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Conventional wisdom says that, in the absence of default penalties, sovereign risk destroys all foreign asset trade. We show that this conventional wisdom rests on one implicit assumption: that assets cannot be retraded in secondary markets. Without this assumption, foreign asset trade is possible even in the absence of default penalties. This result suggests a broader perspective regarding the origins of sovereign risk and its remedies. Sovereign risk affects foreign asset trade only if default penalties are insufficient and secondary markets work imperfectly. To reduce its effects, one can either increase default penalties or improve the working of secondary markets.
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Conventional wisdom views the problem of sovereign risk as one of insufficient penalties. Foreign creditors can only be repaid if the government enforces foreign debts. And this will only happen if foreign creditors can effectively use the threat of imposing penalties to the country. Guided by this assessment of the problem, policy prescriptions to reduce sovereign risk have focused on providing incentives for governments to enforce foreign debts. For instance, countries might want to favor increased trade ties and other forms of foreign dependence that make them vulnerable to foreign retaliation thereby increasing the costs of default penalties.

This paper presents an unconventional view of the problem of sovereign risk as one of missing or imperfect secondary markets. In our setup foreign creditors cannot impose penalties and therefore the government never enforces foreign debts. But foreign creditors can still be repaid by selling their debts in secondary markets. This alternative view of the problem gives rise to a new and different set of policy prescriptions aimed at improving the workings of secondary markets. For instance, countries might want to develop deep secondary markets abroad to reduce their government's ability to intervene in them.

To understand this view of sovereign risk, consider the canonical situation of a country that borrowed in the past and is considering whether to pay back to its foreign creditors. It does not matter whether it was the private sector or the government who borrowed initially. After all, even government debts must ultimately be paid by taxing the private sector. The last word on whether the country pays its foreign debt must come from the country's government however, since nobody else holds enough power to force the private sector to pay. The problem, of course, is that the government cares more about the private sector than about foreign creditors and finds it tempting not to enforce foreign debts. What prevents this? Conventional wisdom says that only the expectation of costly default penalties, such as the loss of collateral and reputation, trade embargoes or even military interventions. If these penalties turn out to be insufficient, the country will default on its debt and start a process of renegotiation. Eventually, some sort of explicit or implicit agreement will be reached and the country will be able to borrow again.

This conventional wisdom does not consider however the possibility that foreign creditors sell their debts in the secondary market, and this is far from an innocuous oversight. Once it becomes known that penalties are insufficient and default is looming, foreign creditors will not passively hold their debts until default takes place. Instead, they will try to sell them in secondary markets and recover any value they can. Who will buy these debts? Certainly not other foreign creditors. But the private sector will, if it expects the government to enforce domestic debts. We show that, indeed, the private sector buys back the debts at face value and domestic debts are enforced. Trading in secondary markets therefore allows foreign creditors to successfully circumvent the opportunistic behavior of the government, 'de facto' averting default and therefore eliminating sovereign risk. The proof of this result is based on two observations: (i) once the private sector has bought back the debt, not enforcing domestic debts can at most redistribute wealth within the private sector but cannot increase its level of wealth; and (ii) trading in the secondary market always ensures that the redistribution that would result from not enforcing domestic debts is undesirable for the government.

A useful way to think about this result is that secondary markets create a 'prisoner's dilemma' situation that forces the country to buy back or repay its debt. It would be better for the different members of the private sector to coordinate actions and not to purchase each other's debts from foreign creditors. If such collusion were possible, it would lead to default and therefore to an increase in the wealth of the country. But the capital gains or profits from violating the agreement would be large, since individuals could purchase the country's foreign debt at a discount and redeem it later at face value. Hence, the agreement is not feasible and the country as a whole ends up repurchasing all of its foreign debt in the secondary market. This outcome constitutes an 'ex-post' inefficiency from the viewpoint of the country because it leads to higher repayment, but for the same reason it raises 'ex-ante' efficiency by allowing the country to borrow more.

The result that secondary markets eliminate sovereign risk constitutes a valuable theoretical benchmark. We derive it first in Section I using a simple two-period, two-region setup so as to develop the basic intuitions in a transparent way. We derive this result again in Section II using a quite general setup with many regions, many periods, many shocks, many sources of market incompleteness, and many sources of heterogeneity within and between regions. This detailed derivation is useful because it shows which assumptions are crucial, and which ones are not. For instance, we find that the result does not depend on governments being benevolent, the nature of shocks or markets being complete. All the crucial assumptions directly relate to the workings of secondary markets. Whatever assets exist, it should be possible to retrade them in secondary markets that are competitive and free from government intervention and other trading frictions.

Of course, these requirements are somewhat unrealistic. Transaction costs, large agents, and many forms of government interference typically impair the workings of real-world secondary markets. Under these circumstances, the problem of sovereign risk resurfaces. In Section III, we analyze the effects of these frictions and find that the picture that emerges from the theory is surprisingly rich. When penalties are known to be insufficient, foreign creditors try to sell their debts, perhaps at a discount, and 'leave' the country. The private sector is willing to buy back these debts if it expects the government to enforce them. The government, in turn, tries to avoid these repurchases by threatening not to enforce, by imposing capital controls and, more generally, by taking a variety of actions intended to put sand on the wheels of secondary markets. If the government is unsuccessful, default is averted. If the government is successful, default takes place and the debt renegotiation process starts. Either way, insufficient penalties start a period of market turbulence which can be usefully understood as a costly struggle among foreign creditors, the private sector, and the government. Existing research, which ignores the role of secondary markets, cannot capture this rich set of interactions. And yet, as we discuss in Section IV, these interactions generate a number of predictions that are consistent with stylized evidence on emerging-market borrowing.

A caveat is in order. Throughout the paper, we study setups where there are no default penal-

ties. This research strategy allows us to clearly isolate the role of secondary markets and their effects. Moreover, in the course of our research it has become apparent that the interactions between secondary markets and default penalties are far from trivial and deserve a separate treatment. Nonetheless, the results presented in this paper suggest a broader perspective regarding the origins of sovereign risk and its remedies. Sovereign risk affects foreign asset trade only if *both,* default penalties are insufficient *and* secondary markets work imperfectly. To reduce the effects of sovereign risk, one can *either* increase default penalties *or* improve the workings of secondary markets.

Related literature:

There is an extensive theoretical literature that studies the role of reputational considerations and direct sanctions in foreign asset trade.[1,2] The empirical relevance of these penalties, however, is still under debate.[3] Without exception, this literature has ignored the role of secondary markets and taken for granted that, if governments do not enforce and/or make payments to foreigners, then foreigners cannot collect on their debts.[4] This was somewhat justified when the literature started in the early 1980's, since virtually all emerging market borrowing was done via syndicated bank loans which were difficult to retrade. However, the institutional setup of emerging-market borrowing has changed dramatically since then: a large fraction of both government and private borrowing is now done by selling bonds and stocks which are traded in deep secondary markets.

This paper is also related to a strand of the literature that asks whether it is optimal for a country that suffers a debt overhang to repurchase its foreign debt before maturity.[5] This question is answered from an ex-post perspective in which the amount of outstanding debt is exogenous to the analysis. We instead focus on debt repurchases when there is no debt overhang and the amount of outstanding debt is endogenous to the analysis. In our context, these repurchases are clearly suboptimal from an ex-post perspective since they lead to the country paying back its debt even when there are no penalties for not doing so. Nonetheless, these repurchases take place in equilibrium and are beneficial from an ex-ante perspective since they allow the country to borrow more in the first place.[6]

I. The basic argument

The main result of this paper is that, if secondary markets work perfectly, sovereign risk has no effects. More precisely, it makes no difference for consumption and welfare whether we assume that all asset payments are enforced or, alternatively, we assume that governments strategically choose which ones, if any, to enforce. This result applies to a very broad class of models, as we

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[1]See Jonathan Eaton and Mark Gersovitz (1981), Herschel I. Grossman and John B. Van Huyck (1988), Jeremy Bulow and Kenneth Rogoff (1989a, b), Raquel Fernández and Robert W. Rosenthal (1990), Andrew Atkeson (1991), Harold L. Cole, James Dow, and William B. English (1995), Cole and Patrick J. Kehoe (1997), Kenneth M. Kletzer and Brian D. Wright (2000), Kehoe and Fabrizio Perri (2002), Mark L. Wright (2002), Manuel Amador (2008), and Guido Sandleris (2008). See Eaton and Fernández (1995) for an excellent survey.

[2]There is also a more applied literature that focuses on the quantitative effects of debt crises on asset trade and business cycles. See, for instance, Kraay et al. (2005), Mark Aguiar and Gita Gopinath (2006, 2007), Vivian Z. Yue (2006), Cristina Arellano (2008), and Enrique G. Mendoza and Yue (2008).

[3]For evidence on the length of exclusion from international capital markets after defaults, see Gaston Gelos, Ratna Sahay, and Sandleris (2004) and Rohan Pitchford and Wright (2007). For evidence on the existence of trade disruptions around times of default, see Andrew K. Rose (2005) and Jose V. Martinez and Sandleris (2007).

[4]Three recent papers examine the role of secondary markets after default, during debt renegotiations. See Sergi Lanau (2007), Pitchford and Wright (2008), and Yan Bai and Jing Zhang (2009).

[5]See Bulow and Rogoff (1988, 1991), Michael P. Dooley (1988), Kenneth Froot (1989), Elhanan Helpman (1989), Paul R. Krugman (1989, 1992), Jeffrey D. Sachs (1990), Peter B. Kenen (1991), Julio J. Rotemberg (1991), Enrica Detragiache (1994), Ishac Diwan and Mark M. Spiegel (1994), and Jorge Fernández-Ruiz (2000).

[6]From a more general perspective, this paper is also related to the work of Alberto Bisin and Adriano A. Rampini (2006), who explore the role of hidden trades in disciplining governments.

formally prove in Section II. In this section, we prove the result in a simple setup so as to develop intuition.

A.   A barebones model of sovereign risk

This section presents one of the simplest worlds in which we can prove our result. We label it the Debtor-Creditor World (D-C World) and it is as follows:
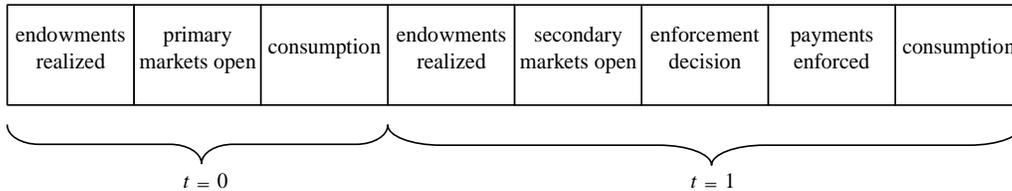
EXAMPLE 1 (Debtor-Creditor World):   *The world lasts two periods: Today and Tomorrow, indexed by $t \in \{0, 1\}$; and it contains two equal-sized regions: Debtor and Creditor, indexed by $j \in \{D, C\}$. Let $\mathcal{I}^j$ be the set of individuals located in region j, and $\mathcal{I}^W = \mathcal{I}^D \cup \mathcal{I}^C$. Each region contains a continuum of infinitesimal individuals that maximize this separable utility function: $U(c_{i0}, c_{i1}) = u(c_{i0}) + u(c_{i1})$ for all $i \in \mathcal{I}^W$; where c_{i0} and c_{i1} are used, respectively, to denote the consumption levels of individual i Today and Tomorrow, and $u(\cdot)$ is monotonic, increasing and concave. All debtors (i.e. residents of Debtor) receive an endowment equal to $y - \varepsilon$ Today and $y + \varepsilon$ Tomorrow. All creditors (i.e. residents of Creditor) receive an endowment equal to $y + \varepsilon$ Today and $y - \varepsilon$ Tomorrow.*

In the D-C World there are no gains from domestic trade because all individuals within a region have the same preferences and endowments. But endowments differ across regions and this creates gains from international trade in bonds. To reap these gains, the world needs well-functioning bond markets. We refer to the bond markets that open Today and Tomorrow as primary and secondary respectively. For these markets to work well, bond payments must be enforced. This is the role of governments.

There are two governments, one in each region, whose only action is to enforce payments by their residents. In doing so, governments can discriminate between payments owed to residents of their own region and to residents of the other region.[7] Governments are assumed to have no credibility so that any promise made before the time of enforcement is discounted by individuals. We consider two alternative institutional setups regarding enforcement:

- We shall say that there is *full enforcement* if the world has institutions ensuring that governments always prefer to enforce bond payments regardless of the parties involved.

- We shall, instead, say that there is *strategic enforcement* if governments choose which bond payments, if any, to enforce in order to maximize the average utility of their residents, i.e. $W^j = \int_{i \in \mathcal{I}^j} u(c_{i1})$ for all $j \in \{D, C\}$.

Thus, the only difference between these setups is whether –at the time of enforcement– governments enforce all payments or act opportunistically. The timing of events is the same in both cases:[8]

endowments realized	primary markets open	consumption	endowments realized	secondary markets open	enforcement decision	payments enforced	consumption

$t = 0$ $t = 1$

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[7]This assumption is only made for simplicity and none of our results depend on it.

[8]An equivalent timing assumption would be that both primary and secondary markets are always open. For simplicity and without loss of generality, we assume that they are open only when there are gains from trade. In Section D we analyze the possibility that secondary markets be closed even if there are gains from trade as a result of capital controls.

An equilibrium of the D-C World is characterized by both individual and government maximization. Under full enforcement, individuals trade in primary and secondary markets given their knowledge that governments always choose to enforce all payments. Under strategic enforcement, individuals trade in primary and secondary markets given their expectations on enforcement. Governments, in turn, choose enforcement after individuals have traded in secondary markets. Naturally, individuals are rational and their expectations on enforcement must be correct in equilibrium.[9]

B. Full enforcement

If governments always enforce all payments, bond prices in secondary markets must equal their face value. If prices were below face value, individuals could make a riskless profit by purchasing bonds and redeeming them. If prices were above face value, the opposite strategy would then deliver a riskless profit. In primary markets, bonds must promise a return of one given the strong symmetry between periods: there is no time preference for consumption and the world endowment is the same in both periods. Therefore, we have that:

$$(1) \qquad (q_0^j)^* = (q_1^j)^* = 1 \ \text{ for all } j \in \{D, C\},$$

where q_t^j is the price in period t of a bond issued by a resident of region j that pays one unit of output Tomorrow, and the asterisk is used to denote the full-enforcement equilibrium. Since bond returns are one, we have the following equilibrium consumption:

$$(2) \qquad (c_{i0})^* = (c_{i1})^* = y \ \text{ for all } i \in \mathcal{I}^W.$$

That is, individuals completely smooth their consumption across periods.

Implementing the full enforcement consumption allocation requires debtors to borrow from creditors. Let x_{it}^j be the bonds issued by residents of region j that are held by individual i after trading in period t. There are many possible distributions of bond holdings in the primary market that support the consumption allocation in Equation (2), given the prices in Equation (1). Among them, it is customary to choose the distribution that minimizes trade volume:[10]

$$(3) \qquad (x_{i0}^C)^* = 0 \ \text{ for all } i \in \mathcal{I}^W \ \text{ and } \ (x_{i0}^D)^* = \begin{cases} -\varepsilon & \text{if } i \in \mathcal{I}^D \\ +\varepsilon & \text{if } i \in \mathcal{I}^C \end{cases}$$

Equation (3) states that debtors issue ε bonds and sell them to creditors. There are even more distributions of bond holdings in the secondary market that support the consumption allocation in Equation (2), given the prices in Equation (1). In fact, any redistribution of the original bonds achieves this since all individuals can directly collect any bond payment under full enforcement. It is again customary to choose among all of these distributions the one that minimizes trade volume which in this case means zero trade:

$$(4) \qquad (x_{i1}^j)^* = (x_{i0}^j)^* \ \text{ for all } j \in \{D, C\}, i \in \mathcal{I}^W.$$

Note that creditors do not go to the secondary market but instead collect their debts directly

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[9]Our concept of equilibrium is the same as in V. V. Chari, Kehoe, and Edward C. Prescott (1989). Namely, individuals behave competitively and take prices and (enforcement) policy as given. Governments, in turn, conduct their (enforcement) policy strategically. In addition, and for clarity of exposition, we rule out the use of mixed strategies by governments. None of our results depend on this assumption.

[10]Minimization of trade volume implies that gross and net bond holdings coincide and are both given by x_{it}^j.

from the original bond issuers. Therefore, the secondary market plays no role under full enforcement and closing it would have no effects on consumption and welfare. To sum up, Equations (1), (2), (3) and (4) provide a complete description of the full-enforcement equilibrium.

Under full enforcement, regional governments are assumed to have both the means and the will to force domestic residents to pay their debts. Under strategic enforcement, governments are still assumed to have the means to enforce debts but they might not have the will to do so. In this last case, it is widely believed that international trade in bonds is not possible in the D-C World since there are no default penalties. The argument goes as follows: creditors lend Today only if they expect debtors to pay their debts Tomorrow. But Tomorrow Debtor's government will not force debtors to pay back their debts since this would lower the average utility of the region. Anticipating this, creditors do not lend Today. There is therefore a unique equilibrium without international trade in bonds in which each region (and therefore each individual) consumes its own endowment. We show next why this conclusion is incorrect.

C. The role of secondary markets

It is evident that, under strategic enforcement, Tomorrow Debtor's government will not enforce payments on bonds held by creditors. It is also evident that creditors must anticipate this Today. But it does not follow that creditors do not lend Today since they still have the option of reselling their bonds Tomorrow in the secondary market. In fact, we show next that in equilibrium bonds trade in the secondary market at face value. Anticipating this, creditors lend to debtors Today and all gains from trade are reaped even if governments choose enforcement strategically.

Define $e_{j'}^{j} \in \{0, 1\}$ to be a variable that takes the value one if bond payments from residents of region j to those of j' are enforced, and zero otherwise. Under full enforcement, we have that $e_{j'}^{j} = 1$ for all j and j' by assumption. Under strategic enforcement, $e_{j'}^{j}$ is obtained as part of the equilibrium and must be consistent with government preferences and bond holdings after the secondary market closes. For instance, assume prices, consumptions and bond holdings are those of the equilibrium with full enforcement. Since all bonds are in the hands of creditors after the secondary market closes, this is possible in an equilibrium with strategic enforcement if and only if Debtor's government prefers to enforce bond payments to creditors. But this cannot be since enforcing these payments would lower the region's average utility:

$$\arg\max_{e_C^D} \left\{ \int_{i \in \mathcal{I}^D} u\left((c_{i1})^* - (1 - e_C^D) \cdot (x_{i1}^D)^* \right) \right\} = 0.$$

As a result, Equations (1), (2), (3) and (4) cannot all simultaneously be part of an equilibrium with strategic enforcement.

This does not mean however that consumption and welfare differ between the cases with full and strategic enforcement. Let a double asterisk denote an equilibrium with strategic enforcement. Assume that Debtor's government is expected to enforce bond payments between debtors. Let prices, consumptions and bond holdings Today be the same as in the equilibrium with full enforcement:

(5) $$(q_0^j)^{**} = (q_1^j)^{**} = 1 \ \text{ for all } \ j \in \{D, C\},$$

(6) $$(c_{i0})^{**} = (c_{i1})^{**} = y \ \text{ for all } i \in \mathcal{I}^W,$$

$$(7) \qquad (x_{i0}^C)^{**} = 0 \text{ for all } i \in \mathcal{I}^W \text{ and } (x_{i0}^D)^{**} = \begin{cases} -\varepsilon & \text{if } i \in \mathcal{I}^D, \\ +\varepsilon & \text{if } i \in \mathcal{I}^C. \end{cases}$$

Instead of assuming no trade in the secondary market, though, assume that trade in this market leads to the following distribution of bond holdings:

$$(8) \qquad (x_{i1}^C)^{**} = 0 \text{ for all } i \in \mathcal{I}^W \text{ and } (x_{i1}^D)^{**} = \begin{cases} \delta_i & \text{if } i \in \mathcal{I}^D, \\ 0 & \text{if } i \in \mathcal{I}^C, \end{cases}$$

with $\int_{i \in \mathcal{I}^D} \delta_i = 0$ and $\delta_i \leq y$ for all $i \in \mathcal{I}^D$.[11] That is, in secondary markets debtors purchase all the bonds from creditors although not necessarily in a symmetric way. In turn, assume that Debtor's government enforces payments between debtors:

$$(9) \qquad\qquad\qquad\qquad (e_D^D)^{**} = 1.$$

The distribution in Equation (8) and the enforcement policy in Equation (9) are consistent with maximization by both individuals and governments. If Debtor's government is expected to enforce bond payments between debtors, the distribution of bond holdings in Equation (8) is consistent with individual maximization since all bonds are in the hands of those (i.e. debtors) capable of redeeming them after the market closes. Otherwise, there would be unexploited trade opportunities as those that cannot collect bond payments would not be selling their bonds to those that can. If individuals choose the distribution of bond holdings in Equation (8), enforcement of bond payments between debtors is consistent with Debtor's government maximization. Jensen's inequality implies that this raises the region's average utility:

$$\arg\max_{e_D^D} \left\{ \int_{i \in \mathcal{I}^D} u\left((c_{i1})^{**} - (1 - e_D^D) \cdot (x_{i1}^D)^{**}\right) \right\} = 1.$$

Therefore, we have shown that Equations (5), (6), (7), (8), and (9) constitute an equilibrium with strategic enforcement.

Consumption and welfare are the same in the equilibria with strategic and full enforcement. The only difference is the amount of trade in the secondary market. In both equilibria, trading in secondary markets must ensure that all bonds end up in the hands of those individuals that can collect payments from bond issuers. Since this is an empty requirement in the case of full enforcement, minimization of trade volume then leads to zero trade. But this is not an empty requirement with strategic enforcement. Since creditors hold all the bonds and Debtor's government never enforces bond payments to them, trade in the secondary market is needed to ensure that all bonds end up in the hands of debtors. It is easy to check that there are many distributions of bond holdings that fulfill this requirement.

Secondary markets play the usual role of transferring assets to those individuals that value them most, leading to maximization of asset value. This means moving bonds from those individuals that cannot collect payments from the original issuers to those that can, leading to maximization of enforcement. Creditors are willing to sell all their bonds at any positive price since they know that any bond left in their hands after the market closes will not be enforced. Therefore, the supply of bonds is vertical. Debtors are willing to buy any quantity of bonds at face value since they know that bonds left in their hands after the market closes will be enforced. That is, the demand for bonds is horizontal until all the endowment of Debtor has been exhausted, and downward-sloping

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[11] This distribution is feasible since the secondary market clears and no individual is left with a negative endowment after trading in it.

thereafter. The equilibrium price is therefore equal to face value if demand and supply cross in the horizontal section of the demand curve. But this must be the case since the face value of all outstanding bonds cannot exceed Debtor's output. Otherwise, we would reach the contradiction that the allocation with full enforcement implies negative consumption for debtors.

Another useful and intuitive way of thinking about the role of secondary markets is that they create a prisoner's dilemma situation that forces the region to repurchase or repay its debt. Once Tomorrow arrives, it would be better for all debtors to agree not to purchase each other's bonds from creditors. If such collusion were possible, it would lead to default and therefore an increase in consumption for all debtors. But each debtor has a strong incentive to depart from such an agreement. Since creditors are willing to sell their bonds at any positive price, the capital gains or profits from violating the agreement would be enormous for a small or infinitesimal debtor. Hence, the agreement is not feasible and the region as a whole ends up paying all of its debts in the secondary market. This outcome, which constitutes an ex-post inefficiency from the viewpoint of the region, somewhat paradoxically ensures ex-ante efficiency since it allows for international trade in bonds Today.

The widespread belief that the absence of default penalties *alone* leads to a unique equilibrium without international trade is thus incorrect. This requires the absence of both default penalties *and* secondary markets. Closing secondary markets does not make any difference with full enforcement, since creditors have the additional option of directly collecting debts from debtors. But closing secondary markets has dramatic effects with strategic enforcement, since creditors do not have this additional option available to them. Once these markets are closed, creditors lose any hope of being repaid and decide not to lend to debtors. As a result, each region (and therefore each individual) ends up consuming its own endowment. With secondary markets, government attempts to use enforcement policy to redistribute from foreign to domestic residents are easily circumvented with the help of additional trading and without creating any welfare loss. Without secondary markets, government attempts to use enforcement policy to redistribute from foreign to domestic residents are also futile. But they destroy valuable international trade and create welfare losses.

To sum up, the equilibrium with strategic enforcement delivers the same consumption and welfare than the equilibrium with full enforcement, but requires more trade in secondary markets. This additional trade is however only the first consequence of moving from full to strategic enforcement. The observant reader has already noticed a second one, namely, that consumption and welfare are unique with full enforcement but not with strategic enforcement. Our analysis of the deceptively simple D-C World is not over yet.[12]

D.   Multiple equilibria and welfare

The equilibrium with strategic enforcement described in the previous section is based on the 'optimistic' expectations that Debtor's government will enforce bond payments between debtors. These expectations are validated in equilibrium since trading in the secondary market results in a distribution of bond holdings such that Debtor's government chooses to enforce payments on all outstanding bonds. What would happen instead if individuals have 'pessimistic' expectations about enforcement? We show next that it is also possible to construct equilibria based on various combinations of optimistic and pessimistic expectations on enforcement.

Assume individuals are pessimistic and expect Debtor's government not to enforce any bond payments. Then, there will be no demand in the secondary market and any bond traded there will

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[12]The equilibrium with full enforcement is unique with respect to consumption and welfare in the D-C World. But this need not be true in other worlds. We shall show later that for each (of the possibly many) equilibrium with full enforcement, there always exists a corresponding equilibrium with strategic enforcement that delivers the same consumption and welfare. What we analyze next is a set of additional equilibria with strategic enforcement that do not correspond to any equilibrium with full enforcement.

command a zero price. Anticipating this, the price of bonds in the primary market is also zero, no bonds are issued, and each region ends up consuming its own endowment.[13] To conclude that this is an equilibrium, we must show that the pessimistic expectations on enforcement are consistent with Debtor's government maximization. But this must be the case here. Since no bonds are issued Today, Debtor's government is indifferent between enforcing and not enforcing payments Tomorrow and, thus, not enforcing is indeed a best response. Therefore, we have found an additional equilibrium with different consumption and welfare from those in the equilibrium with full enforcement.[14]

It is easy to show that there are no additional equilibria in our simple world.[15] The reason is that there is only one meaningful enforcement decision Tomorrow, namely, whether Debtor's government enforces bond payments between debtors. This is only because we have assumed that governments cannot make different enforcement decisions for different groups of residents. But this assumption was just adopted for convenience. Relaxing it generates additional equilibria with strategic enforcement with different levels of consumption and welfare based on different combinations of optimistic and pessimistic expectations. The following example makes this point forcefully.

EXAMPLE 2 (D-C World with Names):   *All assumptions are the same as in the D-C World, except that individuals are also given one of two possible names: 'Dupont' or 'Dupond'.*

Although Duponts and Duponds have the same preferences and endowments, their different names allow governments to discriminate between them when deciding enforcement. This is clearly a minimal departure from the world of the previous section. But it forces Debtor's government to make another meaningful enforcement decision Tomorrow and this creates two additional equilibria. For instance, assume that individuals expect Debtor's government to enforce bonds issued by Duponts and held by other debtors, but not to enforce any bonds issued by Duponds. Given these expectations, Duponts can borrow while Duponds cannot and are therefore forced to consume their own endowment. Bond returns are less than one and all individuals, except for credit-constrained Duponds, equalize the ratio of their marginal utilities Today and Tomorrow. Duponts are better off than in the optimistic equilibrium since the removal of competitors (i.e. Duponds) from the primary market improves the terms at which they can borrow. But both Duponds and creditors are worse off than in the optimistic equilibrium, the former because they cannot borrow and the latter because they lend at worse terms.[16]

Under strategic enforcement there is always an optimistic equilibrium with the same consumption and welfare than under full enforcement. But we have seen that there are other pessimistic equilibria too. In the previous examples, these pessimistic equilibria never lead to a Pareto improvement over full enforcement. But this need not always be the case, as the following example shows:

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[13]As in any situation in which there is a useless asset which has price zero, individuals are indifferent between trading or not. Strictly speaking, in the pessimistic equilibrium, asset holdings are thus indeterminate. We are implicitly adopting the convention that useless assets are not traded in equilibrium.

[14]This pessimistic equilibrium is not the same as the equilibrium with missing secondary markets that the previous literature has focused upon. Pessimism closes the bond market and eliminates all trade, domestic and foreign. Closing secondary markets geographically segments the bond market eliminating international trade but not domestic trade. This difference is obscured in the D-C World because all individuals within a region are identical and there is no domestic trade in equilibrium.

[15]This would not be true if Debtor's government could randomize between enforcement and nonenforcement. In this case, there would be a continuum of equilibria in mixed strategies. In the D-C World all of these equilibria would deliver the same consumption and welfare as the optimistic equilibrium.

[16]To check that this is an equilibrium simply note that all expectations on enforcement are consistent with ex-post government optimization. Naturally, there is another equilibrium in which it is Duponds who can borrow while Duponts are forced to consume their endowment.

EXAMPLE 3 (Lucky-Unlucky World):   *The world lasts two periods: Today and Tomorrow, indexed by $t \in \{0, 1\}$; and it contains two equal-sized regions: Home and Foreign, indexed by $j \in \{H, F\}$. Each region contains a continuum of infinitesimal individuals that maximize the already familiar utility function: $U(c_{i0}, c_{i1}) = u(c_{i0}) + u(c_{i1})$ for all $i \in \mathcal{I}^W = \mathcal{I}^H \cup \mathcal{I}^F$. All individuals receive an endowment of y Today. But Tomorrow there are two states. If $s = s^H$, Home is lucky and its residents receive an endowment equal to $y + \varepsilon$, while Foreign is unlucky and its residents receive an endowment equal to $y - \varepsilon$. If $s = s^F$, Home is unlucky and its residents receive an endowment equal to $y - \varepsilon$, while Foreign is lucky and its residents receive an endowment equal to $y + \varepsilon$. Both states have equal probability.*

Clearly there are gains from international risk sharing in the Lucky-Unlucky World (L-U World). By pooling their endowments, individuals could eliminate the volatility of their consumption at no cost in terms of mean consumption. But we shall consider a situation in which insurance markets are missing. The only asset that can be traded is a noncontingent bond. Under full enforcement there is no international trade and each region is forced to consume its own endowment. The same happens under strategic enforcement if expectations are optimistic. This outcome is not Pareto efficient and the reason, of course, is that markets are incomplete.

But there is another equilibrium with a mix of optimistic and pessimistic expectations that can raise the welfare of all and lead to Pareto efficiency. Assume that individuals expect the lucky region to enforce bond payments between its residents, and the unlucky region not do so. Given these expectations, there is a trading strategy that ensures full risk sharing: in the primary market each individual buys ε bonds issued by residents of the other region and finances this sale by issuing and selling ε bonds. If an individual turns out to be unlucky, he/she will default on his/her bonds and enjoy a consumption equal to y. If an individual turns out to be lucky, he/she will have a capital loss equal to ε and enjoy a consumption equal to y as well.

What is going on? Pessimism closes markets (such as those for Dupond bonds) and/or leads to equilibrium default (such as when a region turns out to be unlucky). In the D-C World markets are complete and, as a result, the allocation with full enforcement is Pareto efficient. In this first-best context, closing markets and/or inducing defaults always reduces welfare. In the L-U World insurance markets are missing and the allocation with full enforcement is no longer Pareto efficient. In this second-best context, it is well known that closing some markets and/or using defaults to change the span of existing assets might lead to Pareto superior outcomes. This classic second-best intuition explains why pessimistic expectations might sometimes lead to higher welfare than optimistic ones.[17]

Up to this point we have shown that: (i) there is always an optimistic equilibrium that delivers the same level of consumption and welfare as the equilibrium with full enforcement; (ii) there are additional equilibria with strategic enforcement that are characterized by pessimistic expectations on enforcement and entail different levels of consumption and welfare; (iii) the optimistic equilibrium need not be the one that delivers the highest possible welfare. The next topic we address is robustness.

E.   Robustness

In order to assess the robustness of the equilibria that exist with strategic enforcement, we introduce a slight modification to the environment. We do so by adding a small preference for enforcement. Assume governments suffer a small welfare loss equal to b every time they decide not to enforce payments. We shall think of b as being arbitrarily small but strictly positive. In particular, in the D-C World this implies that the objective function of Debtor's government is now

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[17]This example also shows that our results do not depend on assuming that markets are complete. The optimistic equilibrium with strategic enforcement replicates the consumption and welfare of the equilibrium with full enforcement regardless of whether the latter is Pareto efficient or not.

given by $W^D = \int_{i \in \mathcal{I}^D} u(c_{i1}) - b \cdot \left(2 - e_C^D - e_D^D\right)$. This small modification to our environment eliminates all equilibria based on pessimistic expectations and, thus, the optimistic equilibrium is the only one which is robust.

The reason behind this result is quite simple. If individuals expect Debtor's government not to enforce any bond payments Tomorrow, no bonds issued by debtors will be traded today. At the time of making an enforcement decision, then, Debtor's government finds that it has no payments to enforce. Without a preference for enforcement, i.e. $b = 0$, this implies that the government is indifferent between enforcement and nonenforcement and the latter is thus a best response. With a small preference for enforcement, i.e. $b > 0$, this is no longer the case: whenever the enforcement decision has no effect on consumption or welfare, the government will choose to enforce payments ex-post, and nonenforcement can therefore not occur in equilibrium.

We therefore add a fourth and final item to our list of results: (iv) only the optimistic equilibrium survives the introduction of an (arbitrarily small) preference for enforcement.[18] This leads us to select the optimistic equilibrium for the D-C World. We then refer to the differences between this equilibrium and the equilibrium with full enforcement as the effects of sovereign risk. Our main result is that, if individuals can freely retrade existing assets, sovereign risk has no effects on consumption and welfare. The only effect of sovereign risk is to increase trade volume as individuals trade not only to smooth their consumption but also to circumvent the strategic or opportunistic behavior of governments.

F. Commitment and enforcement

We end this section by calling the reader's attention to a subtle but important issue. Up to now, we have shown that secondary markets are able to restore the allocation with full enforcement when governments have no commitment and choose enforcement strategically. This situation is often referred to as 'discretion' in the time-inconsistency literature. Some readers might have wondered why, instead of referring to an economy with full enforcement, we have not used the more common terminology of an economy in which governments have commitment. Would these two alternatives not be fundamentally the same? In this section we explain why they are not.

The widespread notion that commitment leads to full enforcement is based, we think, on the prevalence of models with complete markets and representative agents. When markets are incomplete, commitment does not in general lead to full enforcement. Consider, for instance, the L-U World of Example 3, in which each region contains a representative individual but markets are incomplete due to the absence of contingent bonds. As we argued in Section 1.4, in this world the allocation with full enforcement is inefficient. In fact, full enforcement renders the available assets useless. If Home and Foreign had commitment, they would agree Today on the following enforcement policy: the lucky region enforces *all* bond payments, while the unlucky region enforces *none*. This pattern of enforcement would increase the span of noncontingent bonds and lead to higher ex-ante expected utility for all individuals in the world. As a result, in this world commitment would raise welfare by preventing secondary markets from leading to the allocation with full enforcement. This is therefore a world in which discretion delivers the allocation with full enforcement, but commitment does not.[19]

When agents are heterogeneous, commitment need not lead to full enforcement either. Con-

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[18]The optimistic equilibrium is also robust to the introduction of a small cost of enforcement, i.e. $b < 0$. This follows from the fact that, in all optimistic equilibria in which there is inequality in debtor bond holdings after trade in the secondary market, enforcement is strictly preferred by the government of Debtor. Of course, pessimistic equilibria are also robust to the introduction of enforcement costs.

[19]Note that this equilibrium is observationally equivalent to the equilibrium with a mix of optimistic and pessimistic expectations that we studied in Section 1.4. Without commitment, we showed that this equilibrium was neither unique nor robust. With commitment, this equilibrium is both unique and robust.

sider, for instance, the D-C World with Names of Example 2 but assume that Debtor's government only cares about Duponts, i.e. $W^D = \int_{i \in \mathcal{I}^D} \phi_i \cdot u(c_{i1})$ with $\phi_i = 1$ if i is a Dupont and $\phi_i \approx 0$ if i is a Dupond. In this world markets are complete but there is heterogeneity within the Debtor region. If Debtor's government had commitment, it would choose to enforce bond payments by Duponts and not to enforce bond payments by Duponds. This would effectively remove Duponds from the primary market, lowering the supply of bonds and improving the terms at which Duponts borrow. This enforcement policy would raise the welfare of Duponts and that of Debtor's government at the expense of Duponds (and creditors). As in the previous case, commitment does not lead to the full-enforcement allocation.[20]

In all of the examples up to now, governments preferred not to enforce payments ex-post. We have just seen two examples in which governments also prefer not to enforce some payments ex-ante. In these cases, the equilibrium with commitment has different consumption and welfare than the equilibrium with full enforcement. The latter can be implemented with strategic enforcement and secondary markets, but the former cannot.

II. The general case

Results (i)-(iv) were obtained with the help of a very stylized setup. This was useful to build intuitions. But these results apply to a very broad class of models that encompasses many of those that have been used in the previous literature. In this section, we provide a formal proof of these results in a general setup with many regions, many periods, many shocks, many sources of market incompleteness and many sources of heterogeneity within and between regions.

For obvious reasons, the style of this section is more formal and technical than that of the previous one. Some readers might prefer to read first Section III where we go back to the informal style of Section I and use simple variants of the D-C World to show the limits of the argument and develop further intuitions.

A. The model

Consider a world economy with J regions, indexed by $j \in \mathcal{J} \equiv \{1, 2, ..., J\}$. Each region contains a continuum of infinitesimal individuals. We use $\mathcal{I}^j$ to denote the set of individuals located in region j, whereas $\mathcal{I}^W = \bigcup_{j \in \mathcal{J}} \mathcal{I}^j$ denotes the total population of the world. Let $j(i)$ denote the region where individual i lives, namely $j(i) = j'$ if $i \in \mathcal{I}^{j'}$.

The world lasts for $T + 1 \le \infty$ periods, which are indexed by $t \in \mathcal{T} \equiv \{0, 1, \dots, T\}$. Within each period t, the timing is as follows: (i) a shock $s_t \in \mathcal{S}$ is realized and individuals receive an endowment $y_{is_t} \ge 0$ of a perishable consumption good, (ii) asset markets open and individuals retrade existing assets and issue new ones, (iii) governments decide on the enforcement of maturing assets, (iv) enforcement takes place, and (v) individuals consume.

Let $s^t \equiv (s_\tau \mid \tau = 0, 1, ..., t) \in \mathcal{S}^t$ denote the history of realizations of the shock up to period t. Let $\mathbf{e}_t$ and $\mathbf{x}_t$ denote, respectively, the profile of enforcement choices of all governments and the profile of post-trade asset holdings of all individuals in period t. Let $h^t \equiv (s_\tau, \mathbf{e}_\tau, \mathbf{x}_\tau \mid \tau = 0, 1, ..., t) \in \mathcal{H}^t$ denote the history of shocks and actions by governments and individuals up to period t, $h^{0t} \equiv (h^{t-1}, s_t) \in \mathcal{H}^{0t}$ denote the history of shocks and *past* actions by governments and individuals up to period t, and $h^{1t} \equiv (h^{0t}, x_t) \in \mathcal{H}^{1t}$ denote the history of shocks, actions by individuals, and *past* actions by governments up to period t. The probability of observing a history h^τ, conditional on having observed a history h^{0t}, is denoted $\pi(h^\tau \mid h^{0t})$. Let $\mathcal{S} \equiv \bigcup_{t \in \mathcal{T}} \mathcal{S}^t$, $\mathcal{H} \equiv \bigcup_{t \in \mathcal{T}} \mathcal{H}^t$, $\mathcal{H}^0 \equiv \bigcup_{t \in \mathcal{T}} \mathcal{H}^{0t}$, and $\mathcal{H}^1 \equiv \bigcup_{t \in \mathcal{T}} \mathcal{H}^{1t}$.

[20]Despite the preference for Duponts, the consumption allocation without commitment would still be the same as in the full-enforcement equilibrium. This is because Debtor's government would not need to enforce bond payments from Duponts to Duponds since in the secondary market only Duponts would purchase bonds issued by other Duponts.

INDIVIDUAL PREFERENCES AND ASSET STRUCTURE

At each history h^{0t}, individuals trade in assets so as to maximize the expected net present value of their utility

$$(10) \qquad U_{ih^{0t}} = \sum_{\tau=t}^{T} \beta^{\tau-t} \cdot \int_{h^{\tau} \in \mathcal{H}^{\tau}} \pi\left(h^{\tau} \,\middle|\, h^{0t}\right) \cdot u_{is^{\tau}}(c_{ih^{\tau}}) \text{ for all } h^{0t} \in \mathcal{H}^0, i \in \mathcal{I}^W,$$

where $c_{ih^{\tau}}$ denotes consumption by individual i at history h^{τ}. All utility functions $u_{is^{\tau}}(\cdot)$ are either monotonic and strictly concave or zero,[21] and that they can vary across shock histories and individuals.

The asset structure of this economy is characterized by a set of available assets $\mathcal{N}$, which promise payments contingent on the history of shock realizations s^t. Trade in asset markets is frictionless in the sense that all individuals in all histories can trade existing assets costlessly if they are alive. The payment promised by asset $n \in \mathcal{N}$ at history s^t is denoted by $d_{s^t n}$. We use $\mathcal{N}_{s^t}$ to denote the subset of assets for which $d_{s^t n} > 0$. We allow for fairly general constraints on the types and amounts of assets that may be issued at each history by each individual. For example, (i) there may be no assets that pay in certain histories; (ii) there may be constraints on the contingency of assets, such as only allowing for noncontingent bonds; (iii) agents might face individual-specific constraints that limit the type and number of assets that they can issue; (iv) an asset may be issued in some histories but not in others. The only assumption we make on the asset structure itself is that asset payments are 'separable.' That is, for each asset, there always exists a portfolio of existing assets that allows us to replicate each payment separately. This assumption is sufficient but not necessary for our main result to hold and its implications are highlighted below. The simplest environment in which payments are separable is one in which each asset n has a unique maturity period, which we will assume from now on: $\mathcal{N}_{s^{\tau}} \cap \mathcal{N}_{s^{\tau'}} = \varnothing$ for all $s^{\tau}, s^{\tau'} \in \mathcal{S}$, $\tau, \tau' \in \mathcal{T}$, and $\tau \neq \tau'$.

The economy described so far is general enough to encompass many of the previous models used in the literature as particular cases. In terms of asset structure, for example, we can replicate the bond models commonly used in the literature. Such is the case if for all $s^t, (s^t)' \in \mathcal{S}^t$, $t \in \mathcal{T}$, we impose $d_{(s^t)' n} = d_{s^t n}$ for all $n \in \mathcal{N}_{s^t}$. Our framework is also consistent with the two benchmark models in terms of demographics:

- Infinitely-lived representative-agent model: $T = \infty$ and utilities, endowments, and asset-market restrictions are identical for all individuals in the same region.

- Overlapping-Generations economies à la Samuelson: Individuals are partitioned into cohorts $\mathcal{I}_t^j$ for $t \in \mathcal{T}$ and $j \in \mathcal{J}$. An individual $i \in \mathcal{I}_t^j$ resides in country j and lives during periods $\{t, t+1, \ldots, t+l-1\}$, where l is the number of periods individuals live. If $i \in \mathcal{I}_t^j$, then $u_{is^{\tau}}(\cdot) = 0$, $y_{is^{\tau}} = 0$, and issuance at τ are zero for all $\tau \notin \{t, t+1, \ldots, t+l-1\}$.

GOVERNMENT PREFERENCES AND ENFORCEMENT

Each region has a government, whose only action is to enforce payments promised by their residents at each history h^{1t}. We assume that governments have no ability to commit ex-ante to enforcing or to not enforcing payments. That is, governments make a decision regarding the enforcement of maturing payments owed by their residents at each history $h^{1t} \in \mathcal{H}^1$. Hence, at

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[21] We allow $u_{is^{\tau}}(\cdot) = 0$ to account for overlapping generations models.

any given history h^{1t}, the government of region $j \in \mathcal{J}$ must decide on the enforcement of payments promised by assets $n \in \mathcal{N}_{s^t}$. We consider two alternative scenarios regarding government preferences.

The first scenario is that of *full enforcement*. In this scenario governments maximize enforcement. As a result, they enforce all payments by their residents, regardless of the parties involved. All individuals know that they will have to deliver all the payments promised by any asset that they issue and that they will receive all the payments promised by any asset that they purchase.

The second scenario is that of *strategic enforcement*. In this scenario governments maximize a welfare function. As a result, they enforce payments only insofar this raises welfare. In particular, when deciding on enforcement at history h^{1t}, the government of region j maximizes

$$(11) \qquad \int_{i \in \mathcal{I}^j} \phi_i \cdot U_{ih^t},$$

where $\phi_i \geq 0$ is the weight that the government assigns to the utility of individual i. Note that governments attach zero weight to the utility of foreigners.

Governments can make different enforcement decisions for different payments owed by their residents. In particular, governments can discriminate according to the characteristics of issuers and holders. To be more precise, recall that we have allowed for individual heterogeneity in endowments, preferences, restrictions on asset issues, and government weights. Let g denote a group of individuals $i \in \mathcal{I}^g$ and let $g(i)$ denote the group to which individual i belongs. Each region $j \in \mathcal{J}$ is partitioned into a set of groups of individuals with the same characteristics $\mathcal{G}^j$. Namely, $\mathcal{I}^j = \bigcup_{g \in \mathcal{G}^j} \mathcal{I}^g$; $\mathcal{I}^g \cap \mathcal{I}^{g'} = \varnothing$ if $g \neq g'$; and, for all $i, i' \in \mathcal{I}^j$, $g(i) = g(i')$ only if $y_{is^t} = y_{i's^t}$ for all $s^t \in \mathcal{S}$, $u_{is^t} = u_{i's^t}$ for all $s^t \in \mathcal{S}$, i and i' face the same restrictions on the types and amounts of assets that they can issue, and $\phi_i = \phi_{i'}$. Note that this means that all individuals in a given group have the same characteristics, but there may be two individuals with the same characteristics in different groups. Let $\mathcal{G}^W = \bigcup_{j \in \mathcal{J}} \mathcal{G}^j$ denote the set of all groups in the world.

We assume that governments can discriminate according to the groups of the issuer and holder when enforcing payments. However, governments cannot discriminate based on the identity of the individual issuer and holder. In other words, if a government enforces the payment on asset $n \in \mathcal{N}$ from individual $i \in \mathcal{I}^g$ to individual $i' \in \mathcal{I}^{g'}$ in a given history $h^{1t} \in \mathcal{H}^1$, then it must enforce all payments on asset n from individuals in group g to individuals in group g' in that history. Let $e^g_{g'h^{1t}n} \in \{0, 1\}$ denote the decision of the government of region j regarding the enforcement of payments on asset n owed by individuals in group g, to individuals in group g', at history h^{1t}.[22] We use $e^g_{g'h^{1t}n} = 1$ to denote enforcement of such payments, and $e^g_{g'h^{1t}n} = 0$ to denote nonenforcement. In order for individuals to take enforcement decisions as given in equilibrium, we assume that all groups $g \in \mathcal{G}^W$ have positive measure.

EQUILIBRIUM

Let $q^g_{h^{0t}n}$ denote the price of asset n issued by an individual that belongs to group g at history h^{0t}. Let $x^{i'}_{ih^{0t}n}$ denote the holdings of asset n by individual i, issued by individual i', *before* trading in asset markets at history h^{0t}. If $i' \neq i$, $x^{i'}_{ih^{0t}n} \geq 0$ since i cannot hold a negative amount of assets issued by i'. But $x^i_{ih^{0t}n} \leq 0$ since it denotes the (negative of the) outstanding

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[22]In each history h^{1t} the government of region $j \in J$ has $2^{\left(\#\mathcal{G}^j\right) \cdot \left(\#\mathcal{G}^W\right) \cdot \left(\#\mathcal{N}_{s^t}\right)}$ enforcement choices, where # denotes the number of elements in a given set.

assets issued by individual i. Let $\hat{x}^{i'}_{ih^{0t}n}$ denote the holdings of asset n by individual i, issued by individual i', *after* trading in asset markets at history h^{0t}. Naturally, for any nonmaturing asset n at history h^{0t} it must be the case that $x^{i}_{ih^{0(t+1)}n} = \hat{x}^{i}_{ih^{0t}n}$ for all $h^{0(t+1)}$ consistent with h^{0t}. Also, $x^{i}_{ih^{0t}n} = 0$ in period $t = 0$. Let the total net holdings of asset n by individual i at history h^{0t} be denoted by $x_{ih^{0t}n} = x^{i}_{ih^{0t}n} + \int_{i' \in \mathcal{I}^{W} \backslash i} x^{i'}_{ih^{0t}n}$; and similarly for $\hat{x}_{ih^{0t}n}$. Likewise, let $x^{g}_{ih^{0t}n}$ ($\hat{x}^{g}_{ih^{0t}n}$) denote individual i's net holding of asset n issued by members of group g at history h^{0t}, before (after) asset markets open.

Then, the budget constraints faced by an individual $i \in \mathcal{I}^{W}$ at history $h^{0t} \in \mathcal{H}^{0}$ are given by

$$(12) \qquad \hat{y}_{ih^{0t}} \equiv y_{ih^{0t}} + \sum_{n \in \mathcal{N}} \sum_{g \in \mathcal{G}^{W}} q^{g}_{h^{0t}n} \cdot \left(x^{g}_{ih^{0t}n} - \hat{x}^{g}_{ih^{0t}n} \right) \geq 0,$$

$$(13) \qquad c_{ih^{0t}} = \hat{y}_{ih^{0t}} + \sum_{n \in \mathcal{N}_{s^t}} \sum_{g \in \mathcal{G}^{W}} d_{s^t n} \cdot \left(e^{g}_{g(i)h^{1t}n} \cdot \int_{i' \in \mathcal{I}^{g} \backslash i} \hat{x}^{i'}_{ih^{0t}n} - e^{g(i)}_{gh^{1t}n} \cdot \int_{i' \in \mathcal{I}^{g} \backslash i} \hat{x}^{i}_{ih^{0t}n} \right),$$

where $\hat{y}_{ih^{0t}}$ denotes the endowment left in the hands of individual i after trading in asset markets and $\hat{x}^{i}_{ih^{0t}n}$ must always satisfy the issuing constraints that individual i faces with respect to asset n. Equation (12) states that an individual cannot have negative endowment after trading in asset markets, while Equation (13) states that an individual's consumption can be no greater than his endowment after trading in asset markets plus the net payments received from maturing assets. The latter takes into account the fact that not all payments from maturing assets might be enforced. Market clearing conditions are given by

$$(14) \qquad \int_{i \in \mathcal{I}^{W}} \hat{x}^{g}_{ih^{0t}n} = 0 \text{ for all } h^{0t} \in \mathcal{H}^{0}, n \in \mathcal{N}, g \in \mathcal{G}^{W}.$$

An equilibrium of the economy with full enforcement is a set of: (i) asset prices; (ii) consumption profiles and asset holdings, and; (iii) enforcement decisions; such that (a) individuals maximize expected utility (Equation (10)) subject to their budget (Equations (12) and (13)) and issuing constraints; (b) governments always enforce payments; and (c) markets clear (Equation (14)). We denote an equilibrium with full enforcement with an asterisk,

$$\left\{ \left(q^{g}_{h^{0t}n} \right)^{*}, (c_{ih^{t}})^{*}, \left(x^{g}_{ih^{0t}n} \right)^{*}, \left(\hat{x}^{g}_{ih^{0t}n} \right)^{*}, \left(e^{g}_{gh^{1t}n} \right)^{*} \right\}_{h^{t} \in \mathcal{H}, h^{0t} \in \mathcal{H}^{0}, h^{1t} \in \mathcal{H}^{1}, n \in \mathcal{N}, g, g' \in \mathcal{G}^{W}, i \in \mathcal{I}^{W}}.$$

There are always many equilibria with the same consumption and prices that differ in their pre- and/or post-trade asset holdings. The D-C World of Example 1 illustrates this. In addition, there might be equilibria with different consumption and prices. For instance, the class of economies being considered includes OLG economies that can have bubbly equilibria.

An equilibrium of the economy with strategic enforcement is a set of: (i) asset prices; (ii) consumption profiles and asset holdings, and; (iii) enforcement decisions; such that (a) individuals maximize expected utility (Equation (10)) subject to their budget (Equations (12) and (13)) and issuing constraints; (b) governments maximize their objective function (Equation (11)); and (c) markets clear (Equation (14)). We denote an equilibrium with strategic enforcement with two asterisks,

$$\left\{ \left(q^{g}_{h^{0t}n} \right)^{**}, (c_{ih^{t}})^{**}, \left(x^{g}_{ih^{0t}n} \right)^{**}, \left(\hat{x}^{g}_{ih^{0t}n} \right)^{**}, \left(e^{g}_{gh^{1t}n} \right)^{**} \right\}_{h^{t} \in \mathcal{H}, h^{0t} \in \mathcal{H}^{0}, h^{1t} \in \mathcal{H}^{1}, n \in \mathcal{N}, g, g' \in \mathcal{G}^{W}, i \in \mathcal{I}^{W}}.$$

Both with full and strategic enforcement, individuals behave competitively, in the sense that they take future asset prices and enforcement as given. This is because there is a positive measure of individuals in each group $g \in \mathcal{G}^W$, so a deviation by any single individual does not affect asset prices and, in the case of strategic enforcement, the payoffs that governments obtain from any given enforcement policy. With strategic enforcement, on the other hand, governments take into account the potential effects of enforcement policies on future histories.

B.   Main result

Our main result is that for each equilibrium with full enforcement there is a corresponding equilibrium with strategic enforcement that delivers the same consumption profiles and, therefore, the same level of welfare. We now prove this result in the general setup described above, thereby substantially extending result (i) of Section I:

PROPOSITION 4:   *Consider an economy satisfying the previous assumptions regarding prefer-ences, endowments, asset markets, and enforcement technology. For each equilibrium with full enforcement, there exists a corresponding equilibrium with strategic enforcement in which all individuals $i \in \mathcal{I}^W$ attain the same consumption and welfare.*

The proof is by construction. Take an equilibrium of the economy with full enforcement. It is always possible to find an alternative equilibrium with full enforcement that delivers the same consumption and welfare and in which asset holdings and asset prices do not depend on the history of enforcement. This alternative equilibrium is: (i) feasible, because enforcement decisions affect contemporaneous consumption but they do not affect the resources available to individuals for future trading; and (ii) consistent with individual maximization because nobody conditions their actions in response to past nonenforcement. Let this alternative equilibrium be given by

$$\left\{ \left(q_{h^{0t}n}^g \right)^*, \left(c_{ih^t} \right)^*, \left(x_{ih^{0t}n}^g \right)^*, \left(\hat{x}_{ih^{0t}n}^g \right)^*, \left(e_{gh^{1t}n}^g \right)^* \right\}_{h^t \in \mathcal{H}, h^{0t} \in \mathcal{H}^0, h^{1t} \in \mathcal{H}^1, n \in \mathcal{N}, g, g' \in \mathcal{G}^W, i \in \mathcal{I}^W}.$$

We next show that there exists a corresponding equilibrium with strategic enforcement,

$$\left\{ \left(q_{h^{0t}n}^g \right)^{**}, \left(c_{ih^t} \right)^{**}, \left(x_{ih^{0t}n}^g \right)^{**}, \left(\hat{x}_{ih^{0t}n}^g \right)^{**}, \left(e_{gh^{1t}n}^g \right)^{**} \right\}_{h^t \in \mathcal{H}, h^{0t} \in \mathcal{H}^0, h^{1t} \in \mathcal{H}^1, n \in \mathcal{N}, g, g' \in \mathcal{G}^W, i \in \mathcal{I}^W},$$

such that $\left(q_{h^{0t}n}^g \right)^* = \left(q_{h^{0t}n}^g \right)^{**}$, $\left(c_{ih^t} \right)^* = \left(c_{ih^t} \right)^{**}$, and $\left(x_{ih^{0t}n}^g \right)^* = \left(x_{ih^{0t}n}^g \right)^{**}$ for all $h^t \in \mathcal{H}$, $h^{0t} \in \mathcal{H}^0, n \in \mathcal{N}, g \in \mathcal{G}^W, i \in \mathcal{I}^W$.

Consider the following pair of profiles of post-trade asset holdings and enforcement decisions:

(15) $\left(\hat{x}_{ih^{0t}n}^g \right)^{**} = \begin{cases} \delta_{ih^{0t}n} & \text{if } n \in \mathcal{N}_{s^t} \text{ and } i \in I^g \\ 0 & \text{if } n \in \mathcal{N}_{s^t} \text{ and } i \notin I^g \\ \left(\hat{x}_{ih^{0t}n}^g \right)^* & \text{if } n \notin \mathcal{N}_{s^t} \end{cases}$ for all $h^{0t} \in \mathcal{H}^0, g \in \mathcal{G}^W, i \in \mathcal{I}^W,$

(16) $\left(e_{gh^{1t}n}^g \right)^{**} = 1$ for all $n \in \mathcal{N}_{s^t}, h^{1t} \in \mathcal{H}^1, g \in \mathcal{G}^W,$

with $\int_{i \in \mathcal{I}^g} \delta_{ih^{0t}n} = 0$ and $\sum_{n \in \mathcal{N}_{s^t}} \delta_{ih^{0t}n} \leq \left(c_{ih^t} \right)^*$ for all $h^{0t} \in \mathcal{H}^0, h^t \in \mathcal{H}, n \in \mathcal{N}_{s^t}, g \in \mathcal{G}^W, i \in \mathcal{I}^W$. Equation (15) states that, after trading in asset markets, all maturing assets are held by

individuals that belong to the same group as the issuer, while nonmaturing assets are held as in the full-enforcement equilibrium. Equation (16) states that governments enforce payments of all maturing assets within groups. We will show that

$$\left\{ \left(q^g_{h^{0t}n}\right)^*, (c_{ih^t})^*, \left(x^g_{ih^{0t}n}\right)^*, \left(\hat{x}^g_{ih^{0t}n}\right)^{**}, \left(e^g_{gh^{1t}n}\right)^{**} \right\}_{h^t \in \mathcal{H}, h^{0t} \in \mathcal{H}^0, h^{1t} \in \mathcal{H}^1, n \in \mathcal{N}, g, g' \in \mathcal{G}^W, i \in \mathcal{I}^W}$$

is an equilibrium with strategic enforcement.

We first show that the proposed equilibrium satisfies individual maximization. Given governments' enforcement policies, prices are the same as in the equilibrium with full enforcement. In particular, maturing assets still trade at face value. As a result, the consumption profiles and the pretrade asset holdings of the equilibrium with full enforcement must also be consistent with individual maximization under strategic enforcement. The fact that maturing assets trade at face value also implies that (i) individuals are indifferent between buying or not buying maturing assets issued by members of their same group; and (ii) individuals prefer (at least weakly) to sell maturing assets issued by members of different groups. In addition, individuals are satisfying their budget constraints. Equation (13) is satisfied because maturing assets trade at face value and all payments are enforced. And Equation (12) is also satisfied because it follows from Equation (13) and the condition $\sum_{n \in \mathcal{N}_{s^t}} \delta_{ih^{0t}n} \leq (c_{ih^t})^*$.[23] Finally, individuals satisfy their issuance constraints since their issuance is the same as in the equilibrium with full enforcement.

We next show that the proposed equilibrium also satisfies government maximization. The analysis is substantially simplified by the fact that, in the alternative equilibrium with full enforcement from which we started, individuals' actions do not depend on past enforcement decisions. Thus, we only need to check that governments do not have incentives to deviate at any history $h^{1t} \in \mathcal{H}^1$. At the time of enforcement at history h^{1t}, each government $j \in \mathcal{J}$ chooses enforcement $\left\{ e^g_{g'h^{1t}n} \right\}_{g \in \mathcal{G}^J, g' \in \mathcal{G}^W, n \in \mathcal{N}_{s^t}}$ to maximize $\int_{i \in \mathcal{I}^j} \phi_i \cdot U_{ih^t}$ which, given the proposed asset holdings, is given by

$$\sum_{g \in \mathcal{G}^J} \int_{i \in \mathcal{I}^g} \phi_i \cdot u_{is^t} \left((c_{ih^t})^* - \sum_{n \in \mathcal{N}_{s^t}} \left(1 - e^g_{gh^{1t}n}\right) \cdot \delta_{ih^{0t}n} \right).$$

By choosing $e^g_{gh^{1t}n} = 1$ for all $g \in \mathcal{G}^j$ and $n \in \mathcal{N}_{s^t}$, the government of j guarantees that consumption is equalized within each domestic group, i.e. $(c_{ih^t})^* = (c_{i'h^t})^*$ whenever $g(i) = g(i')$. Choosing any other enforcement would not affect total consumption in each group but will, in general, lead to consumption inequality within groups. A straightforward application of Jensen's inequality shows then that the proposed enforcement is a best response for governments.

Finally, we show that the proposed equilibrium satisfies market clearing. This is clearly the case for $n \notin \mathcal{N}_{s^t}$. For $n \in \mathcal{N}_{s^t}$ markets also clear since, under the proposed equilibrium: $\int_{i \in \mathcal{I}^W} \hat{x}^g_{ih^{0t}n} = \int_{i \in \mathcal{I}^g} \hat{x}^g_{ih^{0t}n} = \int_{i \in \mathcal{I}^g} \delta_{ih^{0t}n} = 0$ for all $h^{0t} \in \mathcal{H}^0$ and $g \in \mathcal{G}^W$. With this, we complete the proof of the proposition.

We have shown that (a) if governments are expected to enforce within-group payments, individual maximization leads to each group purchasing its own maturing assets; and (b) if each group purchases its own maturing assets, within-group enforcement is consistent with government maximization. This combination of asset trade and enforcement always allows the economy with strategic enforcement to achieve the same consumption and welfare as the economy with full enforcement. This is sufficient to prove Proposition 4. In general, there are many

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[23]The assumption that asset payments are separable ensures that all groups have enough funds to repurchase at face value all the assets that they have issued in the past and mature at the considered history.

alternative combinations of asset trade and enforcement that achieve the same result. These alternatives involve groups with large weights in the governments objective function and/or low consumption purchasing maturing assets issued by other groups.

C.   Additional equilibria with strategic enforcement

We have shown that each equilibrium with full enforcement has a corresponding equilibrium with strategic enforcement that delivers the same consumption and welfare. However, with strategic enforcement there are additional equilibria with nonenforcement in equilibrium.

Consider, for example, an equilibrium in which individuals expect enforcement to be given by

(17) $$\left(e_{gh^{1t}n}^{g'}\right)^{**} = 0 \text{ for all } h^{1t} \in \mathcal{H}^1, n \in \mathcal{N}_{s^t}, g, g' \in G^W.$$

Given that no payments are expected to be enforced, and that each individual takes enforcement policy as given, equilibrium asset holdings are given by

$$\left(x_{ih^{0t}n}^{i'}\right)^{**} = \left(\hat{x}_{ih^{0t}n}^{i'}\right)^{**} = 0 \text{ for all } h^{0t} \in \mathcal{H}^0, n \in \mathcal{N}, i, i' \in I^W,$$

since no individual is willing to hold any assets. This, in turn, implies that governments are always indifferent between enforcing and not enforcing payments, so that nonenforcement is consistent with government optimization. Hence, the economy with strategic enforcement always has a pessimistic equilibrium in which there is no trade in assets because; (i) everyone expects that no payments will ever be enforced; and.(ii) given these expectations, nonenforcement is an optimal strategy for governments.

Besides equilibria that implement the allocations with full enforcement and the pessimistic equilibrium just described, the economy with strategic enforcement will typically have other equilibria in which there is less than full enforcement because some –but not all– asset payments are expected not to be enforced. For example, consider that expectations regarding enforcement are as in Equation (17) except that for a particular group $g \in \mathcal{G}^W$, $\left(e_{gh^{1t}n}^{g}\right)^{**} = 1$ for all $h^{1t} \in \mathcal{H}^1$, $n \in \mathcal{N}_{s^t}$. This enforcement profile will generically deliver an equilibrium in which assets issued by group g are traded, so that consumption profiles will be different from those of the pessimistic equilibrium but also from the ones that would arise under full enforcement. Examples of this type of equilibria were provided in Section 1.3. Proposition 5 summarizes the discussion:

PROPOSITION 5:   *Consider an economy satisfying the previous assumptions regarding preferences, endowments, asset markets, and enforcement technology. With strategic enforcement, this economy has pessimistic equilibria characterized by total or partial lack of enforcement.*

This proposition extends result (ii) of Section I. Naturally, result (iii) follows directly from our analysis of the D-C World with Names and the L-U World.

D.   Robustness

We have established that the economy with strategic enforcement has many equilibria, which differ in consumption and welfare. We now assess the robustness of these equilibria. To do so, we modify our environment along two dimensions:

- Small preference for enforcement: Governments suffer an arbitrarily small welfare loss from nonenforcement. In particular, a government suffers a welfare cost b whenever it chooses not to enforce payments on a given asset from a given group of its residents to any

other given group of individuals. Hence, the government of region $j \in \mathcal{J}$, at any history h^{1t} maximizes the objective function

$$\int_{i \in \mathcal{I}^j} \phi_i \cdot U_{ih^t} - b \cdot \sum_{g \in \mathcal{G}^j} \sum_{g' \in \mathcal{G}^W} \sum_{n \in \mathcal{N}_{s^t}} (1 - e^g_{gh^{1t}n}).$$

- Strategies are not contingent on the history of enforcement: The strategies of individuals and governments are independent of past enforcement decisions. This assumption implies, in particular, that there can be no reputational equilibria.

If we make these two additional assumptions, all pessimistic equilibria cease to exist. The reason is simple. Consider the pessimistic equilibrium in which no assets are traded because individuals expect the enforcement policy to be as in Equation (17). Under the additional assumptions, these expectations cannot be correct in equilibrium. Given any history h^{1t}, when governments decide on enforcement, they find that no maturing assets have been traded. Consequently, the enforcement decision has no effects on contemporaneous consumption. Moreover, since strategies are not contingent on the history of enforcement, this decision will not have any effect on future consumption either. Therefore, a small preference for enforcement is sufficient to induce governments to enforce payments. A similar reasoning rules out equilibria in which there is less than full enforcement because some -but not all- asset payments are expected not to be enforced.

Proposition 6 summarizes the discussion above:

PROPOSITION 6: *Consider an economy satisfying the previous assumptions regarding preferences, endowments, asset markets, and enforcement technology. Modify this economy by assuming that: (i) governments face an arbitrarily small welfare loss $b > 0$ whenever they choose not to enforce payments on a given asset from a given group of their residents to any other given group of individuals, and; (ii) strategies of individuals and governments are independent of past enforcement decisions. The only equilibria with strategic enforcement of the modified economy are those that deliver the same consumption and welfare as the equilibria with full enforcement.*

Proposition 6 substantially extends result (iv) of Section I. At first sight, the need for the second additional assumption might be surprising since secondary markets suffice by themselves to attain full enforcement and there is therefore no scope for building a reputation for enforcing payments. However, this assumption is necessary because there are times in which governments want to build a reputation for *not* enforcing payments. The following example illustrates this situation:

EXAMPLE 7 (L-U World Infinitely Repeated): *All assumptions are as in the L-U World, except that the world lasts for infinitely many periods. Individuals maximize a utility function: $U_i = \sum_{t=0}^{\infty} \beta^t \cdot u(c_{it})$ for all $i \in \mathcal{I}^W = \mathcal{I}^H \cup \mathcal{I}^F$. All individuals receive an endowment of y at $t = 0$. In all periods $t \geq 1$, there are two possible states that occur with equal probability. If $s_t = s^H$, Home is lucky and its residents receive an endowment equal to $y + \varepsilon$, while Foreign is unlucky and its residents receive an endowment equal to $y - \varepsilon$. If $s_t = s^F$, Home is unlucky and its residents receive an endowment equal to $y - \varepsilon$, while Foreign is lucky and its residents receive an endowment equal to $y + \varepsilon$.*

As in our basic version of the L-U World, we assume that the only assets that can be traded are noncontingent bonds that promise to deliver one unit of the consumption good at a given period t, for all $t \geq 1$.

In the L-U World Infinitely Repeated, the first additional assumption does not suffice to eliminate pessimistic equilibria. To see this, consider an equilibrium of this world in which individual

expectations are such that, for all $t \geq 1$: (i) given $s_t = s^j$, the government of region j is expected to enforce domestic payments whereas the government of the other region is expected not to do so; (ii) if in any given period a government deviates from the expected behavior specified in (i), both governments are expected to enforce domestic payments in all future periods thereafter, regardless of the realizations of the endowment shocks.

Such an equilibrium entails nonenforcement in some states and attains full risk-sharing between regions. Moreover, it need not disappear with a small preference for enforcement b. The reason is that, whenever the government of the unlucky region is considering whether to deviate and enforce domestic payments, it faces a trade-off. On the one hand, it avoids the welfare loss b. On the other, it destroys risk-sharing in all future periods. It can be shown that, for b small enough, governments will choose not to enforce domestic payments whenever their region receives the unlucky shock.[24]

III.   Limits to the argument

The general setup of Section II encompasses many of the models commonly used to study the effects of sovereign risk. Unlike the previous literature, however, we have allowed individuals to freely retrade existing assets. This turned out to be a crucial change in assumption since it leads to the new result that, even in the absence of default penalties, sovereign risk does not affect consumption and welfare. Perhaps surprisingly, the only effect of sovereign risk is to increase trade volume as individuals trade not only to redistribute their consumption across periods and states of nature, but also to circumvent the strategic or opportunistic behavior of governments.

The general setup of the previous section has therefore identified a set of assumptions under which sovereign risk does not matter or is irrelevant. This constitutes a useful theoretical benchmark that can help us improve our understanding of why sovereign risk is a problem in real economies. In this section, we show why and how sovereign risk matters once we relax some assumptions that play a crucial role in the proof of our result and might seem unrealistic. In particular, we focus on the following assumptions:

- *Well-functioning markets.* We have assumed that markets, if they exist, are frictionless and competitive:

    - (No trading frictions) All individuals can trade in asset markets with zero transaction costs in all periods and states of nature.

    - (Competitive behavior) All individuals are infinitesimal and, as a result, they take prices and enforcement decisions of governments as given.

- *Passive governments.* We have assumed that government strategically chooses enforcement without commitment and have no other policy tools at their disposal:

    - (Timing of enforcement) Governments choose enforcement only after secondary markets open and trade has already taken place.

    - (Lack of government intervention) Governments only choose enforcement and do not have other policy tools at their disposal to intervene in markets.

Needless to say, a complete treatment of the effects of relaxing these assumptions in the general setup of Section II is beyond the scope of this paper. We instead return to the D-C World of

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[24]Specifically, this happens if $b \leq \frac{\beta}{2-\beta} \cdot \left[u(y) - \left[\frac{1}{2} u(y + \varepsilon) + \frac{1}{2} u(y - \varepsilon) \right] \right]$.

Section I and develop further variants to sketch the main implications of removing each of these assumptions.[25],[26]

A. Transaction costs

In the general setup of Section II we considered a rich set of restrictions on the issuance of new assets. These restrictions affect both the set of contingencies that assets can incorporate and the set of individuals that can issue them in each period and state of nature. When these restrictions are binding, useful assets are missing and profitable trade opportunities are lost. As a result, the equilibrium might be Pareto inefficient. But even in this case, we always allowed all living individuals (including those that cannot issue new assets) to freely trade all existing assets in all periods and states of nature. That is, although we allowed for restrictions in the number and type of assets that can exist, we also assumed that those assets that do exist are traded frictionlessly. This assumption is important since we have argued that sovereign risk only increases trade volume and this has no welfare consequences. What happens instead if this additional trade is costly? The next example introduces transaction costs in the D-C World:

EXAMPLE 8 (D-C World with Transaction Costs): *All assumptions are as in the D-C World, except that buyers and sellers must pay a proportional or ad valorem transaction cost equal to t_B and t_S, respectively.*

With full enforcement, creditors collect bond payments directly from the issuers of the bonds and, as a result, they only go to the primary market. This means that the relevant bond return for them is $1 \big/ (q_0 \cdot (1 + t_B))$, while the relevant bond return for debtors is $(1 + t_S) \big/ q_0$. The wedge between these bond returns is $(1 + t_B) \cdot (1 + t_S)$. Naturally, the model of Section 1.1. applies as the case in which transaction costs are negligible, i.e. $t_B = t_S = 0$, and there is no wedge. Starting from this benchmark or limiting case, increases in t_S reduce the supply of bonds while increases in t_B reduce the demand for bonds. Both shifts lead to lower trade and less consumption smoothing. Eventually, the combined value of transaction costs crosses the threshold that makes them prohibitive,

$$ (1 + t_B) \cdot (1 + t_S) = \left(\frac{u'(y - \varepsilon)}{u'(y + \varepsilon)} \right)^2 . $$

At this point, all trade disappears and each region consumes its own endowment.

With strategic enforcement, creditors cannot collect bond payments directly and are forced to sell their bonds in the secondary market. As a result, the relevant bond return for them is now $q_1 \big/ (q_0 \cdot (1 + t_B) \cdot (1 + t_S))$. Debtors only purchase their bonds in the secondary market if those are sold with a discount that compensates for the transaction cost: $q_1 \cdot (1 + t_B) = 1$. Therefore, the wedge between bond returns is now one order of magnitude higher than in the full enforcement case, $(1 + t_B)^2 \cdot (1 + t_S)^2$. The reason, of course, is that the additional trading in the secondary market implies that transaction costs are paid twice. Starting from the limiting case of zero transaction costs, we find again that increases in t_S reduce the supply of bonds. But now they also reduce the demand for bonds since creditors must also pay these transaction costs Tomorrow when they sell their bonds in the secondary market. Moreover, increases in t_B lead now to a larger reduction in the demand for bonds since they have the additional effect of lowering the price of bonds in the secondary market. Like the case of full enforcement, increases

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[25]Another assumption that might turn out to be important is that, for each asset, there exist always a portfolio of existing assets that allows us to replicate each asset payment separately. This assumption is sufficient (but not necessary) to ensure that there are enough funds in the secondary market to purchase all assets that deliver payments at face value. Relaxing this assumption might lead to situations in which the secondary market is not liquid enough and this creates problems. Given the current length of this paper, we do not analyze this case here.

[26]In what follows, we select the set of optimistic equilibria and refer to it as 'the' set of strategic-enforcement equilibria.

in transaction costs lower trade and consumption smoothing. But this now happens at a faster rate since each transaction cost applies twice to each bond payment. Note also that the threshold that makes transaction costs prohibitive is lower now,

$$(1 + t_B) \cdot (1 + t_S) = \frac{u'(y - \varepsilon)}{u'(y + \varepsilon)}.$$

This example shows how sovereign risk magnifies the negative effects of transaction costs on consumption and welfare. With transaction costs, the full- and strategic-enforcement equilibria are still similar qualitatively but might differ quantitatively. Knowing that Debtor's government will not enforce bond payments to creditors, the latter are forced to go to the secondary market to sell their bonds and must incur additional transaction costs. Since these additional costs are pure waste, sovereign risk lowers the level of consumption. Since these additional costs increase the wedge between bond returns for debtors and creditors, sovereign risk also worsens the intertemporal distribution of consumption. In a nutshell, in the presence of transaction costs we have that sovereign risk affects consumption and reduces welfare.

Another popular model of transaction costs assumes that some individuals have negligible costs of going to the market, while the rest have prohibitive costs. This structure of costs gives rise to limited participation. Although transaction costs are never paid in equilibrium, the absence of some individuals from the market might also restore a negative role for sovereign risk, as the following example illustrates:

EXAMPLE 9 (D-C World with Limited Participation): *All assumptions are as in the D-C world, except that only a fraction ϕ_t^j of individuals in region j can trade in period t.*

With full enforcement, there is trade only in the primary market. If $\phi_0^C = \phi_0^D$, limited participation affects the demand and supply for bonds symmetrically and the price of bonds remains one. As a result, all market participants choose a flat consumption profile. If $\phi_0^C < \phi_0^D$ $\left(\phi_0^C > \phi_0^D \right)$, limited participation reduces more the demand (supply) for bonds, the price of bonds falls below (goes above) one, and market participants choose an upward-sloping (downward-sloping) consumption profile. In any event, those that cannot participate in the primary market are forced to live in autarky and consume their own endowment. Since the secondary market is not used, the equilibrium outcome does not depend on who can participate in it.

With strategic enforcement, creditors that purchase bonds in the primary market will want to go to the secondary market and sell their bonds at face value. If this is possible, sovereign risk does not affect consumption and welfare even when there is limited participation. However, this need not be the case.

Consider first the situation in which debtors participating in the secondary market do not have enough resources to repurchase the full-enforcement stock of bonds at face value, i.e. $\phi_1^D \cdot (y + \varepsilon) < \phi_0^D \cdot \left| \left(x_0^D \right)^* \right|$. It is clear that, in this case, the strategic enforcement equilibrium will involve less trade in the primary market, i.e. $\left| \left(x_0^D \right)^{**} \right| < \left| \left(x_0^D \right)^* \right|$. In addition, bonds will be traded at a discount,

$$\left(q_1^D \right)^{**} = \frac{\phi_1^D \cdot (y + \varepsilon)}{\phi_0^D \cdot \left| \left(x_0^D \right)^{**} \right|} < 1.$$

This discount creates a wedge between relevant bond returns for creditors, i.e. q_1 / q_0, and debtors, i.e. $1 / q_0$. This wedge worsens the intertemporal distribution of consumption and lowers

welfare.[27]

In addition, consider the situation in which all creditors participating in the primary market run some risk of being excluded from the secondary market. In this case, there is necessarily default in equilibrium. To some extent, both debtors and creditors can diversify this risk by trading in the primary market with many residents of the other region. Creditors can further reduce their exposure to this risk by channeling their lending through those individuals that are most likely to participate in the secondary market. In general, however, it is not possible to fully diversify the risk of default and sovereign risk leads to risky consumption.[28] This is clearly negative for both debtors and creditors. In turn, there is an additional effect that operates through bond returns in a way that depends on the third derivative of the utility function. If the latter is positive, we have the standard case of precautionary savings in which increases in uncertainty lower bond returns. This terms-of-trade effect benefits Debtor and hurts Creditor. The net effect of default risk is therefore negative for Creditor but ambiguous for Debtor. Naturally, the opposite is true if the third derivative of the utility function is negative.

We could examine the effects of introducing other trading frictions. But the two examples of this section already convey a simple and, we think, quite robust intuition: since additional trade is needed to circumvent the strategic or opportunistic behavior of governments, sovereign risk magnifies the negative effects of trading frictions on consumption and welfare.

B.   Large agents

An important assumption that we have made throughout the paper is that agents are small, in the sense that they take enforcement decisions and asset prices as given. This assumption has two important implications that we have invoked repeatedly for our result, namely: (a) there are always individuals who are willing to repurchase maturing assets at face value in the secondary market and; (b) these individuals actually have the resources to do so. In this section, we explore the implications of relaxing the assumption of small agents, by allowing for agents with positive mass or 'large' agents. As we now show, the presence of such agents may substantially affect the demand for maturing assets in the secondary markets.

We begin by framing our discussion within a variation of our D-C World that allows for large agents:

EXAMPLE 10 (D-C World with Large Agents):   *All assumptions are as in the D-C World, except that: (i) there is a continuum of infinitesimal debtors with mass λ^D that make their decisions collectively (i.e., a Debtor Bank), and, (ii) there is a continuum of infinitesimal creditors with mass λ^C that also make their decisions collectively (i.e., a Creditor Bank).*

Suppose first that $\lambda^D = 1$ and $\lambda^C = 0$. Under full enforcement, the presence of a large agent affects the equilibrium because it has market power. In fact, the Debtor Bank is a monopolist in the bond market Today: consequently, it will restrict the supply of bonds in order to raise their market price and the equilibrium will entail $(q_0^D)^* > 1$. Under strategic enforcement, though, the effects of having a unique debtor are much stronger, to the extent that Debtor is unable to borrow at all. The reason is simple: suppose the Debtor Bank issues any positive amount of bonds Today. Creditors purchase these bonds because they expect to sell them Tomorrow before enforcement. Once Tomorrow arrives, though, the Debtor Bank will never buy any of its bonds in the secondary market. It understands that, by purchasing its bonds at any positive price it is simply transferring resources to creditors. Therefore, it must necessarily be the case that $(q_1^D)^{**} = 0$ in equilibrium.

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[27]It also creates inequality among debtors, since those that participate in the secondary market make capital gains on the bonds they repurchase.

[28]One particular case in which full diversification is possible is when ϕ_1^C is nonstochastic.

Anticipating this, creditors will not buy any bonds Today and the only possible equilibrium is one of autarky in which each region consumes its endowment.

What insight do we gain from this example? In the original D-C World, secondary markets are able to achieve the full-enforcement allocation because each individual debtor has a strong incentive to purchase bonds issued by other debtors. This outcome, which constitutes an ex-post inefficiency from the viewpoint of the region, ensures ex-ante efficiency by allowing for international trade in bonds Today. But this prisoner's dilemma type of situation only arises insofar as debtors are small and behave noncooperatively. If there is a unique debtor, as in our example, this reasoning no longer applies.

Of course, the case in which $\lambda^D = 1$ is rather extreme, since the Debtor Bank is the only potential purchaser of its bonds in the secondary market. We now turn to the more interesting case in which $\lambda^D < 1$. We maintain $\lambda^C = 0$. Under full enforcement, the equilibrium is qualitatively similar as before: the Debtor Bank still has market power, so that the supply of bonds is lower, and their market price Today higher, than what they would be in the traditional D-C World. Under strategic enforcement, though, the presence of small debtors can make a substantial difference for the secondary market outcome. To see this, assume that the residents of Debtor as a whole issue $\left(x_0^D\right)^{**}$ bonds Today. When secondary markets open, small debtors are willing to buy any quantity of bonds at face value. Therefore, their aggregate demand for bonds is horizontal until all the combined endowment of small debtors has been exhausted, and downward-sloping thereafter. The equilibrium price is therefore equal to face value if their combined endowment is sufficient to repurchase all the bonds issued in the primary market at face value. In this case, and despite the large agent, the strategic-enforcement equilibrium delivers the same allocation as the full-enforcement one.

To make the example interesting, assume from now on that λ^D is sufficiently large to ensure that the combined endowment of the small debtors is not enough to repurchase all the bonds issued in the primary market. In this case, small debtors will use all of their endowment to purchase bonds in the secondary market.[29] But this is not the end of the story: once small debtors purchase bonds in the secondary market, it is in the interest of the Debtor Bank to enter the market as well. Assume not. Then, the Debtor Bank could make a profit by buying its own bonds at a discount instead of paying face value later when small agents come to redeem them. In equilibrium, the Debtor Bank will buy bonds up to the point in which this gain is offset by the increase in price of the inframarginal bonds. As a result, the Debtor Bank's demand for bonds is given by

$$(18) \qquad \left(x_0^D\right)^{**} \cdot \left(1 - \sqrt{\frac{(1 - \lambda^D) \cdot (y + \varepsilon)}{\left(x_0^D\right)^{**}}}\right).$$

Given the total demand for bonds in the secondary market, equilibrium requires that the price be $\left(q_1^D\right)^{**} = \sqrt{(1 - \lambda^D) \cdot (y + \varepsilon) \Big/ \left(x_0^D\right)^{**}} < 1$, which is decreasing in λ^D and approaches zero as $\lambda^D \to 1$. Hence, equilibrium borrowing in Debtor is restricted with respect to the full-enforcement economy. When the large agent is not too large, the Prisoner's dilemma is only partially solved and Debtor can still borrow but not as much as it would like.

Before concluding, we wish to remark on the effects of allowing for large creditors. We now do so by setting $\lambda^C = 1$. We also maintain $\lambda^D < 1$. A first natural consequence of having a unique creditor –which is valid both under full and strategic enforcement– is that he will be a monopsonist in the primary market for bonds. This will exert downward pressure both on the

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[29]As long as $u(0) = -\infty$, domestic payments are always enforced in equilibrium. We maintain this assumption throughout the section for simplicity.

price of bonds and on the amount of trade in the primary market. However, the presence of a large creditor does not affect the functioning of the secondary market. It could be thought that the Creditor Bank has an incentive to restrict the supply of bonds Tomorrow in order to raise their price, but it is never profitable to do so. This is evident if $\lambda^D = 0$ and the Creditor Bank can sell all bonds at face value. It is also evident if $\lambda^D = 1$ and the Creditor Bank is unable to sell them at any positive price. It can also be shown that if $\lambda^D \in (0, 1)$, restricting the supply of bonds is still not worthwhile because this decreases the Debtor Bank's demand for bonds more than proportionally (see Equation (18)).

There are therefore two main findings in this section. The first one is that coordination among debtors might restrict their collective ability to borrow. In fact, imagine that the government of Debtor generates an institutional arrangement that forces debtors to coordinate their actions. In a world of full enforcement, this would be a perfectly sensible policy from the viewpoint of Debtor, since it would allow its residents to exploit their collective market power and access international capital markets at better terms. In a world of strategic enforcement, on the other hand, this institutional arrangement might backfire if it persists until the time of enforcement. The same market power that benefits debtors at the time of borrowing allows them to distort the outcome of the secondary market: in the extreme case in which all residents of Debtor coordinate their actions, as we have seen, the latter effect manifests itself fully and eliminates all possibility of international borrowing.

The second finding of this section is that coordination among creditors does not enhance their ability to collect on maturing assets. Coordination among creditors certainly enhances their market power and allows them to lend at a higher interest rate. How much they actually collect from their outstanding loans at the time of maturity, though, is ultimately determined by the degree of coordination among debtors. In our world, then, institutional arrangements such as collective action clauses, which are designed to coordinate creditors in order to enhance repayment, are ineffective. The reason for this is clear: creditors in our environment never receive payments directly from debtors, so that coordinating does not benefit them in terms of negotiation or bargaining power. Indeed, they are only able to collect from maturing assets by selling them in the secondary market. Since coordination does not enable them to distort the outcome of the latter in their favor, their ability to extract resources from debtors is not affected by it.

C. The timing of enforcement

Throughout, we have assumed that governments have no commitment and choose their enforcement policy at the time of enforcement. The other extreme of assuming that governments can commit for the indefinite future is certainly unrealistic.[30] But it seems reasonable to assume that governments might have some ability to commit in the short run. To determine the effects of this 'short-term commitment,' in the remaining of the section we analyze the case in which governments make their enforcement decisions for each period before secondary markets open. This extension captures well a situation in which governments have the power to preempt trade in secondary markets by credibly promising not to enforce before trading takes place. The question we address here is when and how the government will use this power and the effects this has.

At first sight, one might be tempted to conclude that endowing the government with this power is devastating for the argument that, in the presence of secondary markets, sovereign risk has no effects on consumption and welfare. For example, in both the D-C World and the L-U World introducing short-term commitment completely destroys asset trade. Before secondary markets open Tomorrow the government of any region whose residents owe payments to foreigners understands that its residents are about to repay their debts to foreigners via secondary markets. But such a government would prevent this by choosing not to enforce before secondary markets open

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[30]See section 1.6 for a discussion of this case in the D-C World.

driving the price of domestic debt to zero. Of course, anticipating this Today the residents of the other region are not willing to purchase domestic debt and, thus, there is no trade in the primary market. Gaining short-term commitment destroys all trade and forces each region and individuals to consume their own endowment. Everybody (including governments) is worse off. The conclusion seems to be therefore that, if governments have short-term commitment, sovereign risk has the traditional effect of eliminating foreign trade and reducing welfare.

But this would be too hasty a conclusion. Although governments always have an incentive to commit not to enforce to avoid payments to foreigners, there may be countervailing forces that might lead to enforcement and asset trade even when governments have short-term commitment. The next two examples illustrate this.

The first example generalizes the D-C World by introducing a role for domestic trade in primary markets and shows how this can reduce the governments' ability to preempt payments to foreigners:[31]

EXAMPLE 11 (D-C World with Ex-Post Inequality): *All assumptions are as in the D-C World, except that debtors are subject to idiosyncratic shocks Tomorrow. In particular, there are two states Tomorrow, s_1 and s_2, each taking place with probability one half. If a given debtor is lucky, he receives $y + \varepsilon + \iota$; otherwise, he receives $y + \varepsilon - \iota$. Debtors are partitioned into two halves, $\mathcal{I}^1$ and $\mathcal{I}^2$, such that all $i \in \mathcal{I}^1$ are lucky in state s_1 and all $i \in \mathcal{I}^2$ are lucky in state s_2.*

In this version of the D-C World there might be gains from domestic trade because there is ex-post heterogeneity among debtors. The basic D-C World of Example 1 applies as the special case in which $\iota = 0$. We assume that markets are complete and that there are two assets: asset 1 pays one in state s_1 and zero in state s_2, and asset 2 pays zero in state s_1 and one in state s_2. In the full-enforcement equilibrium all debtors and creditors consume y in both periods. If $\iota \leq \varepsilon$, this consumption allocation can (but need not) be implemented with only international trade. If $\iota > \varepsilon$, this consumption allocation also requires domestic asset trade between debtors.

The key effect of short-term commitment in this world is that enforcement becomes nondiscriminatory. In particular, while Debtor's government can still choose enforcement before individuals trade in secondary markets, it cannot discriminate between debtor and creditor asset holders. The reason is that even if Debtor's government committed only to enforcing payments between debtors, creditors would resell their assets in the secondary market to debtors at face value and would de facto receive their payment. Thus, if Debtor's government wants to avoid payments to creditors, it must commit not to enforce any payments. This introduces a crucial trade-off: committing not to enforce avoids payments to creditors and increases the average consumption of debtors, while committing to enforce preserves payments between debtors and improves the distribution of consumption among them. Enforcement will take place if and only if the following condition holds:

$$(19) \qquad u(y) \geq \frac{u(y + \varepsilon + \iota) + u(y + \varepsilon - \iota)}{2}.$$

Equation (19) is satisfied if idiosyncratic shocks are sufficiently large relative to regional shocks and the utility function is sufficiently concave. In this case, preserving domestic payments is worth more than avoiding foreign ones. If this condition holds, the economy with short-term commitment also implements the full-enforcement allocation. If this condition fails, however, the only equilibrium is one in which there is no trade and each individual consumes its own

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[31] This example is a stylized version of the worlds considered by Fernando Broner and Jaume Ventura (2005, 2008). Broner and Ventura (2005) use a generalization of this model with many goods and transport costs to study the effects of trade integration on the structure of asset markets, domestic and international risk sharing, and welfare. Broner and Ventura (2008) use another generalization of this model with capital accumulation to study the effects of financial integration on consumption, investment, economic growth, and welfare.

endowment. In the latter case, gaining short-term commitment destroys both domestic and international asset trade and everybody (including governments) is worse off.

Short-term commitment gives Debtor's government the ability to preempt the secondary market and render it ineffective. However, the situation is not the same as one in which secondary markets are simply missing. When secondary markets are missing, the government can discriminate between domestic and foreign payments and would choose to enforce the former but not the latter. This destroys international asset trade but does not affect domestic asset trade. When there are secondary markets and governments have short-term commitment, on the other hand, depending on whether Equation (19) holds either both international and domestic asset trade are unrestricted or neither is possible.[32]

The second example shows that, when there are more than two periods and we allow for long-term assets, individuals can reduce the governments' ability to preempt payments to foreigners:

EXAMPLE 12 (D-C World with Three Periods): *All assumptions are as in the D-C World, except that there are three periods, Today, Tomorrow, and The-Day-After, indexed by $t \in \{0, 1, 2\}$. The-Day-After all individuals in the world receive an endowment equal to y.*

Assume first that the only available assets are short-term bonds. In particular, Today individuals can only issue bonds that pay Tomorrow, while Tomorrow they can issue bonds that pay The-Day-After. The full-enforcement allocation is characterized by all individuals in the world consuming y in each of the three periods. Today debtors sell ε bonds to creditors, which they repay Tomorrow. The-Day-After all individuals simply consume their own endowment. With short-term commitment, no asset trade is possible and individuals are forced to consume their endowment in each of the three periods. Does adding a third period then not make any difference? It does, if we allow for long-term bonds.

Allowing for long-term bonds makes a difference, though. Assume now that Today individuals can also issue bonds that pay The-Day-After. What would happen if Today debtors sold ε long-term bonds to creditors? With full-enforcement, debtors would repurchase these bonds from creditors Tomorrow. By doing so they would end up consuming y both Tomorrow and The-Day-After, while any individual who did not do this would consume $y + \varepsilon$ Tomorrow and $y - \varepsilon$ The-Day-After. But note that the same would happen with short-term commitment. Since these bonds are enforced The-Day-After, Debtor's government makes its enforcement decision only after secondary markets close Tomorrow. But by then debtors have already repurchased all bonds at face value from creditors. As a result, with long-term bonds the full-enforcement allocation is achieved even with short-term commitment.[33],[34]

The intuition for this result is that, just as governments have an ex-post incentive to preempt secondary markets and avoid payments to foreigners, domestic residents have an incentive to issue assets of a long-enough maturity to preempt such government intervention. There is an interesting parallel between Example 12 and the rest of the paper. Just as we had previously shown

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[32] In this example there exists an overborrowing externality that sometimes leads to the destruction of domestic asset trade. Capital controls to limit ex-ante borrowing from foreigners are often optimal in this context. For recent discussions of the problem, see Ricardo J. Caballero and Arvind Krishnamurthy (2001), Eduardo Fernández-Arias and Davide Lombardo (2002), Jean Tirole (2003), Kehoe and Perri (2004), Karsten Jeske (2006), Martin Uribe (2006), and Wright (2006).

[33] Example 12 suggests an interesting relationship between the length of commitment, the persistence of endowment shocks, and the maturity of assets. We conjecture that assets need to have a long enough maturity relative to the persistence of shocks and length of commitment, so that they can be repurchased while endowments are high but before the government decides enforcement.

[34] In reality, bonds often have acceleration clauses that might facilitate default. Example 12 suggests that such clauses might have unintended costs in terms of enforcement.

that allowing for additional markets, which are redundant with full-enforcement, can increase enforcement, Example 12 shows that allowing for additional assets, which are also redundant with full-enforcement, can also increase enforcement.

The examples and discussion of this section show that the timing of enforcement matters, and that the connection between commitment, enforcement, and the role of secondary markets is a subtle one. When the country has debts due to foreigners, the government always has an incentive to commit to not enforcing and preempt trading in secondary markets. But there are countervailing forces. First, when there is not only international but also domestic asset trade, the effect of short-term commitment on enforcement depends on whether domestic or foreign payments are more important. While it is possible for enforcement to be maintained, it is also possible that domestic asset trade be destroyed along with international asset trade. Second, the maturity of assets can play an important role in the effects of short-term commitment on enforcement. In particular, creating assets with long enough maturities might have benefits that go beyond the standard ones.

D. Government intervention

We have assumed throughout that governments' only tool to affect market outcomes is enforcement policy. This is clearly unrealistic. Governments will actively use all policy tools at their disposal to stop the secondary markets from thwarting their attempts to default on foreign debts. We already saw in the previous section how governments might try to preempt secondary markets by moving first and deciding enforcement before markets have had a chance to react. In this section, we allow governments to use additional policy tools to 'fight' against the market. Again, we focus on the D-C World.

We start with an obvious observation: if Debtor's government could open and close secondary markets at will, it would have a time-varying perspective on what to do with this power. Today, the government would be willing to take any action to ensure that the secondary market opens. But Tomorrow, the same government would be willing to take any action to ensure that this market closes. To the extent that Today's government is unable to fully constraint Tomorrow's one, secondary markets will be subject to government interventions designed to avoid debtors repurchasing their debts from creditors.

If these interventions are successful, even if only in part, sovereign risk will affect consumption and welfare. Consider, for instance, the case in which Debtor's government can tax trades in the secondary market and/or exclude some debtors from participating in it. In such a situation, sovereign risk would have similar effects to those analyzed in Examples 4 and 5, in which we allowed for ad valorem transaction costs and limited participation.[35] Consider also the case in which the government can coordinate debtors and alleviate the prisoner's dilemma problem that the country faces. In this case, sovereign risk would have effects that parallel those analyzed in Example 6, where we allowed for large agents.

It should not be surprising that government interventions in the secondary market produce similar effects than the market imperfections we have already analyzed. After all, these interventions are designed to put sand on the wheels of these markets. An interesting and new issue that arises here relates to whether governments have in fact incentives to intervene. The next example explores this issue.

EXAMPLE 13 (D-C World with Two Goods):   *All assumptions are as in the D-C World, except that there are two goods: dates and coconuts. Debtor's endowments consist only of dates, while Creditor's consist only of coconuts. Redefine c_{it} as the following consumption aggregator $c_{it} =$*

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[35]The only difference, of course, is that government-induced transaction costs and/or limited participation would affect only secondary markets and not primary ones.

$\left(c_{D,it}^{(\sigma-1)/\sigma} + c_{C,it}^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)}$ *(with $\sigma > 1$) for all $i \in \mathcal{I}^W$ and $t = 0, 1$; where $c_{D,it}$ and $c_{C,it}$ are the consumptions of dates and coconuts, respectively, of consumer i in date t.*

In this version of the D-C World there are gains from commodity trade. Debtor payments (of dates) to creditors Tomorrow might correspond to two different motives: repurchasing debts in the secondary market and/or buying coconuts for consumption. In the equilibrium with full enforcement, all debtors and creditors consume $(y - \varepsilon)/2$ dates and $(y + \varepsilon)/2$ coconuts Today; and $(y + \varepsilon)/2$ dates and $(y - \varepsilon)/2$ coconuts Tomorrow. To do this, each region gives the other one half of its production in each period.

Assume the government can impose capital controls Tomorrow. By capital controls, we mean that the government can restrict international payments by debtors. For simplicity, assume that capital controls are either zero or prohibitive. If Debtor's government could discriminate between payments according to the transaction, it would do so. For instance, consider the extreme case in which Debtor's government can perfectly discriminate. Then, it would forbid payments intended to repurchase debts, but would not restrict payments intended to purchase coconuts. In this extreme case, sovereign risk destroys all foreign asset trade and everybody is worse off.[36]

If Debtor's government cannot perfectly discriminate between payments according to the type of transaction, it might not be willing to impose capital controls. For instance, consider the other extreme case in which Debtor's government cannot discriminate at all. In this case, it will choose not to impose capital controls as long as:

$$y + \varepsilon \le \left[\left(\frac{y - \varepsilon}{2} \right)^{\frac{\sigma-1}{\sigma}} + \left(\frac{y + \varepsilon}{2} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}.$$

That is, capital controls are imposed only if the foreign debt is high, i.e. large ε; and the gains from trade are low, i.e. small σ. Only in this case do the gains from default exceed the losses from trade disruptions.[37]

An interesting aspect of this example is the connection between goods trade and default. The notion that fear of trade disruptions might induce countries to repay their debts is an old one. The previous literature, which assumed that secondary markets do not exist, viewed these trade disruptions as the result of retaliation by creditors in the event of default. Allowing for secondary markets provides a novel perspective on these trade disruptions as a by-product of capital controls imposed by defaulting debtors.[38]

The main conclusion of this section is that, if governments have policy instruments that enable them to interfere with the working of secondary markets, the negative effects of sovereign risk on international asset trade may resurface. Whether they do so or not will depend on the additional effects of the particular instruments considered. Moreover, such government intervention may result in sovereign risk having other, seemingly unrelated, negative effects. While in the case of

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[36]Of course, this would also be the case if secondary markets closed down for exogenous reasons before Tomorrow's endowments are realized.

[37]Note that in this example capital controls play a very different role than in the previous literature. Here capital controls are used ex-post to avoid repayment to foreigners and have negative ex-ante effects. In Caballero and Krishnamurthy (2001), Fernández-Arias and Lombardo (2002), Tirole (2003), Kehoe and Perri (2004), Broner and Ventura (2005), Jeske (2006), and Wright (2006) capital controls are used ex-ante to avoid overborrowing and thus have positive ex-ante effects. In addition, here capital controls are intended to keep domestic residents from purchasing domestic assets, while in cases of capital flight (e.g. Eaton, 1987) capital controls are intended to keep domestic residents from purchasing foreign assets.

[38]Rose (2005) and Martinez and Sandleris (2007) show that trade decreases around periods of default. They also find that the decrease in trade is not greater vis a vis creditor countries. This, although arguably inconsistent with the interpretation of drops in trade as punishments, is consistent with our interpretation.

Example (11) in the previous section sovereign risk resulted in reduced domestic asset trade, in the case of Example (13) sovereign risk results in reduced international goods trade.

IV. Discussion and implications

Conventional wisdom views the problem of sovereign risk solely as one of insufficient penalties. Foreign creditors do not have the option of selling their debts in secondary markets and, hence, can only be repaid if the government enforces foreign debts. The theory developed here presents an unconventional view of sovereign risk solely as one of missing or imperfect secondary markets. Foreign creditors cannot impose penalties and therefore the government never enforces foreign debts. As a result, foreign creditors can only be repaid by selling their debts in secondary markets.

Both of these views provide useful but incomplete theoretical benchmarks. The next step in this line of research is to integrate default penalties and secondary markets in a single framework. In such a framework, foreign creditors must choose between selling their debts to the market, perhaps at a discount, or instead holding them until maturity. In 'normal times,' foreign creditors are confident that the threat of imposing penalties is sufficient to induce the country to pay back its debts. Therefore, they quietly hold their debts until maturity. Once in a while, this confidence wavers and a 'crisis' starts. Foreign creditors go to the secondary markets and try to sell their debts. The government, which also understands that default penalties are insufficient, tries to prevent the private sector from going to the secondary market and repurchasing foreign debts. A struggle ensues in which foreign creditors, the private sector, and the government all participate. If enough trading takes place before maturity, the government no longer gains much from defaulting on foreign debts and ends up enforcing them. Default has been averted. If not enough trading takes place before maturity, the government still has sizable gains from defaulting on foreign debts and decides not to enforce them. Default takes place and the debt renegotiation phase starts.

What would be the main predictions of such an integrated framework? Of course, we cannot provide a detailed answer to this question yet. Still, we are confident that these predictions would include the following:

- Trading volume should increase and gross international investment positions should decrease during crises as foreign creditors sell their debts to the private sector. This prediction is consistent with the findings of Eduardo Levy Yeyati, Sergio L. Schmukler, and Neeltje Van Horen (2008) and Broner, et al. (2009). The former show that trading volume in emerging markets increases during crises, despite the fact that trading costs (i.e. bid-ask spreads) also increase.[39] The latter show that during crises, while gross capital inflows fall sharply, gross capital outflows do not increase and even fall slightly. Although a more conclusive test of our mechanism would require higher frequency data on the nationality of buyers and sellers for particular assets, such data is not available.

- Expected returns on the country's assets should increase during crises more than can be accounted for by risk aversion. This is because the segment of the demand for the country's assets that values them the most during normal times, namely foreigners, leaves the market. Broner, Guido Lorenzoni, and Sergio Schmukler (2003) find that, consistent with this prediction, excess returns on emerging-market sovereign bonds are close to zero during normal times and very high during crises.

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[39] This evidence refers to stock markets, for which the role of governments as enforcers might seem less relevant than for bonds. However, even in the case of stocks there are policies associated with investor protection and product and factor markets regulations that have similar effects to those of enforcement.

- Defaults should be less common on assets that are traded in secondary markets. This is consistent with evidence provided by Michael Tomz (2007, p. 210). He finds that emerging markets that borrowed via both bank loans and bonds defaulted substantially more often on the former than on the latter. In addition, Andrea Pescatori and Amadou N. Sy (2007) show that defaults were more common when emerging markets borrowed via syndicated bank loans (1970's and 1980's) than when they borrowed via bonds (1990's and 2000's), even though the incidence of debt-servicing difficulties was similar in both periods.

- When default takes place, governments should find it difficult to discriminate between domestic and foreign creditors. This prediction is consistent with the findings of Federico Sturzenegger and Jeromin Zettelmeyer (2007). They analyze a large sample of recent sovereign defaults and find that, overall, foreign creditors do not appear to have been treated differently from domestic ones.[40] Moreover, this difficulty to discriminate establishes a potential link between defaults and disruptions in domestic financial markets. This is consistent with the evidence that sovereign defaults are often associated with banking crises and significant reductions in credit to the private sector (see International Monetary Fund, 2002, and Carlos Arteta and Galina Hale, 2008).

As this tentative list shows, the introduction of secondary markets into the theory of sovereign risk might substantially enhance its ability to explain the behavior of markets and governments around debt crises. This will, no doubt, help improve the design of institutions and policies to cope with the important problem of sovereign risk.

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[40]Interestingly, Sturzenegger and Zettelmeyer (2007) identify larger haircuts for foreign creditors in only two cases of recent sovereign defaults. In at least one of them, Ukraine, the government imposed severe capital controls that presumably affected the workings of secondary markets.

MONTH YEAR

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