereas paying Consenting Creditors costs Country d in debt payment and $\tau(\alpha) < 1 - \alpha$ in reduced default costs (recall that $d \leq \alpha$ and therefore $d + \tau(\alpha) < 1$). By the same token, if the Clause is interpreted narrowly, Country would rather incur reduced default costs of $\tau(\alpha)$ than pay $1 - \alpha$ to Holdout Creditors.

By contrast, if the Clause is interpreted broadly, Country may not pay Consenting Creditors without paying Holdout Creditors. Country must therefore choose between (i) paying d to Consenting Creditors and $1 - \alpha$ to Holdout Creditors (i.e., Holdout Creditors' full claim); or (ii) not paying any creditors and incurring default costs of 1. Country would choose to pay both Consenting and Holdout Creditors if its realized policy payout is greater than or equal to $d + 1 - \alpha$ (which is no greater than 1 since $d \leq \alpha$).

Given Country's optimal strategy and the distribution of Country's policy payout in the event of policy failure, Country's probability of default given a broad interpretation of the Clause as a function of Creditor's demand d and the participation rate α is:

$$P_{nd}(\alpha, d, s) \begin{cases} = 1 & & \in [0,\ \underline{s}] \\ = \frac{\alpha - d - (1-2s)/4}{s} \in (0,1) & \text{if} \quad d + (1-\alpha) & \in (\underline{s},\ \overline{s}) \\ = 0 & & \in [\overline{s},\ 1] \end{cases} . \tag{2}$$

If the sum of Creditors' demands, $d + (1 - \alpha)$, is less than or equal to $\underline{s}$, the lower bound of a failed policy payout, Country never defaults (first line). We call such a demand by Consenting Creditors *"no-default demand."* If the sum of Creditors' demands is strictly between $\underline{s}$ and $\overline{s}$, Country defaults with a probability strictly between 0 and 1 if the Clause is interpreted broadly (middle line). We call such a demand by Consenting Creditors *"interior demand."*[12] If the sum of Creditors' demands is equal to or greater than $\overline{s}$, the upper bound of a failed policy payout, Country defaults with certainty if the Clause is interpreted broadly (third line). We call such a demand by Consenting Creditors *"corner demand."*

Now, any demand of Creditors cannot exceed the participation rate, because Consenting Creditors cannot demand more than their claim of α. Thus, given a participation rate α, Consenting Creditors' optimal payment demand solves

$$\max_{d \in (0,\alpha]} d \times [(1-w)P_{nd}(d,s) + wP_{nd}(\alpha, d, s)], \tag{3}$$

An optimal payment demand maximizes Consenting Creditors' expected recovery. The first term in the square brackets is the joint probability that the Clause is interpreted narrowly and that Country does not fully default. Because, under a narrow interpretation of the Clause, Country need not pay Holdout Creditors to avoid full default, the probability that Country does not fully default is independent of the participation rate and is a function of the payment demand alone. The second term in the square brackets is the joint probability that the Clause is interpreted broadly and that Country does not default. Because under a broad interpretation of the Clause Country must pay both Consenting and Holdout Creditors or default, Country's probability of no-default defined in (2) increases with the participation rate.

[12] We derive the expression for $P_{nd}(\alpha, d, s)$ for this case in the Appendix.

Now, Consenting Creditors' optimal demand given a narrow interpretation of the Clause is no greater than their full-participation demand of $\underline{s}$ (by Proposition 2) and is no less than their optimal demand given a broad interpretation of the Clause. Given Consenting Creditors' optimal demand, Country would rather pay Consenting Creditors than fully default if the clause is interpreted narrowly. We will accordingly substitute from now on $1 - w$ for $(1 - w)P_{nd}(d, s)$ in the first term in the square brackets in (3).

Turning to the second equilibrium condition, no creditor would have incentives to switch position under an unconstrained partial-participation equilibrium if and only if

$$(d/\alpha) \times [1 - w + wP_{nd}(\alpha, d, s)] = wP_{nd}. \tag{4}$$

The left-hand side is Consenting Creditors' recovery rate: the ratio of Consenting Creditors' payment demand and the participation rate multiplied by the probability that Country meets Consenting Creditors' demand. The right-hand side is Holdout Creditors' recovery rate: the joint probability that the Clause is interpreted broadly and that Country does not default (recall that Holdout Creditors' demand consists of their entire claim). In any partial-participation equilibrium, Consenting Creditors' payment demand and the participation rate must satisfy both (3) and (4).

The next proposition presents necessary and sufficient existence conditions for partial-participation equilibria for $w \in (\underline{s}, 1]$. In any such equilibria, Consenting and Holdout Creditors obtain equal recovery rates.[13]

Proposition 3 (partial-participation equilibrium - policy failure) *Let* $\overline{w} \equiv \max \{\underline{s}, s/(1-\underline{s})\}$ *(see Figure 2).*[14]

(a) If Country's policy fails and $w \in (\underline{s}, \overline{w})$ *there exists a unique partial-participation equilibrium in which Country defaults with a strictly positive probability less than* 1 *and Consenting and Holdout Creditors obtain equal recovery rates (Area B in Figure 2).*

[13]Note that a full-participation equilibrium maximizes Creditors' recovery for any w. Under a partial-participation equilibrium, Creditors maximize their expected recovery given a broad interpretation of the Clause by having Consenting Creditors make a no-default demand. Because a no-default demand is strictly less than $\underline{s}$, however, it fails to maximize Creditors' recovery given a narrow interpretation of the Clause.

[14]We suppress the argument s of $\overline{w}$.

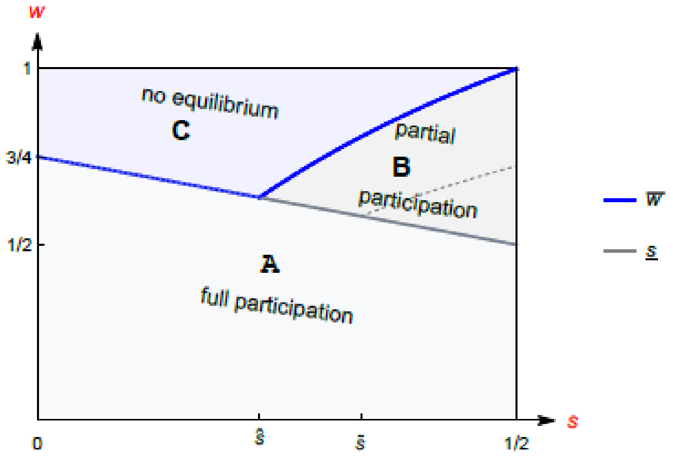


FIGURE 2: EQUILIBRIUM OUTCOME REGIONS

(b) If $w \in [\overline{w}, 1]$ there does not exist any equilibrium (Area C in Figure 2).

PROOF. See the Appendix, which includes a full characterization of the equilibrium outcomes.

We begin by explaining why for $w \in (\underline{s}, 1]$, any candidate partial-participation equilibrium must involve an *interior* payment demand; i.e., a demand under which Country's probability of default given a broad interpretation of the Clause is strictly between 0 and 1.

A corner demand cannot be part of an equilibrium for any w. This is because under any putative equilibrium involving a corner demand, Consenting Creditors' recovery rate is strictly positive but Holdout Creditors' recovery rate is nil. Holdout creditors can consequently profitably deviate to consenting, thereby upsetting the putative equilibrium.

A no-default demand, on the other hand, cannot be part of a partial-participation equilibrium for any $w \in (\underline{s}, 1]$. To see why, observe that Holdout Creditors' recovery rate under a no-default demand is w (the probability that the Clause will be interpreted broadly). If a no-default demand were part of a partial-participation equilibrium, Consenting Creditors' recovery rate – as well as Creditors' recovery – would have to be w too. But under a no-default demand, Creditors' recovery is strictly less than $\underline{s}$ given a narrow interpretation of the Clause and is equal to $\underline{s}$ given a broad interpretation (because the sum of Creditors' demands is $\underline{s}$). Creditors' recovery under a no-default demand must therefore be strictly less than $\underline{s}$ (for any w). It follows that if Consenting Creditors made a no-default demand for any $w \in (\underline{s}, 1]$, Holdout Creditors would obtain a higher recovery rate than Consenting Creditors, providing the latter incentives to switch to holding out. A partial-participation equilibrium for $w \in (\underline{s}, 1]$ therefore exists only if Consenting Creditors' optimal payment demand is neither a corner demand nor a no-default demand but rather an interior demand.

For any pair (s, w) in Area B in Figure 2, there is a unique partial-participation equilibrium because Holdout Creditors' recovery rate is higher than Consenting Creditors' recovery rate for α sufficiently close to 1 and because, as the participation rate decreases, Holdout Creditors' recovery rate decreases more rapidly than Consenting Creditors' recovery rate, given that Consenting Creditors are optimally adjusting their payment demand to the lower participation rate. These two facts together imply that as the participation rate decreases, Consenting and Holdout Creditors' recovery rates cross no more than once.[15]

There does not exist an equilibrium for any pair (s, w) in Area C in Figure 2 because in this region there does not exist an interior demand that maximizes Consenting Creditors' expected recovery *and* satisfies the equal recovery condition for any participation rate. In particular, for high participation rates, Consenting Creditors' optimal demand is either a no-default demand or an interior demand both involving unequal recovery rates, which gives Consenting Creditors incentives to hold out. As the participation rate drops, the optimal interior demand decreases and recovery rates equilibrate. Given the lower participation rate, however, Consenting Creditors maximize their expected recovery by making a corner demand (which is higher than an interior demand) whereby Country always defaults given a broad interpretation of the Clause. A corner demand, in turn, gives holdout creditors incentives to consent and thereby raises the participation rate. The interchanging incentives to hold out (for high participation rates) or consent (for low

[15] A drop in the participation rate has a greater (negative) effect on Holdout Creditors' recovery rate than on Consenting Creditors' recovery rate because Consenting Creditors' optimal interior restructuring demand, $\widehat{d}(\alpha)$, decreases by less than the corresponding drop in α. To see this, note that the first-order condition of Consenting Creditors' optimal demand is $(1 - w) + w \cdot (\Pr_{nd} + d \cdot \partial \Pr_{nd} / \partial d) = 0$. By the Implicit Function Theorem, the derivative of Consenting Creditors' optimal demand with respect to the participation rate for any distribution of Country's failed policy payout is

$$-\frac{\partial \Pr_{nd} / \partial \alpha + d \cdot \partial^2 \Pr_{nd} / \partial d \partial \alpha}{2 \cdot \partial \Pr_{nd} / \partial d + d \cdot \partial^2 \Pr_{nd} / \partial d^2} < 1,$$

because $\partial \Pr_{nd} / \partial \alpha = -\partial \Pr_{nd} / \partial d$ and $\partial^2 \Pr_{nd} / \partial d \partial \sigma = -\partial^2 \Pr_{nd} / \partial d^2$ (by the Chain Rule).

participation rates) thus frustrate any putative equilibrium.[16] As no creditor has received partial payment in satisfaction of its debt, Country would have to pay 1 to all Creditors to avoid default. Since Country is unable to do so, default is certain.

3.2.2 Effects of a stronger clause

We next consider the effect of an increase in w on the sum of Country's expected payments to creditors and default costs.

Proposition 4 (partial participation equilibrium - effects of a stronger clause) *In a partial-participation equilibrium, Country's expected total costs given a policy failure are* $w + (1 - w)\tau(\alpha^*(w))$ *which increase with* w.

PROOF. See the Appendix.

The effect of a stronger Clause on the equilibrium participation rate and payment demand under a partial-participation equilibrium follows from the corresponding effects of a stronger Clause on Consenting Creditors' and Holdout Creditors' recovery rates. Other things being equal, an increase in w increases Holdout Creditors' recovery rate and decreases Consenting Creditors' recovery rate. More creditors consequently hold out, thereby lowering the participation rate. The drop in the participation rate in turn (weakly) lowers Consenting Creditors' optimal demand, which decreases the participation rate further and so on. The resulting equilibrium accordingly involves a lower participation rate and a (weakly) lower Consenting Creditors' demand.

The sum of Country's equilibrium payments to Creditors and default costs given a policy failure increases with w because the increase in Country's default costs as a result of a higher w outweighs any corresponding decrease in Creditors' recovery. More specifically, under a partial-participation equilibrium, Consenting Creditors' recovery in the case of policy failure is $\alpha^* w P^*_{nd}(w)$, whereas Holdout Creditors' recovery is $(1 - \alpha^*) w P^*_{nd}(w)$. Creditors' total recovery is therefore $w P^*_{nd}(w)$. Because Country's expected default costs

[16] As we show in the proof of Proposition 2, an equal-recovery equilibrium exists for values of w and s for which $d^*(w, s) > \alpha^*(w, s)/2$ independently of the distribution of Country's failed policy payout.

are $w(1 - P^*_{nd}(w)) + (1 - w)\tau(\alpha^*)$, Country's expected total costs in the case of policy failure are $w + (1 - w)\tau(\alpha^*(w))$.

Taking the derivative of Country's expected total costs in case of a policy failure with respect to w gives $1 - \tau(\alpha^*) + (1 - w)\tau'(\alpha^*)\alpha^{*\prime}(w)$, which is strictly positive because the participation rate is strictly decreasing with w (as $\alpha^{*\prime}(w) < 0$), and Country's default costs for not paying Holdout Creditors given a narrow interpretation of the Clause are (i) strictly less than $1-\alpha^*$ (as $\tau(\alpha^*) < 1-\alpha^*$) and (ii) strictly decreasing in α^* ($\tau'(\alpha^*) < 0$). Thus, under a partial-participation equilibrium, the sum of Country's expected payments to creditors and default costs in the case of a policy failure increases with w.

4 Optimal Strength of a *Pari Passu* Clause

4.1 Country's unencumbered policy choice

In this section, we present the trade-off associated with higher expected default costs given a policy failure. As a benchmark, we consider Country's unencumbered policy choice in period 1 for $w \in [0, \underline{s}]$; i.e., Country's optimal policy given that the Clause is not affecting Country's interim incentives.

Recall that given that Country's policy succeeds, Creditors make a payment demand of 1 irrespective of w, which Country always accepts (Proposition 1). Further recall that given that Country's policy fails, Creditors make a payment demand of $\underline{s}$ for any $w \in [0, \underline{s}]$, which Country always accepts (Proposition 2). Thus, for any $w \in [0, \underline{s}]$ the equilibrium loan amount is $K(p) \equiv p + (1 - p)\underline{s}$ because Country pays Creditors 1 when the policy succeeds and $\underline{s}$ when the policy fails.

Country's privately-optimal policy for any $w \in [0, \underline{s}]$ accordingly maximizes the difference $R(p) - K(p)$; i.e., the policy payout $R(p) \equiv pr(p) + (1 - p)\mu$ less Country's payments to Creditors in period 2 ($R''(p) < 0$ because $r'(p), r''(p) < 0$). By contrast, the welfare-maximizing policy maximizes the sum $R(p) + V[K(p)]$; i.e., the policy payout plus the equilibrium loan value. Thus, Country equates the marginal benefit of a safer policy and the corresponding marginal cost of higher payments to Creditors ($R'(p) = K'(p)$), whereas the welfare-maximizing (interior) policy equates the marginal cost of a safer policy and the corresponding marginal benefit of a higher loan value ($-R'(p) = V'(K) \times K'(p)$).

As a result of the divergence between its ex-ante and interim incentives, Country chooses in period 1 a riskier policy than the welfare-maximizing policy, thereby trading off a higher expected policy payout for lower expected payments to Creditors (rather than a higher loan value). Anticipating Country's choice of policy, Creditors would be willing to lend Country a lower loan amount than if Country were to choose a safer policy. Country's moral hazard consequently reduces Country's welfare by lowering the expected policy payout and loan amount that Country could otherwise obtain.[17]

4.2 Optimal clause

The potential value of a Clause that gives rise to a partial-participation equilibrium lies in inducing higher expected total costs (consisting of default costs and payments to creditors) given a policy failure. The higher expected total costs, in turn, reduces Country's payoff if its policy fails and thereby curbs Country's incentives to choose too risky a policy.

Suppose that $w \in (\underline{s}, \overline{w})$, where $\overline{w} \equiv \max\{\underline{s}, s/(1-\underline{s})\}$ (if $w \geq \overline{w}$, there is no equilibrium and Country incurs default costs of 1 in the event of policy failure). For any such w there exists a unique partial-participation equilibrium with Country's expected total costs in case of a policy failure increasing with w (by Propositions 3 and 4, respectively). To set up the welfare maximization problem associated with an optimal Clause, let $DC(w)$ denote Country's equilibrium default costs given a policy failure as a function of w. The welfare maximization problem is

$$\max_{w} R(p) + V[K(p,w)] - (1-p)DC(w) \tag{5A}$$

subject to :

$$p = \arg\max_{p} R(p) - K(p,w) - (1-p)DC(w). \tag{5B}$$

The welfare objective function is Country's expected policy payout (first term) plus its

[17] We assume that Country cannot commit to a borrowing cap and therefore cannot reduce moral hazard by promising to pay back Creditors less than 1 (and borrowing less).

equilibrium loan value (second term) less its expected default costs (last term). The incentive compatibility constraint ensures that, through its choice of policy in period 1, Country maximizes the expected policy payout less its expected payments to Creditors and default costs. Recall from Proposition 4 that Country's expected payments to Creditors plus default costs in case of a policy failure are $T(w) \equiv w + (1-w)\tau(\alpha^*(w))$. Thus, Country's period-1 payoff in a partial-participation equilibrium can be written as $R(p) - [p + (1-p)T(w)]$.[18]

Country's privately-optimal policy satisfies the first-order condition $R'(p) = 1 - T(w)$, where $R'(p)$ is the policy's marginal payout and $1 - T(w)$ is the marginal cost of a safer policy, i.e., the difference between Country's payments when the policy succeeds and when it fails. It is straightforward to show that if $T'(w) > 0$ – i.e., Country's expected total costs in case of a policy failure increase with w – then Country chooses a safer policy as w increases (by the Implicit Function Theorem).

A marginal increase in w accordingly indirectly affects Country's policy payout (through the effect of w on p), and both directly and indirectly affects the equilibrium loan value and Country's expected default costs (through the effect of w on p and on the equilibrium quantities). More specifically, an optimal *pari passu* clause minimizes the sum of Country's moral hazard costs and expected default costs by trading off a (i) a higher policy payout, (ii) a higher benefit from an increased loan amount, and (iii) a lower probability that Country's policy fails and precipitates default *against* higher expected default costs in the event of policy failure. Moral hazard costs decrease as Country's expected total costs given a policy failure increase (up to 1). Consequently, any w that maximizes Country's expected total costs in case of a policy failure for a given magnitude of default costs is *potentially* optimal.

The following Proposition considers the effect of w on the equilibrium loan amount.

Proposition 5 (clause strength and loan amount) *Suppose $w^* \in (\underline{s}, \overline{w})$ maximizes Country's policy payout less its default costs. Then the equilibrium loan amount is higher under w^* than under $w \in (0, \underline{s}]$.*

[18] Country's total costs in periods 2 and 3 are $p + (1-p)T(w)$ because Country pays 1 if the policy succeeds and $T(w)$ if the policy fails.

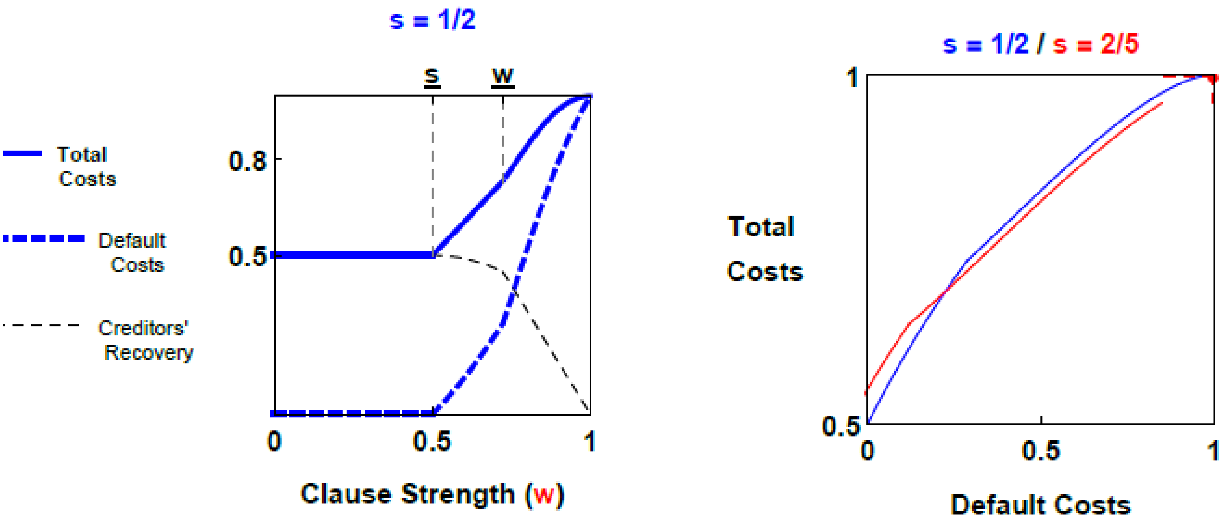


FIGURE 3: COUNTRY'S TOTAL COSTS AND DEFAULT COSTS GIVEN A POLICY FAILURE

The proposition holds because the equilibrium loan amount as a function of w is equal to

$$\begin{aligned} K(p(w), w) &= R(p(w)) - (1 - p(w))DC(p(w), w) \\ &\quad -[R(p(w)) - p(w) - (1 - p(w))T(w)], \end{aligned} \tag{6}$$

where $p(w)$ is Country's optimal period-1 policy. The equilibrium loan amount for a given w is accordingly equal to the difference between Country's privately-optimal policy payout less its corresponding expected default cost (first line of (6)) less Country's optimal interim payoff (second line of (6)). Now, if Country's expected total costs in case of a policy failure ($T(w)$) increase with w, then by the Envelope Theorem, Country's interim payoff must decrease with w; Country is thus worse off midstream if it has to pay more upon a policy failure.[19]

We illustrate the relationship between the Clause**'s** strength and Country's equilibrium expected total costs and default costs in case of a policy failure in the left panel of Figure 3. The graph in this panel shows Country's expected total costs given a policy failure

[19]Let $\Pi(w, p(w)) = R(p(w) - p(w) - (1 - p(w))T(w)$ denote Country's optimal period-1 payoff as a function of w. Then by the Envelope Theorem

$$\begin{aligned} \frac{d}{dw}[\Pi(p(w), w)] &= \frac{\partial}{\partial w}[\Pi(p(w), w)] \\ &= -(1 - p(w))T'(w) < 0. \end{aligned}$$

$(T(w))$, which consists of Country's expected payments to creditors and default costs for $s = 1/2$ and $\tau(\alpha) = (1-\alpha)^2$. For $w \in [0, 1/2]$, a *pari passu* clause gives rise to a full-participation equilibrium in which Country's payments to creditors are 1/2 and default costs are 0. For $w \in (1/2, 1]$, the clause gives rise to a partial-participation equilibrium in which Country's expected total costs of $w + (1-w)\alpha^*(w) > 1/2$ increase with w.

To show the effect of asymmetric information on the potential benefit of a *pari passu* clause, we compare in the right panel of Figure 3 Country's expected total costs and default costs given a policy failure for $s = 1/2$ versus $s = 2/5$. The panel shows parametric plots of Country's expected total costs and default costs as w increases from $\underline{s}$ up to 1 for $s = 1/2$ and $s = 2/5$ (in the latter case, both expected total costs and default costs jump discontinuously to 1 at $\overline{w} = s/(1 - \underline{\mathbf{s}})$). Interestingly, when default costs are low, Country's total costs are higher under $s = 2/5$, whereas when default costs are high, Country's total costs are higher under $s = 1/2$. A less transparent country (with a higher s) might therefore more efficiently use w to constrain moral hazard by implementing higher expected total costs upon a policy failure at lower expected default costs (which are deadweight losses). Furthermore, countries with s sufficiently small for which there does not exist a partial-participation equilibrium could only implement total costs of $\underline{s}$ (if $w \leq \underline{s}$) or total costs associated with certain default (if $w > \underline{s}$). These countries, unlike less transparent ones, thus lack the ability to modulate the clause's strength to induce a probabilistic default and thereby implement intermediate levels of total costs upon a policy failure with less than maximal default costs.

5 Conclusion

This paper presented a sovereign debt model that explicates the strategic effects of *pari passu* clauses and their persistent ambiguous phrasing. We showed that an uncertain *pari passu* clause along with asymmetric information on a sovereign borrower's ability to pay give rise to equilibria in which some creditors hold out and default is probabilistic. Under these equilibria, the sovereign's expected total costs in case of a policy failure increase with the probability that the *pari passu* clause will be interpreted in favor of holdout creditors. By varying the strength of the clause, parties to a sovereign debt contract can implement an optimal (second-best) trade-off between reducing moral hazard and incurring dead-weight default costs.

Our model explains both why sovereign debt contracts include *pari passu* clauses that lend themselves to a broad interpretation as well as why some countries remained hesitant to phase out the clause notwithstanding its uncertain interpretation. In particular, although a narrow interpretation is ex post welfare enhancing - which may explain the opposition to the clause by bodies such as the IMF - a stochastic interpretation is optimal ex ante.

Appendix

This Appendix proves Propositions 2, 3, and 4.

We begin by introducing ancillary notations. Recall that Consenting Creditors' payment demand is an "interior demand" if Country's probability of no-default given a broad interpretation of the Clause is strictly between 0 and 1, where Country's probability of no-default is a function of Creditors' participation rate (α), Consenting Creditors' demand (d), and the degree of information asymmetry between Country and Creditors (s).

We define the set of Consenting Creditors' potentially-optimal interior demands as

$$D_i = \{d \in (0, \underline{s}] : P_{nd}(\alpha, d, s) \in (0, 1)\}. \tag{A1}$$

That is, D_i consists of all strictly positive payment demands weakly less than $\underline{s}$ for which Country's probability of no-default is strictly between 0 and 1.

The following definition states and denotes the infimum and supremum of a non-empty D_i.

Definition A1 *(i)* $\underline{d}(\alpha, s) \equiv \max\{0, \underline{s} - (1-\alpha)\} = \inf(D_i : D_i \neq \varnothing)$*; and* $\overline{d}(\alpha, s) \equiv \min\{\overline{s} - (1-\alpha), \underline{s}\} = \sup(D_i : D_i \neq \varnothing)$.

The infimum of a non-empty D_i as a function of α and s is the maximum of (i) the maximum no-default demand ($\underline{s} - (1-\alpha)$) and (ii) 0. The corresponding supremum is the maximum of (i) the minimum corner demand ($\overline{s} - (1-\alpha)$) and (ii) $\underline{s}$.

The next definition states and denotes the infimum and supremum of participation rates (α) for which D_i includes $\underline{s}$ or is empty.

Definition A2 *(i)* $\overline{\alpha}(s) \equiv 1 - s = \inf(\alpha : \underline{s} \in D_i)$*; and (ii)* $\underline{\alpha}(s) \equiv 1 - \overline{s} = \inf(\alpha : D_i \neq \varnothing)$.

Underlying the infimum and supremum in Definition A2 is the fact that Country's probability of no-default given a broad interpretation of the Clause is strictly positive if and only if the sum of Creditors' demands is is strictly less that the upper bound of the support of Country's payout distribution ($P_{nd}(\alpha, d, s) > 0$ iff $d + (1-\alpha) < \overline{s}$). If $\alpha > \overline{\alpha}(s) \equiv 1 - s$, Holdout Creditors' demand is strictly less than s ($1 - \alpha < s$) and therefore the sum of Creditors' demands is strictly less than $\overline{s}$ for any $d \leq \underline{s}$. If $\alpha \leq \underline{\alpha}(s) \equiv 1 - \overline{s}$, Holdout Creditors' demand is greater or equal to $\overline{s}$ ($1 - \alpha \geq \overline{s}$) and so is the sum of Creditors' demands for any $d > 0$.[20]

Now, for $d \in D_i$ the sum of Creditors' demands is in the interval $(\underline{s}, \overline{s})$. Writing $\alpha - \underline{\alpha}$ for $\overline{s} - (1 - \alpha)$, subtracting d, and dividing the difference by s, Country's probability of no-default given a broad interpretation of the Clause for $d \in D_i$ is

$$P_{nd}(\alpha, d, s) = (1/s) \times (\alpha - \underline{\alpha}(s) - d). \tag{A2}$$

We now turn to the proof of Proposition 2.

Proposition 2 (full-participation equilibrium - policy failure) *If Country's policy fails, then if and only if $w \in [0, \underline{s}]$ there exists a dominant full-participation equilibrium in which Creditors make a payment demand of $\underline{s}$, which Country always accepts (Area A in Figure 2).*

PROOF. That a full-participation equilibrium is dominant is shown in footnote 13. Here we prove that a full-participation equilibrium exists if and only if $w \in [0, \underline{s}]$.

To show sufficiency, suppose that $w \in [0, \underline{s}]$ and that all Creditors participate and make a demand of $\underline{s}$, which Country accepts. Creditors accordingly obtain a recovery rate of $\underline{s}$. If a sufficiently small mass $\varepsilon > 0$ of Creditors deviated to holding out, the participation rate would decrease to $1 - \varepsilon$.[21] By (A2), the probability that Country does not default given a broad interpretation of the Clause would then be $P_{nd}(1 - \varepsilon, \underline{s}, s) = (1/s) \times ((1 - \varepsilon) - \underline{\alpha}(s) - \underline{s}) = 1 - \varepsilon/s$, because $1 - \underline{\alpha}(s) - \underline{s} = s$. The deviating creditors' recovery rate, $wP_{nd}(1 - \varepsilon, \underline{s}, s)$, would therefore be $w(1 - \varepsilon/s)$, which for any $w \in [0, \underline{s}]$ is strictly less than their equilibrium recovery rate of $\underline{s}$. For $w \in [0, \underline{s}]$, therefore, there are no incentives to hold out.

[20] Note that $\underline{s} \in (\underline{\alpha}(s), \overline{\alpha}(s))$.

[21] The proof is trivial if ε is sufficiently large such that a demand of $\underline{s}$ is a corner demand.

To show necessity, suppose that $w \in (\underline{s}, 1]$ and that all Creditors participate and make a demand of $\underline{s}$, which yields a recovery rate of $\underline{s}$. If a sufficiently small mass $\varepsilon > 0$ of Creditors deviated to holding out, the deviating creditors' recovery rate would be $w(1-\varepsilon/s)$ (as shown above). But $w(1-\varepsilon/s) > \underline{s}$ for any $w \in (\underline{s}, 1]$ and a sufficiently small ε, implying that the deviating creditors' recovery rate would be greater than their putative equilibrium recovery rate of $\underline{s}$. For $w \in (\underline{s}, 1]$, therefore, there are incentives to hold out, which frustrate a full-participation equilibrium. $\square$

To prove Proposition 3, we shall prove the following, more comprehensive proposition.

Proposition 3A (partial-participation equilibrium - policy failure) *Let* $\underline{w}(s) \equiv s \cdot \left(5/4 - \sqrt{\underline{s}^2 + (\overline{\alpha}(s)/2)^2}\right)^{-1}$ *for* $s \in (\widetilde{s}, 1/2]$ *and let* $\overline{w}(s) \equiv \max\{s/(1-\underline{s}), \underline{s}\}$ *(see dashed and blue curves in Figure 2). Assume that the approval constraint is not binding.*

(a) For $w \in (\underline{s}, \overline{w})$ *(Area B in Figure 2), there exists a unique equal-recovery equilibrium in which the participation rate and Consenting Creditors' payment demand as a function of the degree of information asymmetry between Country and Creditors (s) and the Clause's strength (w) are:*

$$(\alpha^*(s,w), \qquad d^*(s,w)) =$$

$$\begin{cases} \left(\underline{s} + (A-B)/2 + \sqrt{\underline{s}A + ((A-B)/2)^2},\ \underline{s}\right) & \text{if } w \in (\underline{s},\ \underline{w}] \\ \left(2A + \sqrt{(2A)^2 + B^2}, (1/2) \times \left(2A + B + \sqrt{(2A)^2 + B^2}\right)\right) & \text{if } w \in (\underline{w}, \overline{w}), \end{cases}$$

where $A(s,w) \equiv s(1-w)/w$ *and* $B(s,w) \equiv A(s,w) - \underline{\alpha}(s)$*.*

The equilibrium participation rate, payment demand, and Country's probability of no-default decrease with w (strictly, weakly, and strictly, respectively) and are bounded below by $4\underline{\alpha}(s)$*,* $2\underline{\alpha}(s)$*, and* $\underline{\alpha}(s)/s$*, respectively.*

(b) For $w \in (\overline{w}, 1]$ *(Area C in Figure 2) there does not exist an equal-recovery equilibrium.*

PROOF. We proceed by deriving the equal-recovery participation rate as a function of Consenting Creditors' payment demand and then deriving Consenting Creditors' optimal payment demand as a function of the participation rate. Using the two equilibrium conditions, we solve for the equal-recovery equilibrium participation rate and payment demand as a function of s and w. To show that there does not exist an equal-recovery equilibrium (per part (b)), we find conditions on s and w such that there does not exist an interior demand that maximizes Consenting Creditors' recovery and satisfies the equal recovery condition for any participation rate.

We begin by deriving the equal-recovery participation rate as a function of the (interior) payment demand. Rearranging terms in the equal recovery condition in (4) gives $P_{nd}(\alpha, d, s) = d/(\alpha - d) \times (1-w)/w$. Plugging in $((\alpha - \underline{\alpha}(s)) - d)/s$ for $P_{nd}(\alpha, d, s)$ (from (A2)) and solving for α we get

$$\widehat{\alpha}(d, s, w) = d + \underline{a}(s)/2 + \sqrt{d{\cdot}s{\cdot}(1-w)/w + (\underline{a}(s)/2)^2}, \tag{A3}$$

for $d \in D_i$. The condition (A3) thus restates the equal-recovery equilibrium condition by associating with any interior demand an equal-recovery participation rate.

To simplify the presentation, we pause to derive Consenting Creditors' marginal benefit and cost of making a higher interior demand. Recall from (3) that Consenting Creditors choose a payment demand to maximize $d \times [(1-w) + wP_{nd}(\alpha, d, s)]$. Consenting Creditors' marginal benefit and cost of making a higher interior demand are accordingly

$$MB_d(\alpha, d, s, w) \equiv 1 - w + wP_{nd}(\alpha, d, s) \tag{A4a}$$

and

$$MC_d(\alpha, d, s, w) \equiv -d{\cdot}w{\cdot}\partial P_{nd}(\alpha, d, s)/\partial d. \tag{A4b}$$

The marginal benefit of a higher interior demand (A4a) is the probability that the Clause is either (i) interpreted narrowly or (ii) interpreted broadly and Country does not default. The corresponding marginal cost (A4b) is the demand times the marginal decrease in the probability that Country does not default, i.e., the probability that the Clause is interpreted broadly times the marginal decrease in the probability that Country does not default given a broad interpretation of the Clause. Note that Consenting Creditors' expected recovery from an interior demand is $d \times MB_d(\alpha, d, s, w)$.

We turn next to deriving Consenting Creditors' optimal interior demand as a function of the participation rate.

Case I: $d^* = \underline{s}$. Given a participation rate α, Consenting Creditors maximize their expected recovery by making a payment demand $d = \underline{s}$ if and only if:

$$\begin{aligned} MB_d(\alpha, d, s, w) \quad &> \quad MC_d(\alpha, d, s, w) \text{ for } d \in (\underline{d}(\alpha, s), \underline{s}) && \text{(A5a)} \\ \text{subject to} \quad &: \\ \alpha \quad &> \quad \overline{\alpha}(s). && \text{(A5b)} \end{aligned}$$

The inequality condition (A5a) requires that Consenting Creditors' marginal benefit of increasing any interior demand lower than $\underline{s}$ is greater than the corresponding marginal cost. The inequality constraint (A5b) ensures that a demand of $\underline{s}$ is an interior demand (because for $\alpha \leq \overline{\alpha}(s)$, a demand of $\underline{s}$ is a corner demand by definition of $\overline{\alpha}(s)$). If (A5a) is satisfied, therefore, Consenting Creditors' expected recovery is higher under an interior demand of $\underline{s}$ than under any higher interior or corner demand.

Now, because Consenting Creditors' marginal benefit of making a higher interior demand decreases with d and the corresponding marginal cost increases with d, an interior demand of $\underline{s}$ is optimal if and only if $\lim_{d \to \underline{s}} MB_d(\alpha, d, s, w) \geq \lim_{d \to \underline{s}} MC_d(\alpha, d, s, w)$. Plugging in $((\alpha - \underline{\alpha}(s)) - d)/s$ for $P_{nd}(\alpha, d, s)$, $-1/s$ for $\partial P_{nd}/\partial d$, and $\underline{s}$ for d (because both limits involve continuous functions) we get

$$\alpha \geq \alpha_m(s, w), \tag{A6}$$

where $\alpha_m(s, w) \equiv \overline{\alpha}(s) + \overline{s} - s/w > \overline{\alpha}(s)$ (thereby satisfying (A5b) because $w > 1/2 \geq \overline{s}/s$.

The equal-recovery equilibrium participation rate is obtained by plugging in $\underline{s}$ for d in (A3). Substituting the equal-recovery participation rate for α and solving for w that satisfies (A6) gives $w \leq \underline{w}(s)$, where $\underline{w}(s) > \underline{s}$ for $s > \widetilde{s} \equiv 7/2 - \sqrt{10} \approx 0.33$.

Case II: $d^* < \underline{s}$. Given a participation rate α, Consenting Creditors maximize their expected recovery by making a payment demand $\widehat{d} \in (\underline{d}(\alpha, s), \overline{d}(\alpha, s))$ if and only if

$$\begin{aligned} MB_d(\alpha, \widehat{d}, s, w) &= MC_d(\alpha, \widehat{d}, s, w) \quad \text{(A7a)} \\ \text{subject to} &: \\ \widehat{d} \times MB_d(\alpha, \widehat{d}, s, w) &> (1-w)\min\{\alpha, \underline{s}\} \text{ for } \alpha \leq \overline{\alpha}(s). \quad \text{(A7b)} \end{aligned}$$

The equality condition (A7a) requires that Consenting Creditors' marginal benefit of increasing their interior demand is equal to the corresponding marginal cost.[22] The inequality constraint (A7b) ensures that Consenting Creditors' expected recovery is higher under an optimal interior demand than under a corner demand.[23]

Plugging in $((\alpha - \underline{\alpha}(s)) - d)/s$ for $P_{nd}(\alpha, d, s)$ and $-1/s$ for $\partial P_{nd}/\partial d$ in the equality condition (A7a) and solving for d we get

$$\widehat{d}(\alpha, s, w) = (\alpha + B(s, w))/2, \quad \text{(A8)}$$

where $B(s, w) \equiv s(1-w)/w - \underline{\alpha}(s)$. (A8) is Consenting Creditors' candidate optimal interior demand as a function of α, s and w. Solving for α for which $\widehat{d}(\alpha, s, w) \in (\underline{d}(\alpha, s), \overline{d}(\alpha, s))$ gives $\alpha \in (\alpha_l, \min\{\alpha_m, \alpha_{nd}\})$, where $\alpha_m(s, w)$ is defined in (A6), $\alpha_{nd}(s, w) \equiv \underline{\alpha}(s) + s(1 + 1/w)$ is the value of α for which $\widehat{d}(\alpha, s, w) = \underline{s} - (1-\alpha)$ (maximum no-default demand), and $\alpha_l(s, w) = \underline{\alpha}(s) + s(1 - 1/w)$ is the value of α for which $\widehat{d}(\alpha, s, w) = \overline{s} - (1-\alpha)$ (minimum corner demand).

We turn next to the inequality constraint (A7b). The right-hand side of this inequality increases with α, whereas the left-hand side is capped at $(1-w)\underline{s}$. It therefore suffices to consider the case where $\min\{\alpha, \underline{s}\} = \alpha$. Plugging in $\widehat{d}/(\alpha - \widehat{d}) \times (1-w)/w$ for $P_{nd}(\alpha, \widehat{d}, s)$ (by the equal-recovery condition), the inequality $\widehat{d} \times MB_d(\alpha, \widehat{d}, s, w) > (1-w)\alpha$ reduces to $\widehat{d} > \alpha/2$. But the right-hand side of (A8) is greater than $\alpha/2$ if and only if $B(s, w) > 0$. The supremum value of w for which Consenting Creditors' optimal demand is an equal-recovery interior demand (rather than a corner demand) is therefore the value of w that satisfies $B(s, w) = 0$, which value is $s/(1-\underline{s})$, where $s/(1-\underline{s}) > \underline{s}$ for $s > \widehat{s} \equiv \sqrt{3} - 3/2 \approx$

[22] The second-order condition for a maximum is satisfied because the second derivative of Consenting Creditors' expected recovery with respect to d is $-1/s < 0$.

[23] We assume that if indifferent, Consenting Creditors will make an interior demand rather than a default demand.

0.23. Letting $\overline{w}(s) \equiv \max\{s/(1-\underline{s}), \underline{s}\}$, it follows that for $w \in [\overline{w}, 1]$ there does not exist an interior demand that maximizes Consenting Creditors' recovery and satisfies the equal recovery condition for any participation rate (this proves part (b)).

To obtain the equilibrium participation rate, we substitute $\widehat{d}(\alpha, s, w)$ for d in (A3) and solve for α. Plugging the equilibrium participation rate back into α in (A8) gives the equilibrium payment demand.[24] The equilibrium probability of no-default is decreasing in w because the sum of Creditors' demands increases with w, as we show in footnote 15.

Finally, the lower bounds of the equilibrium participation rate, payment demand, and probability of no-default are obtained by plugging in $\underline{\alpha}(s)$ for A and 0 for B in the respective equilibrium expressions. $\square$

We conclude with an example that illustrates the equilibrium outcome for $s = 1/2$.

Example A1 (partial-participation equilibrium - $s = 1/2$**)** *For* $s = 1/2$ *there exists a unique partial-participation equilibrium in which the participation rate and Consenting Creditors' payment demand as a function of the Clause's strength* (w) *are:*

$$(\alpha^*(w), d^*(w)) = \begin{cases} (1/2 + \sqrt{A/2}, 1/2) & \textit{if } w \in (1/2, c] \\ \left(2A + \sqrt{5A^2}, (1/2) \times \left(3A + \sqrt{5A^2}\right)\right) & \textit{if } w \in (c, 1], \end{cases}$$

where $A(w) \equiv (1-w)/(2w)$ *and* $c \equiv (1 + 1/\sqrt{5})/2 \approx 0.72.$

When $s = 1/2$, $A(w) = B(w) = (1-w)/(2w)$ (because $\underline{\alpha}(1/2) \equiv 1 - \overline{s} = 1 - 1 = 0$). Plugging in A for B and $(1-w)/(2w)$ for A in the equilibrium expressions in Proposition 2A gives the expressions in the Example. The Example illustrates that as w increases, the drop in the equilibrium participation rate is greater than the corresponding drop in Consenting Creditors' payment demand and therefore the sum of Creditors' demands increases with w. In particular, for low values of w, the equilibrium payment demand

[24] For $s \in (\widehat{s}, \widetilde{s})$, both the (equal-recovery) equilibrium participation rate and restructuring demand drop *discontinuously* at $w = \underline{s}$. The discontinuous drop results from the fact that for high participation rates, Consenting Creditors' optimal demand is a no-default demand under which Holdout Creditors obtain a higher recovery rate than Consenting Creditors. Holdout Creditors' higher recovery rate produces a pressure to hold out, which lowers the participation rate and payment demand until Consenting Creditors' optimal demand becomes an interior demand. Country's equilibrium probability of no-default, by contrast, decreases *continuously* with w.

remains the same as w increases while the equilibrium participation rate decreases with w; for high values of w, by contrast, both the equilibrium participation rates and payment demand decrease with w, but the equilibrium participation rate drops more steeply with w than the equilibrium payment demand. Furthermore, because $d^*(w) \geq \alpha^*(w)/2$ for any $w \in (1/2, 1]$, there exists an equal-recovery equilibrium for any such w. $\square$

Proposition 4 *In a partial-participation equilibrium, Country's expected total costs given a policy failure are* $w + (1-w)\tau(\alpha^*(w))$ *which increase with* w.

PROOF. We proceed by showing that the equilibrium participation rate, $\alpha^*(w)$, decreases with w. The rest of the proof is included in the text that follows the proposition.

Consider two cases: $d^* = \underline{s}$ and $d^* < \underline{s}$.

Case I: $d^* = \underline{s}$. From the proof of Proposition 3A,

$$\alpha^*(w) = \underline{s} + \underline{\alpha}(s)/2 + \sqrt{\underline{s}A(w) + (\underline{\alpha}(s)/2)^2} \tag{A9}$$

after plugging in $A(w) - \underline{\alpha}(s)$ for $B(w)$. Taking the derivative with respect to w gives

$$\frac{d\alpha^*(w)}{dw} = \left(\sqrt{\underline{s}A(w) + (\underline{\alpha}(s)/2)^2}\right)^{-1} dA(w)/dw < 0, \tag{A9a}$$

because $dA(w)/dw = -s/w^2 < 0$.

Case II: $d^* < \underline{s}$. From the proof of Proposition 3A,

$$\alpha^*(w) = 2A + \sqrt{(2A)^2 + B^2}. \tag{A10}$$

Plugging in $A(w) - \underline{\alpha}(s)$ for $B(w)$, simplifying and taking the derivative with respect to w gives

$$\begin{aligned} \frac{d\alpha^*(w)}{dw} &= dA(w)/dw \times [(2 + \left((2A)^2 + B^2\right)^{-1/2} (8A + 2B)] \\ &< 0 \end{aligned} \tag{A10a}$$

because $A(w) > 0$, $B(w) \geq 0$ and $dA(w)/dw < 0$. $\square$

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