The Spillovers from Easy Liquidity and the Implications for Multilateralism

Douglas W. Diamond[1] Yunzhi Hu and Raghuram G. Rajan

Chicago Booth and NBER University of North Carolina Chicago Booth and NBER

Abstract

Anticipated exchange rate appreciation in capital-receiving countries, induced by easy monetary policy in source funding countries, increases the expected net worth of firms in receiving countries and their ability to buy assets. Anticipating this higher liquidity for corporate assets, corporations in capital-receiving countries lever up, and neglect alternative sources of debt capacity such as maintaining the pledgeability of their cash flows. When monetary policy in source countries tightens, receiving-country exchange rates depreciate, and liquidity dries up in their corporate sector even if country prospects are sound. Since pledgeability has been neglected, debt capacity plummets, leading to a sudden stop in funding and subsequent financial distress. To avoid such booms and busts, authorities in receiving countries often try to smooth exchange rate volatility (actions consistent with a "fear of floating") by leaning against abrupt appreciations and depreciations. Exchange rate intervention in this view is not an attempt by receiving countries to gain competitive advantage but a macro-prudential tool to mitigate adverse monetary policy spillovers from source countries. We discuss the potential for multilateralism to improve on outcomes.

[1] Diamond and Rajan thank the Center for Research in Security Prices and the Fama-Miller Center at Chicago Booth for research support. Rajan also thanks the Stigler Center and IGM at Chicago Booth for research support. This paper is the basis for the Mundell Fleming Lecture delivered by Raghuram Rajan at the International Monetary Fund's Annual Research Conference on Nov 1, 2018.

A vast body of research since the Global Financial Crisis of 2007-2008 suggests that easy monetary policy in source funding currencies appears to be transmitted to receiving countries via currency appreciation, a rise in borrowing, and an increase in asset prices.[2] This then sets in place the conditions that lead to financial fragility. Nevertheless, if borrowing and lending are rational, why do market participants lever up under these conditions? Why do conditions change so suddenly – is this about fundamentals? What can country authorities do to reduce the associated systemic risks?

To shed further light on these issues, we start by laying out a model of domestic corporate financing based on Diamond, Hu, and Rajan (2018a), which we will subsequently use to discuss the effects of monetary policy, capital flows, and exchange rates on the corporate sector.[3] In a sense, we emphasize the point that the fundamental problem is not necessarily an international one (for example, a dollar shortage). Instead, it could well stem from how international spillovers accentuate underlying phenomena in the domestic corporate sector.

A crude analogy may help fix the central themes in our model. Lenders against housing care little about the income of buyers or their integrity when the housing market is buoyant – if the buyer defaults, the lender only has to repossess the house and sell it to someone else. However, they need to be far more diligent about screening and monitoring buyers, and they need buyers with much greater income and integrity, when the housing market is less liquid. We develop this idea in the context of corporate borrowing, paying attention to where liquidity comes from, endogenizing the amount of leverage, and endogenizing the incentives for integrity. We then bring in the international context.

The key element in the model is that sustained expectations of high future liquidity (in a sense we will make more precise shortly) can incentivize the corporate sector to lever up. The combination of high leverage and high expected liquidity reduces corporate incentives to maintain high levels of governance. The fall-off in governance is not a problem when high liquidity is sustained, but does become problematic when liquidity falls off, since there is then very little supporting the ability of corporations to borrow. Put differently, high expectations of liquidity create the conditions where corporations become dependent on

[2] See, for example, Avdjiev and Hale (2018), Baskaya et al. (2017), Borio (2014), Brauning and Ivashina (2017, 2018), Bruno and Shin (2015, 2017), Cetorelli and Goldberg (2012), Gabaix and Maggiori (2015), Han and Wei (2016), Ioannidou, Ongenga, and Peydro (2015), Ivashina, Scharfstein, and Stein (2015), Jiang, Krishnamurthy and Lustig (2018), Jimenez, Ongenga, Peydro, and Saurina (2014), Jordà, Schularick, Taylor, and Ward (2018), Kalemli-Ozcan, Liu and Shim (2018), Obstfeld and Taylor (2017), Prasad (2014), Rey (2013), and Schularick and Taylor (2012).

[3] Related papers include Borio (2014), Dow, Gorton, and Krishnamurthy (2005), Eisfeldt and Rampini (2006, 2008), Gennaioli, Shleifer, and Vishny (2015), Krishnamurthy and Muir (2017), Rampini and Vishwanathan (2010), and Shleifer and Vishny (1992, 2011).

liquidity to roll over their debt, and when it does not materialize, they experience a sudden stop. Note that this can occur even if economic prospects for corporations are quite bright.

We then set the corporate sector in the international context. Corporations in an emerging market can perceive high liquidity in the domestic economy as the domestic exchange rate appreciates (we will explain why shortly), when source funding-country central banks elsewhere cut interest rates and loosen monetary policy. Conversely, corporate liquidity in receiving countries can tighten when source funding countries tighten monetary policy. We then argue that phenomenon like sudden stops can result from these shifts in liquidity, severely affecting corporate sectors that have become dependent on liquidity for retaining access to funding, even if underlying domestic economic conditions are benign. Such a framework enables us to understand a variety of seemingly sub-optimal policies in emerging markets and developing countries intended to mitigate these fluctuations.

Let us be more specific. First, the model in a domestic context. Consider an economy where expert managers are needed to produce cash flow from assets we call firms. A number of existing firms are run by expert incumbents. There are also other experts around (those have the knowledge to run firms as efficiently as the incumbents). Financiers, who don't really know how to run firms but have funds, are the other agents in the model.

Financiers have two sorts of control rights, which allow them to be repaid and are the basis for a firm's debt capacity; first, control through the right to repossess and sell the underlying asset being financed if payments are missed and, second, control over cash flows generated by the asset. The first right only requires the frictionless enforcement of property rights in the economy, which we assume. It has especial value when there are a large number of capable potential buyers willing to pay a high price for the firm's assets. Greater wealth amongst experts (which we term *liquidity* as in Shleifer and Vishny (1992)) increases potential bids for the firm if repossessed, and increases the availability of this asset-sale-based financing. Clearly, this kind of control right is exogenous to the firm.

The second type of control right is more endogenous, and conferred on creditors by the firm's incumbent manager as she makes the firm's cash flows more appropriable by, or pledgeable to, creditors over the medium term. She could do this, for example, by improving accounting quality or setting up escrow accounts so that cash flows are hard to divert. We assume enhancing pledgeability takes time to set up but is also semi-durable (improving accounting quality is not instantaneous because it requires adopting new systems and hiring reputable people; equally, firing a reputable accountant or changing accounting practices has to be done slowly, perhaps at the time the accountant's term ends, if it is not to be noticed). So the incumbent manager sets pledgeability one period in advance, and it lasts a period.

The two sources of control rights interact. When anticipated liquidity is sufficiently high, increased pledgeability has no effect on how much experts will bid to pay for the firm; they have enough wealth to buy the firm at full value without needing to borrow much against the firm's future cash flows. Higher pledgeability is not needed for enhancing bids for the firm, and thus debt capacity, when the economy is expected to be very liquid. In contrast, when anticipated liquidity is lower so that experts have to borrow substantially to bid for the firm, higher pledgeability does enhance their bids.

Let us now understand an incumbent firm manager's incentives while choosing cash flow pledgeability for the next period. Let us assume she may have some reason to sell some or all of the firm next period with some probability – either because she is no longer capable of running it, or she needs to raise finance for new investment. Higher pledgeability generally increases the price at which she can sell the firm when she is no longer capable of running it, because experts can borrow against future pledgeable cash flows to finance their bids for the firm. It therefore increases the firm's debt capacity up front – and we assume the incumbent has bought the firm by borrowing as much as she can to buy it, which allows us to examine leverage choices also.

However, having borrowed up front, the incumbent faces moral hazard associated with pledgeability. A higher possible bid from experts also enables the existing creditors to collect more if the incumbent stays in control because the creditors have the right to seize assets and sell them when not paid in full. In such situations, the incumbent has to "buy" the firm from creditors, by outbidding experts (or paying debt fully), which reduces her incentive to enhance pledgeability. The tradeoff in setting pledgeability depends both on the probability she will need to sell and on the amount that she has promised to pay creditors (as well as liquidity, as explained earlier). A higher promised debt payment increases the amount that she needs to pay to "buy" the firm from creditors but reduces the residual proceeds that she receives if she sells the firm. Therefore, higher promised debt payments exacerbate the incumbent's moral hazard associated with pledgeability, and when they exceed a threshold, the incumbent will set pledgeability low. Anticipating this, creditors will limit how much they will lend to the incumbent up front when they require the incumbent to have incentives to keep pledgeability high.

In sum then, we have two outside influences on pledgeability –the anticipated liquidity of experts and the level of outstanding debt. In normal times, the need to provide the incumbent incentives for pledgeability keeps up-front borrowing moderate. As prospective liquidity increases, though, the incumbent is able to borrow more to finance the asset, while still retaining the incentive to set pledgeability high. Eventually, though, when the probability that the future state where experts will have plenty of wealth is high enough, repayment of any earlier corporate borrowing is enforced entirely by the potential high resale value of the firm, and high pledgeability is not needed for them to make their bid.

Since pledgeability is not needed to enforce repayment in a future highly liquid state, a high probability of such a state encourages high borrowing up front, which crowds out the incumbent's incentive to enhance pledgeability, even if there is a possible low liquidity state where pledgeability is needed to enhance creditor rights. In other words, when prospective liquidity exceeds a threshold, lenders stop imposing any constraint on leverage, and take their chances if that liquidity does not materialize. Bidders, competing to buy the firm, bid more, but financed with risky leverage.

A crisis or downturn under these circumstances is when liquidity does not materialize. If the low liquidity state is realized, the enforceability of the firm's debt, as well as its borrowing capacity will fall significantly. Experts, also hit by the downturn, no longer have much personal wealth, nor does the low cash flow pledgeability of the firm allow them to borrow against future cash flows to pay for acquiring the firm. Unable to raise funds to repay debt, the firm gets into financial distress even if the firm's earning potential is till high. Credit spreads rise substantially, and they will stay high till the firm raises pledgeability, which will take time, or liquidity rises again in the economy, which could take even longer. The neglect of pledgeability because of high leverage taken on anticipating high liquidity makes the recovery difficult and drawn out.

So far, so domestic. Let us summarize the ingredients. There is up front competition for assets, and bidders with limited wealth borrow as much as possible (against the firm's assets) to bid enough to be successful. Lenders depend on both the pledgeability that successful bidders will set after taking over the firm and the anticipated liquidity of possible future bidders to get repaid on the debt. A sharp increase in anticipated liquidity both enhances upfront borrowing, as well as depresses the pledgeability that is set. The firm's debt capacity becomes more dependent on continued liquidity, which makes it subject to sudden stops in borrowing when that liquidity dries up, even if revenue generating prospects are sound.

Let us now situate this model in an emerging market (or peripheral European country). We add three more ingredients which we justify later based on the vast emerging evidence. First, domestic companies in the emerging market, even those with limited foreign revenues, have a substantial amount of outstanding borrowing from source funding countries, or denominated in the currency of those countries even if sourced elsewhere. The source country is typically the United States and the currency the dollar, though our point is more general (see, for example, Gopinath and Stein (2018) for why domestic companies may take on foreign currency debt). Second, easier (tighter) monetary policy in the source country gets transmitted with significant lags into domestic currency appreciation (depreciation) in the capital-receiving emerging market (see Eichenbaum and Evans (1995), Bruno and Shin (2015)). To the

extent that experts are firms that already have foreign currency borrowing, this means their net worth, and hence their liquidity, is anticipated to increase as the domestic currency value of foreign borrowing diminishes. To the extent that monetary policy in source countries reacts aggressively to low domestic growth but normalizes slowly, especially in an era of low inflation (see Borio and White (2004)), the capital flows to, and currency appreciation in, the emerging market could be substantial. Anticipated liquidity in the emerging market could be enhanced significantly, facilitating higher borrowing, and eventually, resulting in neglected pledgeability. Indeed, as lenders rely on clearly observable liquidity rather than pledgeability for debt recovery, more lending will be at arm's length or cross-border, and more traditionally poorly governed firms will be financed.

At some point, source country monetary policy will normalize. Tighter source country policy will lead to anticipation of a depreciating emerging market currency, as well as lower corporate liquidity. Debt capacity will fall, not just because liquidity is expected to be lower, but because pledgeability has been neglected. So the fall in debt capacity is steeper than the rise. Debt roll over will become significantly more difficult. Foreign and arm's length lenders who are less comfortable than domestic lenders in depending on (the greatly diminished) pledgeability may be quick to leave. The stop is more general, however. All lenders, both domestic and foreign, are reluctant to lend given the diminished debt capacity. Brauning and Ivashina (2018) document that, consistent with our analysis, the effects of US monetary easing and monetary tightening on dollar lending to EM firms is asymmetric, with tightening leading to an abrupt contraction in credit to borrowing firms. Furthermore, they find the contraction is across foreign and domestic lenders, suggesting a more general collapse in debt capacity.

In sum, while the collapse in prospective liquidity may originate with a change in the source country monetary stance, it need have nothing to do with macroeconomic policies in the emerging market, and the credibility or lack thereof. Put differently, the boom and bust in the emerging market could be a genuine spillover from the source country policy.

Standard nostrums – let the domestic exchange rate adjust, for example – do not work as well here. Indeed, the fluctuations in the exchange rate are the source of the fluctuations in corporate liquidity. Instead, our model suggests why the "fear of floating" amongst EM policy makers described by Calvo and Reinhart (2004) is rational, and why EM central banks lean against the wind of exchange rate fluctuations, trying to slow currency appreciation by building reserves, and slow depreciation by supporting the currency. Of course, such intervention exacerbates moral hazard (corporations see a lower risk of borrowing in foreign currency once the central bank smooths currency volatility) which is why some emerging markets like China and India try and control corporate foreign borrowing. All this

suggests why capital account openness has not been an unmitigated blessing for emerging markets (see Prasad, Rajan, and Subramanian (2007)).

Could we do better? Could there be a way of mitigating spillovers, and reducing their consequences? Almost surely, this will require a change in mindset. Industrial countries tend to blame emerging markets for their poor policies and their inability to use capital well while emerging markets accuse industrial countries of being focused on resolving domestic problems while ignoring the international spillovers that result. In an integrated world, we need policies that work for all, that allow industrial countries to address domestic problems while limiting adverse international spillovers. This probably requires shifts in both sending and receiving country policies, and a role for the IMF as an arbiter. We describe how we might get policies that embed the true spirit of multilateralism.

The rest of the paper is as follows. In part I, we lay out the framework for the model in a domestic setting, and solve it in part II. We then reinterpret the model variables in an open economy subject to capital flows from a source country. In part III, we examine how greater ex ante liquidity would affect the implications of the model, as also how intermediation might affect results. In part IV, we examine the scope for multilateralism, and then conclude.

I. The Framework

We start by considering borrowing in a domestic setting, and then we will overlay on this a foreign sector.

A. The Economy and States of Nature

Consider an economy with 3 dates (0, 1, 2) and 2 periods between these dates, with date t marking the end of period t. A period is a phase of the financing cycle (see Borio (2014), for example), which extends over several years. At the beginning of each period, the state of the economy is realized. The economy either can prosper in good state G with probability q^G, or it can be distressed in bad state B (see Figure 1). In period 2, we assume the economy returns to state G for sure – this is meant to represent the long run state of the economy (we model economic fluctuations but not apocalypse).

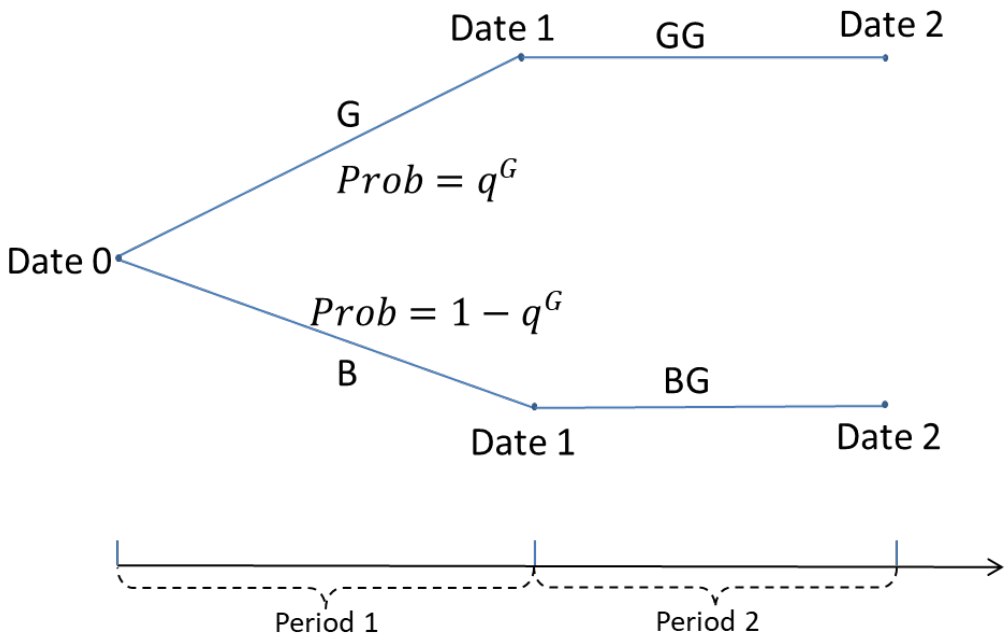

Figure 1: States of Nature

B. Agents and the Asset

There are two types of agents in the economy. *Experts* have *high* (H) ability to produce with an asset, which we call the firm. There is some mutual specialization established over the period between the incumbent expert manager and the firm, which creates a value to incumbency. Therefore, when the state is G, only the expert manager in place at the beginning of that period *t* can produce cash flows C_t with the asset over the period. In the B state, however, even an expert manager cannot produce cash flows. There are also *financiers* who cannot produce cash flows regardless of the state. They have funds to lend provided they break even. All agents are risk neutral. We ignore time discounting, which is just a matter of rescaling the units of cash flows.

An expert incumbent manager retains her ability into the next period only with probability $\theta^H < 1$. Think of θ^H as the degree of stability of the firm. Intuitively, the critical capabilities for success are likely to be stable in a mature firm, or a firm in an industry with little technological innovation. However, in a young firm which has yet to settle into its strategic niche, or in an industry with significant innovation, the critical capabilities for success can vary over time. A manager who is very appropriate in a particular period may be ineffective in the next. This is the sense in which an incumbent can lose ability and this occurs with higher probability in a young firm or a changing industry. An alternative interpretation is that $(1-\theta^H)$ is the probability of arrival of an investment opportunity or a funding need.

So stability θ^H under that interpretation would be the degree to which the firm has no future funding needs.

The incumbent's loss of ability in the next period becomes known to all shortly before the end of the current period. Loss of ability is not an economy wide occurrence and is independent across managers. So even if a manager loses her ability, there are a large number of other expert managers equally able to take her place next period. If a new expert takes over at the end of the current period, she will shape the firm towards her idiosyncratic management style, so she can produce cash flows with the firm's assets in future periods in good states. The manager's (both the incumbent and other bidders) type next period is observable but not verifiable and cannot be written into contacts.

C. Financial Contracts

We assume that the aggregate state s_t is observable but not verifiable. Any manager can raise money from financiers against the asset by writing one period financial contracts. We will focus on debt contracts with promised payments at the end of period t denoted by D_t.

Having acquired control of the firm, the incumbent manager would like to keep the realized cash flow for herself rather than share it with financiers. Two sorts of control rights force the manager to repay the external claims. First, the financier automatically gets paid the "*pledgeable*" portion of the cash flows produced over the period, up to the amount of the financier's claim. Second, just before the end of the period, the financier gets the right to seize and auction the firm to the highest bidder if he has not been paid in full. As in Hart and Moore (1994), giving financiers this right in case of default can induce the borrower to pay more than the pledgeable cash flow this period. Below, we describe the two control rights in detail.

D. Control Rights over Cash Flow: Pledgeability

Let us define cash flow *pledgeability* as the fraction of realized cash flows that are automatically directed to an outside financier. The incumbent chooses pledgeability this period, but it is embedded only by next period, and will then persist for the entire period. So *pledgeability* γ_{t+1} chosen in period *t* is the fraction of period *t+1*'s cash flows that can be automatically paid to outside financiers. The range of feasible pledgeability levels is $\gamma_{t+1} \in [\underline{\gamma}, \overline{\gamma}]$, where $\underline{\gamma}$ and $\overline{\gamma}$ satisfy $0 \le \underline{\gamma} < \overline{\gamma} \le 1$. In general, the range of feasible pledgeability levels is determined by the economy's institutions supporting corporate governance (such as regulators and regulations, investigative agencies, laws and the judiciary). To set $\gamma_{t+1} > \underline{\gamma}$, it costs ε≥0. Our results will be presented primarily for the case where $\varepsilon \to 0$, and positive ε

will only alter the results quantitatively. While any level of pledgeability between $\underline{\gamma}$ and $\overline{\gamma}$ is feasible, in equilibrium the incumbent will choose either $\gamma_{t+1} = \underline{\gamma}$ or $\gamma_{t+1} = \overline{\gamma}$ because, as will be clear shortly, the incumbent's payoff is always linear in pledgeability γ_{t+1}.

A manager has a number of ways of tunneling cash flow out of the firm into her pocket. Increasing pledgeability means closing off tunnels for cash flows generated by a future manager. For example, by moving to a simpler corporate structure today, or by making contracting with suppliers more transparent with stricter rules on dealing with related parties, the incumbent ensures future cash flows cannot be diverted to some non-transparent entity (see, for example, Rajan (2012)). By improving the quality of the accounting systems in place, including the detail and timeliness of disclosures, and by hiring a reputable auditor, the incumbent restricts the scope for future managers to play accounting games to hide cash flow. Any rapid shift from such a transparent accounting procedure to one less transparent, or from a reputable auditor to one less reputable, would be noticed and invite closer scrutiny, defeating the objective of tunneling. Similarly, by taking on debt with strict financial covenants, such as minimum liquidity ratios, minimum collateral requirements, or sinking fund requirements, the incumbent ensures that the firm is positioned in the future to raise debt with similar tough covenants when current debt matures, giving future lenders the confidence that cash flow will not be tunneled. Broadly, any structure that enhances future corporate governance and cannot be fully reversed quickly is a means of enhancing future pledgeability.

The laxity of the general governance environment in the country determines $\underline{\gamma}$, while the scope for an individual corporation to improve on it determines $\overline{\gamma}$. Finally, while we assume pledgeability can be fixed for the next period, we do not assume it is fixed permanently. Over time, accountant quality can be reduced when accountants come up for rotation, for example, and the environment itself will change so that new ways of tunneling emerge. Allowing pledgeability to be chosen for only the next period captures the sense of fixity over the medium term but not for the long run.

E. Control Rights over Assets: Auction and Resale

If creditors have not been paid in full from the pledged cash flow and any additional sum the incumbent voluntarily pays, then they get the right to auction the firm to the highest bidder at date t. One can think of such an auction as a form of bankruptcy. The incumbent manager who has failed to make the full payment may also bid in this auction. Therefore, the incumbent can retain control by either paying off the creditors in full (possibly by borrowing once again against future pledgeable cash flows) or by paying less than the full contracted amount and outbidding other bidders in the auction. The precise format of the

auction does not matter, so long as the incumbent's repayment rises with what other bidders are willing to bid. We assume the incumbent can always bid using other proxies, so contracts that ban the incumbent from participating in the auction after defaulting are infeasible.[4]

F. Initial Conditions and Wealth

Let ω_t^{I,s_t} and ω_t^{H,s_t} respectively be the wealth levels of the incumbent and experts at date *t* in state s_t, with the former termed *incumbent liquidity* and the latter termed *liquidity*. The wealth level of the incumbent is augmented by the unpledged cash flow she generates within the firm $(1-\gamma_1)C_1$ in state G but not in B, so $\omega_1^{I,G} \geq \omega_1^{I,B}$. We assume $\omega_1^{H,G} > \omega_1^{H,B}$ because prosperity lifts the private income of experts as they work as contractors, consultants, or employees. It will also be useful to think of experts as managers running other firms in the industry, who may want to acquire the assets of the target firm we are focused on. In this case, experts (as also the incumbent) may become more liquid when monetary policy rates are cut. As Bernanke and Gertler (1995) argue, a rate cut will have a direct cash flow effect as the outflow on interest payments fall, and an indirect effect on cash flows as economic activity picks up and revenues rise relative to costs, which have large fixed components. Thus monetary easing can enhance liquidity. Later, we will consider how a source country's monetary policy can have effects on liquidity across borders.

We assume the target firm is auctioned at date 0. The specific reason for this sale is unimportant for now – it could represent normal churn in the economy as the initial entrepreneur wants to retire, she has lost ability, or she is bankrupt and the firm is being sold by the receiver.[5] All that matters is she sells out entirely and thus wants the highest price. For now, we assume that each bidder must always raise the largest amount from financiers to avoid being outbid. A sufficient condition to guarantee this is that all potential bidders have no wealth at date 0 and compete by promising creditors the largest possible payment that is credible.

H. Timing

The timing of events is described in Figure 2. After the initial auction, the incumbent takes on debt D_1 that is due at date 1. We assume that the incumbent sets pledgeability γ_2, only knowing the probability of state G and B. Next, the state is realized, then her ability in period 2 is known.

[4] Essentially, we rule out "take-it-or-leave-it" threats from the lender that would allow him to extract all the cash the incumbent has without invoking the outside option of selling the asset to others.

[5] Since what is important here is the leverage the firm is saddled with, a greenfield project that is being financed or a hostile takeover threat that forces incumbent management to lever to the maximum extent and pay shareholders a dividend would also serve our purpose.

Subsequently, production takes place and the pledgeable fraction γ_1 of cash flows (set in the previous period) goes to financiers automatically if state G is realized. She either pays the remaining due or enters the auction. The period ends with potentially a new incumbent in place.

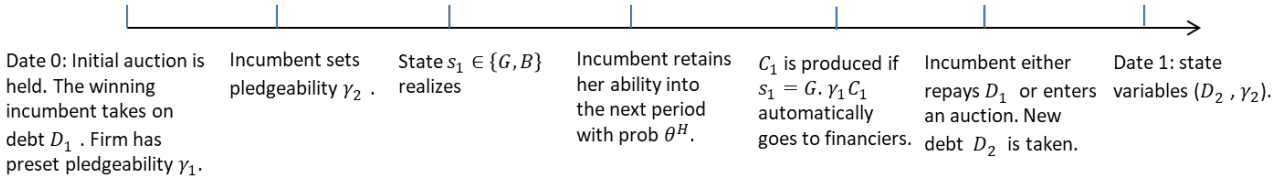

Figure 2: Timing and Decisions in Period 1

II. Solving the Model

In subsection IIA, we start with examples where exogenous debt is due at date 1 to illustrate the main trade-off in this model. We will show that increased pledgeability is sometimes not needed because of plentiful anticipated liquidity, but when it is needed, the incumbent has to be appropriately incentivized. In both examples, to keep matters simple, we eliminate the uncertainty in ex-post aggregate state and therefore uncertainty about the level of liquidity. The examples will motivate the more formal analysis with debt contracts when there is uncertainty about the state.

A. Illustrative Examples with Certainty About the Future State and Liquidity

Let the parameters for this subsection be:

θ^H =0.7, $\overline{\gamma}$ =0.6, $\underline{\gamma}$ =0.3, $\gamma_1 = \overline{\gamma}$, $C_1 = C_2$ =1, $\omega_1^{I,G}$ =0.4, $\varepsilon \to 0$.

Case 1:Plentiful Liquidity: $\omega_1^{H,G}$ =0.8, D_1 =1.5, and q^G =1

This case illustrates that when anticipated liquidity is sufficiently high, pledgeability has no effect on bids and also the equilibrium outcome, because experts have enough wealth to buy the firm at full value without requiring additional pledgeability to enhance their borrowing capacity.

With q^G =1, the good state G, in which experts have high liquidity, will happen for sure. In any possible date 1 auction, experts each have personal wealth $\omega_1^{H,G}$ =0.8 and can borrow at least $\underline{\gamma} C_2$ =0.3. No lender will lend more than the pledged cash flows since the asset is worthless at the end of period 2, so the incumbent in that period cannot be forced to repay any more. Nevertheless, even without raising pledgeability, experts have at least $\omega_1^{H,G} + \underline{\gamma} C_2$ =1.1 in funds, which exceeds the full date-1 value of the asset C_2 =1. With high pledgeability, experts will have even more funds: $\omega_1^{H,G} + \overline{\gamma} C_2$ =1.4. However,

since no one will bid more than C_2=1, higher pledgeability has no effect on the auction price – the price at which the incumbent can sell the asset. On the other hand, higher pledgeability does not affect the price that the incumbent needs to "buy" the asset from creditors either. To see this, note that at date 1, the incumbent will pay the pledged cash flow $\gamma_1 C_1 = 0.6$, leaving 0.9 remaining to be paid. If the incumbent retains ability, she needs to pay off the remaining 0.9 or default and initiate the auction.

If the incumbent had set date-2 pledgeability γ_2 low, at date 1 she will be able to pay her own funds $\omega_1^{I,G}$=0.4, as well as the amount she can borrow at date 1 against the asset, $\underline{\gamma} C_2$=0.3. Since this is less than the remaining amount owed, she will precipitate the auction. Alternatively, she incurs a cost ε if she chose $\gamma_2 = \overline{\gamma} = 0.6$, after which she will be able to borrow 0.6 , which together with her own wealth of 0.4, will allow her to match the auction bid. However, since the outside expert bids the full value of future cash flows, the incumbent does not benefit from holding on to the firm. So she chooses low pledgeability, the firm is sold to experts in the auction, the incumbent pays 0.9 from the sale amount to the initial lender and walks away with 0.1 from the auction proceeds in addition to her date-1 wealth 0.4. Higher pledgeability is not needed (and has no effect on auction bids) because there is ample liquidity. This of course implies that the level of debt does not affect the incumbent's choice of pledgeability. *High liquidity crowds out any incentive to raise pledgeability.*

Case 2: Moderate Liquidity:

$\omega_1^{H,G}$=0.2, D_1=1.2, and q^G=1

We see in this example that when anticipated liquidity is only moderate, and the incumbent can retain control if she retains ability but will want to sell if not, there is moral hazard in choosing pledgeability. High pledgeability increases the outside experts' bids, which the incumbent likes when she has to sell, but not when she retains ability and seeks to retain control. High levels of debt reduce the incumbent's incentive to choose high pledgeability and thus crowd out pledgeability. Let us explain.

After paying $\gamma_1 C_1 = 0.6$, the incumbent owes 0.6 to creditors. Assume first that she retains her ability after choosing pledgeability. Then she has funds plus borrowing capacity of at least $\omega_1^{I,G} + \underline{\gamma} C_2$ =0.7 as before, which means she can pay off the debt and retain control at date 1, without triggering the auction. With liquidity $\omega_1^{H,G}$=0.2, experts can bid up to at most 0.2+ γ_2 C_2 in state G. If the incumbent chose low pledgeability, they will bid only 0.5 for the asset. The incumbent would then default strategically and lower the additional repayment to creditors from 0.6 to 0.5, even while outbidding

experts in the auction and retaining control of the asset. If she chose high pledgeability, however, experts will bid 0.8 for the asset if the auction is triggered, in which case the incumbent is better off not triggering the auction and repaying the remaining debt 0.6. So if the incumbent knew she would retain her ability for sure, an increase in pledgeability would simply increase the payment she would have to make to hold on to the firm – she is always a buyer of the firm in the auction, and loses by raising the auction price.

What happens if she loses her ability? Now she will, perforce, trigger the auction since she has only 0.4 and she cannot raise any additional money herself against period 2 cash flows (since she cannot generate any) to pay the lender the 0.6 owed. If she had set pledgeability low, the amount experts will bid does not cover the outstanding amount owed (0.5<0.6), and the lender would take the entire proceed of the auction. However, if she had set pledgeability high, the auction would raise 0.8, of which 0.6 would go to pay the lender, leaving the incumbent to walk away with 0.2 in addition to her date-1 wealth. The point is that when she loses her ability, the incumbent is a seller of the firm's assets, and if she knew this would occur with certainty, she would prefer setting pledgeability high given its small cost, ε.

Clearly then, the benefit of setting pledgeability high depends on the probability of her being a buyer of the firm from creditors (that is, the probability of retaining ability, which is θ^H) as opposed to being a seller (losing ability). It also depends on what she obtains in each case, which in turn depends on the level of debt D_1. With higher contracted debt, when she increases pledgeability she has to repay more conditional on being a buyer, and keeps less conditional on being a seller. As a result, higher debt reduces the incentive to raise pledgeability. For the given parameters, it turns out that for $D_1 > 1.19$, she is better off in expectation choosing low pledgeability, and this is what she does in this example. The high debt reduces the incentive to increase pledgeability.

Remark: The points to take away from these examples are (i) High anticipated liquidity makes experts bid full value for the firm in the future without resort to high-pledgeability-based borrowing. So there is no need for the incumbent to increase pledgeability. (ii) With more moderate anticipated liquidity, the incumbent's incentive to increase pledgeability depends on whether she is more likely to be a buyer (she prefers a lower bid price and lower pledgeability) of the firm from the lender or a seller to other bidders (she prefers a higher bid price and higher pledgeability). Whether she is a buyer or seller depends on her ability, as well as her own wealth relative to experts. Regardless of which effect is more important, higher outstanding debt tends to reduce her incentive to raise pledgeability – for higher pledgeability will decrease her payoff from firm sale and raise the cost of repaying debt.

We now formally analyze the model, where we will examine both uncertainty as well as how much debt is taken on up front. Because there is a single state in period 2, and the economy ends after that, both the outside expert as well as the incumbent who retains ability can only commit to repay $D_2 = \gamma_2 C_2$ in period 2, where γ_2 is the pledgeability set by the incumbent in period 1. As a result, they can borrow up to $D_2 \equiv \gamma_2 C_2$ when bidding for control at date 1. In subsection IIB, we impose parametric assumptions such that the economy anticipates significant prosperity. High anticipated liquidity supports high leverage and leads to low pledgeability choice. As a result, if prosperity does not continue and liquidity falls, access to finance will drop more than proportionally.

B. *The Economy after a period of prosperity*

In this subsection, we formalize the analysis highlighted in the example with more general parameters. The following parametric assumptions allow us to focus on a case that highlights a key result of the paper.

Assumption 1:

a. $\omega_1^{H,G} \geq \left(1-\underline{\gamma}\right) C_2$

b. $\omega_1^{H,B} < \left(1-\underline{\gamma}\right) C_2$, $\omega_1^{I,B} \geq \omega_1^{H,B}$

Assumption 1a ensures that in state G, liquidity is high enough that experts can afford to pay the full price of the asset even if pledgeability is set as low as $\underline{\gamma}$.[6] Assumption 1b ensures there is limited liquidity in the bad state B so that experts cannot bid the full value of the asset if pledgeability is set low. Meanwhile, the incumbent has more wealth than experts in that state, so she can retain control by outbidding experts in a possible date-1 auction (since pledgeability increases what both parties can borrow by the same amount). We now solve the model backwards, having already determined what happens in period 2.

B.1. Date 1

Consider now the payments and decisions made in period 1. We will focus on the incumbent's incentive in setting pledgeability and how it is affected by the promised payment D_1. We will then solve for the maximum amount an expert can raise, and therefore bid, at date 0.

[6] Experts have wealth $\omega_1^{H,G}$ and can borrow up to $\underline{\gamma} C_2$. Their maximum bid is therefore $\omega_1^{H,G} + \underline{\gamma} C_2$, which exceeds the full value of the asset C_2.

If state G is realized in period 1, cash $\gamma_1 C_1$ is verifiable and directly goes to the financier (up to the value of the promised claim D_1), where γ_1 is the pledgeability that has been set in period 0. Let us define $\widehat{D}_1^{s_1}$ as the remaining payment due at date 1. Clearly, $\widehat{D}_1^G = D_1 - \gamma_1 C_1$ if $\gamma_1 C_1 < D_1$,[7] and $\widehat{D}_1^B = D_1$. In any date-1 auction for the firm, industry outsiders do not bid to take direct control of the firm since the firm generates no cash flow in their hands in the last period, and the firm has no residual value. Therefore, to retain control, the incumbent needs to either pay off her debt D_1 entirely or outbid experts in the date-1 auction. Next, we show how the bids by experts are affected by the incumbent through her setting pledgeability γ_2.

Expert Bid

In any auction for the firm held at date 1, experts bid using their date 1 wealth, ω_1^{H,s_1} and the amount of future cash flow $\gamma_2 C_2$ that can be borrowed against at date 1. Therefore, the total amount that they each can bid is $\omega_1^{H,s_1} + \gamma_2 C_2$. Of course, they will not bid more than the total value of future cash flow, C_2. So the maximum auction bid at date 1 is $B_1^{H,s_1}(\gamma_2) = \min\left[\omega_1^{H,s_1} + \gamma_2 C_2, C_2\right]$. In order to retain control, the incumbent pays the minimum of the remaining debt or outbids experts. That is, she pays $\min\left\{\widehat{D}_1^{s_1}, B_1^{H,s_1}(\gamma_2)\right\} = \min\left\{\widehat{D}_1^{s_1}, \omega_1^{H,s_1} + \gamma_2 C_2, C_2\right\}$. Clearly, through the choice of pledgeability, γ_2, the incumbent could potentially affect the amount of payment needed for her to stay in control.

By choosing a higher level of period-2 pledgeability, the incumbent can increase the experts' bids from $B_1^{H,s_1}(\underline{\gamma})$, thus reducing the firm's *underpricing*, which is the difference between the present value of future cash flows and the actual bid, i.e., $C_2 - B_1^{H,s_1}(\gamma_2) = \max\left\{(1-\gamma_2)C_2 - \omega_1^{H,s_1}, 0\right\}$.

Incumbent Bid

The cash that the incumbent has at date 1 is ω_1^{I,s_1} in state s_1. In addition, she can also raise funds against period 2's output, $\gamma_2 C_2$. Therefore, the incumbent can pay as much as

[7] $\widehat{D}_1^G = 0$ if $\gamma_1 C_1 \geq D_1$. We have assumed that the incumbent always fully levers up so that in equilibrium, $\gamma_1 C_1$ is less than D_1.

$B_1^{I,s_1}(\gamma_2) = \min\{\omega_1^{I,s_1} + \gamma_2 C_2, C_2\}$ to the financier. Comparing $B_1^{I,s_1}(\gamma_2)$ and $B_1^{H,s_1}(\gamma_2)$, we see that the incumbent will outbid experts whenever she has (weakly) more wealth ($\omega_1^{I,s_1} \geq \omega_1^{H,s_1}$), since both parties can borrow up to $\gamma_2 C_2$ if needed. Of course, she will outbid by paying a vanishingly small amount over $B_1^{H,s_1}(\gamma_2)$. The incumbent is always willing to hold on to the asset if she retains ability, since the continuation value of the asset, C_2, is identical for the incumbent and experts.

Pledgeability Choice

Let us now see how the promised remaining payment $\widehat{D}_1^{s_1}$ affects pledgeability choice. Let $V_1^{I,s_1}(\widehat{D}_1^{s_1}, \gamma_2)$ be the incumbent's payoff in state s_1 when she chooses γ_2, given the remaining required payment $\widehat{D}_1^{s_1}$. If state s_1 is known to be realized for sure, and if the remaining payment is $\widehat{D}_1^{s_1}$, the incumbent's benefit from choosing high versus low pledgeability is $\Delta_1^{s_1}(\widehat{D}_1^{s_1}) = V_1^{I,s_1}(\widehat{D}_1^{s_1}, \overline{\gamma}) - V_1^{I,s_1}(\widehat{D}_1^{s_1}, \underline{\gamma})$. If state s_1 is known to be realized for sure, the incumbent chooses high pledgeability $\gamma_2 = \overline{\gamma}$ if and only if $\Delta_1^{s_1}(\widehat{D}_1^{s_1}) > 0$. Consequently, given the probability of the good state being q^G, the risk-neutral incumbent will choose high pledgeability for any given D_1 if and only if $q^G \Delta_1^G(\widehat{D}_1^G) + (1-q^G)\Delta_1^B(\widehat{D}_1^B) \geq 0$, where $\widehat{D}_1^G = D_1 - \gamma_1 C_1$ and $\widehat{D}_1^B = D_1$ are the remaining payments in different states. Below, we solve for V_1^{I,s_1} and $\Delta_1^{s_1}$ separately.

State G - The Continued Boom: Pledgeability does not matter for repayment (no potential underpricing)

Assumption 1a guarantees $B_1^{H,G}(\underline{\gamma}) = \min\{\omega_1^{H,G} + \underline{\gamma} C_2, C_2\} = C_2$. In this case, liquidity is sufficiently high that experts can pay the full price of the asset, even if the incumbent has chosen low pledgeability. Therefore, there is no underpricing in a possible date-1 auction, and raising pledgeability does not change enforceable payments, while resulting in cost ε. External payments are committed to through the high resale price of the asset, and high pledgeability is neither needed nor desired by anyone. Indeed, no incentive to raise pledgeability can emanate from this state – liquidity crowds out any value from higher pledgeability.

Lemma 2.1: Under Assumption 1a and given the remaining payment $\widehat{D}_1^G \leq C_2$, the incumbent expects $V_1^{I,G}(\widehat{D}_1^G, \gamma_2) = C_2 - \widehat{D}_1^G - \varepsilon \cdot 1_{\gamma_2 > \underline{\gamma}}$ for $\gamma_2 \in [\underline{\gamma}, \overline{\gamma}]$. Therefore $\Delta_1^G(\widehat{D}_1^G) \equiv -\varepsilon$ for any $\widehat{D}_1^G$.

In words, if state G were to occur for sure, the incumbent would lose ε for sure by choosing high pledgeability over low pledgeability. Now consider the incentives emanating from state B.

State B - Temporary Distress: Incumbent always can outbid experts

Assumption 1b implies liquidity in state B is limited so that the firm is possibly *underpriced* and, therefore, there are potential rents to experts in the auction. Moreover, since $\omega_1^{I,B} \geq \omega_1^{H,B}$ and both the incumbent (if she retains ability) and experts can borrow up to $\gamma_2 C_2$ in the date-1 auction, the incumbent who retains ability can outbid the expert regardless of her choice of pledgeability. In this case, if the incumbent retains ability, she receives output C_2 but repays $\min\left\{\widehat{D}_1^B, B_1^{H,B}(\gamma_2)\right\}$ to stay in control for net continuation payoff $C_2 - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\gamma_2)\right\}$. By contrast, if she loses her ability and has to sell the firm at price $B_1^{H,B}(\gamma_2)$, her continuation payoff is $B_1^{H,B}(\gamma_2) - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\gamma_2)\right\}$. As a result, the incumbent's payoff in state B is

$$V_1^{I,B}\left(\widehat{D}_1^B, \gamma_2\right) = \theta^H\left(C_2 - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\gamma_2)\right\}\right) + \left(1-\theta^H\right)\left(B_1^{H,B}(\gamma_2) - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\gamma_2)\right\}\right) - \varepsilon 1_{\{\gamma_2 > \underline{\gamma}\}},$$

which is a weighted average of the payoff if she retains her ability and stays in control and the payoff if she loses ability and has to sell the firm. Clearly, she chooses $\gamma_2 = \overline{\gamma}$ iff

$$\begin{aligned}\theta^H\left(C_2 - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\overline{\gamma})\right\}\right) + \left(1-\theta^H\right)\left(B_1^{H,B}(\overline{\gamma}) - \min\left\{\widehat{D}_1^B, B_1^{H,B}(\overline{\gamma})\right\}\right) - \varepsilon \\ \geq \theta^H\left(C_2 - \min\left\{\widehat{D}_1^B, B_1^{H,B}\left(\underline{\gamma}\right)\right\}\right) + \left(1-\theta^H\right)\left(B_1^{H,B}(\underline{\gamma}) - \min\left\{\widehat{D}_1^B, B_1^{H,B}\left(\underline{\gamma}\right)\right\}\right),\end{aligned} \quad (1)$$

where the left hand side is the incumbent's continuation value if she chooses $\gamma_2 = \overline{\gamma}$, while the right hand side is if she chooses $\gamma_2 = \underline{\gamma}$.[8] Note that a higher γ_2 (weakly) increases the amount the incumbent has to pay the financier when she retains capability and control, therefore (weakly) decreasing the first term, while it (weakly) increases the amount the incumbent gets in the auction if she loses capability, thus (weakly) increasing the second term. In choosing to increase γ_2, the incumbent therefore trades off

[8] Constraint (1) can be equivalently written in terms of primitives:

$$\begin{aligned}&\theta^H \max\left\{C_2 - \widehat{D}_1^B, \left(1-\overline{\gamma}\right)C_2 - \omega_1^{H,B}, 0\right\} + \left(1-\theta^H\right)\max\left\{\min\left\{\omega_1^{H,B} + \overline{\gamma}C_2, C_2\right\} - \widehat{D}_1^B, 0\right\} - \varepsilon \\ &\geq \theta^H \max\left\{C_2 - \widehat{D}_1^B, \left(1-\underline{\gamma}\right)C_2 - \omega_1^{H,B}, 0\right\} + \left(1-\theta^H\right)\max\left\{\min\left\{\omega_1^{H,B} + \underline{\gamma}C_2, C_2\right\} - \widehat{D}_1^B, 0\right\}.\end{aligned}$$

higher possible repayments when she *buys* the firm from the lender against higher possible resale value when she *sells* the firm after losing ability.

Importantly, a higher outstanding promised remaining payment $\widehat{D}_1^B$ reduces the incumbent's incentive to choose higher γ_2. It is easily seen that

Lemma 2.2: Under Assumption 1b and given the remaining payment $\widehat{D}_1^B$, the incumbent expects

$$\Delta_1^B\left(\widehat{D}_1^B\right)=\begin{cases}-\theta^H\left[B_1^{H,B}\left(\overline{\gamma}\right)-B_1^{H,B}\left(\underline{\gamma}\right)\right]-\varepsilon & \text{if } \widehat{D}_1^B > B_1^{H,B}\left(\overline{\gamma}\right)\\ \theta^H B_1^{H,B}\left(\underline{\gamma}\right)+\left(1-\theta^H\right)B_1^{H,B}\left(\overline{\gamma}\right)-\varepsilon-\widehat{D}_1^B & \text{if } B_1^{H,B}\left(\underline{\gamma}\right)<\widehat{D}_1^B \le B_1^{H,B}\left(\overline{\gamma}\right)\\ \left(1-\theta^H\right)\left[B_1^{H,B}\left(\overline{\gamma}\right)-B_1^{H,B}\left(\underline{\gamma}\right)\right]-\varepsilon & \text{if } \widehat{D}_1^B \le B_1^{H,B}\left(\underline{\gamma}\right).\end{cases}$$

$\Delta_1^B\left(\widehat{D}_1^B\right)\ge 0$ if and only if $\widehat{D}_1^B \le D_1^{B,\text{PayIC}}=\theta^H B_1^{H,B}(\underline{\gamma})+(1-\theta^H)B_1^{H,B}(\overline{\gamma})-\varepsilon$. Superscript "PayIC" here indicates the required debt payment is the highest that allows the choice of high pledgeability to be incentive compatible.

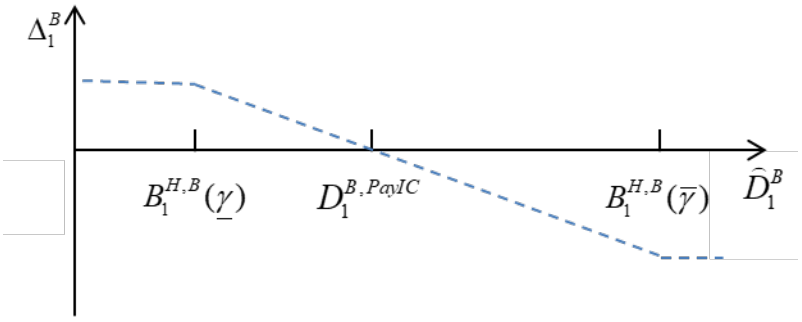

Figure 3 $\Delta_1^B\left(\widehat{D}_1^B\right)$ **as a function of** $\widehat{D}_1^B$

In Figure 3, we plot $\Delta_1^B\left(\widehat{D}_1^B\right)$ against $\widehat{D}_1^B$. Intuitively, with higher debt, more of the pledgeable cash flows are captured by financiers if the incumbent stays in control, and more of the resale value also goes to financiers if the asset is sold. This is the source of moral hazard over pledgeability caused by debt. To see this, for $\widehat{D}_1^B \le B_1^{H,B}\left(\underline{\gamma}\right)$, debt repayment is not increased by higher pledgeability because of the low value of outstanding debt. Instead higher pledgeability only increases outside bids, which is beneficial when the incumbent loses ability and sells the asset. The benefits of high pledgeability are capped at $\left(1-\theta^H\right)\left[B_1^{H,B}\left(\overline{\gamma}\right)-B_1^{H,B}\left(\underline{\gamma}\right)\right]-\varepsilon$. As $\widehat{D}_1^B$ rises to $D_1^{B,PayIC}$, the incumbent has to pay more in expectation to debt holders when she raises pledgeability, so $\Delta_1^B\left(\widehat{D}_1^B\right)$ falls to zero and then goes

negative as the face value of debt increases further. When $\widehat{D}_1^B > B_1^{H,B}(\overline{\gamma})$, the incumbent has to pay the entire increment in sale price from increasing pledgeability to debt holders when she loses ability – so she gets nothing from increasing pledgeability under those circumstances – while she has to pay $B_1^{H,B}(\overline{\gamma})$ instead of $B_1^{H,B}(\underline{\gamma})$ if she retain ability. Hence there is no benefit but only cost to the incumbent by increasing pledgeability, and the cost is capped at $\theta^H\left[B_1^{H,B}(\overline{\gamma}) - B_1^{H,B}(\underline{\gamma})\right] - \varepsilon$. Note that it is easier to incentivize the incumbent, and thus raise the incentive compatible level of debt, when the probability she loses skills $(1-\theta^H)$ is higher, for this enhances the likelihood of sale and reduces the likelihood of retention. Moral hazard over pledgeability increases in stability θ^H.

Given $\Delta_1^G\left(\widehat{D}_1^G\right)$ and $\Delta_1^B\left(\widehat{D}_1^B\right)$, we can check the incumbent's incentive to choose pledgeability for any D_1. Recall that the incumbent will choose high pledgeability if and only if $q^G\Delta_1^G\left(D_1 - \gamma_1 C_1\right) + (1-q^G)\Delta_1^B\left(D_1\right) \geq 0$. Since there is never any incentive to increase pledgeability coming from the future liquid state G, i.e. $\Delta_1^G\left(\widehat{D}_1^G\right) \equiv -\varepsilon \approx 0$ for any $\widehat{D}_1^G$, the constraint therefore depends on the incumbent's incentive in state B. We have:

Proposition 2.1 Given Assumption 1a and 1b, there exists a unique threshold D_1^{IC} such that the incumbent manager sets high pledgeability if and only if $D_1 < D_1^{IC}$. Moreover, as $\varepsilon \to 0$, $D_1^{IC} \to D_1^{B,PayIC}$.

Proof: Directly follows Lemma 2.1 and 2.2. ■

Optimal Debt Level

$D_1^{B,PayIC}$ can be written as $D_1^{B,PayIC} = \theta^H \min\left\{\omega_1^{H,B} + \underline{\gamma}C_2, C_2\right\} + (1-\theta^H)\min\left\{\omega_1^{H,B} + \overline{\gamma}C_2, C_2\right\} - \varepsilon$.

Under Assumption 1b, $D_1^{B,PayIC}$ is well below $\gamma_1 C_1 + C_2$, the most that can be paid in state G. As a result, D_1^{IC}, the highest level of debt which provides incentives for high pledgeability, keeping in mind both future states, may not be the face value that enables the incumbent to raise the most upfront. This is most easily seen when liquidity is plentiful, as in state G with no potential underpricing. In this case, the incumbent can issue debt with face value $\gamma_1 C_1 + B_1^{H,G}(\underline{\gamma}) = \gamma_1 C_1 + C_2$, which she will repay in full in state G, and she will repay only $B_1^{H,B}(\underline{\gamma})$ in state B, because the high face value induces low pledgeability. Even with low pledgeability choice, the incumbent is able to raise

$q^G\left(C_2+\gamma_1 C_1\right)+(1-q^G)B_1^{H,B}(\underline{\gamma})$ at date 0. However, to incentivize high pledgeability, the promised payment cannot exceed $D_1^{IC}=D_1^{B,PayIC}$, which will raise $D_1^{B,PayIC}$ up front. If the difference between $\gamma_1 C_1+C_2$ and $D_1^{B,PayIC}$ is large and if the probability of the good state q^G is sufficiently high, the incumbent could raise more by setting $D_1=\gamma_1 C_1+C_2$. In other words, the incumbent will choose high risky debt that dampens pledgeability over more moderate safe levels of debt that incentivize pledgeability -- the prospect of a highly liquid future state not only makes feasible greater promised payments, but these payments also eliminate incentives to enhance pledgeability that only arise from the low liquidity state. To restore those incentives, debt may have to be set so low that funds raised are greatly reduced – something the incumbent will not want to do if she is bidding at date 0 for the firm. Note that this can happen even if the probability of the low state is significant, and even if the direct cost ε of enhancing pledgeability is infinitesimal. Proposition 2.2 states the results.

Proposition 2.2 Let $\underline{l}=q^G\left(C_2+\gamma_1 C_1\right)+(1-q^G)B_1^{H,B}(\underline{\gamma})$ and $\overline{l}=D_1^{B,PayIC}$. Under Assumption 1a and 1b and $\varepsilon\to 0$, let D_1^{Max} be the face value of the debt that raises the maximum amount at date 0,

a. If $\underline{l}>\overline{l}$, then $D_1^{Max}=\gamma_1 C_1+C_2$, and $\gamma_2=\underline{\gamma}$.

b. If $\underline{l}\le\overline{l}$, then $D_1^{Max}=D_1^{IC}=D_1^{B,PayIC}$, and $\gamma_2=\overline{\gamma}$.

Interestingly, debt will not be renegotiated before, or after, the state s_1 is realized, even if renegotiation is feasible – it will not be renegotiated before because the level of debt is set to raise the maximum amount possible even if it will result in low pledgeability, and it will not be renegotiated after, because relevant parties will not write down their claims given that pledgeability γ_2 has already been set. Interestingly, both the fixed promised debt payments across states, and the act of choosing pledgeability before the state is known, have the effect of causing a spillover between anticipated states.

B.2. Discussion: The Liquidity Leverage Pledgeability Nexus

In sum, if liquidity is anticipated to be high, the competitive credit market allows high debt. When borrowers finance with such high debt, however, they do not have the incentive to set pledgeability high, even if the direct costs of doing so are small and the probability of a low liquidity state non-negligible. Pledgeability is neglected, which nevertheless will be acceptable to lenders who anticipate a high probability of continued high liquidity. Liquidity, asset prices (bids in the auction), and leverage follow each other up, while pledgeability falls. If liquidity does not materialize, access to finance will drop

significantly – for debt capacity falls not just because liquidity has fallen, but because pledgeability has fallen – debt capacity is $B_1^{H,B}(\underline{\gamma})$ instead of $C_2 + \gamma_1 C_1$. Debt capacity is restored only after a long while, either after liquidity has built back up, or pledgeability is raised over time.

Some other points are worth noting. First, in times when prospective liquidity is high, it is immaterial whether the incumbent being financed has low incentives to raise pledgeability or was incapable of raising it at all. Put differently, when pledgeability is not needed, even poorly governed firms (low, fixed γ) that would not have obtained much financing in times of moderate liquidity, will narrow the financing gap with better governed firms. For the observer, this may look like greater risk taking by lenders or a move to lower quality lending. Lenders may indeed be taking more risk, but they are not making ex ante unprofitable loans.[9] Instead, a rising tide of liquidity lifts all corporate boats.

Note also that underinvestment in pledgeability would be more muted if bidders took on less debt at date 0, despite anticipating a high probability of ample liquidity at date 1. Ex-ante competition for the underpriced asset forces bidders to fund themselves issuing high amounts of debt, and lenders to rationally make these loans, even if this results in higher risk, and defaults in some states. Of course, if bidders ex ante had ample amounts of own liquidity with which to bid, they might not need much leverage before they could bid the full value of the asset, beyond which they will not go. We will explore this more fully shortly. This does, however, suggest that sharp increases in anticipated liquidity from current levels tend most to increase bid asset prices, and leverage to fund these bids.

Higher anticipated liquidity is not an unmitigated blessing, and can worsen ex-post outcomes in less liquid realized states. Moreover, it can reduce the overall amount raised up front (see Diamond, Hu, and Rajan (2018 a)). To the extent that government or central bank policies create anticipation of liquidity, these are concerns that have to be kept in mind.

Another way of thinking about anticipated situations of high liquidity is that the prospect of repaying the high level of debt in full is high enough that both borrower and lender neglect the loss given default. Because pledgeability is neglected, the consequences in the low liquidity state can be much more severe than if initial debt were lower. As a related aside, when the B state is realized, and debt capacity turns out to be low because of low liquidity and low pledgeability, it might seem as if the incumbent neglected the

[9] There is an extensive literature on how easier monetary policy exacerbates risk taking and lending to lower quality borrowers. See for example, Bruno and Shin (2015), Ioannidou, Ongenga, and Peydro (2015), Kalemli-Ozcan, Liu and Shim (2018), Morais, Peydro, and Ruiz (2015) and Paligorava and Santos (2017).

possibility of that state occurring (see, for example, Gennaioli, Shleifer, and Vishny (2011)). In reality, though, the high level of debt, optimally taken on in full knowledge of the prospective states, may crowd out pledgeability. There is a spillover between states caused by debt, which may then appear as if particular states were neglected. Of course, if participants we behaviorally prone to neglect these states, the effect we document would be further augmented.

Finally, the link between credit growth, high asset prices, and a higher probability of distress has been noted in the literature starting with the seminal paper by Borio and Lowe (2002). Our model suggests the common driver is anticipated liquidity, which pushes asset prices higher (towards true fundamentals), increases credit growth, and by depressing pledgeability, increases the possibility of financial distress.

C. Where Does Liquidity Come from: The Case of Cross Border Lending

The key exogenous variable in the model thus far is ω_1^{H,s_1}, the liquidity in future state s_1. Where could liquidity come from? Most obviously, the net worth of experts increases if the economy is doing well. So a period of continued prosperity would increase liquidity.

If "outside" experts own their firms, then as we have seen earlier, a cut in real monetary policy rates that is expected to endure for some time could also increase liquidity, especially in indebted sectors such as real estate construction. Monetary policy also can have very important effects through cross border lending. There is a now vast and growing literature on the effects of source funding country monetary policies, measures of global risk aversion, and cross border lending booms. A number of papers (see Claessens and Kose (2018) for a comprehensive survey) make the following points:

Lower (higher) U.S. monetary policy rates tend to lead to a persistent depreciation (appreciation) of the dollar both in real and nominal terms, with a maximum impact that does not occur until at least 24 months after the shock (Eichenbaum and Evans (1995), Bruno and Shin (2015)). Bruno and Shin argue that the delayed exchange rate response (relative to the instantaneous response predicted in the uncovered interest parity literature) stems from the steady buildup of bank debt issuance and cross-border lending in the source currency after the monetary easing. These findings are best documented when the source "funding" currency is the US dollar, but similar such results have been noted for other funding currencies (see Avdjiev et al. (2018)).[10]

[10] See Bruno and Shin (2017), Cetorelli and Goldberg (2012), Ivashina, Scharfstein and Stein (2015), McCauley, McGuire and Sushko (2015), Shin (2012).

Bruno and Shin (2015) relate the steady increase in lending to both supply and demand side changes. On the supply side, the fall in risk aversion (as proxied by the decline in the VIX index) that seems to follow a rate cut (see Bekaert et al. (2013)) leads banks to take on more credit risk. On the demand side, foreign firms that already have dollar debt outstanding see a fall in the value of that debt as the dollar depreciates vis a vis the domestic currency. They also experience a reduction in debt service as dollar interest rates fall along with the weakening of the dollar. This gives them unused dollar debt capacity, which they proceed to utilize.

Yet why do foreign firms borrow in dollars in the first place, even though this exposes many of them to a currency mismatch?[11] An earlier literature (Eichengreen et al. (2007), Goldstein and Turner (2004), Rajan and Tokatlidis (2005)) suggested that when a country frequently relies on inflationary finance, a substantial inflation risk premium is demanded for lending in the domestic currency. To avoid this, borrowers borrow in dollars. More recently, Gopinath and Stein (2018) argue that trade invoicing in dollars leads consumers in other countries to want to hold dollar deposits, and banks issuing such deposits may hedge their low cost dollar deposits by lending to firms in dollars at a discount.[12] Conversely, firms that have access to cheap dollar funding might find it convenient to invoice in dollars, so as to reduce the extent of currency mismatch. Therefore, they argue, dollar invoicing and dollar funding are part of an equilibrium that make dollar assets especially sought after. In a parallel vein, Jiang, Krishnamurthy, and Lustig (2018) build on the special demand for dollar safe assets to argue that foreign firms will issue dollar liabilities, and this will transmit US monetary shocks around the world, as also suggested by Rey (2013).

C.1 Spillovers from the source country: Exchange Rate, Asset Price, and Credit Booms

We cannot do justice to this extensive literature but the takeaways for our model are clear. There are a variety of reasons corporations in countries outside the source "funding" currency country have currency mismatches – a modest fraction of revenues in the funding currency, and significant liabilities in that currency. These corporations will naturally see their net worth, and hence their liquidity in the sense we define it, wax and wane with source funding country monetary policy. Specifically, a more accommodative monetary stance in the source funding country will lead to a steady depreciation of the funding currency. This will lead to a steady anticipated rise in the net worth of those who have borrowed in the funding currency but have much of their revenues in the domestic currency. To the extent that these

[11] See Brauning and Ivashina (2017) offer evidence suggesting the primacy of dollar-denominated loans in the syndicated cross-border loan market, with much of the dollar borrowing undertaken by firms with modest dollar revenues. Such firms are harmed by dollar appreciation (see Du and Schreger (2014), Kalemli-Ozcan et al. (2016)).
[12] For evidence on trade invoicing in dollars see, for example, Gopinath (2015).

constitute most of the experts in a country, it will lead to higher anticipated liquidity in the language of our framework, and therefore an immediate rise in bids for assets/firms that come on the market, financed with increasing amounts of debt. This increase in the availability of finance will also lead to increased investment and growth, though it is not something we focus on in our model.

Thus far, our model's predictions resemble those of many other models in the literature – models that emphasize the balance sheet channel or the risk taking channel of transmission of monetary policy (see, for example, Bernanke and Gertler (1995), Borio and Zhu (2012), and Bruno and Shin (2015)). What is different is that as continued prospective domestic exchange rate appreciation results in an expectation of high expert liquidity and facilitates a rise in domestic leverage, pledgeability gets crowded out. To the extent that domestic lenders are more comfortable lending against cash flow pledgeability (because they are more familiar with the country's institutions of governance), while foreign lenders tend to be relatively more focused on asset sales to enforce payment, foreign lenders will have a higher share of lending at this stage than in earlier stages.[13] As argued earlier, the financing gap between firms with lower intrinsic governance and those with higher intrinsic governance will also narrow. Lender balance sheets will tilt more towards lower quality firms than before, simply as a result of abundant prospective liquidity.

C.2 Sudden Stop

Eventually, of course, when monetary policy in the source country turns to become less accommodative, the domestic exchange rate becomes prone to depreciate, and expectations of future liquidity switch from high to low. Because pledgability has been neglected, corporate debt capacity also plummets, more so than warranted simply by the fall in liquidity. As refinancing becomes hard, firms have to default, and because the fall in exchange-rate-driven-liquidity is a common factor, defaults are widespread. Foreign lenders, who arguably have less comfort relying on pledgeability for loan recovery, know there is less business for them even if the corporate sector recovers – given low anticipated liquidity, pledgeability will be key to recovering on any new loans. So over and above the collapse in debt capacity, the economy will see a thinning out of foreign lenders. Therefore, an abrupt cessation of short term debt lent by foreigners, a sudden stop in capital inflows, and a sharp forcible reversal in the receiving country's current account deficit will become more probable as the source country's monetary policy tightens (Calvo and Reinhart (2000); Milesi-Ferretti and Razin (2000); Edwards (2004); Forbes and Warnock (2012)). If the receiving country has not built foreign exchange reserves, which it spends to

[13] In other words, domestic banks could have been doing more of the cross-border intermediation at the earlier stages, borrowing in dollars and lending in the domestic currency.

cushion exchange rate depreciation at this stage, a sharp depreciation will further tighten domestic liquidity, as the net worth of firms that have borrowed in foreign currency erodes further.

There is evidence consistent with this narrative. Gourinchas and Obstfeld (2012) conclude that many crisis episodes were preceded by significant build-ups in domestic credit as well as large real appreciations of the currency. They find that across all types of crisis, three variables play a statistically and economically significant role: the ratio of domestic credit to output, the real exchange rate, and the ratio of official reserves to output. Kalemli-Ozcan, Liu and Shim (2018) find that firms with higher outstanding foreign debt before an exchange rate appreciation take on yet more debt. Brauning and Ivashina (2018) show that when US monetary policy tightens, not only does credit from foreign banks to EM borrowers tighten, so does credit from local banks, suggesting the problem is one of general creditworthiness. Of course, the key differentiator in our narrative relative to other models of crises is the link between exchange rate movements, leverage, and governance or pledgeability. A finding that pledgeability (equivalently, corporate governance, accounting quality, or bank screening and monitoring) in receiving country corporations falls in the face of persistent high liquidity and increasing leverage would be evidence in favor of our model.[14] Note that apart from the interesting exchange rate channel, nothing in our model restricts the phenomenon to receiving countries. Indeed, there is some evidence for the negative correlation between liquidity and pledgeability in the United States after a sustained boom (see the references in Diamond, Hu, and Rajan (2018 a)).

Before we move to possible actions the authorities can take, it is worth noting that none of what we have modeled requires irrationality on the part of either borrowers or lenders. Once we appeal to other models to explain why firms with largely domestic revenues borrow in dollars, everything else follows. Competition for assets in the face of rising exchange-rate-induced liquidity pushes up leverage, which eventually crowds out pledgeability, and leaves firms vulnerable to a fall in liquidity. The shift in source country monetary policy eventually delivers that shock.

C.3 Fear of Floating

Importantly, our explanation of the boom-bust cycle does not rely on excessive optimism about continued liquidity – though that would exacerbate the phenomenon we describe. Therefore, even if countries have experienced this frequently in the past, there is no reason why private sector participants will not be forced by circumstances to repeat it. Intervention may be necessary to disrupt the cycle.

[14] See, for instance, Johnson et al. (2000) for suggestions that governance was lax before the Asian financial crisis.

Indeed, emerging markets typically are unwilling to allow sharp nominal exchange rate movements, both on the upside and the downside, which has been termed a "fear of floating" (Calvo and Reinhart (2002); Hausmann et al. (2001)). The fear of appreciation is sometimes attributed to a fear of de-industrialization and a fall in competitiveness as the exchange rate is allowed to appreciate. The fear of depreciation is attributed to worries about a mismatch in the exchange rate denomination of assets and liabilities. From the perspective of our model, a sustained appreciation lays the seeds for financial fragility, which is then reaped in the event of a sharp depreciation. Worries about trade competitiveness need not be the reason receiving country authorities have a fear of floating; attempts to moderate exchange rate movements through exchange rate intervention may be entirely macro-prudential in nature, given the authorities have seen the same movie many times and know how it ends. Certainly, a number of emerging market countries have understood that they should build foreign exchange reserves in the face of a sustained domestic currency appreciation. Since dollar weakness is the typical counterpart of domestic currency strength, such purchases across a number of emerging markets may be seen as a widespread demand for "safe" assets at such times. In reality, it may be an attempt by receiving countries to put sand in the wheels of currency appreciation, even while building a war chest to combat the inevitable depreciation.

What this also means is that emerging markets acquire (typically short term) financial assets in the source country when interest rates there are low, only to sell them when rates start moving up. This potentially adds to the cost of the "leaning against the exchange wind" strategy. Unfortunately, there are few other tools that authorities have that will not disrupt the domestic economy significantly. Importantly, tighter monetary policy in the receiving country risks shifting the currency composition of corporate borrowing yet further into "cheaper" dollars (and exacerbating the appreciation), while more accommodative policy could encourage the domestic credit expansion.

Of course, such "leaning against the wind" can induce moral hazard as corporations, confident that the central bank will moderate currency volatility, take on more unhedged foreign currency denominated debt. To combat this, some countries limit corporate foreign currency borrowing (India, for example, sets maximum aggregate limits every year).[15] All this goes to say that there are no clean responses to this problem.

[15] Could limitations on leverage obviate the need for exchange rate intervention? Perhaps, but it does place enormous burdens on regulatory authorities to adopt the right regulations. Moreover, there may be many ways in open economies of concealing or evading regulations on foreign currency borrowing. In practice, therefore, some mix of measures will be used so as to avoid overburdening any single one.

The tendency for boom and bust in receiving countries is more pronounced as quiescent inflation makes source country monetary policy accommodative over long periods, as it has been in recent decades (see, for example, Borio and White (2004)). From the receiving country's perspective, a commitment to "low for long" in the source country is a commitment to sustained easy liquidity in the receiving country – until it reverses. This implies a substantial build up in leverage and financial fragility. No wonder a variety of emerging market policy makers have expressed concern both at sustained easy policy in source funding countries, as well as the possibility that these are reversed abruptly. These concerns are not in contradiction, one follows from the other. We will ask in the concluding section whether there is scope for multilateral action here.

III. Ex Ante Liquidity and Intermediary Leverage

Let us now turn to two other issues. First, thus far we have examined the effects of prospective or anticipated liquidity on leverage and pledgeability. We have assumed that experts have little wealth at date 0. Competition then forces them to lever up to the hilt as they bid for underpriced corporate assets. What if experts had more wealth at date 0? In other words, does the path of liquidity over time matter? To do justice to this question, a full-fledged dynamic model is warranted, but we will try and shed some light on the consequences of ex ante liquidity in our two period model. Second, most lending is done through financial intermediaries. How does rising liquidity affect intermediation?

A. Ex Ante Liquidity

In the previous analysis, we have assumed that the initial bidders always bid less than the present value of future cash flows since moral hazard limits the funds they can raise against the assets, and they have insufficient wealth up front to make up the difference. A sufficient condition is the initial liquidity, ω_0, equals zero. In this subsection, we relax this assumption and assume $\omega_0 > 0$. We will do comparative static analysis with respect to ω_0. As earlier, we assume that $\omega_1^{H,G} > \left(1-\underline{\gamma}\right)C_2$ so that bidders pay a full price for the asset in future state G. In this case, $D_1^{IC} = D_1^{B,PayIC}$. Therefore, as discussed earlier, the face value that pledges out the most is either $\gamma_1 C_1 + C_2$ and $D_1^{B,PayIC}$. Recall that $\underline{l} = q^G\left(\gamma_1 C_1 + C_2\right) + \left(1-q^G\right)B_1^{H,B}\left(\underline{\gamma}\right)$ and $\overline{l} = D_1^{B,PayIC}$. The value of the asset to an initial bidder depends on the level of the initial debt D_1. Let it be V. Specifically,

$$V(D_1)=\begin{cases}\overline{V}=q^G(C_1+C_2)+(1-q^G)\left[\theta^H C_2+(1-\theta^H)B_1^{H,B}(\overline{\gamma})\right] & \text{if } D_1\le D_1^{B,PayIC}\\ \underline{V}=q^G(C_1+C_2)+(1-q^G)\left[\theta^H C_2+(1-\theta^H)B_1^{H,B}(\underline{\gamma})\right] & \text{if } D_1> D_1^{B,PayIC}.\end{cases}$$

Because there is no underpricing in state G, the initial bidder always recoups the full value of the asset C_1+C_2 if state G is realized. If $D_1\le D_1^{B,PayIC}$, the incumbent will set pledgeability high and will sell the firm for $B_1^{H,B}(\overline{\gamma})$ if she loses ability. The value she collects before debt payment is $\overline{V}$. If $D_1>D_1^{B,PayIC}$, low pledgeability $\gamma_2=\underline{\gamma}$ is chosen ex-ante. In this case, if state B occurs and if the incumbent loses her ability, she only sells the firm at price $B_1^{H,B}(\underline{\gamma})$, so she expects to receive $\underline{V}$ overall. It follows that

Lemma 2.3:

1) If $\underline{V}>\omega_0+\max[\underline{l},\overline{l}]$, we have underpricing for sure and the initial winning bid is $\omega_0+\max[\underline{l},\overline{l}]$. If $\overline{l}\ge\underline{l}$, $D_1=D_1^{B,PayIC}$ and $V(D_1)=\overline{V}$ else $D_1=\gamma_1 C_1+C_2$ and $V(D_1)=\underline{V}$.
2) If $\underline{V}\le\omega_0+\max[\underline{l},\overline{l}]$ and
   a. $\overline{l}\ge\underline{l}$
   the initial winning bid is $Min[\overline{V},\omega_0+\overline{l}]$ and $D_1=Min[\overline{V},\omega_0+\overline{l}]-\omega_0$
   b. $\underline{l}>\overline{l}$ and
      (i) $\omega_0+\underline{l}>\underline{V}>\omega_0+\overline{l}$
      the initial winning bid is $\underline{V}$ and $D_1=\left(\underline{V}-\omega_0-(1-q^G)B_1^{H,B}(\underline{\gamma})\right)/q^G$
      (ii) $\omega_0+\underline{l}>\omega_0+\overline{l}\ge\underline{V}$
      the initial winning bid is $Min[\overline{V},\omega_0+\overline{l}]$ and $D_1=Min[\overline{V},\omega_0+\overline{l}]-\omega_0$

Lemma 2.3 (1) suggests (naturally) that if ex ante liquidity ω_0 is low so that bidders cannot bid the full present value of future cash flows to them, the firm is underpriced. The results of the previous section on initial leverage then go through. Debt may go up to levels that inhibit pledgeability if ex-post liquidity is high enough. However, if ex ante liquidity is high enough that the asset is no longer underpriced (Lemma 2.3 (2)), higher ex ante liquidity can limit the amount of debt that is taken on. Moreover, even when anticipated ex post liquidity is such that $\underline{l}>\overline{l}$ so that high levels of debt raise more up front (Lemma 2.3 (2 b (ii)), bidders may prefer lower incentive-compatible levels of debt because it allows them to generate the higher valuation $\overline{V}$ for the asset. Thus higher ex ante liquidity mitigates the consequences of high ex

post liquidity by reducing the need to take on debt while bidding for assets, thus mitigating the effects of leverage on pledgeability.

This also suggests situations where high ex post liquidity is problematic. When perception of high future liquidity emerge suddenly – for instance when the domestic exchange rate is expected to appreciate sharply or in a sustained way, thus raising the ability of bidders to borrow significantly, it has a greater effect in encouraging leverage and suppressing pledgeability than when bidders become steadily wealthier over time, and the difference between future wealth and current wealth is not high. To the extent that emerging markets have higher growth prospects and lower current wealth, they may be more subject to the distortions created by higher prospective liquidity than advanced countries.

B. Intermediation

While cross border flows post global financial crisis have tilted more towards bond financing recently (see, for example, Milesi-Ferretti and Tille (2011) and Lane and Milesi-Ferretti (2017)), Cerutti and Hong (2017) suggest that bank financing continues to play an important part in emerging market financing. How does focusing on intermediation rather than direct lending change our analysis?

Diamond, Hu, and Rajan (2018b) focus on screening intermediaries, such as loan securitizers, whose main activity is to screen out borrowers who are likely to be poorly governed (have low γ_2) and package the remaining loans into securitization vehicles. They conclude that such screening intermediaries are required to have skin in the game (that is, hold costly capital) when screening is valuable, introducing both a benefit and a cost to intermediation. However, both benefit and cost tend to diminish in an environment of high ex post liquidity. More specifically, the value from intermediation, whether screening and reducing adverse selection amongst borrowers, or monitoring and reducing their propensity for moral hazard, tends to become negligible at high levels of anticipated liquidity for reasons we have discussed. As a result, the need for intermediaries to have skin in the game to incentivize or signal proper behavior also diminishes. In periods of high anticipated liquidity, intermediaries thus become highly levered pass-through structures, for similar reasons to ones we have elaborated on in this paper. The propensity for intermediaries to become more highly levered themselves, even as their borrowers lever up, essentially leaves the system with little shock absorbing buffer, yet another potential cost if the anticipated liquidity fails to materialize.

IV. Monetary Policy Spillovers: Implications for Multilateralism

Before the financial crisis, there was a sense that the world had arrived at a policy optimal, which contributed to the Great Moderation. As Eichengreen et al. (2011) argue, the sole objective for monetary

policy was price stability, and it was achieved by flexible inflation targeting. Indeed, by allowing exchange rate variability, the system eliminated the need for exchange rate intervention or reserve accumulation. Inflation targeting plus floating exchange rates, as Eichengreen et al, argue, "could thus be regarded as the triumph of the *"own house in order"* doctrine in the international monetary field. National macro-economic stability was seen as sufficient for inter-national macroeconomic stability. The domestic and international aspects were essentially regarded as two sides of the same coin."

This view is still echoed. For instance, Bernanke (2017) lays out a 2-country model of spillovers to show that a flexible exchange rate can largely insulate emerging markets from both internal and external shocks in the medium run. He argues that even the existence of financial stability spillovers does not invalidate the basic implication of the "trilemma", that exchange rate flexibility can help insulate domestic output from foreign monetary policies; and any remaining spillovers should be tackled by regulatory and macroprudential measures. Of course, such views have been challenged (see, for example, Rey (2013) or Rajan (2014)).

The point of this paper has been to show that there might be a rationale for countries to limit exchange rate movements so as to avoid spillovers affecting financial stability from accommodative monetary policies in funding countries. In other words, exchange rate intervention may be a macroprudential measure in its own right, and not intended to gain the country undertaking it a competitive advantage. Of course, such intervention may also need to be accompanied by other measures so as to mitigate any resulting moral hazard. For recipient countries, there may be no clean ways of avoiding spillovers, and it may well be a matter of muddling through. We have made this point drawing on an extensive empirical literature, much of it after the Global Financial Crisis of 2007-2008, which suggests that source country monetary policy does spill over into recipient countries. The phenomenon we describe – liquidity driving leverage and reducing pledgeability – may well occur in the source country also, but could be magnified via balance sheet currency mismatches and exchange rate movements in recipient countries.

This does raise an important question, though. What responsibility do source countries have for these spillovers? The "own house in order" doctrine suggested none – any spillovers are because of improper policies in recipient countries.[16] This is indeed the view that many source country central bankers, focused on their domestic mandates, espouse. It is hard to know whether they would have the same view

[16] Even this rationale could be debated. To the extent that emerging markets and developing countries have inadequate institutions with limited credibility, their best policy response may fall short of what a developed country would be capable of. Should they be held responsible for spillovers, given they fall short of developed country response, or do sending countries have a duty to recognize their state of development?

if their mandates also included some element of international responsibility. Others, such as Blanchard (2016) and Frankel (2016), recognize there may indeed be spillovers, but do not see any possibility of altering the behavior of sending countries. Instead, they focus on macroprudential policies and even capital flow measures in recipient countries, as does the IMF's Institutional View.[17]

Mishra and Rajan (2018) and Taylor (2017) suggest placing some of the responsibility of adjustment back on source countries through monetary policy rules. For instance, Mishra and Rajan (2018) suggest that certain kinds of monetary policy actions in certain kinds of environments could be ruled out of order because of the adverse spillovers they create, much as sustained unidirectional intervention in the exchange rate used to be frowned upon till recently. Such rules of the game could effectively introduce international responsibility back into central bank behavior, without changing their mandates or requiring international coordination. Indeed, an Eminent Persons Group, tasked by the G-20 with suggesting changes to the global financial architecture, has noted the need for a "rules-based international framework, drawing on a comprehensive and evolving evidence base… to provide policy advice through which countries seek to avoid policies with large spillovers, develop resilient markets, and benefit from capital flows while managing risks to financial stability."[18] It further recommends that the "IMF should also develop a policy framework for sending countries that enables them to meet their domestic objectives while avoiding large international spillovers."

Our paper does raise an additional intriguing possibility. Our model suggests that the cross-border effects of source country monetary policy resemble qualitatively, if not quantitatively, their effects on source country domestic financial stability. Of course, the role of exchange rate changes present an important additional asymmetry between source countries and the others. However, to the extent that source country central banks pay attention not just to price stability but also to domestic financial stability, policy actions may well be altered in a way that will mitigate international spillovers.

Of course, we are still a long way from having the evidence and the understanding that helps us create a rules-based international framework. Yet, we have also come a long way, from blaming emerging markets and developing countries for reacting inadequately to capital inflows. If we are to find ways to utilize capital flows well – to meet the saving needs of rich ageing countries while also meeting the financing needs of developing countries and emerging markets, without precipitating periodic crises – we will need a multilateral co-operative solution. Multiple tools exercised by many countries may be the best way of tacking a multi-faceted problem.

[17] https://www.imf.org/external/np/pp/eng/2012/111412.pdf
[18] https://www.globalfinancialgovernance.org/

Conclusion

Cross-border capital flows, whether pushed by sending countries or pulled by receiving countries, have been a source of financial fragility. We argue in this paper that even if countries at either end of the flows follow reasonable policies, the nature of the expansion in liquidity in the up-cycle may, by increasing leverage and reducing pledgeability, set the stage for a costly downturn. In a world where nationalism is on the rise, such spillovers create an environment that is prone to misunderstanding and potentially conflict. Sending countries may see reserve build-up in receiving countries as unfair exchange rate manipulation, while receiving countries may feel indignant that they have to assume full responsibility for managing the collateral effects of industrial country monetary policies.

Rather than blaming each other, countries should see how best they can benefit from cross-border flows, without incurring the costs. Our paper, building on extensive work by others, suggests there is a genuine problem. There is much scope for further research on what the solutions could be.

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