Bankruptcy Costs, Liability Dollarization, and Vulnerability to Sudden Stops

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Abstract

Emerging market countries that have improved institutions and attained intermediate levels of institutional quality have experienced severe financial crises following capital flow reversals. However, there is also evidence that countries with strong institutions and deep capital markets are less affected by external shocks. We reconcile these two observations using a calibrated DSGE model that extends the financial accelerator framework developed in Bernanke, Gertler, and Gilchrist (1999). The model captures financial market institutional quality with creditors. ability to recover assets from bankrupt firms. Bankruptcy costs affect vulnerability to sudden stops directly but also indirectly by affecting the degree of liability dollarization. Simulations reveal an inverted U-shaped relationship between bankruptcy recovery rates and the output loss following sudden stops. We provide empirical evidence that this non-linear relationship exists.

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1. Introduction

Good institutions should reduce both the probability of sudden stops and the cost associated with them. First, better institutions that regulate and supervise the banking system improve credit allocation, which should reduce the probability of a large capital flow reversal. Second, lack of transparency has been shown to be correlated with herding behavior by international investors (Prasad et al., 2004). In addition, corruption has been negatively linked to the share of foreign direct investment in inflows, a more stable source of funding (Wei and Wu, 2002). Finally, stronger institutions spur domestic financial sector development, which allows firms to borrow in local currency (Burger and Warnock, 2006). This reduces liability dollarization, which has been shown to increase the output loss following a sudden stop (Cavallo, 2004; Guidotti et al., 2004). However, many emerging market countries that have attained intermediate levels of institutional quality have experienced severe financial crises following capital flow reversals. Honig (2008a) finds that countries with moderate levels of institutional quality experience more frequent recessionary sudden stops. Ranciere et al. (2008) find that the link between negative credit skewness and growth is strongest in the set of financially liberalized countries with a medium degree of contract enforceability.

In this paper, we present a model showing that improved governance can in some cases increase the cost of a sudden stop. Our measure of institutional quality is a bankruptcy recovery rate, which is a key parameter in the financial accelerator framework developed by Bernanke, Gertler, and Gilchrist (1999) (hereafter BGG). The model includes a contract between foreign creditors and domestic entrepreneurs. According to this contract, as entrepreneurs borrow more for a given level of net worth, they are charged a higher interest rate on their loans. The financial imperfection that generates this external finance premium is the result of a cost that lenders must incur when borrowers default in order to observe and retrieve borrowers' realized returns. Lenders pay this amount only when firms default on their loans; otherwise lenders receive a fixed payment. We can therefore interpret this cost as a cost of bankruptcy that reflects auditing, accounting, and legal expenditures associated with liquidation (Carlstrom and Fuerst, 1997). The lower the bankruptcy cost, the greater the proportion of a firm's value that creditors can recover from a firm that is unable to repay the full amount of the loan; i.e. the greater the recovery rate.

We claim that this bankruptcy cost, and therefore, the recovery rate in the standard financial accelerator model is a reflection of institutional quality. First, countries with strong legal systems that protect creditor rights and provide an orderly bankruptcy process should have lower bankruptcy costs. Second, given that a firm has declared bankruptcy, prudential regulation and supervision of the financial system that requires disclosure and transparency of firms' financial positions should also reduce these costs.

In contrast to BGG and later work that extends the financial accelerator framework to an open economy setting (Choi and Cook, 2003; Gertler, Gilchrist, and Natalucci, 2007, hereafter GGN), we calibrate our model to different levels of bankruptcy costs. We then analyze the effect of an exogenous increase in foreign interest rates, which initiates a sudden stop. There are two direct effects of an increase in the recovery rate. First, a higher recovery rate lowers the level of financial frictions due to asymmetric information. This effect causes a more muted output response to external shocks. Second, when financial frictions are lower, we show that borrowing costs are less sensitive to leverage. Therefore, when there is a sudden stop and borrowing costs increase, firms must respond by decreasing investment significantly. This effect amplifies the response of output.

We use the framework to model two types of economies. We first analyze our benchmark economy that is characterized by the ability of domestic firms to obtain finance in local currency. In this economy, the first effect dominates, and a reduction in bankruptcy costs reduces vulnerability to sudden stops. We then look an economy in which domestic firms must borrow in foreign currency. In this case, we find the opposite result that lower bankruptcy costs actually increase the output loss following a sudden stop. Specifically, liability dollarization and the depreciation of the currency strengthens the second effect, leading to a larger drop in output.

Finally, we look at the more realistic intermediate case in which some firms borrow in local currency and others borrow in dollars. In contrast to GGN (2007) and Choi and Cook (2003) in which all borrowing is denominated in a single currency, we make liability dollarization endogenous. Specifically, we model a causal relationship between institutional quality, captured by bankruptcy costs, and the degree to which firms borrow in local currency. This link has been proposed before. Burger and Warnock (2006) provide empirical evidence that institutional quality affects the development of the domestic financial system. This allows domestic firms to obtain sufficient funds from domestic lenders so that they are not forced to borrow from abroad. They therefore do not have foreign currency-denominated liabilities on their balance sheets.[1] To model this relationship, we assume that there is a fixed wedge between recovery rates for domestic lenders and foreign lenders (c.f. Iacoviello, Minetti, 2006; Rajan and Zingales, 1998; Hermalin and Rose, 1999). In this case, an increase in the recovery rate stimulates domestic lending, assumed to be in local currency, more than foreign lending, reducing the share of dollar liabilities.

[1] Caballero and Krishnamurthy (2003) show that if domestic financial markets are underdeveloped, firms will have excessive dollar liabilities.

Simulations reveal an inverted U-shaped relationship between institutional quality and vulnerability to sudden stops. In particular, an improvement in government quality increases the output loss following a sudden stop, but this effect only applies to countries that start with low levels of government quality. Finally, we provide empirical evidence that this non-linear relationship exists. This result is consistent with recent models (e.g. Schneider and Tornell, 2004; Ranciere et al, 2008) showing that countries with intermediate levels of institutional quality that are characterized by limited contract enforcement and bailout guarantees are more likely to experience sudden stops. Aghion et al., (2004) present a model showing that countries with intermediate levels of financial development experience the most instability as a result of financial liberalization. Our paper adds to this literature by describing the dynamic behavior of vulnerability to sudden stops as countries transition from low to high institutional quality economies.

Thus we focus on the impact of a capital flow reversal. The initial outflow is exogenous and caused by a rise in foreign interest rates. Certainly a rise in U.S. real interest rates played a large role in the Latin American debt crisis. Of course sudden stops are also caused by domestic factors. We do not address this aspect of sudden stops in our paper. Instead, we endogenize the effect of a foreign interest rate shock on the financial system and the magnitude of the resulting capital outflow. Our work complements the literature on the role of credit frictions in amplifying the response of output during sudden stops (e.g. Arellano and Mendoza, 2002; Mendoza and Smith, 2006; Mendoza, 2006a & b; Chari et. al, 2005; Neumeyer and Perri, 2005). We provide further insight by showing that the relationship between the financial frictions and vulnerability to sudden stops is not always positive and depends on the initial level of institutional quality.

The rest of the paper is organized as follows: Section 2 presents and calibrates the model.

We then simulate sudden stop-induced output drops for different values of the recovery rate parameter. Section 3 provides empirical evidence that, at least in a certain range, a decline in bankruptcy costs can increase the output loss following sudden stops. Section 4 concludes.

2. Model Economy

In this section, we build a model to analyze the relationship between institutional quality and vulnerability to sudden stops. The financial accelerator framework of BGG in an open economy setting is well suited for this purpose. First, the model includes bankruptcy costs that can proxy for institutional quality. Second, institutional quality through a financial contract determines the leverage of domestic firms. These balance sheet effects in turn determine how vulnerable a country is to sudden stops. Third, the general equilibrium framework together with reasonable calibration allows us to quantify the vulnerability to sudden stops. Finally, unlike the standard RBC model, the financial accelerator mechanism replicates the high amplitude of the output response to shocks observed in the data.

2.1. Benchmark Model (No Liability Dollarization)

There are six types of agents in the benchmark economy: households, entrepreneurs, a domestic bank, retailers, capital producers, and a central bank. Households work, consume, and invest in deposits denominated in domestic and foreign currency that have a riskless rate of return. Entrepreneurs are risk neutral, and borrow from domestic banks to finance the production of wholesale goods. A domestic bank finances entrepreneurs using the deposits of consumers.[2] Retailers are monopolistically competitive and transform wholesale goods into final consumption goods. Retailers are included to simplify the financial contract and motivate price stickiness. Capital producers turn investment into capital goods. Finally, a central bank conducts monetary

[2] Funding does not have to come exclusively from domestic sources. But we assume in this section that all financing is denominated in local currency.

policy using a Taylor (1993) rule. Aside from the financial contract, the rest of the economy follows a standard dynamic New-Keynesian small open economy framework. Details of the economy are deferred to Appendix A. In this section, we focus on the financial contract.

The Contract between the Domestic Bank and Entrepreneurs

There is a continuum of entrepreneurs with insufficient net worth to internally finance their investments. Entrepreneurs borrow the difference between their desired investment and net worth from a domestic bank. The external finance premium is determined according to the contract with the bank. Entrepreneurs' return on investment is subject to an idiosyncratic shock.

$$\left[1-F\left(\bar{A}_{it}\right)\right]\left(R_t + x_{it}\right)B_{it} + (1-\mu)\left[\int_0^{\bar{A}_{it}} A_{it} R_t^k Q_{t-1} K_{it} \delta F\left(A_{it}\right)\right] = R_t B_{it} \tag{2.1}$$

where, A_{it} is the idiosyncratic shock to returns to capital and is log normally, i.i.d. $\bar{A}_{it}$ is the expected cutoff value of the firm specific shock below which the firm is unable to pay back its debt. x_{it} , μ , Q_{t-1} , K_{it} , and R_t represent the external finance premium, bankruptcy cost coefficient, price of capital, capital stock, and the risk free rate respectively. The recovery rate is given by 1-μ. Equation (2.1) shows that banks set their expected returns equal to the risk free rate. The right hand side represents the opportunity costs of financing the entrepreneur. Expected returns consist of the principal and interest payments with probability $1-F\left(\bar{A}_{it}\right)$ and whatever the firm has if it defaults net of bankruptcy costs. Funds borrowed from the bank, B_{it}, and the return to capital, R_t^k, are given by:

$$B_{it} = Q_{t-1}K_{it} - N_{it} \tag{2.2}$$

$$R_t^k = \left(\alpha \frac{P_t^w A_t K_t^{\alpha} L_t^{1-a}}{P_t} + \left(1-\delta\right)\frac{Q_t}{P_t}\right) / \frac{Q_{t-1}}{P_{t-1}} \tag{2.3}$$

where N_{it} and $Q_{t-1}K_{it}$ are the net worth and the desired investment of entrepreneur *i* respectively, and P_t / P_t^w is the markup of retail goods over whole sale goods. We assume that entrepreneurs purchase their entire capital stock every period. This assumption ensures that the external finance premium is determined based on the overall leverage of the firm and not just the marginal investment. The second equation that characterizes the contract is as follows:

$$\overline{A}_{it} R_t^k Q_{t-1} K_{it} = \left(R_t + x_{it}\right) B_{it} \tag{2.4}$$

Entrepreneurs need at least the cutoff value of the idiosyncratic shock to pay the principal and interest. $\overline{A}_{it}$ and the risk premium, x_{it}, are determined simultaneously using equations (2.1) and (2.2). Entrepreneurs in the model are assumed to be risk neutral and are exposed to both idiosyncratic and aggregate shocks. Therefore, technology-related risks are transferred from risk-averse domestic consumers to the entrepreneurs via the financial intermediary.[3] From the revenue maximization problem of the entrepreneur, subject to (2.1), we derive:[4]

$$\frac{E_{t-1}\left[R_t^k\right]}{R_t} = v\left(\frac{Q_{t-1}K_{it}}{N_{it}}\right) \qquad v'\left(\frac{Q_{t-1}K_{it}}{N_{it}}\right) > 0 \tag{2.5}$$

Equation (2.5) represents the supply of capital relation. When firms become more leveraged, banks charge a higher premium to compensate for the higher probability of default. Similarly, we can show by inverting (2.5) that leverage is positively related to the relative returns to capital.

$$\frac{Q_{t-1}K_{it}}{N_{it}} = \varphi\left(\frac{E_{t-1}\left(R_t^k\right)}{R_t}\right), \qquad \varphi'\left(\frac{E_{t-1}\left(R_t^k\right)}{R_t}\right) > 0 \tag{2.6}$$

The overall demand for capital is obtained by aggregating over all entrepreneurs.

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[3] Assuming that the country is exposed to an adverse aggregate shock, the standard financial accelerator framework implies that the bank collects more from entrepreneurs that survive to compensate for the losses from bad loans. A more realistic contract in which foreign banks include the expected, instead of the ex post, returns to capital in the financial contract does not change the results. Proof is available on http://homepages.uconn.edu/~ula06001/.

[4] The derivation of this relationship is provided in BGG.

$$Q_{t-1}K_t = \varphi\left(E_{t-1}\left(R_t^k\right)/R_t\right)N_t \tag{2.7}$$

According to this relation, firms base their investment decisions on the expected returns to capital relative to the risk free rate. Furthermore, we can also show that in steady state higher bankruptcy costs correspond to lower leverage so that $\varphi'(\mu) > 0$.[5] The entrepreneurs' net worth evolves according to the following:

$$N_{it+1} = \gamma^e V_{it} + W_t^e / P_t \tag{2.8}$$

where W_t^e / P_t, V_{it} are an entrepreneur's real wage and equity. V_{it} is given by,

$$V_{it} = R_t^k Q_{t-1}K_{it} - \left(R_t + \frac{\mu\int_0^{\bar{A}_i} A_{it}R_t^k Q_{t-1}K_{it}dF\left(A_{it}\right)}{Q_{t-1}K_{it} - N_{it}} \right)\left(Q_{t-1}K_{it} - N_{it}\right) \tag{2.9}$$

The first term on the right hand side of equation (2.9) represents the returns to capital given that the firm does not go bankrupt. The second term is the expected debt payment. γ^e in equation (2.8) is the survival probability of the entrepreneur. This variable is needed to prevent entrepreneurs from building up enough net worth and becoming self sufficient.[6] Net worth is composed of the net returns to capital if the firm stays afloat and real wages. Equations (2.8) and (2.9) define the second part of the financial accelerator mechanism. In particular, if there is an increase in asset prices, returns to capital along with firms' net worth increases as well.[7] If entrepreneurs do not survive, they consume the returns to capital net of debt payments such that $C_{it}^e = \left(1-\gamma^e\right)V_{it}$.

2.2. Parameterization

[5] Proof is available upon request.
[6] Because internal finance is cheaper, there is an incentive to be self sufficient.
[7] Equation (2.9) can be used to show that $dV_t / dQ_t > 0$.

When possible, we calibrate the model to Brazil. Brazil was chosen due to available data used to calibrate most of the parameters. When Brazilian data are not available, we choose parameter values used for emerging market countries or that are standard in the literature.

Preferences and Technology

The quarterly discount factor β is set to 0.961 to match the annual T-Bill rate of 17.14%. The coefficient of relative risk aversion is $\Omega = 2$, which is standard in RBC models.[8] Since imports are 20% of consumption, we set the share parameter, γ, equal to 0.8. A significant number of studies assume that elasticity of substitution between home and foreign goods is equal to one in order to simplify the analysis of optimal monetary policy (c.f. Devereux and Engel, 2003; Clarida et al, 2002). However, empirical estimates of this parameter are usually greater than 1 and range between 5 and 6.[9] These relatively higher values also explain the home bias for domestic goods. Therefore, we assume that $\rho = 5$.

The two commonly used values for labor supply elasticity in emerging markets are 1.4 (Correia et al, 1995) and 2 (Mendoza, 1991). We follow the existing literature and choose the parameter κ in the utility function such that the labor supply elasticity is 2, and the average hours worked relative to the total hours available is 0.333. The habit persistence parameter b is initially equal to 0.85. Empirical estimates of this parameter range from 0.8 (Fuhrer, 2000; Constantinides, 1990) to 0.95 (Campell and Cochrane, 1995; Lettau and Uhlig, 2000). Values within this range explain the equity premium puzzle and help replicate the hump shaped response to shocks observed in the data. We test the sensitivity of our results to habit formation in consumption by setting this parameter equal to zero.

[8] We considered different values for Ω in our sensitivity analysis including $\Omega = 1$. Results did not change significantly.
[9] Obstfeld and Rogoff (2000) find that the estimates range from 1.2 to 21.4. Anderson and Van Wincoop (2004) argue that the range of values lie between 5 and 6. Adolfson et al (2007), using a Bayesian estimation technique, state that values between 5 and 6 are preferable.

We follow Kanczuk (2004) and set the capital share parameter α equal to 0.41. We find that the quarterly depreciation rate δ equals 3.1% when we assume that the investment/output ratio is 16%. Using the conventional value of 2.5% did not change our results. significantly.

Empirical estimates of the elasticity of the price of capital with respect to the investment-capital ratio lie between 20 (Woodford, 2003) and 2 (Chirinko, 1993). Despite amplifying real rigidities and replicating the hump shaped response observed in the data, higher values of this elasticity yield implausible costs of capital. In our benchmark model, we set this parameter equal to 2 following King and Wolman (1996).

As in Cespedes, Ochoa, and Soto (2005), we assume that the probability of an adjustment in retailer prices, $1-\theta$, is 0.35. Basu and Fernald (1993) find that markup rates for the U.S. lie between 1.15 and 1.23. Based on this result, studies that include imperfect competition calibrate the markup rate to 1.2. We could not find an empirical estimate of markups in Brazil. However, surveys of emerging market countries (e.g. Dobrinsky, Korosi, Markov and Halpern, 2006) suggest that $\eta = 1.2$ is a reasonable assumption. Finally, we set the price elasticity of export demand, ε, and the elasticity of marginal depreciation with respect to the utilization rate, *x*, equal to 1, consistent with GGN.

External Finance Premium

We calibrate the financial sector parameters to match the following: 1)_Annual business failure rate of 10%. 2)_ Difference between lending rate and the risk free rate equal to 260 basis point. 3)_ Leverage ratio, QK/N, equal to 2 or debt-net worth ratio of 1. In order to obtain these steady state values we fixed the bankruptcy cost coefficient to 0.5, the quarterly survival rate of entrepreneurs to 0.9728, and assumed that the idiosyncratic productivity variable A_{it} is log-normally distributed with a variance equal to 0.078 and a mean of unity.

Most models of financial imperfections are calibrated to advanced countries. For example, the bankruptcy costs are chosen to be less than 30% of firm assets (e.g. Bernanke, Gertler and Gilchrist, 2000 use 12%; Carlstrom and Fuerst, 1997 use 20%). According to the World Bank's 2008 Doing Business report, bankruptcy costs are much larger for emerging market countries. For example, the low recovery rate reported for Brazil (85.4%) implies that bankruptcy costs are approximately 3.9 times those in advanced economies (21.7%). Therefore, $\mu = 0.5$ is a reasonable parameter value for Brazil.

We found evidence on the business failure rate for Brazil from a various sources. According to a survey conducted by Sebrae (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas—Small Business Administration of Brazil) in 2004, Brazil has one of the highest business failure rates in the world and approximately half of the 470,000 small firms that open every year close down within two years. Instituto Brasileiro de Geografia e Estatistica (IBGE, Statistics Office of Brazil) reports that more than 99% of the firms in Brazil are small. Using these observations and the fact that there are approximately 4.5 million businesses in 2004, a steady state business failure rate of roughly 10% (much higher than the 3% level used in models calibrated to advanced countries) is reasonably consistent with data.[10]

The only empirical study we found related to leverage in Brazil was by Agrawal and Mohadi (2004). The authors find using data from Worldscope and IFC, that the debt-equity ratio in Brazil between 1980 and 1997 averaged 1.01, implying a QK/N of approximately 2 consistent with our steady state leverage ratio. According to the "Lending Interest Rates and Bank Spreads" publication of Banco Central do Brazil, the average spread between lending and

[10] Statistics announced by Office of Advocacy show that bankruptcy rates are approximately 2.3% for the U.S.

funding rates for the 2003-2006 period was equal to 28.5 % for corporations. Therefore, the steady state interest rate premium in the model (26%) is not too different from data.

Finally, we set the exponents of inflation and output (γ_π, γ_y, τ) in the central bank's policy rule equal to 2, 0.75, and 0 respectively, similar to Gertler, Gilchrist, and Natalucci (2007). The authors argue that these parameter values provide a reasonable approximation to the behavior of interest rate in an emerging market country such as Korea. Nevertheless, there is evidence that the standard Taylor rule is not a good representation of monetary policy in Brazil (Kanczuk, 2004). We check the sensitivity to a different monetary policy rule later in the paper.

2.3. Capital Reversals in the Benchmark Model

In this section we study the effects of capital reversals in two economies: a high institutional quality economy (HIQE) and a low institutional quality economy (LIQE). We simulate capital reversals with a positive shock to foreign interest rates. We then compare the impulse responses obtained from the two economies.

We calibrate the LIQE to the benchmark parameter values discussed in Section 2.2. For the HIQE, the only change we make is setting the bankruptcy cost coefficient to 0.2. This value falls within the reasonable range found for developed economies (albeit, closer to the lower end). Carlstrom and Fuerst (1997) argue that bankruptcy costs should be within the 0.2-0.36 range for a developed economy. The new value of the bankruptcy cost coefficient, implies a leverage ratio of 3.8 and an interest rate spread of 15.8 percentage points. This compares with the values of 0.5, 2, and 26 in the benchmark model, respectively. Therefore, the HIQE is characterized by lower bankruptcy costs, higher leverage, and a lower risk premium than the LIQE.

Next, we log-linearize our model and report the impulse responses to a 100 annualized basis points increase in foreign interest rates in the two economies. Figure 1 shows the results. In both of the economies, a positive shock to foreign interest rates results in an increase in domestic interest rates and a depreciation of the currency. The latter generates a rise in foreign goods' prices and inflation. The central bank responds by raising the interest rates. Real interest rates increase due to price rigidities, and prompt a drop in output, consumption, and investment. As asset prices decrease in response to a drop in investment, entrepreneurs' net worth falls. This produces an increase in leverage, notwithstanding the drop in investment. The fall in investment also increases returns to capital, thus matching the increase in external finance premium.

In addition, the amplitude of impulse responses in the LIQE is higher. There are two counteracting effects that that determine this outcome. First, when bankruptcy costs are low, the effect of the financial accelerator mechanism is more muted, and the output loss due to financial frictions is lower. This can be seen more clearly if we consider the evolution of net worth shown in equation (2.8) and the aggregate resource constraint given by,

$$Y_t = C_t^H + C_t^{eH} + C_t^{H*} + I_t^H + \mu\left(\int_0^{\overline{A}_i} A_i f(\overline{A}_i)\delta A_i\right) R_t^k Q_{t-1} K_t \tag{2.10}$$

Moreover, small bankruptcy costs imply that entrepreneurs' net worth falls by less, as can be seen from equation (2.9). The smaller drop in net worth prevents a sharp increase in the external finance premium and a large decrease in investment. We refer to this combined effect as the financial accelerator effect. The second effect is due to the nature of the financial contract and can be observed more clearly if we log-linearize (2.5) around a non-stochastic steady state:[11]

$$\tilde{EFP}_t = \alpha_1\left(\mu, \overline{A}_i\right)\tilde{LEV}_t \tag{2.11}$$

where $\alpha_1'(\mu) > 0$, $\tilde{EFP}_t = \tilde{R}_t^k - \tilde{R}_t$, $\tilde{LEV}_t = \tilde{Q}_{t-1} + \tilde{K}_t - \tilde{N}_t$ and the two variables denote percent deviations from steady state. In the HIQE, the external finance premium is less sensitive to

[11] The expression for the coefficient of the leverage variable is available on http://homepages.uconn.edu/~ula06001/.

leverage ratios. Therefore, after the initial surge in leverage prompted by a drop in net worth, investment has to fall significantly in order to counteract the decrease in the wedge between the risk free interest rates and the returns to capital. Specifically, since the coefficient of the leverage variable in equation (2.11) is lower for the HIQE, investment has to fall by more in response to an increase in R_t. The reason is that when bankruptcy costs are low, creditors are not as affected by bankruptcy since they can retrieve a greater portion of a bankrupt firm's assets. In this case, the risk free rate is a relatively more important determinant of external finance rates. In contrast, when bankruptcy costs are high, leverage plays a more predominant role. We refer to this effect as the leverage sensitivity effect. By changing bankruptcy costs, we uncover this feature of the model, which to this point has not been documented theoretically or empirically despite the sizeable literature on the financial accelerator effect. There is a line of finance literature, however, (c.f. Collin–Dufresne, Goldstein, 2001; Tang, 2006) that reports a higher leverage ratio sensitivity of spreads for corporate bonds with lower credit ratings compared to bonds with high credit ratings. In the empirical section we provide evidence for the leverage sensitivity effect.

To summarize, we find that when borrowing is denominated in local currency, the financial accelerator effect dominates the leverage sensitivity effect. In this case, the output response to capital reversals is more muted when institutional quality is higher. These initial results are similar to studies (BGG and GGN) showing that output responses to various shocks are smaller when the financial accelerator effect is shut off (μ is set equal to zero).

2.4. Complete Liability Dollarization

In this section, we look at the case of an economy in which domestic entrepreneurs are assumed to rely exclusively on foreign financing, which is denominated in foreign currency. Introducing liability dollarization to the model affects only the part of the model pertaining to the financial contract; the rest of the economy is the same. By incorporating balance sheet effects, we obtain the opposite result from Section 2.3. In particular, a reduction in bankruptcy costs increases an economy's vulnerability to a capital reversal.

In addition, having firms bypass the domestic banking sector and borrow from abroad also captures the growing rate of direct foreign borrowing observed in these countries.[12] Moreover, in contrast to previous studies that analyze credit market imperfections in an open economy setting (Chue and Cook, 2004; Gertler, Gilchrist and Natalucci, 2007), introducing direct foreign borrowing allows us to derive the country default-risk premium endogenously.[13]

The terms of the contract are determined according to the equations below:

$$\left[1 - F\left(\overline{A}_{it}\right)\right]\left(R_t^* + x_{it}\right)F_{it} + (1-\mu_t)\left[\int_0^{\overline{A}_{it}} A_{it} R_t^k Q_{t-1} K_{it}\, dF\left(A_{it}\right)\right] / s_t^r = R_t^* F_{it} \tag{2.12}$$

$$\overline{A}_{it} R_t^k Q_{t-1} K_{it} / s_t^r = \left(R_t^* + x_{it}\right) F_{it} \tag{2.13}$$

$$Q_{t-1} K_{it} - N_{it} = s_t^r F_{it} \tag{2.14}$$

where s_t^r, R_t^* and F_{it} denote the real exchange rate, foreign risk free interest rate and nominal foreign borrowing respectively. The financial contract is different from that in the benchmark model in two ways. First, loans are denominated in dollars, and lenders equate their expected returns to the foreign interest rates.[14] Second, the supply of capital relationship depends on the exchange rate. Thus exchange rates directly impact the external finance premium. Given the terms of the contract, we can obtain the relationship between external finance premium and leverage in a similar fashion.[15]

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[12] See IMF's GFSR and WEO for April 2007.

[13] The country risk premium is exogenous in GGN. Chue, Cook (2003) use a bank-specific shock to derive the risk premium.

[14] In our model it is not important whether foreigners or domestic residents provide the foreign currency denominated funds. In either case the opportunity cost for the lender is the risk free foreign interest rate.

[15] The derivation is similar to that in BGG and is available upon request.

$$\frac{E_{t-1}\left[\left(s_{t-1}^{r} / s_{t}^{r}\right)R_{t}^{k}\right]}{R_{t}^{*}} = v_{f}\left(\frac{Q_{t-1}K_{it}}{N_{it}}\right) \qquad \text{where} \quad v_{f}'\left(\frac{Q_{t-1}K_{it}}{N_{it}}\right) > 0 \tag{2.15}$$

As in the previous section, we calibrate this economy to high and low levels of bankruptcy costs and report the impulse responses to a 100 annualized basis point foreign interest rate shock. Results are displayed in Figure 2.[16] There are two main results. First, compared to the economy with no dollarization, the amplitudes of the responses are significantly higher for each level of institutional quality. Second, the leverage sensitivity effect dominates the financial accelerator effect, so that the output response is greater when μ is lower. This finding is exactly opposite to that in the previous section.

There are two factors that produce these different results. First, entrepreneurs' net worth now includes foreign instead of domestic interest rates and exchange rates:

$$V_{it} = R_{t}^{k}Q_{t-1}K_{it} - \left(s_{t}^{r}R_{t}^{*}F_{it} + \mu\int_{0}^{\overline{A}_{i}} A_{it}R_{t}^{k}Q_{t-1}K_{it}dF\left(A_{it}\right)\right) \tag{2.16}$$

This modification causes foreign interest rate shocks to be fully transmitted to entrepreneurs' net worth in contrast to the previous section where part of the external shock was absorbed by exchange rates. Furthermore, the depreciating currency has a negative effect on net worth by inflating the domestic currency value of the firms' loans. The larger negative impact on net worth causes a sharp increase in the external finance premium and a larger drop in investment following a sudden stop compared to the benchmark model.

Second, the relationship between the external finance premium and leverage is different. This can be seen more clearly from the linearized version of equation (2.15):

$$\tilde{EFP}_{t}^{*} = \alpha_{1f}\left(\mu, \overline{A}_{i}\right)\tilde{LEV}_{t} + \left(\tilde{s}_{t}^{r} - \tilde{s}_{t-1}^{r}\right) \tag{2.17}$$

[16] The figure shows a large fall in investment. Joyce and Nabar (2008) find empirically that for sudden stops to reduce investment, the banking system has to collapse following the withdrawal of funds by external depositors.

where $\alpha_{1f}'(\mu) > 0$, $\tilde{EFP}_t^* = \tilde{R}_t^k - \tilde{R}_t^*$ $\tilde{LEV}_t = \tilde{Q}_{t-1} + \tilde{K}_t - \tilde{N}_t$. In contrast to the benchmark model, exchange rates have an impact on the relationship between leverage and the external finance premium. Similarly, a capital reversal shrinks the wedge between the returns to capital and the risk free interest rates, prompting a drop in investment. However, investment falls by an additional amount to lower leverage and counteract the rise in foreign debt caused by the depreciation. Therefore, the drop in investment is more pronounced than in Section 2.3.

The second difference with a non-dollarized economy, which is more critical for our analysis, is that an increase in institutional quality produces a larger output drop. As explained above, leverage sensitivity of the external finance premium is low when institutional quality is high (i.e., α_{1f} is smaller in a HIQE). Since, compared to a non-dollarized economy a larger fall in investment is required, leverage sensitivity becomes more important. Therefore, the drop in investment in a HIQE is larger. In fact, under our calibration, the subsequent larger response of output is enough to overcome the weaker financial accelerator effect. Therefore, improvements in institutional quality increase vulnerability to sudden stops with liability dollarization.

2.5. Partial Dollarization - The Intermediate Case

In this section, we derive the relationship between institutional quality and liability dollarization by allowing for borrowing in both local and foreign currency. In the new economy, there are firms that borrow from abroad in foreign currency (Type 1) and firms that borrow domestically in local currency (Type 2).[17] Since agents are risk neutral, they are indifferent between borrowing in domestic or foreign currency as long as the interest parity condition holds. The firms produce two types of intermediate goods that are aggregated to produce the final good.

[17] Of course foreigners can also lend in local currency in foreign or domestic markets and lend in foreign currency in domestic markets. Similarly, domestic lenders can lend in foreign currency in domestic markets. What matters is the currency denomination of the loan, not the nationality of the lender. See the empirical section of the paper.

$$Y_t = \left(\lambda^d Y_{1t}^{\rho^d} + \left(1-\lambda^d\right) Y_{2t}^{\rho^d}\right)^{1/\rho^d} \tag{2.18}$$

where, $Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{1-\alpha}$, $\quad i = 1, 2$. Contracts with creditors differ by type of firm and yield:

$$\frac{E_{t-1}\left[\left(s_{t-1}^r / s_t^r\right) R_{1t}^k\right]}{R_t^*} = v\left(\frac{Q_{1t-1} K_{1t}}{N_{1t}}\right) : \text{ Type 1,} \qquad \frac{E_{t-1}\left(R_{2t}^k\right)}{R_t} = v\left(\frac{Q_{2t-1} K_{2t}}{N_{2t}}\right) : \text{Type 2}$$

We assume a higher bankruptcy cost coefficient, μ^*, for borrowing from abroad. In particular, we assume that there is a positive fixed wedge between the bankruptcy costs of domestic and foreign currency denominated loans equal to FC such that $\mu^* = \mu + FC$. We explain later why this assumption is critical to derive the non-linear relationship between bankruptcy costs and vulnerability to sudden stops. A significant number of papers (c.f. Iacoviello, Minetti, 2006; Rajan and Zingales, 1998; Hermalin and Rose, 1999) argue that bankruptcy costs are higher for foreign lenders. This difference is due to factors such as limited local experience and knowledge of foreign lenders, an inability to identify efficient borrowers due to a lack of a credit/relationship history, higher costs of additional information for foreign lenders , nationalistic bias in the legal system, and international capital flow barriers.

Due to arbitrage, the returns to capital for the two firms are equal such that $E_{t-1}\left(R_{1t}^k - R_{2t}^k\right) = 0$. This condition also implies that the external finance premiums for the two types of firms are equal, and that they are indifferent between borrowing in domestic and foreign currency. However, the price of capital and leverage are different for each type of firm.

$$E_{t-1}\left[Q_{it} / P_t^w - \left[\Phi'\left(I_{it} / K_{it}\right)\right]^{-1}\right] = 0, \quad \Phi'(\bullet) > 0, \;\; i = 1, 2 \tag{2.19}$$

Liability dollarization is the proportion of borrowing in foreign currency:

$$LD_t = s_t^r B_{1t} / \left(s_t^r B_{1t} + B_{2t}\right) \tag{2.20}$$

where LD_t represents liability dollarization and $B_{1t} = \left(Q_{1t-1}K_{1t} - N_{1t}\right)/ s_t^r$, $B_{2t} = \left(Q_{2t-1}K_{2t} - N_{2t}\right)$ are foreign and domestic currency borrowing, respectively. As before, the average bankruptcy cost as a percent of assets is set to 0.5, and average leverage is to set to 2. We further set liability dollarization to 39%, which matches Brazil's average for the years 2000 to 2006.[18] To obtain these values we set *FC*, μ, the share parameter, γ^d to 0.42, 0.2, and 0.41 respectively. Calibrating the substitution parameter ρ^d so that there is imperfect substitutability did not produce significant deviations from our results, therefore, $\rho^d = 1$. In our simulations, we deviate from this baseline calibration by altering only the bankruptcy coefficient. We then measure the response of output to foreign interest rate shocks for different values of μ.

An important characteristic of the non-stochastic steady state is the negative relationship between the bankruptcy cost coefficient and leverage. As expected, when bankruptcy costs fall firms reduce their leverage to counteract the effects on the external finance premium. In addition, as displayed in the left panel of Figure 3, we find that the relationship between the two variables is convex. The reason is that at high levels of bankruptcy costs, firms rely more on internal financing and reduce their chance of default significantly. The reduction in default probability decreases by more as external borrowing approaches zero. Furthermore, since, the marginal product of capital is higher at high levels of μ, the negative effect of an increase in bankruptcy costs on lenders expected return is counteracted by smaller drops in leverage.

As a consequence of this relationship between leverage and the bankruptcy cost coefficient, we find that higher bankruptcy costs correspond to higher liability dollarization. The

[18] Data on lending in foreign currency was absent for Brazil. Nevertheless, we were able to obtain share of corporate borrowing that was funded by external resources from Banco Central do Brasil, Financial System Statistics. This average ratio in the 2000-2006 period was equal to 38.8%. We should mention that we are omitting foreign currency lending by domestic institutions and domestic currency lending by foreign institutions by calibrating to this value. Alternatively, we considered the total foreign and domestic currency bonds/GDP ratios to proxy liability dollarization and calculated 40.5% share of foreign currency bonds in 2001. Calibrating to this value did not change our results significantly.

right panel of Figure 4 depicts this positive relationship. The intuition is as follows: when bankruptcy costs are high, the difference between the leverage of the two types of firms is small despite the wedge, *FC*, and liability dollarization is relatively high. However, when bankruptcy costs are low, due to the convex relationship between μ and leverage, the difference in bankruptcy costs, *FC*, plays a more important role. Specifically, the risk premium on domestic borrowing is much lower than on foreign borrowing, thus liability dollarization is relatively low.

Therefore, by calibrating to different levels of μ, we also set the level of dollarization in the economy, which in turn alters the relationship between vulnerability to sudden stops and recovery costs. Figure 4 shows the output responses to a 100 basis point positive shock to foreign interest rates for different values of μ. We can see from the bottom figure that for high values of μ (low institutional quality), a reduction in μ (an improvement in quality) increases the vulnerability to sudden stops. For high values of μ, there is enough liability dollarization for the leverage sensitivity effect to dominate the financial accelerator effect. A fall in μ, however, also results in less liability dollarization so that the financial accelerator effect becomes relatively more important. In fact, below a certain value of μ, vulnerability to sudden stops starts to diminish, as depicted in the top panel. Figure 5 summarizes this non-linear relationship between output responses and recovery costs. We measure vulnerability to sudden stops with the maximum amplitude of the output response to a 100 annualized basis points increase in foreign interest rates. If we further proxy institutional quality with recovery costs, the figure reveals an inverted U-Shaped relationship between institutional quality and vulnerability to sudden stops.

2.6 Sensitivity Analysis

In this section we check the sensitivity of our results to different parameter values. Figure 6 displays the results. So far we have assumed that the central bank operates a flexible exchange rate. Under a fixed exchange rate, where $R_t = R_t^*$, however, we no longer obtain an inverted U-shaped curve, as depicted in the top panel of Figure 6. This is not surprising since Type 1 agents face the same contract as Type 2 when the exchange rate is fixed, notwithstanding the fixed cost wedge between the two bankruptcy costs. Therefore, the leverage sensitivity effect no longer dominates the financial accelerator effect when recovery costs are high, as leverage does not have to fall further to compensate for the depreciating currency. Furthermore, since interest rates are increased more aggressively under a fixed regime, the financial accelerator effect is amplified. Thus, we find that under a fixed exchange rate, improving institutions unambiguously reduces vulnerability to sudden stops. Another noteworthy observation is that the benchmark Taylor rule does a better job of insulating the economy from external shocks for every value of μ.

It has been shown that including habit persistence in standard RBC models significantly improves their ability to account for stylized facts (Boldrin, Christiano, and Fisher, 2001). However, habit persistence is not included in the studies we referred to, and output responses of our model may be insignificant once we exclude this mechanism. As can be seen in the middle panel of Figure 6, shutting habit persistence off does not affect our results significantly. Output responses decrease at most by approximately 0.1 percent with this modification.

We initially calibrated the fixed cost wedge parameter, *FC*, to match the level of dollarization in the economy. This is an important parameter that determines the relative strength of the financial accelerator and leverage sensitivity effects. Because we do not have an empirical estimate for this fixed cost, we calibrate *FC* to two other values and report the results in the bottom panel of Figure 6. As can been seen, when *FC* is smaller (larger), the U-Curve reaches its maximum at a smaller (larger) value of μ. This reflects a higher (lower) level of investment and borrowing by Type 1 agents and, therefore, a higher (lower) share of liability dollarization. Since the higher (lower) level of liability dollarization increases (decreases) the strength of the leverage sensitivity effect, the turning point on the U-Shaped curve is observed for smaller (larger) values of μ. Also, the higher share of dollarization has an amplifying effect.

3. Empirical Analysis

The model makes a number of predictions about the effects of the bankruptcy cost coefficient on liability dollarization, firm leverage, and the output loss following a sudden stop. In this section, we provide empirical evidence for these links. The key variable in all these relationships is the bankruptcy cost coefficient. The World Bank's Doing Business database provides data on the recovery rate, defined as "how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm." In the model, this variable corresponds to one minus the bankruptcy cost coefficient.

Figure 3 depicts a negative relationship between the bankruptcy cost and firm leverage. We therefore test for a positive relationship between the recovery rate and firm leverage. We estimate the following cross-sectional regression:

$$LEVERAGE_i = \alpha + \beta \cdot RECOVERY_i + \varepsilon_i \tag{3.1}$$

where $LEVERAGE_i$ is equal to the average leverage ratio of firms in each country for 2005-2007. Data is from Mergent online. Because the number of firms used to calculate the average varies by country, we estimate this model using weighted least squares. Data for *RECOVERY* are for 2005 since some firms only report leverage for 2005. Results are presented in Table 1. The coefficient of *RECOVERY* is significant at the 1% level and implies that a 1 percentage point increase in the recovery rate leads to a 0.57 percentage point increase in leverage.

We also provide evidence for the leverage sensitivity effect. When recovery rates are high, creditors are less affected by bankruptcy and therefore leverage plays a small role compared to the risk free rate in determining external finance rates. Thus, the higher the recovery rate, the less sensitive is the external finance premium to firm leverage. To test this implication of the model, we estimate the following model:

$$RISKPREM_i = \alpha + \beta_0 \cdot LEVERAGE_i + \beta_1 \cdot LEVERAGE_i \cdot RECOVERY_i + Controls_i \cdot \delta + \varepsilon_i \qquad (3.2)$$

The dependent variable is the "interest rate (%) charged by banks on loans to prime private sector customers minus the 'risk free' treasury bill interest rate at which short-term government securities are issued or traded in the market." To maximize the sample size, we take the average over the years 2005 to 2007 for each country since some countries only have data for a single year. Data are obtained from the World Bank's *World Development Indicators* and the Emerging Market Bond Spread (EMBS). As a control variable, we include private credit provided by domestic banks and other financial institutions as a percent of the market capitalization of domestic firms (Collin-Dufresne, et al., 2001). The results are given in Table 2. In both columns, the interaction term is negative and significant, implying that the effect of leverage on the risk premium is smaller in countries with higher recovery rates. The coefficient, however, is rather small and implies that an increase in the recovery rate from 0% to 100% reduces the impact of leverage by only 0.4 percentage points.

The right panel of Figure 3 depicts a positive relationship between the bankruptcy cost and liability dollarization. Equivalently, there is a positive relationship between the recovery rate and *local* currency borrowing. Specifically, the model predicts that an increase in the recovery rate will increase both local currency and foreign currency lending, but that the former increases relative to the latter. In the model, we make the assumption that all foreign borrowing is denominated in foreign currency, and all domestic borrowing is denominated in domestic currency. In that case, liability dollarization and the proportion of firm borrowing from foreign lenders are equivalent. If that were the case, then to test this relationship we could estimate the effect of recovery rates on either variable. The two, however, are not necessarily the same. While it is true that for most countries, foreign borrowing is denominated in foreign currency, there is greater variation in the degree to which bonds issued in domestic debt markets are denominated in local currency.[19] Since it is ultimately the extent of local-currency-denominated debt that reduces currency risk, we focus on the effect of recovery rates on this variable, as opposed to the proportion of borrowing from foreign lenders.

To verify that higher recovery rates increase the size of local currency relative to foreign currency domestic bond markets, we estimate the following cross-sectional regression:

$$LCBGDP_i - FCBGDP_i = \alpha + \beta \cdot RECOVERY_i + Controls_i \cdot \delta + \varepsilon_i \tag{3.3}$$

LCBGDP and *FCBGDP* are the amount of local currency and foreign currency bonds outstanding as a percent of GDP, respectively. Data are as of end-2001 and are taken from Table 1 of Burger and Warnock (2006), who use unpublished BIS data supplemented with data from Bloomberg. Local currency bonds are those issued by residents of a particular country in that country's currency, regardless of whether it was placed in the domestic market or abroad. For the overwhelming majority of countries, however, most local currency bonds are issued at home, which matches the assumption in the model.[20]

We also consider the percent of total bonds, including both those issued at home and abroad, that are denominated in domestic currency. *LCBSHARE* gives the local currency share of total bonds. This variable, however, does not capture local currency bond market development. For example, two countries could have the same local currency share, but if one

[19] Eichengreen et al. (2002) and Hausmann and Panizza (2003) find that most countries are unable to borrow from abroad in their own currency, regardless of macro policy or institutional quality, a phenomenon known as (external) original sin. Burger and Warnock (2006), however, find that both macro policy and institutional quality increase the size of local currency bond markets.

[20] Even if this were not the case and foreign lenders provide local currency finance either from abroad or in domestic markets, *LCBGDP* still measures exposure to currency risk as it captures the ability to borrow in local currency.

has a larger local currency bond market relative to GDP and therefore relies less on foreign-currency-denominated foreign borrowing, she is less vulnerable to an exchange rate depreciation.

Data for *RECOVERY* are for 2003, while the dependent variable is taken as of end-2001. However, there is little time series variation in the recovery rate from 2003 to 2007, and so 2003 data are most likely a good representation of earlier values for this variable.

Following Ize and Levy-Yeyati (2003), we include as a control variable the dollar share of the minimum variance portfolio calculated over the previous five years (1996-2000).[21] They argue that with strict interest parity, dollarization will be the result of the relative volatilities of the real exchange rate and inflation. The share of dollar lending then becomes the proportion of dollar loans in the minimum variance portfolio (MVP). We add trade as a percent of GDP to explain dollarization relative to the size of the economy. It can be argued that dollarization is a natural consequence of increased trade and integration as exporters and importers require more foreign currency for their businesses, thus creating a need for dollar accounts.

Table 3 presents the results. The coefficient of *RECOVERY* in the first column is large and significant, implying that a one percentage point increase in the recovery rate leads to a 0.6 percentage point increase in the ratio of local currency bonds to GDP. In the domestic context, therefore, original sin is a misnomer institutional quality can stimulate local currency bond market development (Jeanne, 2003). The effect on foreign currency bonds is positive but smaller and less significant (p-value=0.109). Not surprisingly, greater recovery rates increase local currency lending relative to foreign currency lending, confirming the predictions of the model.[22] In the fourth column, however, the coefficient of *RECOVERY* is positive but insignificant in predicting the local currency share (as opposed to when we scale by GDP, an increase in the

[21] This is calculated as 100*[VAR(inflation) + COV(inflation, real exchange rate depreciation)] / [VAR(inflation) + VAR(real exchange rate depreciation) + 2COV(inflation, real exchange rate depreciation)].
[22] We obtain similar results using the regressors in Burger and Warnock (2006).

local currency share implies a decrease in the foreign currency share). As mentioned above, however, this variable is not necessarily a good measure of exposure to currency risk.

We also examine whether higher recovery rates increase local currency relative to foreign currency lending in the domestic banking system as opposed to the bond market. We use the database constructed in Honig (2008b) which provides data on domestic banking system dollarization for the years 1998 to 2000. Data are limited to emerging markets and developing nations. In addition, data for foreign currency loans provided by domestic banks to domestic firms are far less available than foreign currency deposits in domestic banks. In fact, using foreign currency credit as the dependent variable results in an insufficient number of observations. We use foreign currency deposits instead as a proxy. This is reasonable since banks typically match foreign currency deposits with foreign currency loans (Honohan and Shi, 2003). One reason is that there are often regulations in emerging market countries requiring banks to limit currency mismatches on their balance sheets (Calvo and Mishkin, 2003). As a result, the median level of bank dollar mismatch, defined as dollar deposits minus dollar credit divided by total liabilities, is close to zero. We estimate the following cross-sectional regression:

$$LCDGDP_i - FCDGDP_i = \alpha + \beta \cdot RECOVERY_i + Controls_i \cdot \delta + \varepsilon_i \qquad (3.4)$$

LCDGDP and *FCDGDP* are local currency deposits as a percent of GDP and foreign currency deposits as a percent of GDP, respectively. As before, we scale by GDP to capture the development of local currency lending. As an alternative dependent variable, we consider *LCDSHARE*, which is defined as local currency deposits as a percent of total deposits. We take the average of the dependent variable from 1998 to 2000 to maximize the number of countries in the sample (data are often available for only one of the years but not the remaining two).

Again, we include as controls the dollar share of the minimum variance portfolio, now calculated over the years 1993-1997, and the average ratio of trade to GDP calculated over the same period. Because there may be restrictions that affect dollar deposits, we also include a variable that controls for the regulatory environment. We construct a dummy variable based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* that indicates whether a country allows residents' dollar deposit accounts with only minor restrictions as opposed to either severely restricting them or prohibiting them outright (Arteta, 2005).

The results are presented in Table 4. As in the bond market, an increase in the recovery rate increases both local currency lending as a percent of GDP and local currency lending relative to foreign currency lending, scaled by GDP. Unlike the bond market, however, there is a significant effect on local currency lending as a percent of total lending. As in Ize and Levy-Yeyati (2003), an increase in the dollar share of the minimum variance portfolio reduces local currency lending relative to GDP and to total deposits. It also reduces local currency relative to foreign currency lending as a percent of GDP. Allowing dollar deposits encourages deposit dollarization and therefore reduces the share of local currency deposits. Finally, Figure 5 depicts an inverted U-shaped relationship between the recovery rate and the output loss following a sudden stop. To test this prediction, we estimate the following cross-sectional regression:

$$GROWTHSS_i = \alpha + \beta_1 \cdot RECOVERY_i + \beta_2 \cdot RECOVERY_i^2 + Controls_i \cdot \delta + \varepsilon_i \qquad (3.5)$$

To classify observations as sudden stops, we follow the algorithm in Frankel and Cavallo (2004), updating their data through 2004. A sudden stop occurs in year "t," if the fall in the financial account surplus (from period "t-1") of country "i" exceeds twice the standard deviation of the financial account surplus, the current account deficit falls by any amount either in "t" or in "t+1", and GDP per capita falls by any amount either in "t" or in "t+1." A sudden stop is therefore a large fall in net capital inflows (i.e. a reduction in the financial account surplus) that is accompanied by a reduction in the current account deficit and by a contraction in output. The requirement that GDP per capita falls is necessary because in some cases, a decline in the financial account surplus may be the natural result of a positive terms of trade shock that provides an additional source of funding (Calvo et al., 2004). More importantly, however, this restriction limits attention to *costly* sudden stops, which is of far greater interest.

To construct the dependent variable, we first take the average growth rate during the year of a sudden stop and the year after, which we define as a sudden stop *episode*.[23] Including the year after the initial reversal in capital flows captures the fact that there can be and often is a lagged response of output. It is also possible that sudden stops occur late in the year and therefore do not have sufficient time to affect GDP growth in the same year. However, because data for recovery rates are taken from 2003 only, and because our sudden stop data begins in 1982 and ends in 2004, we average GDP growth *again* over all sudden stop episodes during this sample period. This results in one observation per country. Of course recovery rates in 2003 might not be a good proxy for earlier data. However, the fact that there is little time series variation from 2003 to 2007 suggests that perhaps this is not a large issue. For the control variables, we average over the sample period the values in the year before each sudden stop.

The regressors are standard in the empirical literature on sudden stops (c.f. Calvo, 2003; Calvo et al., 2002, 2004; Edwards, 2004; Frankel and Cavallo, 2004; Guidotti et al., 2004). We follow Frankel and Cavallo (2004) and include the ratio of foreign liabilities of deposit money banks to M1, the ratio of trade to GDP, the log of reserves in months of imports, and the ratio of short-term debt to external debt. Results were similar when we included the CA balance as a

[23] This means that we include only countries that have experienced at least one sudden stop during the sample period.

percent of GDP, the log of real GDP per capita, the ratio of foreign direct investment to GDP, the ratio of public debt to GDP, and the external debt of the public and private sector.

Table 5 presents the results. In the first column, we estimate equation (3.2) by OLS. In the second column, we eliminate observations during sudden stop episodes in which growth is positive before we take the average over the sample period.[24] Because this censors the dependent variable above at zero, we estimate a Tobit model. Both columns indicate an inverted U-shaped relationship between the recovery rate and $(-1)\cdot GROWTHSS_i$ following a sudden stop.[25] The coefficients are both individually and jointly significant, Thus, beginning at low levels of the recovery rate, an increase in the rate initially increases the output loss during a sudden stop. Eventually, however, the output loss begins to fall for higher values of the recovery rate. Further calculations reveal that the hump in the relationship occurs at a recovery level of 30.3, which is slightly less than the average of 36.7. Therefore, for a significant number of countries, an increase in the recovery rate augments the output loss.[26] Finally, in unreported regressions, we estimate the same model but use non-sudden stop episodes as a control group. The inverted U-shaped relationship does not hold in this sample. We find that trade openness reduces and greater share of short term debt augments the contractionary effect of sudden stops. The other variables have the expected sign but are insignificant. The exception is external debt, which has a positive effect on growth.

[24] In our definition of sudden stops, growth is required to be negative in year t or t+1. Therefore, it is possible for there to be positive values of growth during sudden stops episodes. As discussed above, this can occur if there is a lagged response of output to the capital flow reversal so that growth is still positive in year t of the sudden stop.

[25] Honig (2008a) finds a similar non-linear relationship between a more general institutional quality variable (an average of law and order, corruption, and bureaucracy quality) and the *frequency* of sudden stops.

[26] To test the mode's implication that an increase in the recovery rate reduces the output loss during a sudden stop to the right of the hump by reducing liability dollarization, we could include local currency bond market development as a regressor. If the hypothesis is correct, then controlling for this variable should eliminate the downward sloping part of the inverted U-shaped relationship and leave only the upward sloping part. In other words, adding this variable should make the coefficient of $RECOVERY^2$ insignificant. When we include this variable, the quadratic term remains significant. However, the addition of local currency bond market development shrinks the sample size to 14 countries. In addition, the quadratic relationship can still hold if there are other effects of the recovery rate not included in the model that mitigate the fall in growth during a sudden stop.

4. Conclusion

Emerging market countries that have experienced initial improvements in institutional quality have in the process also become more vulnerable to sudden stops. This result is surprising and breaks with the widespread literature on the benefits of good institutions. Advanced economies with strong institutions, on the other hand, do not suffer large drops in output during capital reversals. These two observations imply a non-linear effect of institutional quality on the contractionary impact of sudden stops. In this paper, we provide a theoretical explanation for this relationship using a DSGE model for a small open economy. To derive this relationship, we first analyze the direct effects of an improvement in institutional quality. A reduction in the bankruptcy cost coefficient, our indicator of institutional quality, weakens the financial accelerator effect during a sudden stop, leading to a smaller drop in output. However, lower bankruptcy costs also reduce the sensitivity of the external finance premium to leverage, requiring a larger fall investment in response to a capital reversal. This leverage sensitivity effect plays a critical role in the model, and we provide empirical evidence that it exists. We then show that the relative strengths of these two effects depend on the level of liability dollarization. When liabilities are heavily dollarized, the second effect dominates, so that lower bankruptcy costs actually magnify the output loss during sudden stops.

When we further model a causal effect of bankruptcy costs on liability dollarization, which we verify empirically, simulations yield an inverted U-shaped relationship between institutional quality and the negative of growth during sudden stops. Finally, empirical evidence from sudden stop episodes over a 23 year period also reveal the non-linear effect. Thus we demonstrate both theoretically and empirically that the effect of institutional improvement on risk is ambiguous and depends on the initial level of institutional quality.

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Table 1: Equation 3.1 - Leverage and the Recovery Rate

Dependent variable:	*LEVERAGE*
RECOVERY	0.567
	(5.53)***
Obs., Countries	45
R^2	0.42

* significant at 10%; ** significant at 5%; *** significant at 1%.

Notes: Cross-section regression estimated by Weighted Least Squares (WLS) where the weight is based on the number of firms in each country that is used to calculate the average leverage ratio. *LEVERAGE* = average leverage ratio of firms in each country for the years 2005 to 2007. *RECOVERY* (2003) - how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm. Robust t-statistics in parentheses.

Table 2: Equation 3.2 - Leverage Sensitivity Effect

Dependent variable:	*RISKPREM*	*RISKPREM*
LEVERAGE	0.245	0.245
	(1.680)	(1.680)
*LEVERAGE*RECOVERY*	-0.003	-0.004
	(2.70)**	(2.83)***
Private Credit /		0.000
Market Capitalization		(0.080)
Obs., Countries	34	33
R^2	0.28	0.32

* significant at 10%; ** significant at 5%; *** significant at 1%.

Notes: Cross-section regressions estimated by Weighted Least Squares (WLS). *RISKPREM* - interest rate (%) charged by banks on loans to prime private sector customers minus the 'risk free' treasury bill interest rate at which short-term government securities are issued or traded in the market; average 2005 to 2007. *LEVERAGE* = average leverage ratio of firms in each country for the years 2005 to 2007. *RECOVERY* - how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm; average 2005 to 2007. Private Credit / Market Capitalization - private credit provided by domestic banks and other financial institutions as a percent of the market capitalization of domestic firms. Robust t-statistics in parentheses.

Table 3: Equation 3.3 - The Recovery Rate and Local Currency Borrowing in the Domestic Bond Market

Dependent variable:	*LCBGDP*	*FCBGDP*	*LCBGDP-FCBGDP*	*LCBSHARE*
RECOVERY	0.619	0.108	0.510	0.050
	(3.19)***	(1.640)	(2.41)**	(0.430)
Dollar Share MVP	-0.097	-0.043	-0.054	-0.187
(1996-2000)	(0.460)	(0.860)	(0.220)	(1.230)
Trade % of GDP	-0.017	0.042	-0.059	-0.041
(1996-2000)	(0.120)	(1.130)	(0.420)	(0.710)
Obs., Countries	45	45	45	45
R^2	0.20	0.14	0.13	0.09

* significant at 10%; ** significant at 5%; *** significant at 1%.

Notes: Cross-section regressions estimated by Ordinary Least Squares (OLS). *LCBGDP* (end-2001) - local currency bonds % of GDP. *FCBGDP* (end-2001) - foreign currency bonds % of GDP. *LCBSHARE* (end-2001) - local currency bonds % of total bonds. *RECOVERY* (2003) - how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm. Dollar Share MVP - dollar share of the minimum variance portfolio (Ize and Levy-Yeyati, 2003). Robust t-statistics in parentheses.

Table 4: Equation 3.4 - The Recovery Rate and Local Currency Borrowing in the Domestic Banking System

Dependent variable:	*LCDGDP*	*FCDGDP*	*LCDGDP - FCDGDP*	*LCDSHARE*
RECOVERY	0.264	-0.082	0.346	0.310
	(1.92)*	(1.030)	(2.64)**	(2.11)**
Dollar Share MVP	-0.165	-0.024	-0.141	-0.199
(1993-1997)	(3.65)***	(0.610)	(3.66)***	(3.56)***
FC Deposits Allowed	-3.979	5.044	-9.023	-10.695
(1993-1997)	(0.640)	(2.21)**	(1.420)	(1.98)*
Trade % of GDP	0.105	0.095	0.010	-0.064
(1993-1997)	(1.120)	(1.140)	(0.120)	(0.690)
Obs., Countries	64	64	64	64
R^2	0.28	0.10	0.29	0.29

* significant at 10%; ** significant at 5%; *** significant at 1%.

Notes: Cross-section regressions estimated by Ordinary Least Squares (OLS). *LCDGDP* (avg. 1998-2000) - local currency deposits % of GDP. *FCDGDP* (avg. 1998-2000) - foreign currency deposits % of GDP. *LCDSHARE* (avg. 1998-2000) - local currency deposits % of total deposits. *RECOVERY* (2003) - how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm. Dollar Share MVP - dollar share of the minimum variance portfolio (Ize and Levy-Yeyati, 2003). FC Deposits Allowed - foreign currency deposits allowed (Arteta, 2005). Robust t-statistics in parentheses.

Table 5: Equation 3.5 - Growth during a sudden stop episode

Dependent variable: *GROWTHSS*		
	OLS	Tobit (censored above at 0)[a]
RECOVERY	-0.242	-0.276
	(2.37)**	(2.40)**
$RECOVERY^2$	0.004	0.004
	(2.00)*	(2.12)**
Foreign liabilities/	-0.001	-0.001
M1 (%)	(1.230)	(1.190)
Trade/GDP (%)	0.052	0.052
	(2.83)***	(2.82)***
log total reserves	0.585	0.685
months of imports	(1.050)	(1.270)
External debt	0.018	0.016
/GDP (%)	(1.73)*	(1.370)
Short-term debt	-0.120	-0.127
/total external debt (%)	(2.77)**	(2.98)***
Obs., Countries	32	32
F test for *RECOVERY*[b]	0.04	0.02
R^2	0.50	n.a.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Notes: Cross-country regression. *GROWTHSS* - Average over 1982 to 2004 of the average growth rate during year t and t+1 of a sudden stop. *RECOVERY* (2003) - how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm. Private Credit / Market Capitalization - private credit provided by domestic banks and other financial institutions as a percent of the market capitalization of domestic firms. Robust t-statistics in parentheses.

[a] Individual growth rates during sudden stops are censored above at zero before the average is taken.

[b] p-value for joint significance of *RECOVERY* and $RECOVERY^2$

Figure 1: Impulse Responses to a 100 Annualized Basis Point Increase in Foreign Interest Rates
(Benchmark Model)

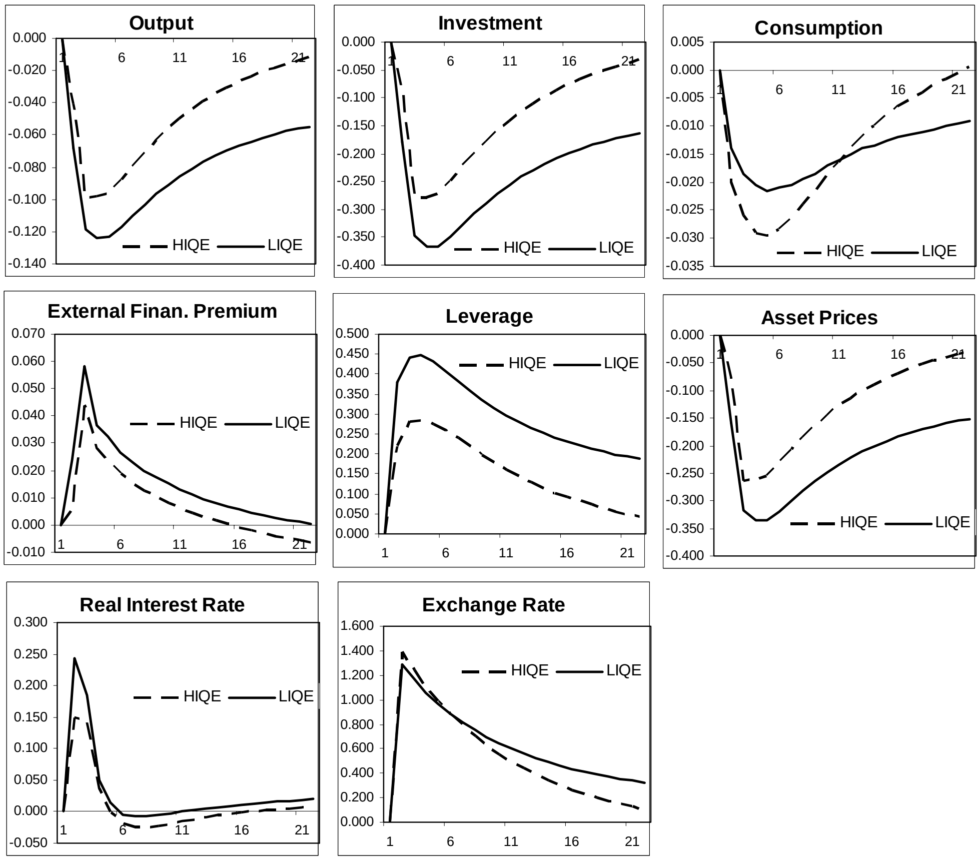


Figure 2: Impulse Responses to a Annualized 100 Basis Point Increase in Foreign Interest Rates
(Liability Dollarized Economy)

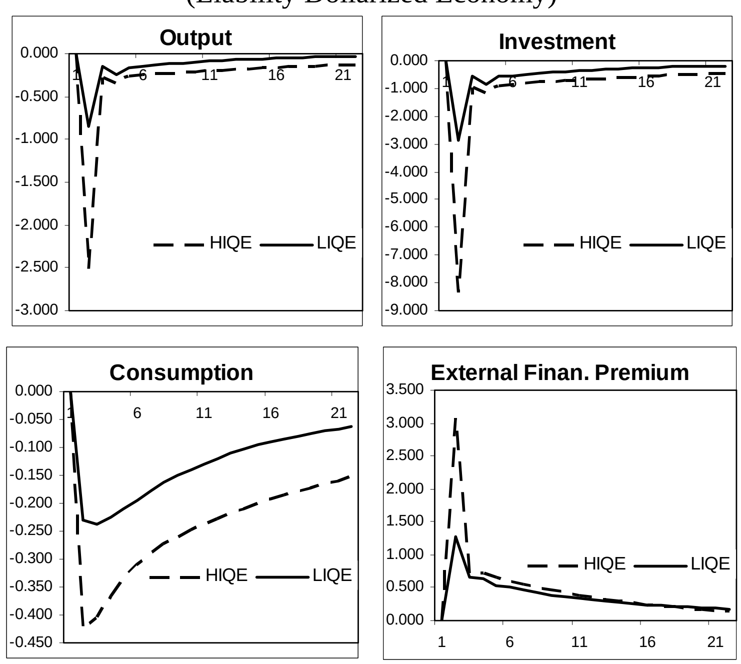


Figure 3: Steady State Relationship between Leverage, Bankrup.Costs & Liability Dollar.

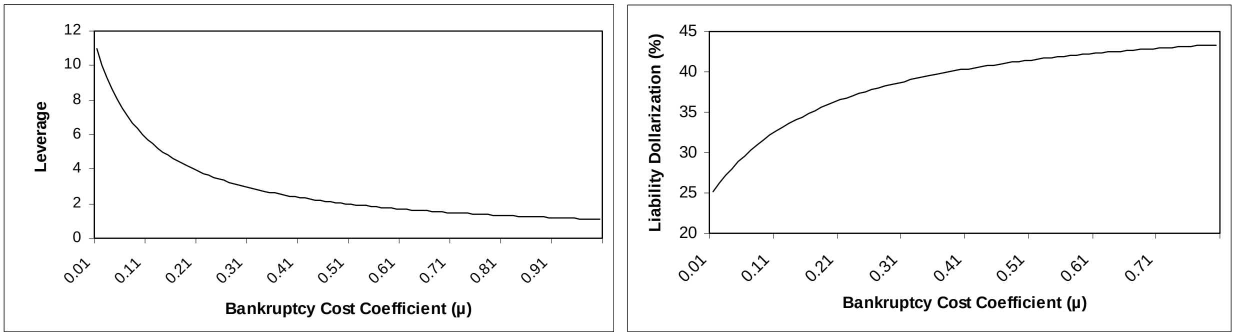


Figure 4: Output Responses to a 100 basis point positive Shock to Foreign Interest Rates
(For Different Levels of the Bankruptcy Cost Coefficient)

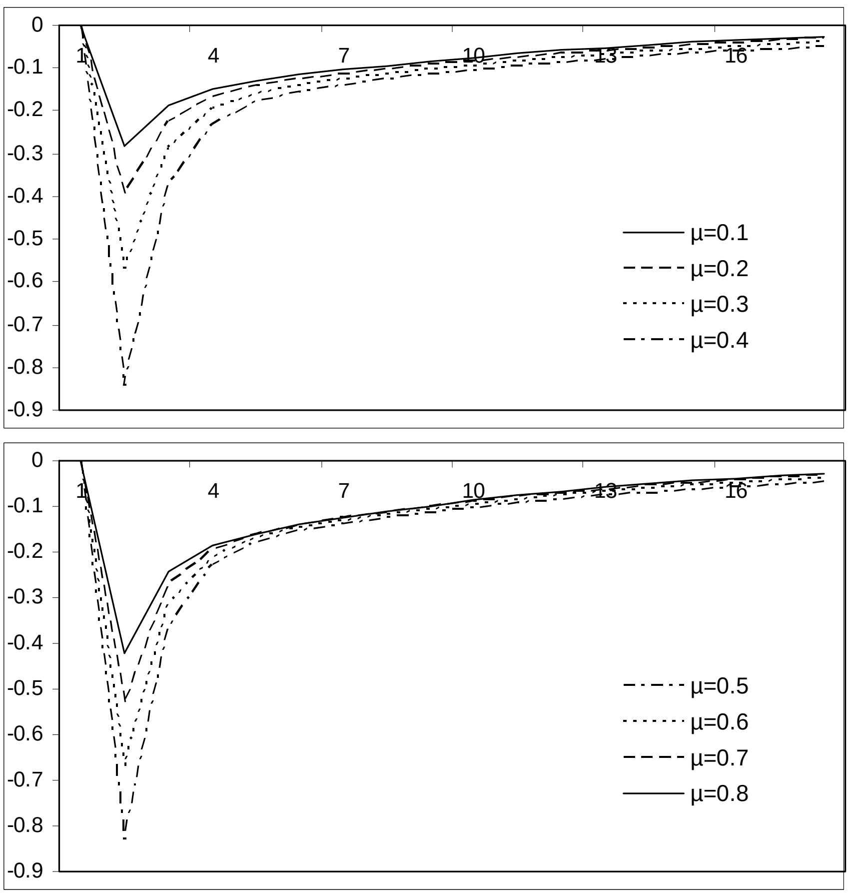
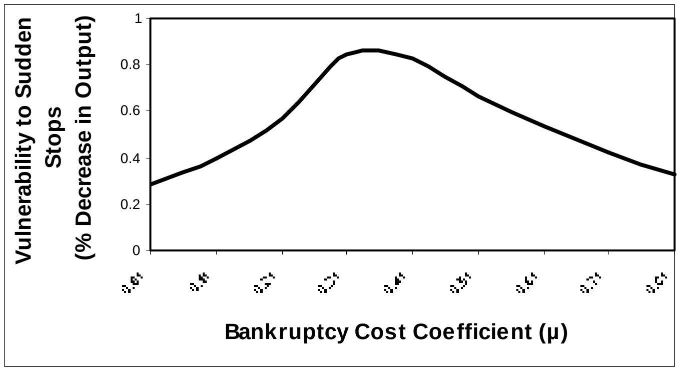
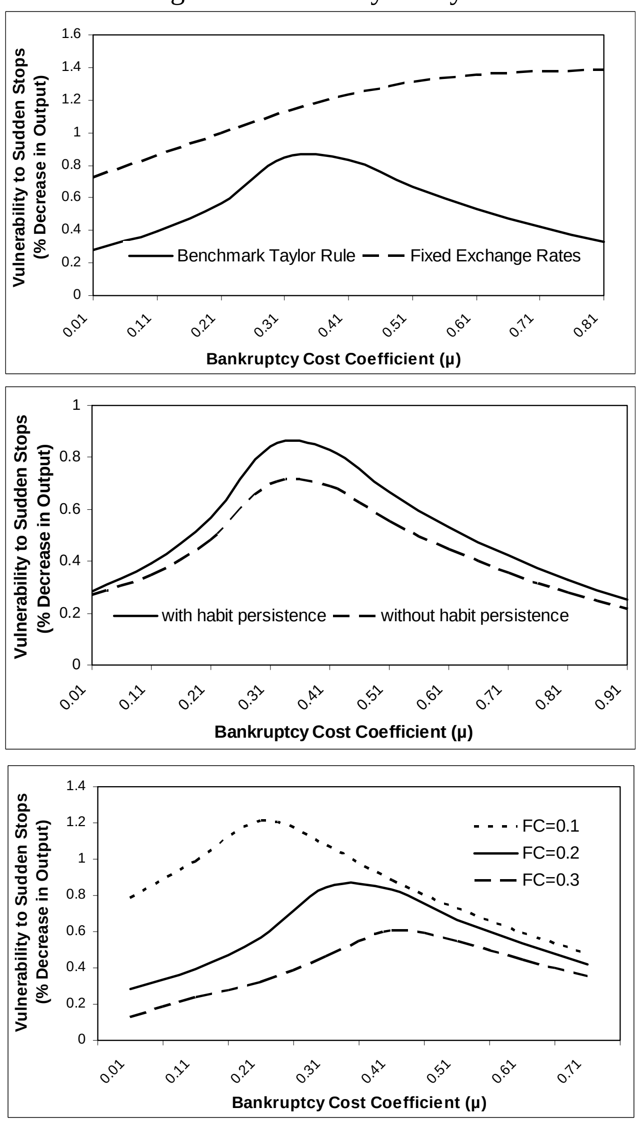


Figure 5: Relationship between Vulnerability to Sudden Stops and Bankruptcy Costs (*)



(*) Vulnerability to Sudden Stops represents the maximum amplitude of the negative output response to a 100 basis point increase in foreign interest rates corresponding to the level of each bankruptcy cost coefficient.

Figure 6: Sensitivity Analysis



(*) Vulnerability to Sudden Stops represents the maximum amplitude of the negative output response to a 100 basis point increase in foreign interest rates corresponding to the level of each bankruptcy cost coefficient.

Appendix A: The Rest of the Model

Aggregate production function is given by, $Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$, where the labor input $L_t = \left(L_t^h\right)^{\omega}\left(L_t^e\right)^{1-\omega}$ is a composite of household's and entrepreneurs labor supply. This modification is needed to provide some net worth to entrepreneurs that start producing for the first time. In our simulations ω is set equal to 0.05 and entrepreneurs' labor supply decision does not affect output significantly. The following sections describe the agents in the economy.

A.1 Households

Households consume a composite good, C_t; a CES aggregation of domestic and foreign goods, C_t^H and C_t^F respectively, where, C_t^H is a composite of the goods sold by the retailers.

$$C_t = \left[(\gamma)^{\frac{1}{p}}\left(C_t^H\right)^{\frac{p-1}{p}} + (1-\gamma)^{\frac{1}{p}}\left(C_t^F\right)^{\frac{p-1}{p}}\right]^{\frac{p}{p-1}} \tag{A.1}$$

The corresponding price index is given by, $P_t = \left[(\gamma)\left(P_t^H\right)^{1-p} + (1-\gamma)\left(P_t^F\right)^{1-p}\right]^{\frac{1}{p-1}}$. Households exhibit habit formation and maximize,

$$E_t\left[\sum_{i=0}^{\infty}\beta^i\left[\left(C_{t+i} - bC_{t+i-1}\right)^{1-\Omega}/1-\Omega + x\ln\left(M_{t+i}/P_{t+i}\right) - k\ln\left(1-L_{t+i}^h\right)\right]\right] \tag{A.2}$$

$$\text{s.t}\, C_t + \left(M_t + (1+R_{t-1})D_{t-1} + (1+R_{t-1}^*)s_t D_{t-1}^*\right)/P_t + T_t = \left(W_t^h L_t^h + M_{t-1} + D_t + s_t D_t^*\right)/P_t + \Pi_t \tag{A.3}$$

Consumers buy goods, hold money, M_t, pay lump sum taxes, T_t. Their income comes from wages, profits received from the retailers, Π_t, the returns on deposits, and their money holdings. Furthermore, consumers can borrow in terms of foreign currency at the risk free interest rate R_t^* , or in domestic currency at an interest rate R_t . Nominal foreign and domestic debt payments are denoted by $(1+R_{t-1})D_{t-1}$ and $(1+R_{t-1}^*)s_t D_{t-1}$ respectively, and s_t represents the exchange rate. Given this setup, the first order conditions are derived from the consumer's optimization problem. Consumption allocation and intertemporal efficiency:

$$\frac{C_t^H}{C_t^F} = \frac{\gamma}{1-\gamma}\left(\frac{P_t^H}{P_t^F}\right)^{-p} \tag{A.4}$$

$$\lambda_t \frac{W_t^h}{P_t} = k\frac{1}{1-L_t^h} \tag{A.5}$$

marginal utility of consumption and intermtemporal efficiency:

$$\lambda_t = \left(C_t - bC_{t-1}\right)^{-\Omega} - \beta b\left(C_{t+1} - bC_t\right)^{-\Omega} \tag{A.6}$$

$$\lambda_t = \beta E_t\left(\lambda_{t+1}(1+R_t)P_t / P_{t+1}\right) \tag{A.7}$$

uncovered interest parity condition, law of one price, and foreign demand for home goods is:

$$E_t\left(\lambda_{t+1}\frac{P_t}{P_{t+1}}\left[(1+R_t)-(1+R_t^*)\frac{s_{t+1}}{s_t}\right]\right) = 0 \tag{A.8}$$

$$P_t^H = s_t P_t^{H*}, \quad P_t^F = s_t P_t^{F*} \tag{A.9}$$

$$C_t^{H*} = \left(\frac{P_t^{H*}}{P_t^*}\right)^{-\varepsilon} Y_t^* \tag{A.10}$$

where P_t^{F*} P_t^{H*}, are the foreign price of home and foreign goods and P_t^{F*}=1 in every period. Y_t^* is foreign income, and the foreign aggregate price level P_t^* is exogenously determined.

A.2 Entrepreneurs

Wholesale firms are managed by entrepreneurs and produce according to:

$$Y_{it} = A_t K_{it}^{\alpha} L_{it}^{1-\alpha} \tag{A.11}$$

where A_t is an i.i.d. aggregate productivity shock. Capital expenditures are financed by banks and the entrepreneurs' net worth such that,

$$Q_{t-1}K_{it} = N_{it} + B_{it} \qquad \text{(A.12)}$$

where N_{it} is the net worth of the firm at the end of period t-1 and at the beginning of period t, B_{it} denotes the funds borrowed from the banks, and Q_{t-1} is the price of assets in period t-1. In the benchmark model we assume that households' domestic deposits equal the aggregate borrowing requirement of the entrepreneurs such that $B_t = D_t / P_t$. In addition to the economy wide technology shock, entrepreneurs face idiosyncratic, iid, returns to capital shocks, A_{it}. Real returns to capital are composed of A_{it} and the real return, averaged across firms, R_t^k.

$$R_{it}^k = A_{it}\left(\alpha \frac{P_t^w A_t K_t^\alpha L_t^{1-a}}{P_t} + (1-\delta)\frac{Q_t}{P_t}\right) / \frac{Q_{t-1}}{P_{t-1}} = A_{it} R_t^k \qquad \text{(A.13)}$$

P_t^w is the price of the wholesale good, and P_t is the price level. Firms hire labor according to:

$$(1-\alpha)\omega \frac{Y_t}{L_t} = \eta_t \frac{W_t^h}{P_t}, \quad (1-\alpha)(1-\omega)\frac{Y_t}{L_t} = \eta_t \frac{W_t^e}{P_t} \qquad \text{(A.14)}$$

where $\eta_t = P_t / P_t^w$ and $1/\eta_t$ represents the relative price of wholesale goods.

A.3 Capital Producers

There are increasing marginal costs to capital production. The capital stock evolves according to:

$$K_{t+1} = \Phi(I_t / K_t)K_t + (1-\delta)K_t \qquad \text{(A.15)}$$

Capital producers are perfectly competitive. They use wholesale goods as inputs to produce capital according to the production function: $\Phi(I_t / K_t)K_t$. The price of capital goods is derived from the producers' profit maximization problem. The final component of the accelerator mechanism is given by equation (A.16).

$$E_{t-1}\left[Q_t / P_t^w - [\Phi'(I_t / K_t)]^{-1}\right] = 0 \qquad \Phi'(\bullet) > 0 \qquad \text{(A.16)}$$

If entrepreneurs experience a positive asset price shock, they borrow more and demand more capital. This leads to an increase in their expected net worth for the following period. In addition, as investment increases, there is upward pressure on asset prices, amplifying the initial response.

A.4 Retail Firms

Retail firms are monopolistically competitive. They buy wholesale goods and sell them after repackaging at no resource cost. The purpose of including these firms at this stage is to have a simple contract between the firm and the banking sector.[27] The other benefit of this framework is that it allows for sticky prices and therefore monetary policy that is not neutral in the short run. The demand for goods produced by retail firms is given by,

$$Y_t^H(z) = \left(\frac{P_t^H(z)}{P_t^H}\right)^{-\upsilon} Y_t^H \tag{A.17}$$

where $Y_t^H = \left(\int_0^1 Y_t^H(z)^{\frac{\nu-1}{\nu}} dz\right)^{\frac{\upsilon}{\upsilon-1}}$. Following the pricing scheme of Calvo (1983), we assume that only θ fraction of retailers adjust their prices at a specific time.

$$P_t^H = \left(P_{t-1}^H\right)^{\theta} \left(P_{t-1}^{*H}\right)^{1-\theta} \tag{A.18}$$

Retailers maximize an intertemporal loss function and set their optimal price $P_t^{*H} = \mu_1 \prod_{i=0}^{\infty} P_{t+i}^{w^{(1-\beta\theta)(\beta\theta)^i}}$, where $\mu_1 = 1/(1-1/\nu)$ is the desired gross mark up over wholesale prices. Given this setup, one can solve for the domestic inflation rate as,

$$\frac{P_t^H}{P_{t-1}^H} = \left(\mu_1 \frac{P_t^w}{P_t^H}\right)^{\frac{(1-\theta)(1-\beta\theta)}{\theta}} E_t\left(\frac{P_{t+1}^H}{P_t^H}\right)^{\beta} \tag{A.19}$$

where the first term is retailers' marginal cost, and the second term is the expected inflation rate.

A.5 Central Bank and the Government

[27] A financial contract with a monopolistically competitive firm would complicate aggregation due to the different levels of leverage for each monopolistic firm.

The central bank follows a Taylor rule, and sets interest rates to stabilize output and inflation rates around their target values:

$$R_t = \left[\left(1 + rr^{ss}\right)\left(P_t / P_{t-1}\right)^{\gamma_\pi} \left(Y_t^H / Y_t^{ss}\right)^{\gamma_y} \right]^{1-\tau} R_{t-1}^{\tau} \tag{A.20}$$

The last item on the right hand side is the interest rate smoothing term. Y_t^{ss} and rr^{ss} are the steady state levels of output and the real interest rate respectively.

A.6 Closing the Model

To close the model, we assume that the government finances its expenditures by printing money and collecting lump sum taxes, and the resource constraint in the economy holds:

$$G_t = \left(M_t - M_{t-1}\right) / P_t + T_t \tag{A.21}$$

$$Y_t^H = C_t^H + C_t^{eH} + C_t^{H*} + I_t^H + \mu \left(\int_0^{\bar{A}_i} A_i f(\bar{A}_i) \delta A_i \right) R_t^k Q_{t-1} K_t \tag{A.22}$$

where C_t^{eH} is entrepreneurial consumption, and $\mu \left(\int_0^{\bar{A}_i} A_i f(\bar{A}_i) \delta A_i \right) R_t^k Q_{t-1} K_t$ are the total bankruptcy costs. Finally, we obtain the balance of payments condition in the economy by adding consumers' and entrepreneurs' budget constraints:

$$\begin{aligned} C_t + C_t^e + I_t + \left[\left(1 + R_{t-1}\right) D_{t-1} + \left(1 + R_{t-1}^*\right) s_t \left(D_{t-1}^* + B_{t-1}\right) \right] / P_t + \mu \left(\int_0^{\bar{A}_i} A_i f(\bar{A}_i) \delta A_i \right) R_t^k Q_{t-1} K_t \\ = Y_t + \left[D_t + s_t \left(D_t^* + B_t\right) \right] / P_t + \Pi_t \end{aligned} \tag{A.23}$$

Appendix B: Variables and Data Sources

Variable	Description and Source
RECOVERY	The recovery rate is recorded as cents on the dollar recouped by creditors through the bankruptcy or insolvency proceedings. The calculation takes into account whether the business emerges from the proceedings as a going concern as well as costs and the loss in value due to the time spent closing down. If the business keeps operating, no value is lost on the initial claim, set at 100 cents on the dollar. If it does not, the initial 100 cents on the dollar are reduced to 70 cents on the dollar. Then the official costs of the insolvency procedure are deducted (1 cent for each percentage of the initial value). Finally, the value lost as a result of the time the money remains tied up in insolvency proceedings is taken into account, including the loss of value due to depreciation of the hotel furniture. Consistent with international accounting practice, the depreciation rate for furniture is taken to be 20%. The furniture is assumed to account for a quarter of the total value of assets. The recovery rate is the present value of the remaining proceeds, based on end-2006 lending rates from the IMF's IFS, supplemented with data from central banks. Source:World Bank Doing Business database.
Leverage Regressions	
Leverage ratio	Source: Mergent online.
Risk premium on lending	Risk premium on lending is the interest rate charged by banks on loans to prime private sector customers minus the risk free treasury bill interest rate at which short-term government securities are issued or traded in the market. In some countries this spread may be negative, indicating that the market considers its best corporate clients to be lower risk than the government. Source: WDI.
Emerging Market Bond Spread	Source: JP Morgan EMBI.
Market Capitalization	Market capitalization (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles. Data are in current U.S. dollars. S&P, Emerging Stock Markets Factbook and supplemental S&P data. Source: WDI.
Private Credit	Private credit provided by banks and other financial institutions. Source: IFS 22d+42d.
Banking System Dollarization Variables	
Local currency deposits	Local currency deposits of residents held in domestic banks. Source: IMF Country Reports.
Foreign currency deposits	Foreign currency deposits of residents held in domestic banks. Source: IMF Country Reports.
Total deposits	Total deposits in domestic banks. Source: IMF Country Reports.
Foreign currency deposits allowed	IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.
Local Currency Bond Market Variables	
LCBGDP and *FCBGDP*	Local currency bonds as a percent of GDP (both in $). Local currency bonds are those issued by residents of a particular country (for example, Chile) in that country's currency (Chilean pesos), regardless of whether it was placed in the domestic market or offshore. Source: Burger and Warnock (2006), Table 1. All data are as of end-2001. Data are from security-level data underlying BIS Table 14B (International Bonds and Notes by Country of Residence) and the unpublished long-term debt component of BIS Table 16A (Domestic Debt Securities). Local-currency-denominated debt is the sum of domestic long-term debt (from Table 16A) and the local currency portion of Table 14B. Domestic long-term debt for countries not available on Table 16A and data for Brady bonds are from Merrill Lynch (2002). Included in total bonds is $2.5 trillion of foreign currency bonds, denominated primarily in dollars, Euros, and sterling.
LCBSHARE	The ratio of local currency to total bonds (%). Source:Burger,Warnock (2006).
Budget Surplus% GDP(average 1982-2000)	Central government budget surplus (% of GDP). Source: IFS v80.
Growth real GDP (average 1991 to 2000)	GDP growth (annual %). Source: WDI. NY.GDP.MKTP.KD.ZG
Inflation Variance	Annual percent change in consumer price index. Source: WDI.
log real GDP per capita	Log of GDP per capita (constant 2000 US$). Source: WDI.
Sudden Stop Variables	
Financial Account	Net sum of direct investment (78bdd+78bed), portfolio investment (78bfd + 78bgd), financial derivatives(78bwd + 78bxd), and other investment(78bhd + 78bid).Source:IFS 78bjd.
Trade (% of GDP)	Exports plus Imports divided by GDP. Source: IFS and WDI.
Foreign Liabilities/M1 (%)	Foreign Liabilities of Deposit Money Banks/M1 (%). Source: IFS 26c/34.
Current Account (% of GDP)	Current Account Balance as % of GDP. Source: IFS and WDI.
Log of Total Reserves in Months of Imports	This item shows reserves expressed in terms of the number of months of imports of goods and services which could be paid for. Source: WDI.
FDI (% of GDP)	Foreign direct investment, net inflows (% of GDP). Source: IFS and WDI.
Government Debt (% of GDP)	Central government debt, total (% of GDP). Source: WDI.
External Debt (% of GDP)	External debt, total (DOD, current US$) % of GDP: Total external debt is debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Data are in current U.S. dollars.Source:WDI.
Short term debt (% of total external debt)	Short-term debt (% of total external debt): Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Source: WDI.