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Trade, Gravity, and Sudden Stops: On How Commercial Trade Can Increase the Stability of Capital Flows

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Abstract: Financial stability is an important policy objective since crises are associated with big economic, social, and political costs. Promoting stability requires preventing "sudden stops" in capital flows, which are events in which foreign financing abruptly disappears. This paper contributes to the discussion by providing new theoretical and empirical evidence on the causal connection between lack of exposure to commercial trade and proclivity to sudden stops. On the theoretical front, I show how exposure to trade raises the creditworthiness of countries and reduces the probability of sudden stops. In relatively closed economies, sudden stops (when they occur) are more harmful, and thus the option to default on the inherited debt is more attractive. Therefore, conditional on the amount that lenders are willing to loan, decreased exposure to trade increases the likelihood of default. A sudden stop takes place when the borrowers reject the amount that lenders want to loan: They receive no new funding, and they concurrently default on the outstanding debt to "ease the pain." This proposition is tested using "gravity estimates," which are based on countries' geographic characteristics as appropriate instruments for trade. The results indicate that, all else equal, a 10 percentage point decrease in the trade-to-gross domestic product ratio increases the probability of a sudden stop between 30 percent and 40 percent. The policy implications are unambiguous: Increasing the tradable component of a country's GDP will, ceteris paribus, reduce the vulnerability of that country to sudden stops in capital flows.

JEL classification: F32, F36, F41

Key words: stops, current account adjustment, trade, gravity model

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I. Introduction

When foreign financing available to countries abruptly disappears, a phenomenon that in the economic literature is called "sudden stops,"[2] countries are forced to go through a potentially painful resource transfer to creditor countries. When this happens, any outstanding current account deficit, previously financed with foreign capital inflows, has to be eliminated or financed with international reserve losses. Either option amounts to a net resource transfer to creditor countries. The size of the transfer is an increasing function of the current account deficit before the shock. Less obviously, the cost in terms of output loss of generating a current account adjustment is a decreasing function of exposure to trade (i.e. structural trade to GDP ratio).[3] Recent papers on sudden stops, most prominently Calvo, Izquierdo and Mejia (2003) and Edwards (2004), have shown that there is a positive correlation between lack of exposure to trade (in what follows, I shall refer to this as closedness) and the occurrence of sudden stops. Yet, due to the potential endogeneity of trade, causality has not been firmly established.[4] Furthermore, the theoretical underpinnings of the relationships have remained unexplored. The purpose of this paper is to provide new theoretical and empirical evidence on the causal relationship between lack of exposure to trade and sudden stops.

What is the link between trade and sudden stops? Any resource transfer operating through a current account adjustment requires a change in the real exchange rate, the relative price of traded to non-traded goods.[5] A real exchange rate depreciation will induce a substitution in domestic consumption away from the traded and into the non-traded goods. Similarly, it will induce a substitution in production in the opposite direction. Both effects will generate the foreign exchange needed to re-establish external equilibrium by

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[2] To the best of my knowledge, the expression "Sudden Stops" was first used by Dornbusch, Goldfajn and Valdes (1995) and has since become increasingly popular. The first analytic approach to the problem of sudden stops is Calvo (1998).

[3] Note that "Sudden Stops" are financial shocks to the capital account that cause an adjustment in the current account or/and a change in reserves. This approach is somewhat novel since much of the previous analysis deals with the reverse causality: current account shocks that cause an adjustment in the capital account and/or reserves. See Bergin (2004) for a review of the literature.

[4] The exceptions are Cavallo and Frankel (2004) which is an extension of this paper with some additional results and a broader scope of analysis, and Calvo, Izquierdo and Mejia (2003) who deal with the problem of endogeneity of trade by computing two-step hierarchical bootstrapped confidence intervals for all variables in the model.

[5] Honoring my roots, I define the real exchange rate in the *Latin* tradition, as the relative price of traded goods in terms of non-traded goods.

reducing the current account deficit. In the theoretical model outlined in this paper, it is shown that in financially constrained countries—those countries that have only limited access to foreign financing— the magnitude of the required real exchange rate depreciation (in short, "real depreciation") for a given quantity of resource transfer is unambiguously a decreasing function of exposure to trade.[6] Furthermore, in these financially constrained economies, real depreciations are recessionary because of the adverse effects of weaker exchange rates on the country's balance sheets.[7] Thus, lack of exposure to trade, by increasing the size of the real depreciation in the aftermath of a shock, also increases the ensuing output contraction.

Sudden stops, if they occur, can be quite harmful, especially in closed economies. In order to circumvent the pain, countries that face a sudden stop might be tempted to default on their external obligations. In the second part of the model, sudden stops are endogenized. They happen when the borrowers simultaneously choose to reject the amount that they are offered by foreign lenders and to default on the inherited debt. As sudden stops (when they happen) are more harmful in relatively closed economies, and default on the inherited debt provides relief, any given offer from lenders is more likely to be rejected in closed economies, making sudden stops more likely. Interestingly, there are additional connections between the temptation to default on external debts and lack of exposure to trade that reinforce the conjectured link. Rose (2002) shows that debt default and subsequent renegotiations reduce bilateral trade between creditors and debtors.[8] To the extent that trade comprises a large part of a country's economic activities, that country will have less incentives to default, and sudden stops should be less likely.[9]

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[6] The quantity of resource transfer is the outstanding current account deficit before the shock.

[7] This relates to the so-called "balance sheet" effect of real depreciations, where mismatches in the currency denomination of assets and liabilities can lead to massive bankruptcies. Analytical literature on balance sheet effects and output contraction includes: Kiyotaki and Moore (1997), Krugman (1999), Aghion, Banerjee and Bacchetta (2000), Cespedes, Chang and Velasco (2000), Caballero and Krishnamurty (2002), Christiano, Gust and Roldos (2004) and Mendoza (2002). On the empirical side, Cavallo, Kisselev, Perri and Roubini (2002) and Guidotti, Sturzenneger and Villar (2004) provide evidence on the importance of these effects.

[8] Rose (2002) provides evidence of the importance of this channel. He shows that when a country defaults on its debt, the decline in bilateral trade with creditors is approximately 8% a year and persists for around 15 years.

[9] The point was originally made by Eaton and Gersovitz (1981). They argue that countries that trade more are subject to more harmful trade-related retaliation in the aftermath of default and therefore are less likely to default.

The borrowers' temptation to default can be driven by a variety of things, but the previous discussion makes it clear that one structural element is the country's exposure to trade. All in all, countries with less exposure should be more prone to sudden stops. Tempting as it might be to jump right in and test this proposition empirically, one has to be very careful in considering the potential endogeneity of (or reverse causality between) trade, financial openness, and one of its plausible outcomes: sudden stops.[10] Aizenman (2003) shows in the setting of a simple model how more commercial openness increases the effective cost of enforcing financial repression, making financial openness a by-product of greater trade integration. Similarly one could potentially think of a reverse causality process, whereby for example, greater financial openness may reduce the cost of trade credit and encourage FDI, and both adjustments may facilitate more commercial trade. More recently, Aizenman and Noy (2004) investigate the presence of two-way feedbacks between financial and trade integration and present evidence on the existence of such connections. Thus, it is possible that countries that are less prone to sudden stops for reasons other than trade (i.e., a long tradition of financial openness and reliability) trade more. To deal with this identification problem, I use "gravity estimates" as instrumental variable for trade.

The methodology of using "gravity estimates" as instrumental variables is an intuitive two-stage procedure developed by Frankel and Romer (1999) in the context of their research on trade and growth, and later applied to a variety of settings in which trade and some other variable could be jointly determined.[11] The first stage consists of aggregating up across a country's partners the prediction of a gravity equation that explains bilateral trade with distance, population, language, land-border, land-area, and landlocked status. In the second stage, this predicted trade variable is used as an instrument for actual trade in an equation of sudden stops. Gravity estimates are a good instrumental variable because they are based on geographical variables (which are plausibly exogenous) yet

[10] Evidently, some degree of financial openness is a necessary condition for sudden stops; the easiest way to avoid sudden stops is to remain isolated from foreign capital inflows. This is true independently from commercial trade patterns. The hypothesis tested in this paper is that once capital inflows are allowed, then closedness becomes an important determinant of the stability of foreign capital inflows.

[11] See for example: Frankel and Rose (2002) where they show that currency unions might raise trade and output; Frankel and Rose (2005) where they show that trade is not bad for the environment.

when aggregated across all bilateral trading partners they are highly correlated with a country's overall trade.

I use financial account and current account information for all countries in the world with available data in the IMF International Financial Statistics (IFS)—141 countries in total— for the period 1970-2002, to statistically identify sudden stops in capital flows. A sudden stop episode is defined as taking place in a country during the year in which there is a noticeable reduction in the current account deficit that is driven by a disruptive (i.e. accompanied by a fall in real output) reduction in foreign capital inflows.[12] Then, the Frankel and Rose (2002) dataset is used to compute gravity estimates for each country in the sample.

Using a stacked cross-section (141 countries between 1970 and 2002), controlling for other possible determinants of sudden stops, and using the instrumental variables technique described above, I show that lack of exposure to trade is indeed a powerful predictor of these capital account shocks. Moving from Australia's average trade share (approximately 30% of GDP) to Argentina's current trade share (approximately 20% of GDP), increases the probability of a sudden stop between 30% and 40%. This result could be counterintuitive: more closedness does not "shield" countries from the volatility of world markets. On the contrary, by reducing the creditworthiness of countries, more closedness leads to greater vulnerability to sudden stops.

The paper is organized as follows: in the next section I introduce the model and establish the link between closedness and real depreciations, real depreciations and the ex-post output cost of sudden stops, and the ex-post cost of sudden stop and their ex-ante probability. In section III, I explain the methodology to be used in seeking to test the main theoretical prediction of the model. Finally, I report results, discuss them and draw policy conclusions.

[12] A reduction in the financial account surplus could potentially be the optimal response to positive terms of trade shocks. To rule out these as crises episodes, I require that a sudden stop be accompanied by output contraction. As a matter of fact, this assumption is not essential for the results and I later show that all the findings are robust to alternative definitions of sudden stops.

II. Closedness and Sudden Stops: An Analytic Approach

There are two main hypotheses supporting the conjecture that closedness causes sudden stops. The first one is that real depreciations can be costly in terms of output loss. I show that this is true for a sub-set of countries, which will be defined as "financially constrained." The second hypothesis is that countries with more closedness undergo larger real depreciations and more output loss in the aftermath of sudden stops. Putting these pieces together and modeling sudden stops as endogenous crises that occur when the lenders don't extend new financing, and the borrowers simultaneously default on the inherited debt to "ease the pain," leads to the main theoretical prediction of the model: those countries with more closedness are (ceteris paribus) more prone to sudden stops.

In a world with perfect capital mobility and no financial-market imperfections, real depreciations are expansionary. In fact, in models in the Mundell-Fleming tradition, real depreciations (and even devaluations) have standard demand-switching effects that aid the recovery in the aftermath of negative external shocks. But a world of perfect capital mobility and no imperfections is one in which capital should flow to where it is relatively scarce and, therefore, where relatively poor countries could sustain prolonged periods of current account deficits. This is clearly not empirically true. Financial imperfections abound everywhere and capital mobility is far from perfect. Here, a simple model in the tradition of Krugman (1999) and Céspedes, Chang and Velasco (2003) is presented where financial imperfections limit the entrepreneur's capacity to borrow internationally, and where all international debt is denominated in foreign currency. The latter assumption introduces the "balance sheet" phenomena into the model, by allowing for a perverse feedback from real depreciations to investment and real output by increasing the cost of debt repayment.

1) The Model

There are two periods, t=0 and t+1=1, and two domestic actors, the workers, who consume a mixture of imported (M_t) and home-produced (C_{Nt}) goods in every period, and the entrepreneurs, who invest in period t, retire in period t+1, and consume their wealth only at retirement. Consumers (the workers), maximize the following intertemporal Cobb-Douglas utility function:

$$\sum_t \beta^t U(C) = \sum_t \beta^t \left\{ \frac{\left(C_{Nt}\right)^{\gamma} \left(M_t\right)^{1-\gamma}}{\left(\gamma\right)^{\gamma} \left(1-\gamma\right)^{1-\gamma}} \right\} \qquad (1)$$

subject to budget constraint,

$$C_{Nt} + P_t M_t \leq W_t \qquad (2)$$

where $0<\gamma<1$; $\beta>0$ is the inter-temporal discount factor; $P_t = (P_{Mt} / P_{Nt})$ is the real exchange rate; and W_t is real income (wages) denominated in domestic goods units. I make the simplifying and innocuous assumption that labor is inelastically supplied and that each worker is endowed and supplies exactly one unit of labor in every period.

The minimum cost of one unit of consumption is given by:

$$CPI_t = (P_t)^{1-\gamma} = \left(\frac{P_{Mt}}{P_{Nt}} \right)^{1-\gamma} \qquad (3)$$

Normalizing $P_{Mt} = 1$ in both periods, then (3) simplifies to:

$$CPI_t = \left(P_{Nt}\right)^{\gamma-1} \qquad (4)$$

Using (4) I can re-write (2) in terms of the CPI to get:

$$\left(P_{Nt}\right)^{\gamma-1} C = W_t \qquad (5)$$

where the equal sign replaces the inequality because I rule out the plausibility of savings (domestic or foreign) on the part of workers and/or non-interior solutions. This expression says that the value of total consumption is equal to real wages.

2) Consumption

Workers solve their intra-temporal consumption problem by maximizing (1) subject to (2) which yields a standard first order condition (FOC):

$$\left(\frac{1-\gamma}{\gamma} \right) \frac{C_{Nt}}{M_t} = \frac{1}{P_{Nt}} \qquad (6)$$

Define, for future reference:

$$\frac{1}{P_{Nt}} = RER_t \qquad (7)$$

where RER_t is the real exchange rate.

3) Production

The production of the home good is carried out using a Cobb-Douglas technology:

$$Y_t = K_t^{\alpha} L_t^{1-\alpha} \qquad (8)$$

where, $0 < \alpha < 1$, K_t is the capital stock comprised only of domestic goods, and L_t is labor input. Given the assumed characteristics of labor supply, I set $L_t \equiv 1$. Therefore, (8) simplifies to:

$$Y_t = K_t^{\alpha} \qquad (9)$$

The representative home firm's problem is to maximize profits given by:

$$\Pi = Y_t - W_t - R_t K_t \qquad (10)$$

where R_t is the domestic return to capital. Profit maximization yields the standard FOC:

$$\alpha Y_t = R_t K_t \qquad (11)$$

$$(1-\alpha) Y_t = W_t \qquad (12)$$

Most of the action in this model comes from what entrepreneurs do. At the end of period t, they have some net worth N_t, expressed in units of domestic goods, and have access to a world capital market where the (safe) interest rate (expressed in units of domestic goods) is given by r_t. I assume, with no loss of generality, that $r_t = 0$ is constant and exogenous.

Entrepreneurs invest in capital for period t+1 at the end of period t using their net worth N_t and borrow from capital markets according to the following restriction:

$$N_t + RER_t d_{t+1} = K_{t+1} \qquad (13)$$

where "d_{t+1}" is the stock of foreign debt in period t+1. Capital consists of only domestic goods. I introduce financial imperfections by assuming that entrepreneurs cannot borrow more than a multiple $0 < \mu < 1$ of their net worth N_t:

$$RER_t d_{t+1} \leq \mu N_t \qquad (14)$$

where μ is a stochastic random variable whose realization becomes common knowledge at the end of t=0 (more on this below). Condition (14) may or may not bind. If it binds, the country is "financially constrained." Sudden stops are relevant phenomena insofar as they impose a cap on international financing available for domestic investment. Therefore, the

only case relevant here is the case in which (14) binds (for any possible realization of the random variable). Combining (13) and (14): [13]

$$K_{t+1} = (1+\mu) N_t \qquad (15)$$

In every period, entrepreneurs collect their return to capital (αY_t), repay inherited foreign debt ($RER_t\, d_t$). Therefore, their net worth is:

$$N_t = \alpha Y_t - RER_t d_t \geq 0 \qquad (16)$$

Note that $N_t \geq 0$ implies that entrepreneurs are never insolvent. In (16) we see the "balance sheet" effect. An increase in RER_t (i.e. a real depreciation) reduces the net worth of entrepreneurs. With less net worth, they can invest less. To see this, combine (15) and (16):

$$K_{t+1} = (1+\mu)(\alpha Y_t - RER_t d_t) \qquad (17)$$

This expression shows that investment carried forward is as expected, an increasing function of the return to capital, and a decreasing function of the cost of debt-repayment in domestic goods.

4) Market Clearing

To derive the market clearing conditions, recall that given that entrepreneurs don't consume until retirement, the consumption of domestic goods is simply a fraction γ of the value of total consumption given by (5). Note that we have not ruled out the possibility that part of the domestic goods are exported abroad, but assuming that the foreign elasticity of substitution across goods in consumption is one, and that the share of domestic goods in foreigners' expenditure is negligible, the home good value of exports is RER_tX, where X is exogenous.[14] The only other use of home goods is for domestic investment. Putting these pieces together and using (7) yields the market clearing condition for home goods:

$$Y_t = K_{t+1} + \gamma (RER_t)^{1-\gamma} C_t + RER_t X \qquad (18)$$

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[13] If constraint (14) did not bind (i.e. we did not allow for sudden stops), then investment decisions are driven by marginal returns and real borrowing costs:

$$\alpha Y_{t+1} = \left(\frac{RER_{t+1}}{RER_t} \right) K_{t+1}$$

This equation is a standard arbitrage condition. Investment decisions are carried in period t but they don't yield return until period t+1. The return on investment in simply the return to capital (αY_{t+1}) and the cost of borrowing abroad to invest K_{t+1} units is simply (RER_{t+1}/ RER_t) per unit.

[14] Krugman (1999) and Céspedes, Chang and Velasco (2003) make this simplifying assumption too. It allows treating X as exogenous.

Next, combine (5), (7) and (12) to obtain:

$$(1-\alpha)Y_t = (RER_t)^{1-\gamma} C_t \qquad (19)$$

And combining (18) and (19) yields:

$$\lambda Y_t = K_{t+1} + RER_t X \qquad (20)$$

where $\lambda = 1-\gamma(1-\alpha) > 0$.

Note that equation (20) captures the standard positive aspect of real depreciations, which is that, all else being equal, a more depreciated real exchange rate increases the home value of exports which results in a boost to domestic output. In the absence of capital market imperfections and balance sheet effects, this would be the only aspect of real depreciations that matters.

5) Equilibrium

Next I use the fact that this is a 2-period model (i.e., t=0 and t=1) to solve for the equilibrium conditions sequentially. At the end of t=0 entrepreneurs make the choices that determine investment carried forward. For simplicity, assume Y_0 is fixed and exogenous. Y_1 instead is given by (9). K_1 is pinned down by two equations (20) and (17) which are re-written as follows:

$$\lambda Y_0 = K_1 + RER_0 X \qquad (21)$$

$$K_1 = (1+\mu)(\alpha Y_0 - RER_0 d_0) \qquad (22)$$

where d_0 is the debt that entrepreneurs have inherited. Equation (21) is the "aggregate demand" equation (AD) and (22) is the "financial constraint" (FC). Together, they define a system of equations with two unknowns: RER_0 and K_1. In Figure 1, I solve the problem diagrammatically.[15]

In order to analyze the consequences of sudden stops, we begin by treating them as exogenous shocks (i.e. μ non-random and exogenous). A sudden stop is a tightening of the borrowing constraint (i.e. a fall in μ). This is illustrated in Figure 2 as an inward rotation of the FC.

[15] I consider only the case in which the slope of the FC is smaller (i.e. steeper) than the slope of AD. The opposite case is empirically odd, since it implies that a tightening of the financial constraint leads to an increase in investment. Formal proofs are in the analytic appendix.

Figure 1: Aggregate Demand and Financial Constraint

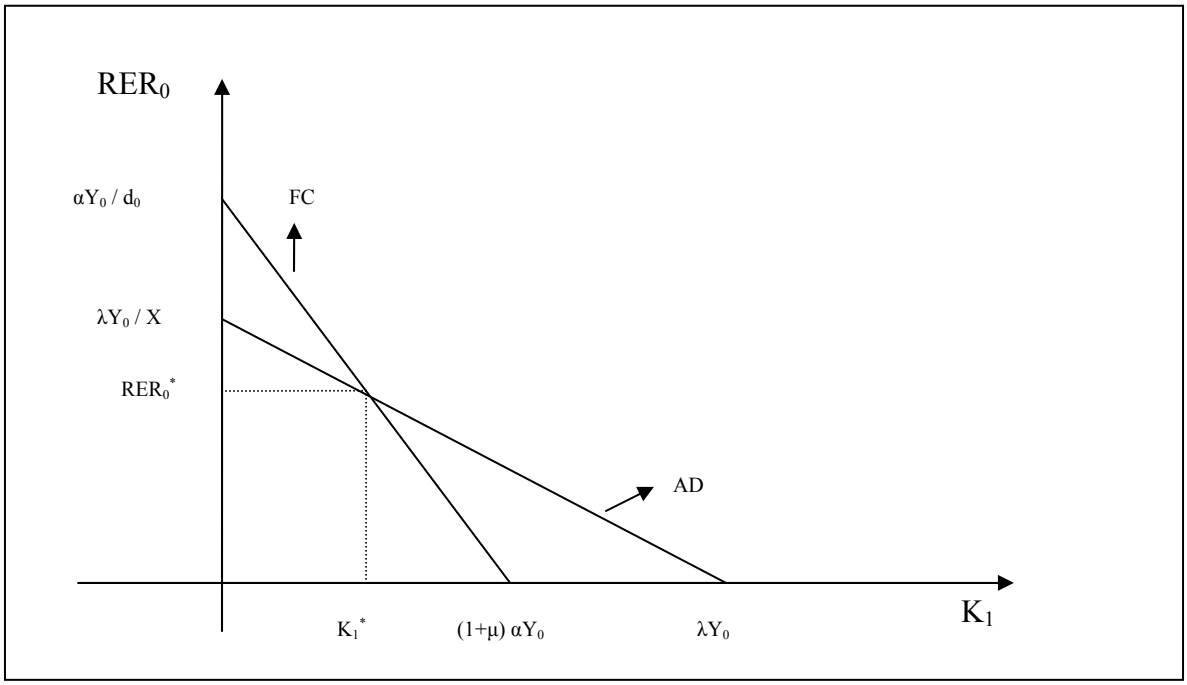
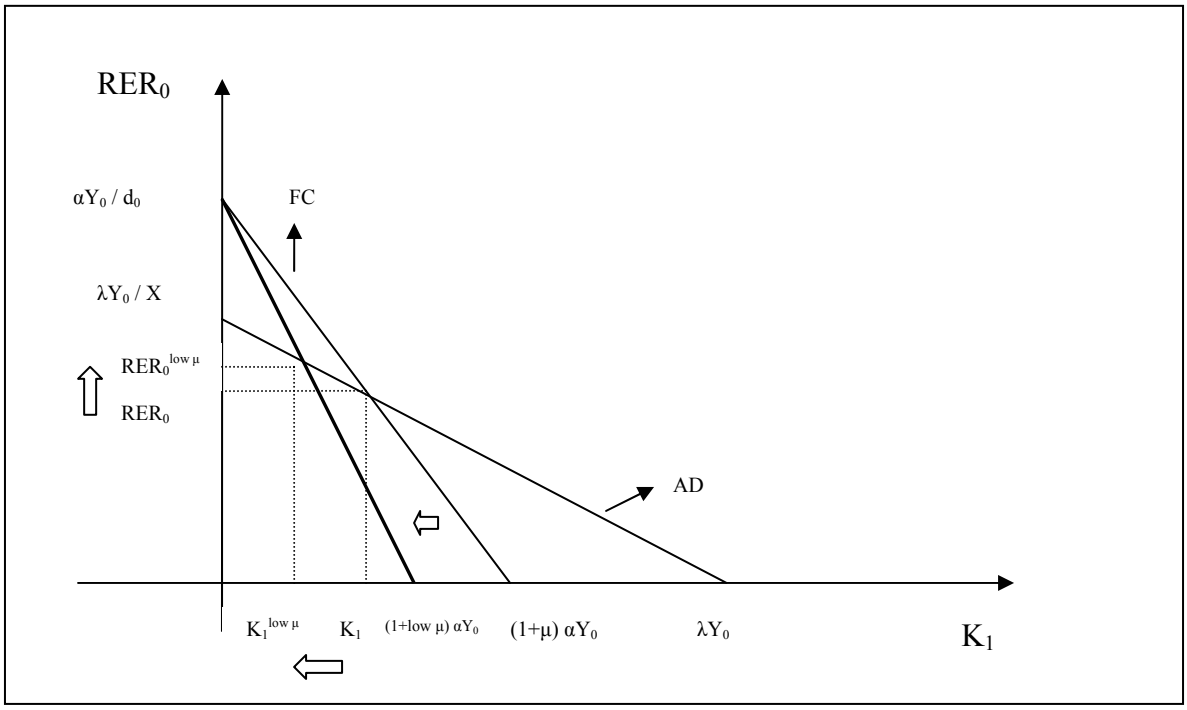
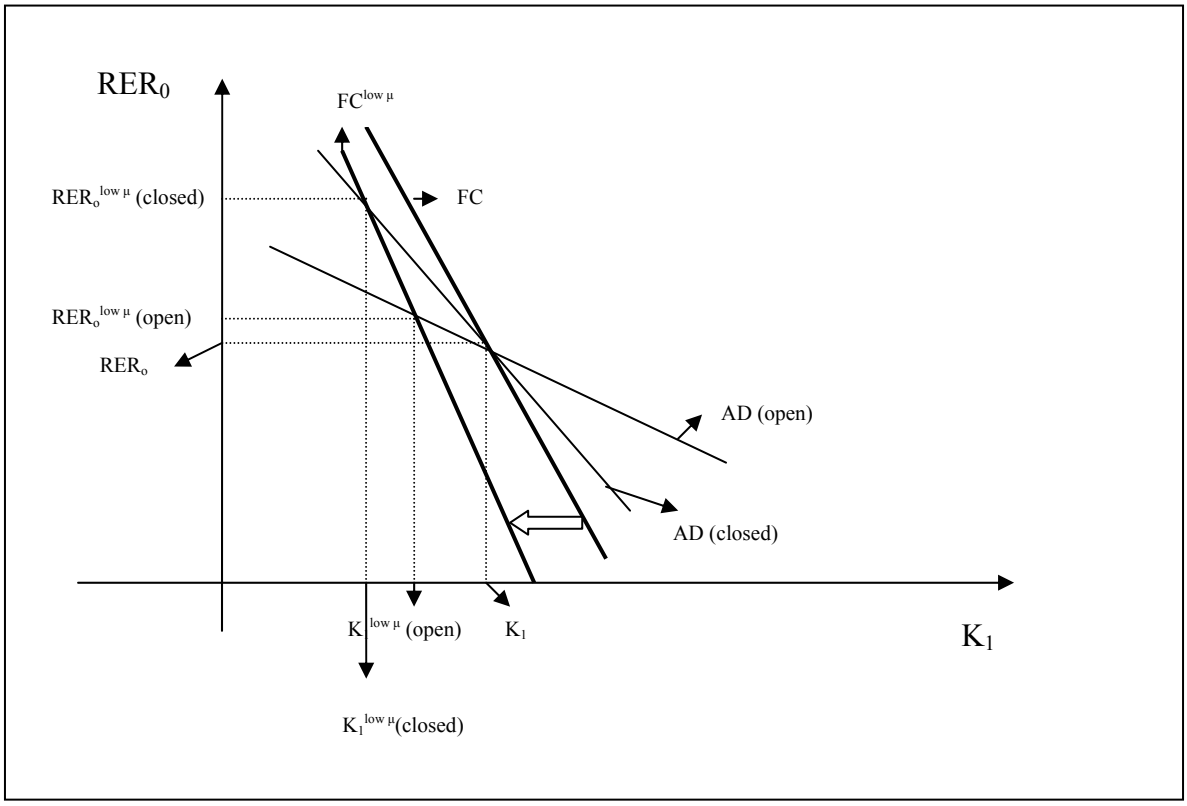


Figure 2: Tightening of the Financial Constraint



The immediate consequence of the tightening is the depreciation of the real exchange rate (i.e. $RER_0^{low\ \mu} > RER_0$) that leads to a decrease investment (i.e. $K_1^{low\ \mu} < K_1$). A fall in investment translates into a contraction of real output at t+1=1 (i.e. $Y_1^{low\ \mu} < Y_1$).[16] Interestingly, the contractionary effects of a tightening of the FC are strengthened by closedness. To see this, note that for countries that trade less (i.e. low X) AD is steeper. Figure 3 plots the relevant parts of AD and FC for two countries that are identical except that one is low X (i.e. closed) while the other is high X (i.e. open). For the sake of the argument, assume that exogenous parameters are such that RER_0 and K_1 are the same in both countries.

Figure 3: Tightening of the FC in Closed and Open Economies



As illustrated in Figure 3, the country with more closedness suffers greater real exchange rate depreciation and more output loss in the aftermath of an identical shock. Technically, this means that more closedness accentuates the effects of a tightening of the

[16] See analytic appendix for formal proof. On the empirical front, Hutchinson and Noy (2004) find that sudden stops have a large negative, but short lived, impact on output growth. They estimate that the cumulative output loss of a sudden stop is around 13-15 percent over a three-year period.

FC on investment and output. The formal proof of this result is in the Analytical Appendix (Appendix A.4) at the end of the paper.

In summary, the link between closedness and the fall in output associated with a tightening of the FC (i.e. sudden stop) is given by the real exchange rate. Closedness increases the size of the real exchange rate depreciation required in the aftermath of a tightening and, consequently, economies with more closedness suffer more. Cavallo and Frankel (2004) provide empirical evidence of the existence of correlation between (lack of) trade openness and output contraction in the aftermath of sudden stops.

It is clear from the previous analysis that sudden stops are more harmful in less open economies. But does this make them more or less likely? To answer this question we need to think carefully about what causes them. Thus far, we have treated sudden stops as purely exogenous shocks. The next step is to endogenize them.

6) Endogenous Sudden Stops

The timing of events is as follows. At the end of t=0, when entrepreneurs decide how much to invest and right before they pay the inherited debt d_0, lenders make an "offer" about the level of μ. The offer is random (i.e. μ is random) because it is driven by stochastic shocks to the risk preferences of lenders. For simplicity, assume first that μ is uniformly distributed in the support (0, 1).[17] Uncertainty is realized when borrowers receive the offer, and they can accept or reject any offer.[18] Consider a representative offer μ**:**

- If the borrowers reject the offer, there will be no additional lending (μ=0). In retaliation, the borrowers default on d_0 (the inherited debt) to "ease the pain." We call this situation a "sudden stop" (SS). Recall that we are assuming that the entrepreneurs are never insolvent, so default is always strategic: borrowers don't pay back the inherited debt because they don't want to, not because they can't.

[17] This assumption is relaxed later to endogeneize the extent of credit rationing.

[18] The source of uncertainty in the model traces back to stochastic shocks to lenders' risk preferences that determine how much they want to lend. The lending to a particular country is part of the investment portfolio decision of lenders. There are reasons outside the model why the financing limit that the lenders are willing to extend to a particular country at a point in time is stochastic. For example, periods in time when interest rates in the world are low and liquidity is high are periods when there are plenty of resources available to everyone.

Defaulting on d_0 effectively yields "relief" to the borrowers as it reduces the transfers to the lenders (see Appendix A.4 for details).[19]

- If the borrowers accept the offer, the new lending takes place accordingly and the borrowers pay back the inherited debt. In this case there is no sudden stop (NSS). Note that the offer might be high or low, but if it is accepted by the borrowers it means that there is new lending and thereby NSS.

In this setting a sudden stop is the situation in which the realization of μ (i.e. the "offer") leads to a crisis in which there is no lending to the borrowers (i.e. $\mu = 0$) and consequently default on the inherited debt (i.e. $d_0 = 0$).[20] In other words, the crisis is caused by the borrowers' decision to reject the lenders' offer.

After uncertainty is realized and the borrowers and lenders make their moves, the next period begins. At the end of it entrepreneurs collect the return to capital and pay back the debt (if there is any). Note that the net worth at the end of t+1 is given by equation (16) where $d_1=0$ if there was a SS at the end of t=0.

For any realization of μ, the borrowers reject the offer if the payoff given by rejection is bigger than the payoff given by acceptance. Recall that the borrowers (the entrepreneurs) care about their consumption at retirement. Therefore, their payoff is the net worth attainable in t+1=1.

- If they reject the offer, $N_1 = N_1^R = \alpha Y_1^R$
- If they accept the offer, $N_1 = N_1^A = \alpha Y_1^A - \left(RER_1\right) d_1$

The borrowers reject the offer if $N_1^R > N_1^A$, where R = reject and A = accept.

Note that, given that $Y_1^R = (K_1^R)^\alpha$, and that rearranging equation (22) we get that $K_1^R = \alpha Y_0$, it follows directly that N_1^R is determined by the exogenous variable Y_0 and the exogenous parameter α.[21] In particular, note that N_1^R does not change with μ. Instead N_1^A

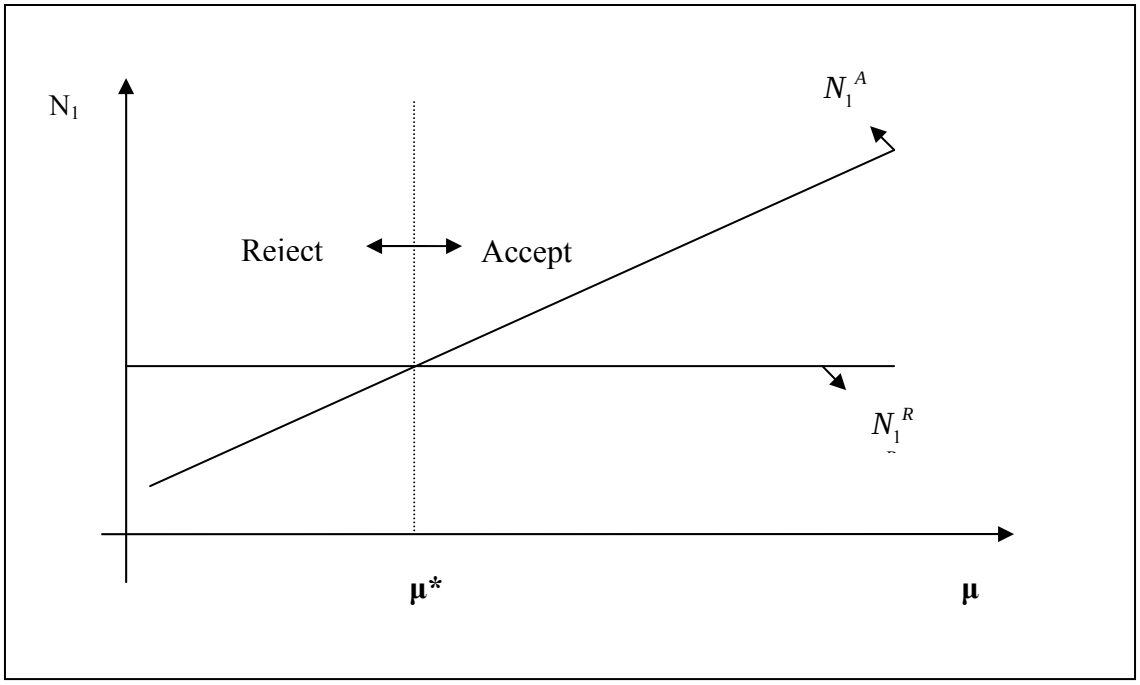
[19] For analytical simplicity, we assume that there are no sanctions associated to default. The results do not change when sanctions are allowed, as long as sanctions are not big enough to prevent default altogether. See appendix for details.

[20] See Calvo et. al. (2003) for a discussion about the close association between sudden stops and debt defaults.

[21] Note that when rejection takes place $\mu=0$ (because there is no lending), and $d_0=0$ (because there is default on the inherited debt), so it follows from equation (22) that $K^R_1 = \alpha Y_0$

is monotonically increasing in μ.[22] That is, within the subset of offers that are accepted, more generous offers yield higher net worth. Figure 4 summarizes the relationship between N_1^R, N_1^A and μ.

Figure 4: N_1^R, N_1^A **and** μ



In this figure, N_1^A is drawn as a straight line for simplicity. What is important for our purposes here, is that given that N_1^A is monotonically increasing in the realization of μ and that the y-intercept of N_1^A is below the y-intercept of N_1^R,[23] then there is a threshold value $\mu = \mu^*$ below which the borrowers reject any offer and above which they accept it. Therefore, given the exogenous variables, μ^* is the realization of μ that satisfies $N_1^R = N_1^A$ (See equation (44) in the Appendix A.4).

Note that we can formally compute the equilibrium probability of sudden stops for every country (conditional on the amount that lenders are willing to offer) as the probability that the realization of the random variable μ falls below μ^*. Thus:

[22] See appendix for proof. Also, computer simulations of the model are available upon request.

[23] Note that when μ=0 (there is no new lending), the difference between N_1^A and N_1^R is that the former includes the payment of the inherited debt while the latter does not. Therefore, it must be true that when there is no new lending, $N_1^R > N_1^A$.

$$P(SS) = P(\mu < \mu^*) = \int_0^{\mu^*} f(\mu) d\mu \qquad (23)$$

where $P(SS)$ is the probability of sudden stops, and $f(\mu)$ is the p.d.f. of the uniform distribution. It follows directly that:

$$P(SS) = \mu^* \qquad (24)$$

In Appendix A.4 it is shown that μ^* is a *decreasing* function of X/d_0. The intuition is straightforward: μ^* is inversely proportional to the creditworthiness of the debtor country as lower μ^* implies that, conditional on the amount that lenders are willing to offer, there is less risk of default. The creditworthiness of countries depends positively on exposure to trade (i.e., X), and negatively on the amount of inherited debt (i.e., d_0). In other words, economies that trade less are more likely to default on the inherited debt and, therefore, to suffer endogenous sudden stops. Therefore, normalizing all variables by Y_0 it follows that:

$$P(SS) = \mu^* = f\left(\underset{-}{\frac{X}{Y_0}}, \underset{+}{\frac{d_0}{Y_0}}\right) \qquad (25)$$

where the signs below each variable indicate the direction of causality.

So far, I have assumed that μ is uniformly distributed in the support (0, 1). This has the advantage of keeping the problem tractable, but it has the drawback that that it does not allow the extent of credit rationing captured by μ to respond endogenously to the likelihood of sudden stops. One potential criticism to this approach is that there is incompleteness in the way the model has been specified because lenders should behave optimally too. To deal with this problem, assume that μ is random but that has a distribution whose mean in inversely proportional to μ^*. This means that more creditworthy countries (i.e., countries with lower μ^*) are exposed, on average, to less credit rationing. For concreteness, assume that μ has a distribution with mean 1- μ^*. As the maximum feasible level of credit rationing is given by $\mu = 0$, the distribution of μ is necessarily bounded below by zero. Thus, potential candidates for alternative distributions of μ are the chi-squared and the exponential.

This alternative formulation endogenizes the extent of credit rationing, while keeping the randomness of μ as a way of introducing exogenous shocks to the economy.[24] What are the implications of this alternative specification for the equilibrium probability of sudden stops?

Let's begin with the case where μ is exponentially distributed (the chi-squared case is worked out in Appendix A.4). The equilibrium probability of sudden stops for every country is given by (23):

$$P(SS) = P(\mu < \mu^*) = \int_0^{\mu^*} f(\mu) d\mu$$

where $f(\mu) = \frac{1}{(1-\mu^*)} e^{-\frac{\mu}{(1-\mu^*)}}$ is the p.d.f. of the of the exponential distribution and 1- μ^* is the mean. Thus, solving the integral, it follows that:

$$P(SS) = 1 - e^{-\frac{\mu^*}{(1-\mu^*)}} \qquad (26)$$

This implies that the change in the probability of sudden stops for a given change in the threshold μ^* is given by:

$$\frac{dP(SS)}{d\mu^*} = \frac{e^{\frac{\mu^*}{\mu^*-1}}}{(\mu^*-1)^2} > 0 \qquad (27)$$

which is monotonically increasing for any μ^*. Therefore as μ^* is, in turn, a decreasing function exposure to trade (i.e., X), it follows that the probability of sudden stops is, as before, an increasing function of closedness.

In summary, this way of modeling sudden stops has the advantage that it fits nicely with the previous result that a tighter FC leads to more harmful outcomes in economies with more closedness. It is precisely because a low realization of μ might be "too costly to bear" in economies with less exposure to trade that the temptation to default on the inherited debt (d_0) might trigger a sudden stop as an endogenous response to the borrowers

[24] Periods when the liquidity conditions in the world are tight are periods when the realized μ falls below the mean, while periods when the world liquidity conditions are more lax are periods when the realized μ falls above the mean.

optimization problem: they would rather not receive any lending and default on the inherited debt, than to accept an offer that is insufficient to get a level of investment that, given what they already owe, surpasses what they get if they default. A higher ratio of trade is a form of "giving hostages" that makes a cutoff of lending (i.e. sudden stops) less likely.[25] In the next section we explore this prediction of the model.

III. Empirical Methodology

In the next section, I test the proposition that countries with greater closedness are more prone to sudden stops in capital flows. To do so, I estimate variants of the following equation:

$$\mathbf{P(SS)_{i,t} = c + \varphi(Closedness)_{i,t} + \delta_1(Foreign\ Debt/GDP)_{i,t-1} + \delta_2(Liability\ Dollarization)_{i,t-1} + \chi(CA/GDP)_{i,t-1} + \omega Z + \varepsilon_{i,t}} \quad (28)$$

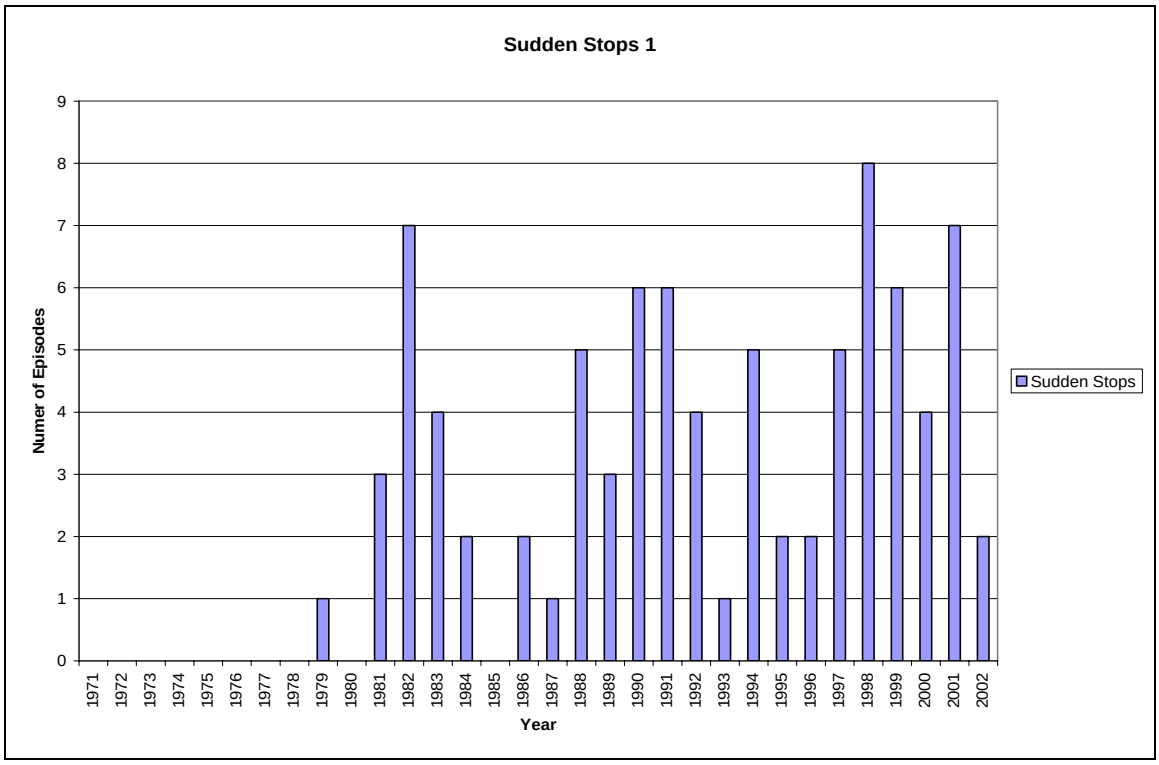
where equation (28) is simply an extended version of equation (25), with a linear functional form.

- "c" is a constant term.
- "SS" is a dummy variable that takes value 1 if a sudden stop hits country "i" at year "t" and 0 otherwise. Consequently, $P(SS)_{i,t}$ is the probability of a sudden stop taking place in country "i" during year "t".
- "Closedness" is the negative of the trade to GDP ratio.
- "CA/GDP" is the current account balance to GDP. It is included in the regressions because, as stated in the Introduction, the cost of the sudden stop and thus, its probability, will naturally be directly linked to the outstanding current account balance (i.e. a measure of the required resource transfer abroad in the aftermath of the shock).
- "Foreign Debt/GDP" and "Liability Dollarization" are discussed in detail below.
- "Z" is a set of lagged and contemporaneous regressors included for robustness checks.

[25] The point was originally made by Eaton and Gersovitz (1981).

In order to construct the dummy variable $SS_{i,t}$, it is important to have a measure of sudden cuts in foreign capital inflows (i.e., worsening of the financial account surplus) that is not the consequence of a positive shock that works as alternative financing source, namely a terms of trade shock. To do so, I follow Calvo, Izquierdo and Mejia (2003) closely, and using data from the IMF International Financial Statistics database (IFS) for the period 1970-2002, I compute sudden stop episodes as a reduction in the Current Account (CA) deficit during the same year of a reduction in Financial Account (FA) surplus. To guarantee that this reduction in the CA deficit is not the result of a boom—rising exports, imports and income—the episode has to be accompanied by a simultaneous reduction in real output. In other words, a sudden stop occurs during the year in which there is a noticeable reduction in the current account deficit that is triggered by a disruptive (i.e. recessionary) reduction in foreign capital inflows.[26] Based on alternative definitions of what is "noticeable" and "disruptive" I compute four different classifications of sudden stops. Figure 5 summarizes the overall (global) pattern of sudden stops for my preferred classification: SS1.

Figure 5: Sudden Stop 1



[26] Technical details are left to the data appendix.

The total number of episodes in SS1 is 86 which is 2.39 percent of total available country/year observations in the dataset.[27] As Figure 5 shows, these events take place around well-known crises prone epochs: the early 1980's debt crises in Latin America; the 1997-1998 Asian crises; and the new wave of crises in developing countries in the late 1990's and early 2000. As for the regional split, 16% of all sudden stops occurred in the Asia-Pacific region; 13% in Europe; 33% in Latin America; 15% in the Middle East; 21% in Africa; and 1% in South Asia[28] and North America respectively. Alternative definitions show similar patterns of temporal/spatial distribution.[29]

As for the regressors:

- "Closedness" is typically measured in empirical work using (the negative of) a country's ratio of total exports plus total imports to GDP—the so-called "trade to GDP ratio" (X + M / Y). All the necessary data is readily available from the IFS for almost all the countries in the world. But, as argued in the Introduction, the problem with using this measure of closedness is that it might be correlated with other unobserved country characteristics creating identification problems and potentially biased estimators. To try to avoid these, I instrument closedness by the negative of the "predicted" trade to GDP ratio based on gravity equations. In its most basic form, the gravity equation captures the intuitive notion that bilateral trade flows are proportional to the product of each country GDP level, and inversely related to the distance between them. Therefore, using data on country's geographic characteristics, bilateral trade flows, and GDP, I compute the "predicted" trade to GDP ratio. Research on gravity has extended in recent years, and there are some very complete databases that can be used for these computations. In particular, I use the dataset available at Andrew Rose's webpage,[30] which has been widely used for empirical research.[31] Details on the methodology used are left to the appendix. The

[27] The complete list of crises episodes per country is in Table A.1. in Appendix A.1.
[28] The South Asian region countries are: India, Sri-Lanka, Maldives, Nepal and Pakistan,
[29] Graphs are available upon request.
[30] http://faculty.haas.berkeley.edu/arose/RecRes.htm
[31] The data set consists of 41,678 bilateral trade observations spanning six different years (1970, 1975, 1980, 1985, 1990, and 1995). All 186 countries, dependencies, territories, overseas departments, colonies, and so forth for which the United Nations Statistical Office collects international trade data are included in the data set. The trade data are taken from the World Trade Database, a consistent recompilation of the U.N. trade data

critical element is that, to the extent that the "predicted" trade to GDP ratio is highly positively correlated to the actual trade to GDP ratio, then it is a good instrument, because it is unlikely that geography is related to economic outcomes through any channel other than trade (i.e. geography is quite plausibly exogenous).[32] A limitation imposed by this methodology is that it does not allow for enough variation in the instrument so as to estimate a model with country fixed effects (more on this below). I don't consider this to be a serious problem, because most of the variation in closedness is across countries, not over time.

- "d_0/Y_0" in equation (25) is split into "Foreign Debt/GDP" and "Liability Dollarization" in (28). In the model of the previous section "d_0/Y_0" played a dual role: a proxy for vulnerability to "balance sheet" effects (i.e. "Liability Dollarization") and a proxy for "foreign indebtness" (i.e. "Foreign Debt/GDP"). The reason is the assumption that all external debt is denominated in foreign currency. That is not necessarily true empirically,[33] so in the actual implementation of (25) I seek to capture the vulnerability to "balance sheet" effects independently from the level of indebtness by including a separate proxy for currency mismatches in the balance sheets. Data for "Foreign Debt/GDP" comes from IFS, where foreign debt is line 89a in that database.
- I use two alternative measures of "liability dollarization." First the ratio of foreign liabilities of the financial sector to money (IFS line 26C/Line 34). Although this is not a direct measure of the extent to which a country's balance sheet present a mismatch in the currency denomination of assets and liabilities this variable has been used in the literature as a close proxy,[34] primarily because it is available for almost all countries since 1970, and because it should be correlated to actual balance sheet mismatches. Second, the alternative proxy is a measure of deposit dollarization from Arteta (2002 and 2003). This is "Dollar Deposits/Total Deposits" in the financial system. Intuitively, countries with a high percentage of deposit

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presented in Feenstra, Lipsey, and Bowen (1997), augmented with data from U.N.'s International Trade Statistics Yearbook. This data set is estimated to cover at least 98% of all trade.

[32] The actual correlation between the variable closedness and the instrument used in this paper is 0.52.

[33] In particular, the measure of foreign debt that I use IFS line 89a is based on residence of the lender, not on currency denomination of debt.

[34] See Alesina and Wagner (2003) and Guidotti, Sturzzenneger and Villar (2004)

dollarization, but whose domestic currency is not the U.S. dollar, are (most likely) countries whose public and private sectors tend to borrow heavily in foreign currencies. In Arteta's database, data on the aggregate volume of foreign-currency-denominated ("dollar") deposits of residents are available for 92 developing and transition economies. The time span varies across countries, with some having data from as early as 1975 and some having data only from about 1995 onwards.

Finally, "Z" is a set of (lagged and contemporaneous) regressors included for robustness check purposes and to reduce the risk of omitted variable bias. These are:

- "Reserves in months of imports" (because reserves could potentially be used as self-insurance against sudden stops),
- "Log of GDP per capita" (to control for the stage of economic development),
- "FDI / GDP" (the stability of FDI flows could reduce the likelihood of sudden stops),
- "Institutional Quality" (to control for the possibility that closedness, even after instrumenting it, is not incorrectly appropriating effects on sudden stops that really go through institutions),
- "Short-term debt / Total debt" (to control for the effect of the term structure of the debt in the likelihood of a crisis), and
- "Index of Exchange Rate Rigidity," a measure for nominal exchange rate rigidity (it is included to test whether exchange rate policy affects the probability of sudden stops).

All these variables come from WDI CD-ROM with the exception of the "institutional quality" data that comes from Kaufmann et. al. (2002) and Marshall and Jaggers (2002)'s Polity IV Project, and the data on "Index of Exchange Rate Rigidity," that comes from Levy Yeyati and Sturzenegger (2003).

In order to compute the probability of sudden stops, I use instrumental variables Probit and linear regression techniques.[35] Non-instrumental variables results are also reported. I do not report panel data (country) fixed-effects results because, as already

[35] One limitation of linear models vis-à-vis non-linear models is that the probability of a sudden stop is not necessarily constrained to the [0, 1] interval.

discussed, most important source of variation is across countries, not within. The main drawback of this methodology is that the results may therefore carry an omitted variable bias because I am not controlling for country specific effects. To minimize this problem, I include in the regressions controls for various other possible determinants of sudden stops. Nevertheless, even at the risk of some persistent omitted variable bias, the methodology used here is at least properly controlling for endogeneity so that reverse causality cannot be blamed for the positive effects of closedness on sudden stops. Finally, single cross-section results are also reported.

Summary statistics for all the variables and a complete list of data sources are found in the Appendix A.3.

IV. Results

I now proceed with the instrumental variables estimation of equation (28) using a stacked cross-section and computing standard errors that are robust to clustered heteroskedasticity. All independent variables—other than "closedness" and "effectiveness of government"— are lagged one period to ameliorate endogeneity (introducing contemporaneous rather than lagged variables does not affect the results). Nevertheless, the methodology employed here only promises the exogeneity of closedness, so no causal relationship will be inferred from the other point estimates.[36] I do not exclude contiguous crises episodes, but all the results are robust to the inclusion of a one-year, two sided omission window around crises episodes. Results include regional dummies, but these coefficients are not reported.[37] As a measure of institutional quality I report the coefficient on "effectiveness of government" which is one of the six proxies of institutional quality in Kaufman et. al. (2002). All the results are qualitatively and quantitatively robust to the inclusion of any of the other five proxies proposed in that paper.[38] Given that the institutional quality data in Kaufman et. al. (2002) has limited time series variation, every country in the sample is assigned the average value (time-invariant). As additional

[36] The main purpose of the additional controls is to minimize the risk of omitted variable bias. In particular, I treat the control variables as exogenous, even when some of them could perhaps be considered endogenous.
[37] Further details on the results and robustness checks are available upon request.
[38] These are: "Voice and Accountability", "Control of Corruption", "Rule of Law", "Political Stability/Lack of Violence", and "Regulatory Framework".

robustness check, I also use Marshall and Jaggers (2002)'s Polity IV Project data, which is panel (country/year), but provides a measure of the political regime's characteristics: either democracy (high values) or autocracy (low values), rather that institutional quality per se.[39] Using this measure does not change the outcomes.

The results reported are based on my preferred definition of sudden stops (SS1), but all estimates are robust to the use of the alternative definitions.[40] Not surprisingly, the explanatory power of these regressions is not high. This is consistent with the performance of standard models of crises and the usual inability of leading-indicator exercises to properly predict events.[41] Table 1 summarizes the results for some variants of (28) using instrumental variables (IV) Probit specification.[42] The results from linear regression models (available in Table A.5.0 in Appendix A.5) are qualitatively very similar, although the coefficients are not directly comparable. The first column (shaded) is the main specification, the rest of the columns are different variants of (28) with controls. "Closedness" is positive and statistically significant across all the variants.

Table 1.b reports the implied marginal effects for closedness estimated from the IV probit regressions at the mean of the independent variables (first row). It also reports the predicted change in the probability of a sudden stop for a 10 percentage point increase in closedness (which in the real world would be going from Australia's situation to Argentina's) by combining the marginal effects with the estimated probability of sudden stops (i.e., the probability of a positive outcome —second row—).[43] The results range between 40% and 56%, with the benchmark case being 42%. That is, a country that trades 10% less of GDP (i.e., Argentina vis-à-vis Australia) is, ceteris paribus, 42% more likely to be hit by a sudden stop. The estimated marginal effects from the linear regressions (see

[39] In particular, I use: POLITY2 (numeric). Range = -10 to 10 (-10 = high autocracy; 10 = high democracy). Combined Polity Score: Computed by subtracting AUTOC from DEMOC; normal range polity scores are imputed for coded "interregnum" and "transition period" special polity conditions, polities coded "interruption" on the POLITY variable are left blank.

[40] I use three alternative definitions. The details are in the data appendix.

[41] See, for example, Arteta (2003)

[42] The method of estimation is maximum likelihood, and standard errors are corrected to account for clustered heteroskedasticity. The results are robust when a two-sep estimator is implemented using the method of Whitney Newey, "Efficient Estimation of Limited Dependent Variable Models with Endogenous Explanatory Variables", Journal of Econometrics (1987).

[43] A 10 percentage point increase in the independent variable "closedness" is, for example, an increase from the mean value of this variable in the sample, which is -0.73, to -0.63 (see appendix A.3. for summary statistics).

Table A.5.0 in Appendix A.5) are smaller but less reliable.[44] The average change in the probability of an event occurring as the result of a unit change in the value of closedness is approximately 0.077. This means that an increase of 10 percentage points in closedness increases the likelihood of a sudden stop by approximately 32%.[45]

Table 1: Instrumental Variables Probit Regressions

	Dependent Variable: Sudden Stop 1								
Closedness $_t$	**1.95** (0.55)***	**2.98** (0.49)***	**2.81** (1.38)**	**2.69** (0.89)***	**2.92** (0.45)***	**2.42** (0.52)***	**1.58** (0.49)***	**1.86** (0.47)***	**1.73** (0.52)***
Foreign Debt/ GDP $_{t-1}$	**0.20** (0.24)	**0.75** (0.27)***	**-0.039** (0.81)	**0.22** (0.42)	**0.79** (0.26)***	**0.40** (0.26)			
Short Term Debt/ Total Debt $_{t-1}$		**0.96** (0.98)	**1.33** (1.46)	**1.21** (1.08	**1.12** (0.85)			**0.13** (0.69)	
Liability Dollarization $_{t-1}$ (1)	**0.56** (0.22)**	**0.034** (0.31)		**0.33** (0.30)		**0.65** (0.27)**	**0.59** (0.23)**	**0.36** (0.29)	
Liability Dollarization $_{t-1}$ (2)			**-0.78** (0.99)						
Exchange Rate Rigidity $_{t-1}$				**0.07** (0.165)					
Current Account/ GDP $_{t-1}$	**-5.66** (1.14)***	**-5.29** (1.52)***	**-8.02** (2.42)***	**-7.20** (1.82)***	**-5.53** (1.49)***	**-5.46** (1.32)***	**-3.96** (1.07)***	**-4.09** (1.14)***	
FDI/GDP $_{t-1}$				**0.064** (0.05)					
Ln Reserves in Months of Imports $_{t-1}$				**0.062** (0.14)					
Ln GDP per capita $_{t-1}$		**0.40** (0.20)*		**0.15** (0.21)	**0.48** (0.21)**	**0.067** (0.15)	**-0.009** (0.10)	**0.29** (0.15)*	
Effectiveness of Government $_t$		**0.21** (0.25)		**0.22** (0.29)	**0.17** (0.25)	**-0.26** (0.23)	**-0.05** (0.15)	**0.16** (0.15)	
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Year Fixed-Effects?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**-1.33** (0.54)**	**-2.79** (1.46)*	**0.24** (1.51)	**-1.99** (1.63)	**-3.54** (1.50)**	**-1.29** (1.17)	**-1.24** (0.93)	**-2.82** (1.05)**	**-1.13** (0.61)
Obs.	**1040**	**706**	**260**	**560**	**748**	**915**	**1458**	**1177**	**1377**

Robust standard errors reported in parenthesis.
*** Statistically Significant at 1%
** Statistically Significant at 5%
* Statistically Significant at 10%

[44] Note that in a linear regression model the slope coefficient of a regressor measures the effect on the average value of the regressand for a unit change in the value of the regressor. Although linear regression applied to a binary dependent variable has a simple interpretation, it has problems, not least of which is that it is possible to have nonsensical predicted values.

[45] Given the estimated coefficient on closedness, a 0.10 increase in the independent variable increases the left hand side by: 0.10*0.077= 0.0077. The left hand-side variable is either "0's" or "1's". Because 2.39% of the observations in the sample are 1's, a 0.0077 increase in the left hand side variable means that there is an increase in the probability of observing a 1 instead of a 0 (i.e. observing a sudden stop) of approximately (0.0077/0.0239)*100=32%

Table 1.b: Marginal effects (for closedness) after ivprobit

	Marginal effects (dy/dx) are for discrete change of dummy variable from 0 to 1								
Closedness $_t$	0.14	0.34	0.17	0.20	0.34	0.20	0.11	0.16	0.16
Probability of a positive outcome	0.033	0.06	0.03	0.04	0.06	0.04	0.03	0.04	0.042
Δ(PSS)	**42%**	**55%**	**56%**	**50%**	**55%**	**50%**	**36%**	**40%**	**38%**

Δ(PSS) = the change in the probability of a sudden stop given by a 10 percentage point increase in closedness (i.e., an increase of 0.10 in the independent variable). It is computed by multiplying the marginal effect (first row) by 0.10 and diving by the probability of a positive outcome (second row). Marginal effects estimated at the mean of the independent variables.

Interestingly, $б_1$ –the coefficient on "Foreign Debt/GDP"—is positive but statistically significant across only few of the variants in Table 1.[46, 47] This result is consistent with the hypothesis that different countries are able to tolerate different levels of debt.[48] A critic might argue that the ratio of foreign debt to GDP might also be endogenous and thus its inclusion in the regressions could lead to biased estimates. Even though all regressors are lagged, there might still be some persistent endogeneity. In the absence of good instruments for the ratio of foreign debt to GDP an alternative test is to exclude it. The results reported in columns (7), (8) and (9) of Table 1 indicate that the estimates of the effect of closedness do not change when debt measures are excluded.

$б_2$ –the coefficient that seeks to capture the "balance sheet" effects—is positive but not always statistically significant when definition (1) is used (although it is significant in the main specification), and negative but insignificant when Arteta's dollarization definition is used instead.[49] This result suggests that these measures of dollarization appear not to have significant detrimental effects in terms of increased vulnerability to sudden stops. A closer inspection of Table 1 reveals that the only instances when $б_2$ appears as statistically significant are when "short term debt / total debt" is excluded from the regressions. The results reported in columns (5) and (9) of Table 1 indicate that the estimated effects of closedness are robust to the exclusion of any of the proxies for dollarization.

[46] Similarly, Calvo et. al. (2003) don't find a significant effect of total public debt on the probability of sudden stops in their probit regressions, nor do Frankel and Rose (1996) in their probit regressions of currency crises.

[47] Using "Foreign Debt/Exports" as a solution to concerns about how foreign debt and GDP are measured in domestic currency fails to change any results.

[48] See Calvo et. al. (2003) for a more in-depth discussion.

[49] Note that when Arteta's definition is used, a lot of data points are lost. Interestingly, the coefficient on closedness appears to increase a lot.

Finally, χ –the coefficient that controls for the size of the transfer in the aftermath of a sudden stop—is negative and statistically significant across all variants, meaning that, as conjectured in the Introduction, larger resource transfer in its aftermath (i.e. low initial CA/Y) makes sudden stops more likely. Column (9) shows that the estimated effect of closedness is also robust the exclusion of this variable from the regressions.

As for the controls: the coefficient on short term debt to total debt appears as positive, but statistically insignificant. This means that the term structure of the debt does not to have a significant effect on the probability of sudden stops. The exclusion of this variable does not affect the results on closedness. The coefficient on the index of rigidity of the nominal exchange rate is positive (indicating a positive relationship between the rigidity of the nominal exchange rate and sudden stops) but statistically insignificant. The rest of the controls (including institutional quality proxies) rarely appear to be statistically significant and all the results on closedness are robust to the inclusion of these variables in the regressions. Regional dummies (not reported) are typically insignificant. Recall that controls are included to minimize the omitted variable bias. But if some of these controls are also endogenous then the estimated effect of closedness could still be biased. To verify that the results are not driven by the inclusion of any of these controls, column (9) in Table 1 reports the regression results without controls. It is shown that the result on closedness is robust to the exclusion of all the control variables.

The results for ordinary probit regressions are reported in Table 2.[50] These results must be taken with caution due to the endogeneity problems already mentioned. The sign of the point estimate of closedness is positive across all variants, but noticeably smaller than the ones obtained in the instrumental variables estimations. Table 2.b. reports the implied changes in the probability of a sudden stop for a 10 percentage point increase in closedness. They range between 1/2 and 1/3 of their counterparts in Table 1.b. This means that correcting for the potential sources of endogeneity, the effect of closedness on the probability of sudden stops is even stronger than what one would be lead to conclude from the OLS regressions.[51] One possible interpretation is that the OLS results may underestimate the true relationship between exposure to trade and sudden stops because in

[50] Table A.5.2 in Appendix A.5 reports the results from Pooled OLS regressions.
[51] For these kind of estimates, see Edwards (2004)

the immediate aftermath of a crisis there might be a boom in exports due to ensuing real exchange depreciation. Another possible interpretation is that, in line with Aizenman (2003), more financial openness (which is a pre-requisite for sudden stops) leads to more trade by reducing the cost of access to trade credit. Irrespective of the possible channels, what is clear from these results is that the direction of the bias in the OLS regressions is towards reducing the effect of lack of exposure to trade on the likelihood of sudden stops. The rest of the point estimates are qualitatively similar to those found in Table 1, except for "Foreign Debt/GDP" which is now negative, but statistically insignificant.

Table 2: Ordinary Probit Regressions

(Reporting marginal effects)

	Dependent Variable: Sudden Stop 1							
Closedness $_t$	**0.035** (0.018)**	**0.069** (0.024)**	**0.25** (0.09)**	**0.05** (0.03)	**0.072** (0.025)**	**0.046** (0.02)**	**0.027** (0.015)*	**0.033** (0.017)**
Foreign Debt/ GDP $_{t-1}$	**-0.005** (0.014)	**-0.006** (0.019)	**-0.04** (0.08)	**-0.04** (0.027)	**-0.002** (0.019)	**-0.009** (0.016)		
Short Term Debt/ Total Debt $_{t-1}$		**0.08** (0.07)	**0.08** (0.19)	**0.13** (0.09)	**0.09** (0.062)	**0.03** (0.014)*		**0.03** (0.042)
Liability Dollarization $_{t-1}$ (1)	**0.02** (0.012)	**0.02** (0.022)		**0.03** (0.017)			**0.02** (0.013)	**0.02** (0.017)
Liability Dollarization $_{t-1}$ (2)			**0.02** (0.09)					
Exchange Rate Rigidity Index $_{t-1}$				**0.02** (0.013)				
Current Account/ GDP $_{t-1}$	**-0.27** (0.097)**	**-0.43** (0.15)**	**-0.85** (0.36)**	**-0.54** (0.17)***	**-0.46** (0.15)**	**-0.33** (0.13)**	**-0.22** (0.08)**	**-0.24** (0.09)**
FDI/GDP $_{t-1}$				**-0.003** (0.002)				
Ln Reserves in Months of Imports $_{t-1}$				**0.003** (0.008)				
Ln GDP per capita $_{t-1}$		**0.003** (0.015)		**-0.007** (0.016)	**0.003** (0.016)	**-0.007** (0.009)	**0.0003** (0.006)	**0.01** (0.01)
Effectiveness of Government $_t$		**0.01** (0.02)		**0.02** (0.022)	**0.01** (0.022)	**-0.004** (0.016)	**-0.002** (0.011)	**0.004** (0.013)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Year Fixed-Effects?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Obs.	**778**	**464**	**118**	**352**	**477**	**597**	**1120**	**904**
Pseudo R^2	**0.1**	**0.12**	**0.22**	**0.17**	**0.11**	**0.11**	**0.09**	**0.09**

Marginal effects estimated at the mean of the independent variables.
Robust standard errors reported in parenthesis.
*** Statistically Significant at 1%
** Statistically Significant at 5%
* Statistically Significant at 10%

Table 2.b: Implied changes in the probability of sudden stops

Probability of a positive outcome	0.028	0.036	0.061	0.03	0.037	0.029	0.026	0.031
Δ(PSS)	**12.5%**	**19%**	**40%**	**17%**	**19%**	**16%**	**10%**	**11%**

Δ(PSS) = the change in the probability of a sudden stop given by a 10 percentage point increase in closedness (i.e., an increase of 0.10 in the independent variable). It is computed by multiplying the marginal effect (first row in Table 2) by 0.10 and diving by the probability of a positive outcome (first row in Table 2.b).

As a first robustness check, I test if the results are sensitive to the definition of sudden stops. To do so, I re-run all regressions using the alternative definitions listed in Appendix A.1. Table A.5.1 in Appendix A.5 reports the results of the IV probit regressions for the main specification using the alternative definitions. As shown in the table, the results are robust to different definitions of sudden stops.

As an additional robustness check, I run all regressions on a single cross-section of countries. To do so, I construct two new dependant variables that seek to measure countries' proclivity to sudden stops: (1) the number of sudden stops that each country experienced between 1970 and 2002; and (2) a dummy variable that takes value 1 if the country experienced at least one sudden stop between 1970 and 2002, and zero otherwise.[52] Given the nature of these new variables, I apply a tobit model to (1) and a probit model to (2). The regressors are the 1970-2002 average of each of the variables used in the panel regressions. The results for some specifications are reported in Tables 3 and 4. For comparability purposes I focus only on the probit regressions here. The tobit results (which are reassuringly similar) are reported in Tables A.5.3 and A.5.4 in Appendix A.5.

The evidence is consistent with that of the panel estimates. Closedness is systematically associated with more proclivity to sudden stops in ordinary and instrumental variables regressions. The other regressors have the standard signs. The only noticeable differences with the panel regressions are that: (i) the current account balance loses statistical significance in the cross-section regressions. The most likely reason is that for most countries, it averages out to zero over extended periods of time; and (ii) liability dollarization appears to be more statistically significant in all the regressions. This is probably due to the fact that over longer horizons, the dollarization proxies do a better job in capturing balance sheet mismatches. As for the predicted changes in the probability of

[52] In order to achieve more variation in the dependant variable, I use "SS3" which is the most stringent of my sudden stop variables. See Appendix A.1. for the definitions.

sudden stops for a 10 percentage point increase in closedness, they average 29% in the ordinary regressions, and 32% for the IV regressions. Even though there is a smaller spread between ordinary and IV estimates than in the previous regressions, the IV estimates still systematically predict higher increases in the probability of sudden stops for a given increase in closedness.

Table 3: IV Probit Regressions (cross-section)

	Dependent Variable: Prone to Sudden Stop					
Closedness	**2.68** (0.58)***	**3.01** (0.68)***	**3.13** (0.77)***	**2.87** (1.32)**	**3.39** (1.73)**	**3.67** (1.83)**
Foreign Debt/ GDP		**1.17** (0.39)***	**0.82** (0.60)	**0.90** (0.76)	**1.09** (0.90)	**1.12** (0.96)
Short Term Debt/ Total Debt				**-1.24** (2.16)	**-2.34** (2.21)	**-4.25** (2.77)
Liability Dollarization (1)	**1.27** (0.51)**	**1.84** (0.62)**	**1.85** (0.58)**	**2.24** (1.02)**	**2.48** (1.43)*	**2.76** (1.66)*
Current Account/ GDP			**-5.55** (7.43)	**1.50** (11.4)	**5.17** (11.2)	**-0.28** (12.55)
GDP per capita						**0.0003** (0.0003)
Effectiveness of Government					**0.85** (0.52)	**0.38** (0.77)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**0.66** (0.87)	**0.29** (0.86)	**0.26** (0.83)	**0.13** (0.91)	**1.82** (1.42)	**1.34** (1.61)
Obs.	**104**	**74**	**74**	**62**	**53**	**53**

Dependant variable takes value 1 if the country had at least one sudden stop between 1970 & 2002, and 0 otherwise.
All independent variables are year averages for the period 1970-2002.
Robust standard errors reported in parenthesis.
*** Statistically Significant at 1%
** Statistically Significant at 5%
* Statistically Significant at 10%

Table 3.b: Marginal effects (for closedness) after ivprobit

	Marginal effects (dy/dx) are for discrete change of dummy variable from 0 to 1					
Closedness	0.97	1.07	1.13	1.04	1.32	1.44
Probability of a positive outcome	0.33	0.32	0.32	0.33	0.42	0.44
Δ(PSS)	**29%**	**33%**	**35%**	**32%**	**31%**	**33%**

Δ(PSS) = the change in the probability of a sudden stop given by a 10 percentage point increase in closedness (i.e., an increase of 0.10 in the independent variable). It is computed by multiplying the marginal effect (first row) by 0.10 and diving by the probability of a positive outcome (second row). Marginal effects estimated at the mean of the independent variables.

Table 4: Ordinary Probit Regressions (cross-section)

(Reporting marginal effects)

	Dependent Variable: Prone to Sudden Stop					
Closedness	**0.58** (0.15)***	**0.67** (0.17)***	**0.67** (0.18)***	**0.86** (0.22)***	**1.06** (0.30)***	**1.25** (0.38)***
Foreign Debt/ GDP		**0.30** (0.15)**	**0.30** (0.21)	**0.32** (0.26)	**0.35** (0.31)	**0.38** (0.33)
Short Term Debt/ Total Debt				**-0.54** (0.69)	**-0.88** (0.85)	**-1.63** (1.08)
Liability Dollarization (1)	**0.37** (0.17)**	**0.52** (0.20)**	**0.52** (0.20)**	**0.69** (0.31)**	**1.02** (0.57)*	**1.13** (0.60)**
Current Account/ GDP			**-0.07** (2.02)	**1.74** (2.82)	**2.38** (3.82)	**0.22** (0.66)
GDP per capita						**0.0001** (0.0001)
Effectiveness of Government					**0.28** (0.19)	**0.12** (0.28)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Obs.	**114**	**81**	**81**	**67**	**56**	**56**
Pseudo R2	**0.15**	**0.21**	**0.21**	**0.26**	**0.31**	**0.32**

Marginal effects estimated at the mean of the independent variables.
Dependant variable takes value 1 if the country had at least one sudden stop between 1970 & 2002, and 0 otherwise.
All independent variables are year averages for the period 1970-2002.
Robust Standard errors reported in parenthesis.
*** Statistically Significant at 1%
** Statistically Significant at 5%
* Statistically Significant at 10%

Table 4.b: Implied changes in the probability of sudden stops

Probability of a positive outcome	0.28	0.27	0.27	0.27	0.37	0.38
Δ(PSS)	**21%**	**25%**	**25%**	**32%**	**29%**	**33%**

Δ(PSS) = the change in the probability of a sudden stop given by a 10 percentage point increase in closedness (i.e., an increase of 0.10 in the independent variable). It is computed by multiplying the marginal effect (first row in Table 4) by 0.10 and diving by the probability of a positive outcome (first row in Table 4.b).

As a final robustness check I stack the data into decades (instead of years) and run seemingly unrelated regressions to account for the possibility that the equation errors are correlated. The dependant variables are the number of sudden stops in the decade and the regressors are the decade averages of each independent variable. As in previous regressions, all control variables (other than closedness) are lagged one period (in this case a decade) to ameliorate potential endogoneity.[53] The results and implied marginal effects are reported in Table A.5.5 in Appendix A.5. The coefficients on closedness are once again positive and statistically significant at standard confidence levels for both decades. The estimated change in the probability of a sudden stop given by a 10 percentage point

[53] This is the reason why the number of sudden stops in 1970 is not treated as an additional linear equation in the system

increase in closedness fluctuates between 12% and 18%, and the results are similar in both decades. Given that these are non-instrumental variables regressions, they are comparable to those in Tables 2 and 2.b. In those tables the corresponding estimated change in the probability of a sudden stop varies between 12.5% and 19%.[54] Thus, potentially correlated error terms don't seem to affect the results.

In summary, the evidence appears to be quite robust. As predicted by the theory, economies that trade less are more prone to sudden stops. Controlling for other possible determinants of these shocks and instrumenting closedness by gravity estimates to avoid identification problems, I find empirical evidence on the existence of a causal link between closedness and the instability of financial flows. In fact—for a given set of controls— only closedness and (in the panel regressions) the size of current account deficit before the shock, appear as significant predictors of these events. The effect of closedness on the probability of sudden stops does not only appear to be qualitatively robust, but it is also quantitatively significant. A conservative estimate (based on the IV regressions) yields the surprising result that, all else equal, increasing closedness by 10 percentage points (i.e. going from Australia's current trade share to Argentina's average trade share) increases the probability of a sudden stop between 30% and 40%. Cavallo and Frankel (2004) find that this causal link between closedness and sudden stops also extends to other forms of external crises.

V. Conclusions

Sudden stops in capital flows can be costly and painful in financially constrained economies. Determining what causes them has become a priority in the research agenda. This paper presents a framework that endogenizes sudden stops and yields one important testable implication: countries that trade less with the rest of world are, ceteris paribus, more prone to these events. The empirical evidence reported here, which corrects for the endogeneity of trade, supports this prediction.

The policy implications of this result are important because stable capital flows can be instrumental for long-run growth. Recent episodes of balance of payment crises in

[54] Excluding the case when Arteta's measure of dollarization is used in which case the estimated effect of closedness in much bigger. There is no sufficient time-series variation in Arteta's data to run the seemingly unrelated regressions using that measure of dollarization.

developing countries have aroused the debate on the appropriateness of capital account openness. Nevertheless, to the best of my knowledge, no part of that debate argues that capital flows are *per se* bad. The question they pose is under what circumstances will capital inflows spur growth and not simply sow the seeds for future troubles. One critical element is the stability of these flows. If capital inflows are not prone to sudden reversals, then it is more likely that they will be functional to economic development. The central point of this paper is that a way to be safer is to trade more goods and services with the rest of the world.

This result is counterintuitive to many because one view prevailing in the discussions is that more trade means more exposure to the external shocks, and so closedness presumably provides a shield against these shocks. Instead, this paper presents a framework that shows that more trade reduces the adverse amplifying effects of external shocks, and thereby reduces the vulnerability to crises.

The quantity of commercial trade has an exogenous component (i.e. geography, distance to markets), but also an endogenous one (i.e. trade policy). Trade policy, in turn, has a locally manageable component: home country tariffs, and an exogenous element from the point of view of any individual country: other countries trade and immigration policies. If emerging market economies want to take advantage of open capital markets, but decrease the risks of sudden stops, they should pursue trade policies that promote trade. If developed countries want to help, they should eliminate pending barriers and liberalize their trade policies too. Without large quantities of trade, capital account openness that leads to indebtness in foreign currencies is risky, and should probably be avoided.

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Appendixes

A.1 Sudden Stops

I use four alternative definitions of sudden stops: my preferred definition "SS1", and three alternative "SS2", "SS3" and "SS4". "SS2" and "SS3" are conceptually equivalent to "SS1", but are more restrictive in that they capture fewer episodes. "SS4" is, instead, equivalent to "SS1" but is less restrictive in that classifies as sudden stops events that don't necessarily trigger recessions.

Algorithm used to compute "Sudden Stop 1" (SS1):

1) Use IFS Financial Account Data (Line 78B) annual data for all available countries in the period 1970-2002.
2) Compute the standard deviation of observations for each decade (70´s, 80´s, 90's+) in the sample and then compute the mean standard deviation by averaging the results obtained for each decade.
3) Compute the year to year changes in the financial account (FA) for all countries in the sample. Unavailable data points are classified as "n.a."
4) Filter to keep observations (country/year) that show reductions in the financial account between years "t" and "t-1" if at "t-1", FA was in surplus (i.e. keep only observations that show reductions in FA surpluses). Observations that don't pass this filter, because they show either a year-to-year increase in the FA; or a year-to-year reduction in an outstanding FA deficit are classified as "0".
5) Filter again to keep (out of the observations already filtered in step (4)) only those that represent a reduction in the FA surplus that is above 2 standard deviations from the mean standard deviation computed in step (2). Observations that don't pass this filter are classified as "0" adding to the "0's" from step (4).
6) Filter again to keep only those observations that are accompanied by a fall in GDP per capita in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4) and (5)
7) Filter again to keep only those that are accompanied by a fall in the current account deficit in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4), (5) and (6).
8) Classify the observations that survive all filters as "1" indicating that they represent episodes (country/year) when SS took place. The other observations are classified as either "0" which means no episodes were registered during that year in that country, or "n.a" which means that some data is missing.
9) Results:

Number of Observations in the Dataset

"1" sudden stop	**"0" no episode**	**"n.a." no data**
86	3510	1651

Algorithm used to compute "Sudden Stop 2" (SS2):

1) Use IFS Financial Account Data (Line 78B) annual data for all available countries in the period 1970-2002.
2) Compute the standard deviation of observations for each decade (70´s, 80´s, 90's+) in the sample.
3) Compute the year to year changes in the financial account (FA) for all countries in the sample. Unavailable data points are classified as "n.a."
4) Filter to keep observations (country/year) that show reductions in the financial account between years "t" and "t-1" if at "t-1" FA was in surplus (i.e. keep only observations that show reductions in FA surpluses). Observations that don't pass this filter, because they show either a year-to-year increase in the FA; or a year-to-year reduction in an outstanding FA deficit are classified as "0".
5) Filter again to keep (out of the observations already filtered in step (4)) only those that represent a reduction in the FA surplus that is above 2 standard deviations from the corresponding decade standard deviation computed in step (2). Observations that don't pass this filter are classified as "0" adding to the "0's" from step (4).
6) Filter again to keep only those observations that are accompanied by a fall in GDP per capita in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4) and (5)
7) Filter again to keep only those that are accompanied by a fall in the current account deficit in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4), (5) and (6).
8) Classify the observations that survive all filters as "1" indicating that they represent episodes (country/year) when SS took place. The other observations are classified as either "0" which means no episodes were registered during that year in that country, or "n.a" which means that some data is missing.
9) Results:

Number of Observations in the Dataset

"1" sudden stop	**"0" no episode**	**"n.a." no data**
68	3531	1648

Algorithm used to compute "Sudden Stop 3" (SS3):

1) Use IFS Financial Account Data (Line 78B) annual data for all available countries in the period 1970-2002.
2) Compute the year to year changes in the financial account (FA) for all countries in the sample. Unavailable data points are classified as "n.a."
3) Compute the standard deviation the year to year changes for each decade (70´s, 80´s, 90's+) in the sample and then compute the mean standard deviation for by averaging the results obtained for each decade
4) Filter to keep observations (country/year) that show reductions in the financial account between years "t" and "t-1" if at "t-1" FA was in surplus (i.e. keep only observations that show reductions in FA surpluses). Observations that don't pass this filter, because they show either a year-to-year increase in the FA; or a year-to-year reduction in an outstanding FA deficit are classified as "0".
5) Filter again to keep (out of the observations already filtered in step (4)) only those that represent a reduction in the FA surplus that is above 2 standard deviations from the mean standard deviation computed in step (3). Observations that don't pass this filter are classified as "0" adding to the "0's" from step (4).
6) Filter again to keep only those observations that are accompanied by a fall in GDP per capita in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4) and (5)
7) Filter again to keep only those that are accompanied by a fall in the current account deficit in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4), (5) and (6).
8) Classify the observations that survive all filters as "1" indicating that they represent episodes (country/year) when SS took place. The other observations are classified as either "0" which means no episodes were registered during that year in that country, or "n.a" which means that some data is missing.
9) Results:

Number of Observations in the Dataset

"1" sudden stop	**"0" no episode**	**"n.a." no data**
48	3551	1648

Algorithm used to compute "Sudden Stop 4" (SS4):

1) Use IFS Financial Account Data (Line 78B) annual data for all available countries in the period 1970-2002.
2) Compute the standard deviation of observations for each decade (70´s, 80´s, 90's+) in the sample and then compute the mean standard deviation for by averaging the results obtained for each decade.
3) Compute the year to year changes in the financial account (FA) for all countries in the sample. Unavailable data points are classified as "n.a."
4) Filter to keep observations (country/year) that show reductions in the financial account between years "t" and "t-1" if at "t-1" FA was in surplus (i.e. keep only observations that show reductions in FA surpluses). Observations that don't pass this filter, because they show either a year-to-year increase in the FA; or a year-to-year reduction in an outstanding FA deficit are classified as "0".
5) Filter again to keep (out of the observations already filtered in step (4)) only those that represent a reduction in the FA surplus that is above 2 standard deviations from the mean standard deviation computed in step (2). Observations that don't pass this filter are classified as "0" adding to the "0's" from step (4).
6) Filter again to keep only those that are accompanied by a fall in the current account deficit in that country during the same year or the year immediately after. Observations that don't pass this filter are classified as "0" adding to the "0's" from steps (4), (5) and (6).
7) Classify the observations that survive all filters as "1" indicating that they represent episodes (country/year) when SS took place. The other observations are classified as either "0" which means no episodes were registered during that year in that country, or "n.a" which means that some data is missing.
8) Results:

Number of Observations in the Dataset

"1" sudden stop	**"0" no episode**	**"n.a." no data**
145	3450	1652

Table A.1: Sudden Stop 1

Country	Episodes			
Afghanistan, I.S. of	0			
Albania	0			
Algeria	1	1990		
Angola	0			
Antigua and Barbuda	0			
Argentina	1	2001		
Aruba	0			
Australia	0			
Austria	0			
Bahamas, The	0			
Bahrain, Kingdom of	0			
Bangladesh	0			
Barbados	1	1982		
Belgium	0			
Belgium-Luxembourg	0			
Belize	0			
Benin	1	1983		
Bolivia	1	1982		
Bosnia & Herzegovina	0			
Botswana	0			
Brazil	0			
Bulgaria	0			
Burkina Faso	1	1989		
Burundi	0			
Cambodia	0			
Cameroon	2	1988	1990	
Canada	1	1982		
Cape Verde	1	1990		
Central African Rep.	1	1988		
Chad	0			
Chile	3	1982	1983	1998
China,P.R.: Mainland	0			
China,P.R.:Hong Kong	0			
Colombia	2	1998	1999	

Country	Episodes		
Comoros	1	1988	
Congo, Republic of	2	1984	1996
Costa Rica	2	1981	1996
Côte d'Ivoire	0		
Croatia	0		
Cyprus	0		
Czech Republic	0		
Czechoslovakia	0		
Denmark	0		
Djibouti	0		
Dominica	1	2001	
Dominican Republic	0		
Ecuador	2	1983	1999
Egypt	1	1990	
El Salvador	1	1979	
Equatorial Guinea	0		
Ethiopia	2	1982	1991
Fiji	1	1999	
Finland	1	1991	
France	0		
Gabon	0		
Gambia, The	1	1982	
Germany	1	2001	
Ghana	0		
Greece	0		
Grenada	0		
Guatemala	0		
Guinea	0		
Guinea-Bissau	1	1986	
Guyana	0		
Haiti	0		
Honduras	0		
Hungary	0		
Iceland	1	2001	

Country	Episodes			
India	0			
Indonesia	1	1997		
Iran, I.R. of	0			
Iraq	0			
Ireland	0			
Israel	2	1988	1998	
Italy	0			
Jamaica	0			
Japan	0			
Jordan	2	1992	1993	
Kenya	0			
Kiribati	0			
Korea	1	1997		
Kuwait	0			
Kyrgyz Republic	0			
Lao People's Dem.Rep	0			
Lesotho	0			
Liberia	0			
Libya	0			
Macedonia, FYR	0			
Madagascar	0			
Malawi	1	1981		
Malaysia	1	1997		
Maldives	0			
Mali	0			
Malta	1	2000		
Mauritania	0			
Mauritius	0			
Mexico	3	1982	1994	1995
Mongolia	2	1990	1991	
Montserrat	0			
Morocco	1	1995		
Mozambique	0			
Myanmar	0			

Country	Episodes		
Namibia	0		
Nepal	0		
Netherlands	1	1981	
Netherlands Antilles	0		
New Zealand	2	1988	1998
Nicaragua	1	1986	
Niger	0		
Nigeria	1	1999	
Norway	0		
Oman	2	1987	1999
Pakistan	0		
Panama	1	2000	
Papua New Guinea	0		
Paraguay	1	2002	
Peru	1	1998	
Philippines	2	1997	1998
Poland	0		
Portugal	1	1992	
Romania	0		
Rwanda	1	1994	
Samoa	0		
São Tomé & Príncipe	0		
Saudi Arabia	0		
Senegal	0		
Seychelles	1	2000	
Sierra Leone	0		
Singapore	0		
Slovak Republic	0		
Slovenia	0		
Solomon Islands	1	1998	
Somalia	0		
South Africa	0		
Spain	1	1992	
Sri Lanka	1	2001	

Country	Episodes				
St. Kitts and Nevis	0				
St. Lucia	1	2001			
St. Vincent & Grens.	1	2000			
Sudan	0				
Suriname	1	1992			
Swaziland	1	1999			
Sweden	1	1991			
Switzerland	0				
Syrian Arab Republic	1	1989			
Tanzania	0				
Thailand	1	1997			
Togo	0				
Tonga	1	1989			
Trinidad and Tobago	1	1984			
Tunisia	0				
Turkey	4	1991	1994	1998	2001
Uganda	0				
United Kingdom	0				
United States	0				
Uruguay	1	2002			
Vanuatu	1	1991			
Venezuela, Rep. Bol.	1	1994			
Vietnam	0				
Yemen, Republic of	1	1994			
Zambia	1	1990			
Zimbabwe	1	1983			

A.2. Gravity Estimates

To compute the gravity estimates I use Frankel and Rose (2002) dataset. It consists of 41,678 bilateral trade observations spanning six different years (1970, 1975, 1980, 1985, 1990, and 1995). All 186 countries, dependencies, territories, overseas departments, colonies, and so forth for which the United Nations Statistical Office collects international trade data are included in the data set. The trade data are taken from the World Trade Database, a consistent recompilation of the U.N. trade data presented in Feenstra, Lipsey, and Bowen (1997), augmented with data from U.N.'s International Trade Statistics Yearbook. This data set is estimated to cover at least 98% of all trade.

For each of the six different years for which I have data I compute OLS regressions of the following form:

$$\mathbf{Log\ (T_{i,j} / Y_i) = c + \alpha\ logdist_{i,j} + \beta logpop_j + \gamma comlang_{i,j} + \delta border_{i,j} + \theta areap_{i,j} + \rho landlock + \mu}$$

Where "$T_{i,j}$" is the bilateral trade value between countries "i" and "j"; "Y_i" is the real GDP of country "i"; "c" is a constant term; "$logdist_{i,j}$" is the log of the distance between the economic centers of countries "i" and "j"; "comlang" is a dummy variable that takes value one if "i" and "j" share a common language and is zero otherwise; "border" is a dummy variable that takes value one if "i" and "j" share a border and is zero otherwise; "$areap_{i,j}$" is the log of the product of the areas (in km^2) of countries "i" and "j"; and "landlock" takes values two if "i" and "j" are both landlocked, one if either "i" or "j" are landlocked, and zero otherwise; and "μ" is the error term.

The gravity estimates are generated by taking the exponent of fitted values and summing across bilateral partners j. This yields estimates for six different years: 1970, 1975, 1980, 1985, 1990 and 1995. The missing values of the panel are generated by taking the observation corresponding to the closest year with data. The correlation between trade ratio and generated IV for the entire panel is 0.52.

A.3. Summary Statistics and Data Sources

Variable	Obs.	Mean	Std. Dev.	Min	Max
SS1	3596	.0239155	.1528071	0	1
SS1bis (no contiguous crises)	3590	.0222841	.1476266	0	1
SS2	3599	.0188941	.1361701	0	1
SS2bis (no contiguous crises)	3596	.0180756	.1332436	0	1
SS3	3599	.013337	.1147293	0	1
SS3bis (no contiguous crises)	3597	.0127884	.1123762	0	1
SS4	3595	.0403338	.1967683	0	1
SS4bis (no contiguous crises)	3587	.0381935	.1916898	0	1
Closedness (A)	4247	-.7322445	.432648	-2.960163	-.0153068
Fitted closedness (B)	4261	-.1487951	.1497813	-1.364657	-.0016543
Liability Dollarization (1) (C)	3454	.3207969	.3902904	0	1.999936
Liability Dollarization (2) (D)	897	.2666019	.2752479	0	1
CA / GDP (F)	3630	-.038277	.1034782	-2.404958	.58553
Foreign Debt / GDP (G)	1791	.2779454	.4373619	0	5.844839
Index of Exchange Rate Rigidity (H)	3059	2.411246	.8072297	1	3
Voice and Accountability (I)	3255	.3525906	.9023457	-1.623367	1.693636
Political Stability/Lack of Violence (I)	3038	.2303492	.8255066	-1.694225	1.69047
Effectiveness of Government (I)	3038	.3136892	.8409723	-1.320767	2.082198
Regulatory Framework (I)	3224	.3598345	.5851707	-1.500832	1.244778
Rule of Law (I)	3224	.2939932	.871838	-1.203638	1.995832
Control of Corruption (I)	3038	.2972141	.9230486	-1.104606	2.129017
FDI / GDP (J)	3963	1.902769	4.577513	-82.81054	145.2095
Reserves in Month of Imports (K)	3795	3.420814	2.958747	-.0919	32.14791
GDP per capita (L)	2799	6840.761	9583.074	84.72	52675.27
Short Term Debt / Total External Debt (M)	3430	12.39872	12.85917	0	99.90642
Polity 2 (O)	4102	.4193077	7.567316	-10	10

(A) The negative of the trade to GDP ratio over 100. Source: WDI-CD ROM
(B) See Appendix A.2 for an explanation of the methodology employed and data used.
(C) The ratio of foreign liabilities of the financial sector to money. Source: IFS (Line 26C/line 34)
(D) The ratio of "Total Dollar Deposits/Total Deposits. Source: Arteta (2002) and Arteta (2003)
(F) Ratio over 100. Source: WDI-CD ROM
(G) Source: IFS line 89c
(H) index=1 is (de-facto) flexible exchange rate; index=2 is (de-facto) intermediate arrangement; and index=3 is (de-facto) peg. Source: Levy Yeyati and Sturzenegger (2003).
(I) Source: Kaufman et. al. (2002)
(J) Source: WDI-CR ROM
(K) Source: WDI-CD ROM
(L) Source: WDI-CD ROM
(M) Ratio over 100. Source: WDI-CD Rom
(O) Range = -10 to 10 (-10 = high autocracy; 10 = high democracy). Combined Polity Score: Computed by subtracting AUTOC from DEMOC; normal range polity scores are imputed for coded "interregnum" and "transition period" special polity conditions, polities coded "interruption" on the POLITY variable are left blank. Source: Marshall and Jaggers (2002)

A.4 Analytical Appendix

(A) Proof that closedness (low X) increases the output cost associated to a tightening of the financial constraint μ .

Combine equations (21) and (22) in Section II and solve for K_1 and RER_0 in terms of the exogenous parameters. The result is,

$$RER_0 = Y_0 \frac{\lambda - \upsilon\alpha}{X - \upsilon d_0} > 0, \qquad (29)$$

and

$$K_1 = Y_0 \upsilon \frac{X\alpha - \lambda d_0}{X - \upsilon d_0} > 0, \qquad (30)$$

where, for notational simplicity, we set $\upsilon \equiv 1 + \mu$. The unique positive equilibrium results from the following inequalities:

(i) $\alpha X > \lambda d_0$, because FC is steeper than AD (y-intercept in Figure 1, Section II).

(ii) $\lambda > \upsilon\alpha$, because FC is steeper than AD (x-intercept in Figure 1, Section II).

And finally,

(iii) $X - \upsilon d_0 > 0$, where the sign of the inequality follows directly from combining (i) and (ii).

First, we are interested in the effect of a tightening of the financial constraint on investment (K_1) and therefore on output at $t+1=1$. Note that,

$$\frac{dK_1}{d\upsilon} = (\alpha X Y_0 - \lambda d_0 Y_0) \frac{X}{(-X + \upsilon d_0)^2} > 0 \qquad (31)$$

where the sign follows from (i). Therefore, a lower υ reduces K_1. This implies that, all else being equal,

$$Y_1^{low\mu} < Y_1^{high\mu}$$

The next step is to figure out if trade (i.e., X) ameliorates or strengthens the effects of a tightening of the FC on K_1. It turns out that,

$$\frac{d(\frac{dK_1}{d\upsilon})}{dX} = (\alpha X Y_0 - \lambda d_0 Y_0) \frac{X + \upsilon d_0}{(-X + \upsilon d_0)^3} < 0, \qquad (32)$$

where the sign of the inequality follows from (iii). Therefore, more trade (i.e., high X) lessens the effect of changes in the financial constraint on investment and output. In other

words, when there is a tightening, the ensuing contraction in investment (and thereby output) will be dampened if X is higher.[55] In short, closedness amplifies the effect of shocks on investment and output).

(B) Proof that defaulting on the outstanding debt (d_0) "eases the pain" in the aftermath of a tightening of the financial constraint.

In the model outlined in Section II, debt repudiation brings along an immediate increase in investment (i.e., it "eases the pain") because it frees-up resources that would otherwise go to pay back the inherited debt. This result holds even if there are sanctions in the aftermath of default, as long as sanctions are not big enough to prevent default (i.e., with sanctions, the borrower does not end up paying more than what it would have paid if she did not default). The critical element is that default ultimately reduces the inherited debt. The reason is that the effect of a debt reduction on investment is positive. Too see this note that,

$$\frac{dK_1}{dd_0} = \upsilon \frac{-\lambda Y_0 X + \upsilon \alpha X Y_0}{(-X + \upsilon d_0)^2} < 0 , \qquad (33)$$

where the sign of the inequality follows from (ii).

(C) Computing the Probability of a Sudden Stop.

For a particular realization of the random variable "υ" (i.e., "the offer"), the borrower rejects it if $N_1^A < N_1^R$, where N_1^A is the net worth attainable to borrowers in $t+1=1$ if they accept the offer, and N_1^R is the net worth attainable if they reject it. If follows from equation (16) in Section II that,

$$N_1^R = \alpha Y_1^R \qquad (34)$$

To see why, note if the borrowers reject the offer, there is no new lending ($d_0 = 0$), so N_1^R is just the return to capital in $t+1=1$. In turn, from equation (9) in Section II, we know that $Y_1^R = (K_1^R)^\alpha$. And from equation (30), it follows that $K_1^R = \alpha Y_0$. Therefore, N_1^R ultimately depends only on Y_0 and α, <u>but not on</u> υ.

Instead, N_1^A is more complicated. When an offer is accepted there is new lending taking place. Thus, it follows from equation (16) in Section II that,

$$N_1^A = \alpha Y_1^A - RER_1 d_1 \ , \qquad (35)$$

where $Y_1^A = (K_1^A)^\alpha$, and from equation (14) in Section II,

[55] Similarly, when there is a relaxation of the borrowing constraint, the countries that trade less benefit more.

$$d_1 = \frac{(\upsilon - 1)N_0}{RER_0}, \qquad (36)$$

from equation (20) in Section II, plus the assumption that $t+1=1$ is the last period (so there is no investment in the subsequent period but entrepreneurs consume their wealth), it follows that,

$$RER_1 = \frac{(\lambda - \alpha)}{(X - d_1)} Y_1^A, \qquad (37)$$

Note that, from equation (16) in Section II, combined with (29),

$$N_0 = \alpha Y_0 - (Y_0 \frac{\lambda - \alpha\upsilon}{X - d_0\upsilon})d_0, \qquad (38)$$

Therefore, we can re-write N_1^A as follows:

$$N_1^A = (K_1^A)^{\alpha}(\alpha - \phi), \qquad (39)$$

where $\phi = \frac{(\lambda - \alpha)d_1}{(X - d_1)}$. Recall that we are assuming that the entrepreneurs are never insolvent (i.e., $N_1^A \geq 0$), therefore ϕ is always bounded above by α. Consequently, for analytical simplicity, from now on we treat it as a positive constant. We use (30) to re-write N_1^A as follows,

$$N_1^A = \varphi(Y_0\upsilon \frac{\alpha X - d_0\lambda}{X - \upsilon d_0})^{\alpha}, \qquad (40)$$

where $\varphi \equiv (\alpha - \phi) > 0$. Note that, unlike N_1^R, the net worth attainable to entrepreneurs when they accept an offer (i.e., N_1^A) does depend on the value of υ (i.e., the generosity of the offer). In particular,

$$\frac{dN_1^A}{d\upsilon} = \alpha\varphi(Y_0\upsilon \frac{\alpha X - d_0\lambda}{X - \upsilon d_0})^{\alpha} \frac{X}{(X - d_0\upsilon)\upsilon} > 0, \qquad (41)$$

where the sign of the inequality follows from (i) and (ii). In words, more generous offers that are accepted lead to higher net worth.

In summary, while N_1^R is constant, N_1^A is monotonically increasing in υ. Therefore, given a set of values for the exogenous variables (including X) a country will default (and suffer a sudden stop) every time that the realization of the random variable υ is <u>below</u> a threshold υ^*. This threshold is such that, as seen in Figure 4 in Section II, $N_1^R = N_1^A$.

Therefore, we can explicitly solve for threshold υ^* by setting these two equations equal and solving for the unknown.[56] We begin by setting $N_1^R = N_1^A$:

$$\varphi(Y_0\upsilon^* \frac{\alpha X - d_0\lambda}{X - \upsilon^* d_0})^\alpha = \alpha(\alpha Y_0)^\alpha, \qquad (42)$$

and we re-arrange this equation as follows,

$$\upsilon^* \frac{\alpha X - d_0\lambda}{X - \upsilon^* d_0} = \alpha^{\frac{1+\alpha}{\alpha}} \varphi^{-\frac{1}{\alpha}}. \qquad (43)$$

Next, define $\alpha^{\frac{1+\alpha}{\alpha}} \varphi^{-\frac{1}{\alpha}} \equiv \Lambda$, where by construction, $\Lambda > \alpha$.[57] Therefore, the threshold υ^* is,

$$\upsilon^* = \frac{\Lambda \frac{X}{d_0}}{\alpha \frac{X}{d_0} + (\Lambda - \lambda)}, \qquad (44)$$

where $\alpha - \lambda < \Lambda - \lambda < 0$.

The threshold υ^* is needed to compute the probability of a sudden stop ($P(SS)$). If $\upsilon < \upsilon^*$, then $N_1^R > N_1^A$ and consequently there is a sudden stop. Therefore, $P(SS)$ is the probability that $\upsilon < \upsilon^*$,

$$P(SS) = \text{Prob}(\upsilon < \upsilon^*) = \int_1^{\upsilon^*} f(\upsilon) d\upsilon, \qquad (45)$$

where $f(\upsilon)$ is the p.d.f. of υ. Since υ is assumed to be uniformly distributed in the support (1,2),[58] then,

[56] It is easy to show that the equilibrium is unique. Note that when μ=0 (there is no new lending), the difference between N_1^A and N_1^R is that the former includes the payment of the inherited debt while the latter does not. Therefore, it must be true that when there is no new lending, $N_1^R > N_1^A$. Since N_1^R is constant, but N_1^A is monotonically increasing, then they can intersect at only one point, the threshold υ^*.

[57] To see this, note that that if $\alpha = \varphi$, then $\Lambda = \alpha$. Therefore, any values $\alpha > \varphi$ yields the result that $\Lambda > \alpha$.

[58] Recall that μ is assumed in Section II to be uniformly distributed in the support (0,1).

$$P(SS) = \text{Prob}(\upsilon < \upsilon^*) = \upsilon^* - 1 = \mu^* = \frac{\Lambda \frac{X}{d_0}}{\alpha \frac{X}{d_0} + (\Lambda - \lambda)} - 1, \qquad (46)$$

which simplifies to:

$$P(SS) = \frac{\frac{X}{d_0}(\Lambda - \alpha) - (\Lambda - \lambda)}{\frac{X}{d_0}\alpha + (\Lambda - \lambda)} > 0. \qquad (47)$$

Note that because $\Lambda - \lambda < 0$ and $\Lambda > \alpha$, the probability is (as it should be) less than 1.

Next, by computing the partial derivative of $P(SS)$ with respect to X we verify that the probability of a sudden stop is a decreasing function of openness to trade,

$$\frac{dP(SS)}{dX} = d_0 \Lambda \frac{\Lambda - \lambda}{(X\alpha + d_0\Lambda - \lambda d_0)^2} < 0. \qquad (48)$$

This result leads to a testable implication of the model: all in all, economies that trade less are more prone to sudden stops in capital flows. On a similar vein, countries with more external debt are more prone to crises,

$$\frac{dP(SS)}{dd_0} = X \Lambda \frac{\Lambda - \lambda}{(X\alpha + d_0\Lambda - \lambda d_0)^2} > 0. \qquad (49)$$

(D) The P(SS) with chi-squared distributed random shocks.

In section II the P(SS) is derived under the assumption that μ is either uniformly or exponentially distributed. Here it is shown that the results generalize to other possible distributions too. For example assume that μ has a chi-squared distribution with mean 1-μ^*. Thus,

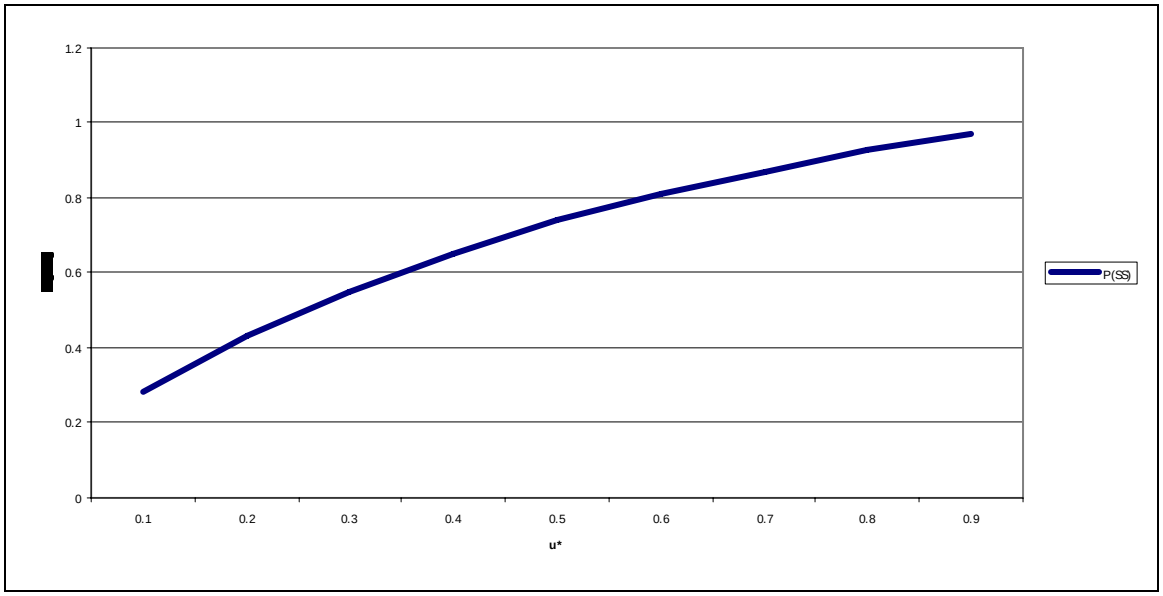
$$f(\mu) = \frac{1}{\Gamma(\frac{1-\mu^*}{2}) 2^{\frac{(1-\mu^*)}{2}}} \mu^{\frac{(1-\mu^*)}{2}-1} e^{-\frac{(1-\mu^*)}{2}} \qquad (50)$$

is the p.d.f of μ, where Γ is the gamma function. This in turn implies that

$$P(SS) = \frac{\Upsilon(\frac{(1-\mu^*)}{2}, \frac{\mu}{2})}{\Gamma(\frac{(1-\mu^*)}{2})} \qquad (51)$$

where Υ is the incomplete gamma function. Even though we can not get an easily interpretable solution for $P(SS)$, we can approximate it numerically. Figure A.1 plots the relationship between $P(SS)$ and μ^* for different possible values of μ^*, which is shown to be monotonically increasing.

Figure A.1: Probability of Sudden Stops
(Chi-squared distribution)



Therefore as μ^* is, in turn, a decreasing function exposure to trade, it follows that the probability of sudden stops is an increasing function of closedness.

A.5. Additional Regressions

Table A.5.0: Instrumental Variables Linear Regressions

	Dependent Variable: Sudden Stop 1							
Closedness $_t$	**0.066** (0.02)***	**0.09** (0.06)**	**0.23** (0.10)**	**0.13** (0.06)**	**0.1** (0.03)***	**0.06** (0.02)**	**0.05** (0.02)**	**0.06** (0.02)**
Foreign Debt/ GDP $_{t-1}$	**-0.006** (0.018)	**0.007** (0.024)	**0.11** (0.141)	**-0.0002** (0.026)	**0.01** (0.024)	**-0.007** (0.020)		
Short Term Debt/ Total Debt $_{t-1}$		**0.07** (0.06)	**-0.02** (0.17)	**0.13** (0.11)	**0.09** (0.05)*			**0.03** (0.04)
Liability Dollarization $_{t-1}$ (1)	**0.037** (0.017)	**0.016** (0.032)		**0.028** (0.03)		**0.029** (0.02)	**0.036** (0.018)*	**0.028** (0.028)
Liability Dollarization $_{t-1}$ (2)			**-0.07** (0.108)					
Exchange Rate Rigidity Index $_{t-1}$				**0.011** (0.012)				
Current Account/ GDP $_{t-1}$	**-0.32** (0.1)***	**-0.38** (0.15)**	**-0.67** (0.29)**	**-0.48** (0.19)**	**-0.39** (0.14)**	**-0.32** (0.12)**	**-0.24** (0.078)**	**-0.23** (0.08)**
FDI/GDP $_{t-1}$				**-0.0003** (0.003)				
Ln Reserves in Months of Imports $_{t-1}$				**-0.0014** (0.004)				
Ln GDP per capita $_{t-1}$		**0.009** (0.015)	**0.086** (0.04)	**-0.005** (0.016)	**0.011** (0.014)	**-0.004** (0.009)	**-0.0003** (0.006)	**0.014** (0.01)
Effectiveness of Government $_t$		**0.007** (0.02)	**-0.072** (0.04)*	**0.021** (0.026)	**0.007** (0.019)	**-0.006** (0.019)	**-0.002** (0.011)	**0.007** (0.015)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Year Fixed-Effects?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**0.0363** (0.027)	**-0.02** (0.106)	**-0.312** (0.34)	**0.055** (0.09)	**0.049** (0.118)	**0.085** (0.08)	**0.033** (0.043)	**-0.063** (0.08)
Obs.	**1040**	**705**	**215**	**559**	**747**	**914**	**1458**	**1176**
R^2	**0.04**	**0.06**	**0.2**	**0.08**	**0.05**	**0.05**	**0.01**	**0.03**

Robust standard errors reported in parenthesis.
*** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%

Table A.5.1: Instrumental Variables Probit Regressions
(Alternative Sudden Stop Definitions)

	SS1	SS2	SS3	SS4
Closedness $_t$	**1.95** (0.55)***	**1.45** (0.53)**	**2.43** (0.67)***	**0.89** (0.48)*
Foreign Debt/ GDP $_{t-1}$	**0.20** (0.24)	**0.28** (0.22)	**-0.42** (0.44)	**0.13** (0.156)
Liability Dollarization $_{t-1}$ (1)	**0.56** (0.22)**	**0.7** (0.17)***	**0.79** (0.19)***	**0.51** (0.19)**
Current Account/ GDP $_{t-1}$	**-5.66** (1.14)***	**-4.79** (1.27)***	**-6.5** (1.78)***	**-5.11** (1.21)***
Regional Dummies?	**YES**	**YES**	**YES**	**YES**
Year Fixed-Effects?	**YES**	**YES**	**YES**	**YES**
Constant	**-1.33** (0.54)**	**-1.89** (0.50)***	**-1.29** (0.60)	**-2.05** (0.39)
Obs.	**1040**	**1040**	**1040**	**1040**

Robust standard errors reported in parenthesis. *** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%
As indicated in Appendix A.1., I use four alternative definitions of sudden stops. "SS2" and "SS3" are conceptually equivalent to "SS1", but are more restrictive in that they capture fewer episodes. "SS4" is, instead, equivalent to "SS1" but is less restrictive in that classifies as sudden stops events that don't necessarily trigger output contractions.

Table A.5.2: Pooled OLS Regressions

	Dependent Variable: Sudden Stop 1							
Closedness $_t$	**0.024** (0.013)*	**0.038** (0.02)**	**0.19** (0.06)**	**0.021** (0.0241)	**0.041** (0.02)**	**0.030** (0.016)*	**0.018** (0.011)*	**0.021** (0.0137)
Foreign Debt/ GDP $_{t-1}$	**-0.009** (0.018)	**-0.008** (0.02)	**0.1** (0.13)	**-0.03** (0.019)	**-0.003** (0.02)	**-0.013** (0.019)		
Short Term Debt/ Total Debt $_{t-1}$		**0.045** (0.055)	**-0.045** (0.162)	**0.119** (0.0974)	**0.067** (0.052)			**0.026** (0.039)
Liability Dollarization $_{t-1}$ (1)	**0.022** (0.017)	**0.023** (0.030)		**0.029** (0.035)		**0.025** (0.019)	**0.022** (0.016)	**0.0312** (0.028)
Liability Dollarization $_{t-1}$ (2)			**-0.06** (0.09)					
Exchange Rate Rigidity Index $_{t-1}$				**0.007** (0.01)				
Current Account/ GDP $_{t-1}$	**-0.22** (0.07)**	**-0.27** (0.11)**	**-0.66** (0.3)**	**-0.34** (0.14)**	**-0.27** (0.1)**	**-0.24** (0.09)**	**-0.19** (0.066)**	**-0.17** (0.07)**
FDI/GDP $_{t-1}$				**-0.0009** (0.0019)				
Ln Reserves in Months of Imports $_{t-1}$				**0.0008** (0.0033)				
Ln GDP per capita $_{t-1}$		**0.003** (0.014)	**0.082** (0.044)*	**-0.008** (0.014)	**0.005** (0.013)	**-0.006** (0.009)	**-0.001** (0.006)	**0.01** (0.009)
Effectiveness of Government $_t$		**0.005** (0.022)	**-0.07** (0.04)*	**0.015** (0.025)	**0.007** (0.019)	**-0.002** (0.018)	**-0.001** (0.011)	**0.003** (0.014)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Year Fixed-Effects?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
constant	**-0.0013** (0.014)	**-0.004** (0.09)	**-0.277** (0.32)	**0.084** (0.118)	**0.0007** (0.1076)	**0.061** (0.076)	**-0.017** (0.043)	**-0.081** (0.079)
Obs.	**1122**	**745**	**219**	**599**	**787**	**961**	**1534**	**1235**
R^2	**0.04**	**0.06**	**0.19**	**0.07**	**0.06**	**0.05**	**0.03**	**0.04**

Robust standard errors reported in parenthesis.
*** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%

Table A.5.3: Ordinary Tobit Regressions (cross-section)

	Dependent Variable: Number of Sudden Stops between 1970 & 2002					
Closedness	**2.00** (0.57)***	**2.30** (0.66)***	**2.27** (0.68)***	**2.40** (0.77)**	**2.22** (0.80)**	**2.24** (0.81)**
Foreign Debt/ GDP		**1.12** (0.62)*	**1.18** (0.72)	**1.13** (0.74)	**1.04** (0.69)	**1.04** (0.69)
Short Term Debt/ Total Debt				**-2.58** (2.51)	**-3.08** (2.39)	**-3.37** (2.53)
Liability Dollarization (1)	**1.27** (0.60)**	**1.65** (0.67)**	**1.64** (0.67)**	**1.50** (0.79)*	**1.34** (0.84)	**1.21** (0.92)
Current Account/ GDP			**1.11** (6.69)	**7.9** (8.09)	**8.11** (8.24)	**6.74** (8.94)
GDP per capita						**0.0001** (0.0002)
Effectiveness of Government					**0.49** (0.40)	**0.42** (0.47)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**0.046** (1.07)	**-0.14** (0.88)	**-0.12** (0.89)	**0.62** (0.91)	**1.58** (1.10)	**1.49** (1.10)
Obs.	**114**	**81**	**81**	**67**	**56**	**56**
Pseudo R2	**0.10**	**0.15**	**0.15**	**0.18**	**0.19**	**0.19**
Number of Sudden Stops	**36**	**26**	**26**	**23**	**23**	**23**

All independent variables are year averages for the period 1970-2002.
Standard errors reported in parenthesis.
*** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%

Table A.5.4: IV Tobit Regressions (cross-section)

	Dependent Variable: Number of Sudden Stop between 1970 & 2002					
Closedness	**3.49** (1.26)**	**3.70** (1.21)**	**3.87** (1.30)**	**3.14** (1.38)**	**3.41** (1.72)**	**3.49** (1.78)**
Foreign Debt/ GDP		**1.58** (0.72)**	**1.22** (0.77)	**1.12** (0.74)	**1.36** (0.81)*	**1.35** (0.80)*
Short Term Debt/ Total Debt				**-2.06** (2.47)	**-2.81** (2.36)	**-3.37** (2.50)
Liability Dollarization (1)	**1.60** (0.69)**	**1.95** (0.73)**	**1.97** (0.73)**	**1.57** (0.79)**	**1.01** (0.95)	**0.78** (1.07)
Current Account/ GDP			**-5.71** (8.04)	**2.12** (9.54)	**5.47** (8.56)	**3.2** (9.6)
GDP per capita						**0.0001** (0.0002)
Effectiveness of Government					**0.68** (0.48)	**0.52** (0.51)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**0.95** (1.05)	**0.44** (0.99)	**0.41** (0.99)	**0.77** (1.14)	**2.12** (1.31)	**1.99** (1.29)
Obs.	**104**	**74**	**74**	**62**	**53**	**53**
Number of Sudden Stops	**36**	**26**	**26**	**23**	**23**	**23**

All independent variables are year averages for the period 1970-2002.
Robust standard errors reported in parenthesis.
*** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%

Table A.5.5: Seemingly Unrelated Regressions (stacked by decades)

	Dependent Variable: Number of Sudden Stops between per decade					
	(1)		(2)		(3)	
	Number of Sudden Stops in 1980	**Number of Sudden Stops in 1990**	**Number of Sudden Stops in 1980**	**Number of Sudden Stops in 1990**	**Number of Sudden Stops in 1980**	**Number of Sudden Stops in 1990**
Closedness $_{t}$	**0.30** (0.12)**	**018** (0.08)**	**0.31** (0.16)**	**0.18** (0.11)*	**0.35** (0.16)**	**0.18** (0.11)*
Foreign Debt/ GDP $_{t-1}$			**0.32** (0.59)	**0.16** (0.14)		
Liability Dollarization $_{t-1}$	**0.11** (0.18)	**0.21** (0.10)**	**0.47** (0.22)**	**0.42** (0.14)**	**0.24** (0.23)	**0.32** (0.13)**
GDP per capita $_{t-1}$					**0.002** (0.063)	**-0.05** (0.045)
Regional Dummies?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Constant	**0.15** (0.21)	**0.33** (0.16)	**0.05** (0.21)	**0.33** (0.18)*	**0.52** (0.68)	**0.35** (0.50)
Obs.	**90**	**90**	**45**	**45**	**66**	**66**
R2	**0.11**	**0.17**	**0.21**	**0.28**	**0.12**	**0.20**

All independent variables are decade averages.
Standard errors reported in parenthesis.
*** Statistically Significant at 1% / ** Statistically Significant at 5% / * Statistically Significant at 10%

Table A.5.5(b): Implied changes in the probability of sudden stops

	(1)		(2)		(3)	
	Number of Sudden Stops in 1980	**Number of Sudden Stops in 1990**	**Number of Sudden Stops in 1980**	**Number of Sudden Stops in 1990**	**Number of Sudden Stops in 1980**	**Number of Sudden Stops in 1990**
Probability of a positive outcome	0.2	0.12	0.17	0.13	0.23	0.15
Δ(PSS)	**15%**	**15%**	**18%**	**14%**	**15%**	**12%**

Δ(PSS) = the change in the probability of a sudden stop given by a 10 percentage point increase in closedness (i.e., an increase of 0.10 in the independent variable). It is computed by multiplying the marginal effect (first row in Table A.5.5.) by 0.10 and diving by the probability of a positive outcome.