

New Empirical Results on Default: A Discussion of “A Gravity Model of Sovereign Lending: Trade, Default and Credit”

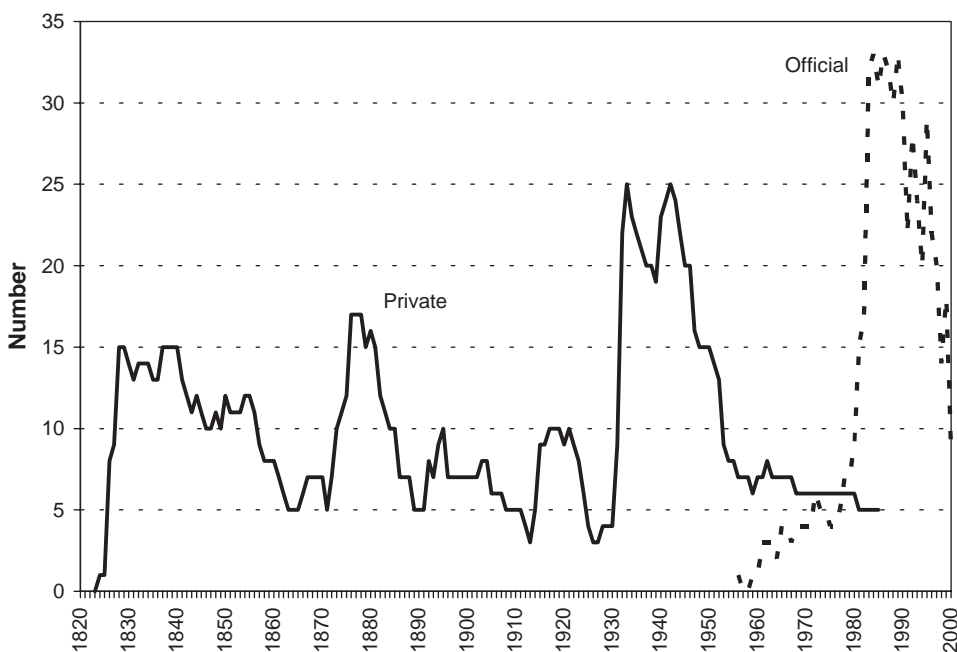
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Sovereign default, while by no means ubiquitous, is still all too common. Moreover, as illustrated in Figure 1, sovereign debt *crises*, in which multiple debtor countries get into payments difficulties at roughly the same time, occur with surprising regularity. When this is combined with the fact that defaults appear to be very costly, to both the creditors who lose money on their investments and also to the defaulting country itself, it is natural that discussion turns to questions such as if and how the international financial system might be “reformed” to minimize the incidence and costs of these crises.

However, before policymakers can talk sensibly about “reforming the international financial architecture,” it is necessary that they have a clear understanding of both the incentives faced by creditors and defaulting countries, and the ways in which institutions and governments affect these incentives. In this regard, economists have developed no shortage of interesting and clever *theories*, both formal and informal, of the incentives governing the default process. Much has been written about the incentives of defaulting countries to repay their debts, and about the punishments creditors can use to deter default, including the use of legal sanctions since the passage of the (U.S.) Foreign Sovereign Immunities Act in 1976, the loss of access to credit markets (the so-called “reputation” models of Eaton and Gersovitz, 1981, and many others), the loss of a country’s reputation

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Figure 1. Two Centuries of Default and Rescheduling



Source: See Appendix.

outside of the credit market (Cole and Kehoe, 1998), and the imposition of trade and trade credit sanctions (Bulow and Rogoff, 1989; Kaletsky, 1985; and Rose, 2002). There has also been some theoretical work on incentives of creditors, chiefly focusing on the credibility of coordinated lending embargoes (Bulow and Rogoff, 1989; Kletzer and B. Wright, 2000; and M. Wright, 2003a), and on the operation of institutions aimed at facilitating cooperation among creditors (Eichengreen and Portes, 1989; Mauro and Yafeh, 2003; and M. Wright, 2003c). However, there has, on the whole, been much less *empirical* work aimed at disentangling the importance of these various theories.

Viewed from this perspective, the contribution of Rose and Spiegel (2004) is especially welcome. Together with a small number of other recent papers, Rose and Spiegel are contributing toward constructing a body of evidence about the nature and form of sovereign lending and default that can be used to, first, discriminate between theories and, second, to build a framework within which potential reforms can be assessed. In particular, their finding that bilateral bank debt stocks are larger between countries that have larger bilateral trade flows, even after controlling for the usual suspects, is consistent with an important role for trade and/or trade credit sanctions in enforcing repayment by sovereign debtors along the lines of the model outlined in their paper.

This discussion, after critically reviewing the methodology and findings of Rose and Spiegel, takes these findings as given and asks the question: to what extent

do these results allow us to distinguish between different theories of default? To answer this question, we write down a simple off-the-shelf model of sovereign lending in which repayment is enforced by threatened loss of future capital market access (that is, the loss of the debtor's reputation) and show that this model makes similar predictions for the direction of lending as does a model in which trade sanctions enforce repayment. However, we go on to show that this prediction depends crucially on the assumed nature of the trading environment and that it comes at the cost of dramatically underpredicting the level of gross capital flows. In summary, the Rose and Spiegel finding on the direction of lending, should it prove to be robust and *when combined with evidence about the level of gross capital flows*, constitutes a substantial challenge for reputation models of repayment. The discussion concludes by speculating as to how this challenge may be answered and by outlining some open empirical questions on default that await answers.

I. Trade, Default, and Credit

The centerpiece of the Rose and Spiegel empirical strategy is to estimate a gravity equation. However, unlike the typical gravity equation in which the dependent variable is bilateral flows of *real trade*, in this implementation it becomes the bilateral stock of financial assets held by banks. The data come from the Bank for International Settlements data on bank balance sheets on a consolidated basis. The independent variables in the analysis span the usual range of variables. In addition, the flow of bilateral real trade is added as an independent variable. The key result is the finding that the higher the flow of real trade between two countries, the higher the stock of bilateral assets held by banks in the creditor country. The result is both statistically and economically significant—typically on the order of a 5 percent increase in stocks resulting from a 10 percent increase in trade—and is robust across a number of specifications, possible sets of instruments, and robustness checks.

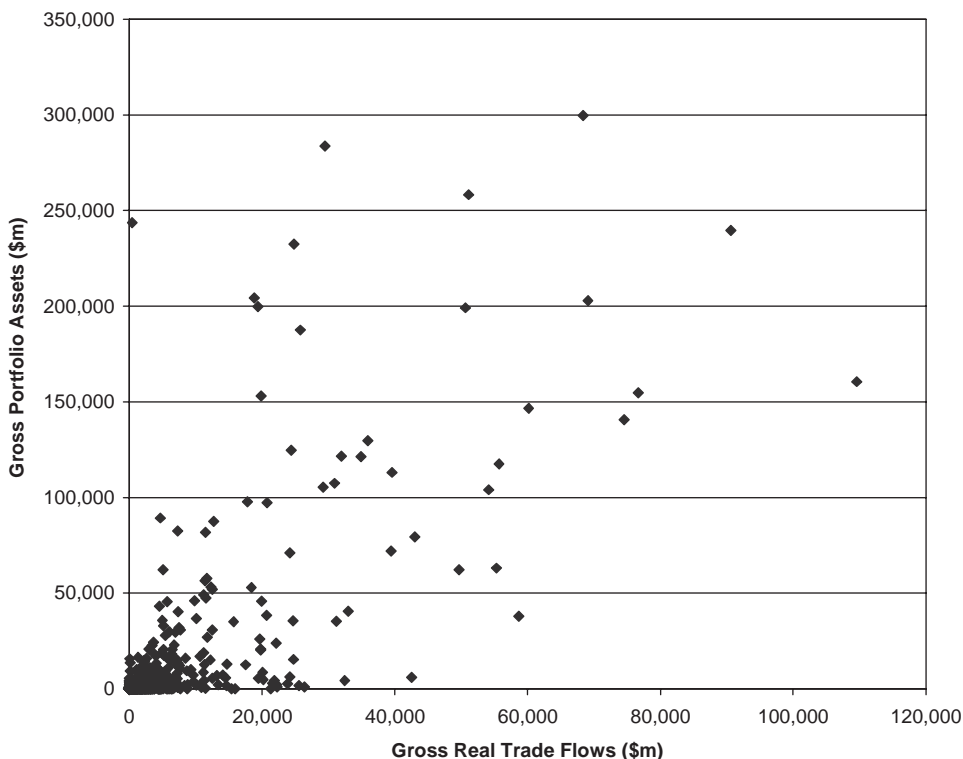
What is interesting, and perhaps a little surprising, about this result is that it holds despite controlling for the usual list of gravity variables. One might certainly have expected two large neighboring countries to have substantial cross holdings of assets/liabilities due, among other reasons, to the fact they had more real trade and hence more trade credit. They may also have had greater cross holdings of assets—in particular equities—due to better flows of information, as suggested by Portes, Rey, and Oh (2001). However, the results suggest that trade is important above and beyond that component that is suggested by the usual explanators of trade. The question then becomes to what extent is this extra importance evidence of the importance of trade and trade credit sanctions in enforcing repayment?

Before turning to a direct discussion of this question, it is first useful to note a couple of potentially important caveats to the empirical analysis. One question concerning the implementation of the strategy is whether or not the focus upon bank debt, as opposed to the assets and liabilities of a country more generally, affects the results? The lack of good data for other forms of assets and liabilities makes this impossible to answer definitively—Rose and Spiegel had to look where the

light was shining—but it begs the question of whether other forms of capital flows have very different patterns. Moreover, this issue is becoming increasingly important due to the increasing shift of sovereign lending away from bank loans and toward bonds, and the recent rise in private foreign direct investment. The usage of bank lending is perhaps most troubling because it has the potential to be contaminated by trade credit extended by these banks, a feature that quite reasonably could be expected to be correlated with trade patterns, even after controlling for the usual explainers of trade: a pair of countries that trades an unusually high amount might also be expected to have an unusually high amount of trade credit.

One way to assess the importance of the above criticism empirically is to examine data on other forms of international investment. A first cut at such an exercise is contained in Figure 2, which plots an estimate of the stock of bilateral portfolio investment assets in 2001 from the IMF’s *Coordinated Portfolio Investment Survey* against bilateral trade flows for almost 2,000 country pairs. As was the case for bank debt stocks, the figure shows that there is a positive correlation between the two series, with a correlation coefficient of roughly 0.75. This is comforting, and suggests that portfolio investments such as equities behave roughly similarly to bank debt. Perhaps foreign direct investment does as well?

Figure 2. Bilateral Portfolio Assets, 2001



Source: See Appendix.

A second caveat associated with the implementation concerns the usage of the bank loan data on a consolidated basis. These data allocate bank assets to the country within which the bank is headquartered. The trade sanction story advanced by Rose and Spiegel postulates that a country will restrict trade as a punishment against any country that defaults on loans made by its citizens. But in this age of multinational banking, a default on loans made by the foreign branch of a British bank could plausibly have its largest effect upon foreign depositors. If so, should we expect British trade to decline? If not, then why is British trade (and not the trade of the foreign country in which the branch is located) the relevant determinant of lending flows?

As regards the interpretation of the results, one question that arises concerns the estimates that result when attention is restricted to industrial countries. If, as seems plausible, the risk of default in lending to an industrial country is much lower than for emerging market economies—say because of superior institutions, the availability of other diplomatic punishments, or what have you—one might have expected that the relationship between trade and lending would be weaker for the industrial countries. The results, however, are often stronger.

Another obvious objection to the hypothesis that it is trade sanctions (although perhaps not *trade credit* sanctions) that enforce repayment is that we do not seem to observe trade sanctions being imposed in any instances of default. Moreover, it is not obvious whether international obligations through the World Trade Organization would allow the usage of trade sanctions in the event of a default today. The idea that trade sanctions were important in history, and in particular in averting a possible default in Argentina in the 1930s, also seems doubtful, especially in the light of recent work by Tomz (2003). Finally, debt settlements in practice do not seem to discriminate between groups of creditors on the basis of trading relationships, in contrast to the model put forward in the paper.

All of the above questions, in principle, cast some shadows on the thesis put forward by Rose and Spiegel. But all of them are very hard to answer in light of the available data. The rest of this discussion punts on these questions entirely, takes the Rose-Spiegel result at face value, and proceeds to ask whether this fact can be explained by a model of credit market reputation. The answer, it will turn out, is yes, although possibly not without creating further problems for the reputation story.

II. A Simple Model

To explore the ability of a reputation-based model of repayment incentives to match this fact, we will begin with a version of the well-known model of Kletzer and B. Wright (2000), although in fact the results hold for a much broader class of models. In this version of the model there are two risk-neutral creditor countries (indexed by $j = 1, 2$) and one risk-averse debtor country with utility function U and discount factor β . International capital flows occur to smooth consumption and to reallocate consumption over time at a price q , defined to be the inverse of the gross international interest rate R . The absence of any international system of contract enforcement means that in equilibrium, lending patterns must be designed to reduce (in fact, eliminate) the possibility of default.

The key to the result is, intuitively, that in this model, default possibilities are minimized by keeping gross capital flows as small as possible, and in fact equal to net capital flows. Loosely speaking, the reason is that if gross flows are larger than net flows, the debtor can strategically default at the point when the most resources are under its control: default has become more tempting. But this implies that financial flows (and hence their corresponding stocks) should follow trade flows, which is enough to give us the direction of lending result discussed above.

To see this result, let y_t be the identically and independently distributed level of the endowment that the debtor country receives at the start of the period. The nature of the interaction between the debtor and the two creditors is modeled as a game in which, at the start of each period and after observing the level of the debtor's endowment, the debtor and creditors simultaneously make transfers of goods to each other. As there are no gains from trade between creditors, we can without loss focus on transfers of goods to the debtor $\{\tau_t^{Cj}\}$ from each creditor $j = 1, 2$, and from debtor $\{\tau_t^{Dj}\}$ to each creditor $j = 1, 2$.

It is by now well known that there are many subgame perfect equilibria of such a game, the worst of which is autarky and produces an expected welfare for the debtor of V^A . Because autarky is the worst possible outcome, a threat to place the debtor in autarky—that is, exclude the debtor from financial markets—is the worst possible threat that can be made, and so serves to support the most lending possible. It then follows that any equilibrium level of transfers $\{\tau_t^{Cj}, \tau_t^{Dj}\}$ must satisfy

$$U\left(y_t + \sum_{j=1,2} (\tau_t^{Cj} - \tau_t^{Dj})\right) + \beta V_{t+1} \geq U\left(y_t + \sum_{j=1,2} \tau_t^{Cj}\right) + BV^A$$

$$(\tau_t^{Dj} - \tau_t^{Cj}) + q\Pi_{t+1}^j \geq -\tau_t^{Cj}$$

for all j and t , where V_{t+1} denotes the expected future welfare of the debtor under the equilibrium strategies, and $q\Pi_{t+1}^j$ denotes the expected present value of any future profits that the j th creditor expects to make in the future. That is, $q\Pi_{t+1}^j$ denotes the net (and as we will see below, also gross) value of any assets held by creditor country j against the debtor.

If we restrict attention to those equilibria that are constrained efficient (that is, efficient but for the threat of default, which is the convention) and in which default is tempting for the agents (so that the constraints bind), then it is easy to show that the equilibrium features a minimal level of gross capital flows: in equilibrium, if the debtor makes a transfer (that is, if $\tau_t^{Dj} > 0$ some j), then no creditor makes a transfer ($\tau_t^{Cj} = 0$ all j). In other words, gross flows are equal to net flows, which are defined as the current account deficit of the country. The proof follows from the above equations: if the debtor transfers resources and the constraint binds, the constraint can be made less binding, and hence efficiency can be increased, by reducing the transfers from the creditors on the right hand side of the inequality.

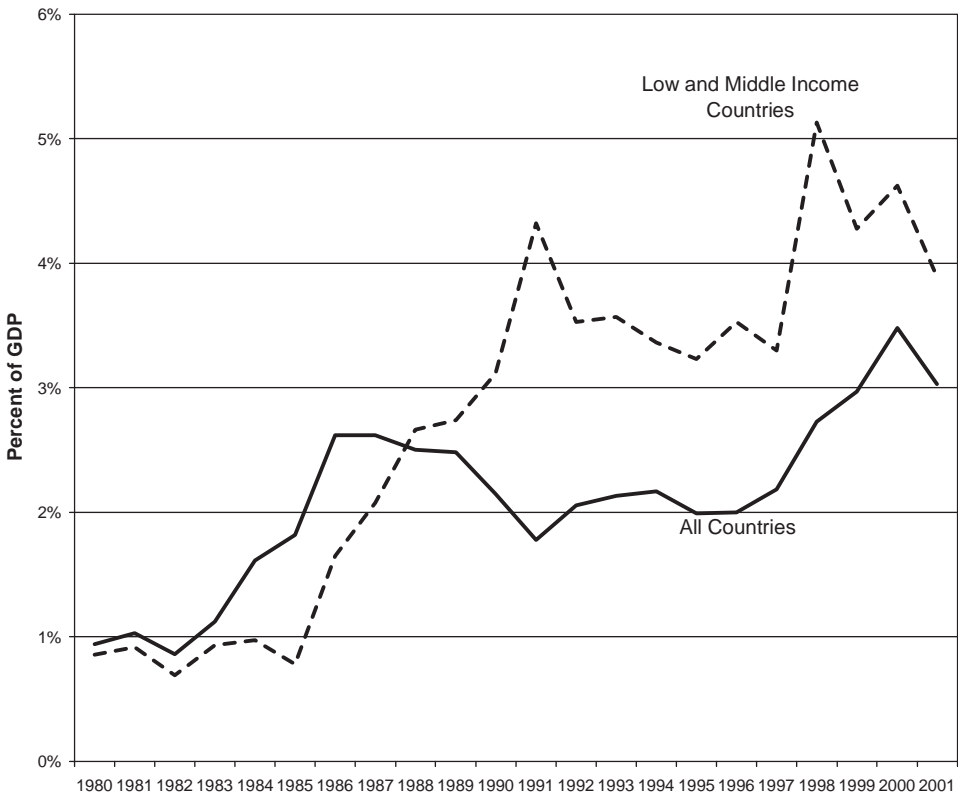
This result is sufficient to imply that the countries with the largest asset holdings are also the countries with the largest trade flows. This follows from the second sequence of equations: in a constrained efficient equilibrium at which the

constraints bind, the larger is current bilateral exports to the debtor (that is, the larger is τ_t^{Cj}), the larger is the present value of bilateral assets $q\Pi_{t+1}^j$. Again the intuition is straightforward: for a given value of trade, the larger are gross asset holdings, the more tempted some party will be to default. This temptation is minimized by keeping gross assets equal to net assets, which in turn requires that the largest traders hold the most assets.

The above model of sovereign debt enforced by a country's concern for its reputation, is thus able to produce the result found by Rose and Spiegel. However, the result comes at a price: it also predicts that gross capital flows should be small and, in fact, no larger than net capital flows. As can be seen in Figures 3 and 4, whereas gross capital flows to developing countries in 1980 were not much larger than net capital flows, today they are almost five times larger. A related observation for developed economies is often cited (see, for example, Obstfeld and Rogoff, 2000) as evidence against the importance of default risk for these countries.

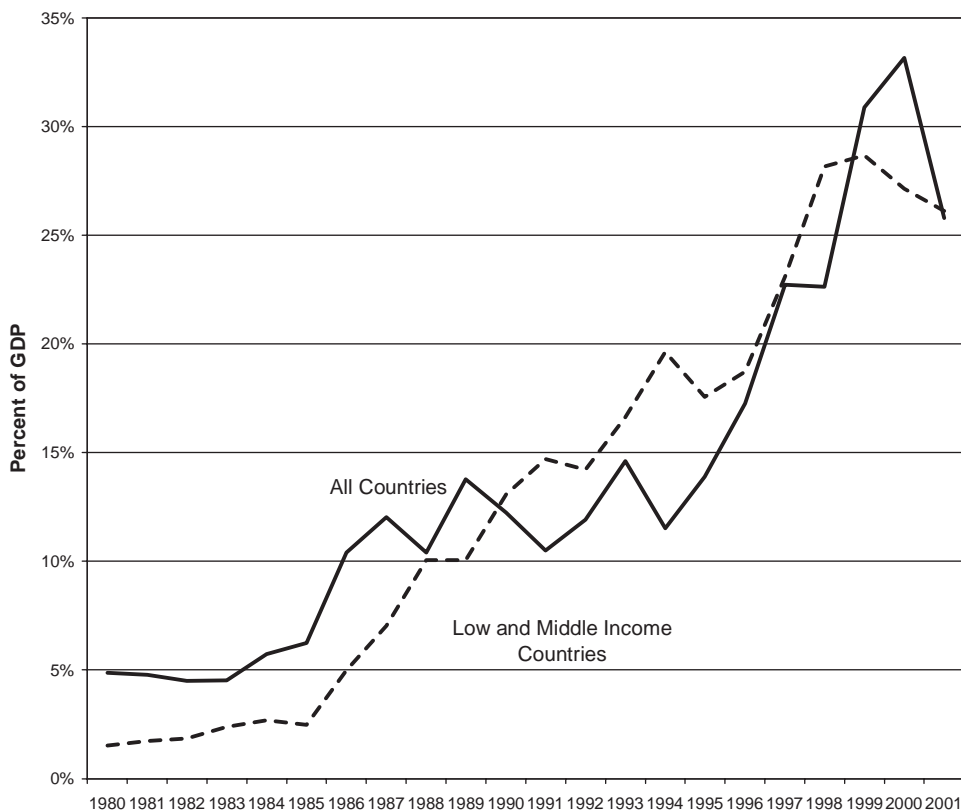
This begs the question of whether or not a reputation model can explain simultaneously both the level of gross capital flows, and the direction those flows (and hence corresponding asset stocks) take. One avenue that could be taken would be

Figure 3. Net Capital Flows



Source: See Appendix.

Figure 4. Gross Capital Flows



Source: See Appendix.

to abandon the focus on constrained efficient allocations. When allocations are not even constrained efficient, then gross flows can exceed net flows. However, the level of net capital flows that can be sustained declines in the amount by which gross capital flows exceed net flows. Consequently, it is difficult to see how such an explanation could explain simultaneous increases in both net and gross capital flows displayed in Figures 3 and 4. Another possibility is that default is not really a constraint, so that like any other complete markets model we are free to “gross up” portfolios in any way we choose. But such an approach places no restriction on the direction of gross flows and, moreover, begs the question of why we should be concerned about default in the first place.

Yet a third response is to note that it is not default and reputations per se, but rather their interaction with the trading technology, that produces the result that gross flows must be small in the face of default risk in this model. In particular, the above results were all derived under a specification of trade that involves all countries simultaneously exchanging goods. Suppose instead that trade takes place continuously throughout a period, and that a default consists of an early termination of the period of trade. To be concrete, suppose that trade takes place continuously

over an interval of time normalized to length one, and that either a creditor or a debtor can terminate trade at any point $s \in [0,1]$ along that interval.

Under these assumptions, the relevant participation constraints become

$$U\left(y_t + \sum_{j=1,2} (\tau_t^{Cj} - \tau_t^{Dj})\right) + \beta V_{t+1} \geq U\left(y_t + s \sum_{j=1,2} (\tau_t^{Cj} - \tau_t^{Dj})\right) + BV^A$$

$$(\tau_t^{Dj} - \tau_t^{Cj}) + q\Pi_{t+1}^j \geq s(\tau_t^{Dj} - \tau_t^{Cj})$$

for all $s \in [0,1]$ all j and t . Then, with a little work, it can be shown that gross capital flows are unconstrained for any level of net capital flows: simply fix the net level of transfers $\sum_{j=1,2} (\tau_t^{Cj} - \tau_t^{Dj})$ and vary the level of gross transfers keeping the

level of net transfers constant. In this case, default is always most tempting to an agent at the start of a period (that is, $s = 0$) and the temptation to default is invariant to the level of gross flows. This shows that a reputation model can produce arbitrarily high levels of gross flows. Moreover, the implications of this model for net capital flows, consumption, default, and welfare are exactly the same as for the earlier model presented above. However, now it is also true that there is no reason for gross asset positions to be correlated with gross trade flows: the argument used before now only works for net trade flows and net asset positions.

To summarize: a reputation model of debt is capable of explaining the Rose and Spiegel finding that gross asset positions are correlated with gross trade flows. Such a model is also capable of explaining arbitrarily large gross capital flows. However, the versions of these models that have presently been devised are not capable of simultaneously explaining both of these facts. The Rose and Spiegel finding on the direction of debts, in combination with the presence of large gross capital flows, therefore constitutes a challenge to reputational models of debt.

IV. Concluding Remarks

This discussion began by arguing that economists and policymakers still lack answers to some of the most fundamental questions concerning the incentives of debtors and creditors in the repayment of debt. In terms of providing answers to these questions, theory is still ahead of empirical work. However, thanks to the work of Rose and Spiegel, empirical work is catching up. In particular, their finding that bilateral asset holdings follow bilateral trade flows, should it prove to be robust, and when combined with evidence about the magnitude of gross flows, is a substantial challenge to the traditional reputation models of debt.

This does not necessarily constitute the final word on reputation models. As the discussion in the last section shows, the implications of reputation models for the level and direction of asset flows depend not only on the nature of contract enforcement but also on the details of the trading environment. Indeed, the discussion of the last section hints that a resolution of the two facts may lie in the way in which trade and financial frictions interact. In some recent work, M. Wright (2003b) shows that when default is deterred by a concern for preserving one's reputation,

and that when a country's trading partners have an information advantage in reacting to a default, a model of this sort can produce large gross flows that closely follow trade patterns. Whether similar models of both trade and financial frictions can explain this and other facts about debt and repayment remains an open question.

Nor does this constitute the final empirical word on default. Not only are there many other aspects of the default process that are not well understood, but economists still lack good answers to the other question posed at the beginning: how do changes in government policy and institutions affect the incentives to repay debts? In part, the lack of good answers to this question reflects the fact that a study of variations in institutions of this scope inevitably involves studying the behavior of sovereign debt over the course of many decades, if not centuries. Some recent work by Klingen, Weder, and Zettelmeyer (2003), which examines rates of return on lending over three decades from 1970 to 2000, finds that returns on sovereign debt following the Brady restructuring deals were abnormally high, which is consistent with a positive role for some types of government intervention in resolving default. However, the interventions in the early years of the 1980s debt crisis were associated with very low returns. One thing is certain: with further empirical and theoretical work, the prospects of realizing positive welfare gains from the reform of the international financial system become stronger.

APPENDIX

Two Centuries of Default

Data on the incidence of default are taken from Suter (1992) up to 1989, and are extrapolated forward to 2000 using data from various issues of the World Bank's *Global Development Finance*.

Portfolio Assets

Data on bilateral holdings of portfolio investment assets for 2001 come from the IMF's *Coordinated Portfolio Investment Survey*. Bilateral pairs for which data were not available were omitted. The corresponding real trade flows data come from the IMF's *Direction of Trade Statistics*.

Gross and Net Capital Flows

Gross capital flows are notoriously difficult to measure. The measure we construct is no more than a coarse lower bound, and is based on summing the absolute value of each debit and credit category within the capital and financial account for each country, and then aggregating over countries. These data came from the IMF's *International Financial Statistics*. Note that not all countries report capital flows at the same level of disaggregation. For the purpose of constructing this series, the level of disaggregation was to include data from the capital account, for which credits and debits are recorded separately, as well as credits and debits from within the financial account for direct investment, portfolio investment, financial derivatives, and other investments. That is, the breakdown of portfolio investment into equity and debt, and of other investments by sector (central bank, government, banks, and other), was not included. The subset of developed economies was defined as the membership of the OECD in 1991, excluding Turkey. Net capital flows are defined as the average current account deficit of a country, in absolute value.

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