Dollars Dollars Everywhere, Not a Dime to Lend:

Credit Limit Constraints on Financial Sector Absorptive Capacity

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Abstract

The inability of developing countries to absorb and retain capital has long puzzled observers. The unanticipated events of 9/11 simultaneously led to a surge in capital flow into Pakistan, and an increase in aggregate demand. Yet despite rising deposit to loan ratios and precipitous fall in cost of capital, banks showed remarkable hesitancy to expand firm credit. We use quarterly firm-level data on debt capacity limits on all actively borrowing firms in Pakistan to show that debt capacity constraints led to the limited absorptive capacity of financial sector. Consistent with debt capacity hypothesis, "financial slack" positively predicts credit growth, and this predictability shoots up immediately following 9/11. This financial slack effect is stronger within industries receiving larger demand shocks, stronger within smaller firms, and completely absent for firms that do not face debt capacity constraints due to ex-ante lax regulation. A number of tests show that our results are unlikely to be driven by unobserved firm quality or expected changes in loan demand. Tentative estimates put the economy wide costs of these debt capacity constraints at 2.3% of GDP.

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Why does capital not flow from rich to poor countries? Lucas (1990) observed that the magnitude of foreign capital flows into developing economies was too small to reconcile with the standard economic assumption of diminishing returns for capital-rich economies. Although financial integration and liberalization have rapidly advanced since then, the Lucas puzzle has only deepened. The last five years have witnessed developing economies exporting capital on net, with high growth countries such as China, Korea, and India exporting even more (Gourinchas and Jeanne 2006, Prasad, Rajan, and Subramanian 2006).

Although a number of explanations have been proposed for the limited absorptive capacity of developing countries, providing empirical support for any one remains difficult. This paper uses micro data to test if firm level debt capacity constraints offer a plausible explanation for the inability to absorb capital. According to the debt capacity hypothesis, external financing of firms is limited by balance sheet factors such as existing firm collateral and cash flows. Such balance sheet based lending may be driven by standard agency costs that are particularly pronounced in developing economies. Hence despite growth opportunities *and* availability of liquidity, financial sector fails to absorb the optimal amount of capital.

We test predictions of the debt capacity hypothesis by exploiting the unexpected consequences for Pakistan of the tragic events of 9/11. 9/11 brought a large and sudden boon for the Pakistani economy. It ended Pakistan's international isolation, renewed government's access to bilateral and multilateral liquidity, reversed flight of private capital and led to a sharp rise in aggregate demand. Yet banks were remarkably sluggish in increasing firm credit despite sharp increases in deposit to loan ratio, plummeting cost of capital from 11% to 2% and higher economy wide rates of investment.

The unexpected consequences of 9/11 provide a natural ground for testing whether firm debt capacity constraints were responsible for the muted responce of Pakistan's financial sector. We use a rich dataset that includes debt capacity limits set by banks for all firms in the economy. A review of individual banks' credit manuals as well as central bank's prudential regulations shows that debt capacity, i.e. credit limit, is set by banks based primarily on a firm's collateralizable assets and historic cash flows. Since unused lines of credit are costless in Pakistan, firms try to get as large a credit limit approved as possible.

Our empirical methodology is based on the simple observation that under the debt capacity hypothesis, a bank's ability to increase credit is bounded by its firms' unused debt capacity.

Hence a shock like the unexpected consequences of 9/11 generates a number of testable predictions. First, ceteris paribus, firms with greater initial financial slack (i.e. unused debt capacity) should experience larger growth in bank credit. We refer to this as the *financial slack effect.* Second, there is a prediction on the precise timing of the financial slack effect. If limited increase in bank credit after 9/11 was driven primarily by debt capacity constraints then the financial slack effect should shoot up exactly when 9/11 hits. Third, the financial slack effect should be stronger among industries that experienced a larger (unexpected) increase in investment demand due to 9/11. Fourth, the financial slack effect should be stronger for firms (such as small firms) that are likely to face stricter debt capacity constraints. Finally, the financial slack effect should disappear for firms that ex-ante, for reasons written down in credit manuals, do not face debt capacity constraints.

We find strong support for all of the above predictions in a sample of over 23,000 actively borrowing firms at the time of 9/11. There is a large financial slack effect as a 1 percentage points larger pre-9/11 financial slack is associated with 0.21 percentage points higher growth in bank credit post-9/11. Estimating the financial slack effect at a quarterly frequency shows that it shoots up right after 9/11. While magnitude and timing of the financial slack effect are in line with the predictions of the debt capacity hypothesis, there may also be a concern that the estimates are driven by spurious unobserved firm attributes.

A primary concern is that initial financial slack may be positively correlated with unobserved firm quality, and that 9/11 triggered a greater economic boon for better quality firms. If this were true, the relationship between future credit growth and financial slack at the time of 9/11 will be spuriously generated by better quality firms having larger financial slack, and demanding larger increases in credit as well. Alternatively, firms that anticipate larger future external financing needs may request larger financial slack. Then to the extent realized credit demand post 9/11 is correlated with expected demand before 9/11, the financial slack effect will be spurious. While these concerns are legitimate, one could equivalently argue that better quality firms have greater *current* demand for credit, thus creating a negative correlation between firm quality and *ex ante* financial slack. Nonetheless, we conduct a series of tests to check whether the financial slack effect is driven by concerns of unobserved firm quality or expected credit demand.

First, we include a direct measure of firm quality, credit history, in the regression specification. There is external validity to use credit history as a measure of firm quality since firms with better payment history grew faster post-9/11. Yet including the firm quality measure does not change the financial slack effect. We next use a more non-parametric measure of firm quality based on a firm's top management. Since top management is likely to be a key determinant of firm quality, we put in common director fixed effects, thus comparing two firms which share a director is common but differ in their initial financial slack. Doing so does not reduce our main result either. We also explore the within-firm time-series variation by incorporating firm fixed effects and comparing the financial slack effect for the same firm around 9/11 and earlier time periods. To the extent firm quality is a time-invariant attribute, any biases arising from unobserved quality are addressed by the firm fixed effect. Using firm fixed effect also does not reduce our estimates. Similarly, since the financial slack effect is much stronger right after 9/11, and the 9/11 shock was entirely unexpected, expected changes in credit demand is an unlikely explanation of our results.

Additional tests further bolster the view that the financial slack effect is due to debt capacity constraints and not spurious unobserved firm characteristics. The effect is stronger among industries receiving a stronger (unexpected) post 9/11 demad shock, and among smaller firms that are likely to face tighter debt capacity constraints.

Finally an examination of bank lending rules suggests a falsification test. Lending guidelines for exporters are very different compared to non-exporters, in part because exporters can use (future) export orders as collateral when borrowing. This suggests that exporting firms will be less constrained by historical balance sheet items, and should show little or no financial slack effect. Our tests show that this is indeed the case - initial financial slack has no predictability for future borrowing for exporters even though export sector also received a large positive boom.

The limited absorptive capacity of the financial sector implied that the economy was forced to export capital abroad even though firms with binding financial slack would have liked to borrow more. How costly are these limitations in absorptive capacity? We use our firm-level regression results to estimate the economy-wide cost of "missed lending" due to debt capacity constraints. A conservative estimate of the incremental return forgone on missed lending suggests an overall cost of 2.3% of GDP in present value terms in the aftermath of 9/11.

Firm debt capacity constraints have long been the favorite mechanism for modeling financial underdevelopment and its impact on macro outcomes. Bernanke and Gertler (1989), Kiyotaki and Moore (1997), Aghion, Banerjee and Piketty (1999), Caballero and Krishnamurthy (2002) and many others use debt capacity constraints to explain business cycles, economic volatility, and financial fragility in emerging markets. Others use these constraints to build parsimonious theories of growth, development, and inequality (Greenwood and Javonovic (1990), Galor and Zeira (1993), Aghion and Bolton (1997), Piketty (1997), and Banerjee and Newman (1998)). A common theme in these papers is that agency costs, such as the fear that a firm will misappropriate external funds if its equity at stake drops too low, gives rise to borrowing capacity that is limited by a firm's collateralizable assets. This generates the dependence of borrowing capacity on collateralizability rather than future profitability that is key to the literature on borrowing constraints.

There is a large literature estimating the magnitude and nature of borrowing constraints. Existing empirical literature, with the exception of papers like Banerjee and Duflo (2004) and Zia(2006a), has almost exclusively focused on estimating investment-cashflow sensitivity. Earlier work found evidence for positive investment-cashflow correlation but was also criticized because of the likely co-determination of both internal cash and investment demand (Fazzari, Hubbard, and Petersen (1988, 2000), Poterba (1988), Kaplan and Zingales (1997, 2000)). Later work then looked for plausibly exogenous sources of shocks to internal cash flow, and showed that there is a causal link between internal cash flow and firm investment (Blanchard, Lopez-de-Silanes, and Shleifer (1994), Lamont (1997), Almeida, Campello, and Weisbach (2004), and Rauh (2006)).

In contrast our paper focuses on the causal relationship between a firm's *ex ante* borrowing capacity, and its subsequent ability to borrow externally in the face of new growth opportunities. The unique context of our tests, and micro level details of the data permit us to address some of the first order identification concerns. Furthermore, the existing literature has mostly focused on the US, while theoretically borrowing constraints are likely to be more prevalent and more costly in emerging markets. Our results also identify a causal channel for the existence of the global financial paradox - debt capacity constraints limit the ability of the local economy to absorb foreign capital inflows, which then eventually flow back out of the country.

I The Context - Background and Aggregate Impact

This section describes how the consequences of 911 on Pakistan's economy provide a natural environment for testing for the lack of absorptive capacity in the financial sector and also presents some motivating macroeconomic results.

A. Background

Pakistan's economy was suffering from weak growth, low investment, and balance of payment problems in the period preceding 9/11. Growth had declined to 3-4% from an average rate of 6% in the first half of 1990s, central bank reserves could only cover seven weeks of imports, and the black market exchange rate premium had risen to almost 6%. While a single factor is seldom the sole cause of macroeconomic weakness, the nuclear tests conducted by Pakistan in 1998 in response to similar tests by India, and the ensuing international financial sanctions played a large role in stagnating the economy. Denial of access to international liquidity by agencies such as the IMF put severe pressure on the central bank to keep interest rates high in order to stem balance of payment crises. The real lending rate rose to 9% compared to an average of 5% in the first half of 1990s. The high cost of liquidity kept the local economy distressed as firms found it difficult to borrow at higher interest rates.

B. The Events of 9/11

The events that followed 9/11 led to a sudden reversal of Pakistan's economic fortunes and subsequent years witnessed an unprecedented economic upsurge. This was primarily due to the removal of international financial sanctions, a reversal of capital flight, and significant increase in international economic assistance. The net result was an unexpected surge in the supply of liquidity, a sharp drop in real interest rates, and a rise in aggregate demand. These changes are described in more detail below.

Liquidity Surge and Interest Rate Drop

There was a large inflow of liquidity into the banking sector in the months following the events of 9/11. There were three main reasons for the inflow. First, Pakistan's willingness to help in the Afghan war renewed government's access to IMF, World Bank, and other foreign liquidity providers that had been severely curtailed due to the post nuclear test sanctions.

Second, a crack-down on the *hundi* or informal foreign exchange market stemmed the flow of capital flight through the black market and forced foreign remittances (Pakistan's largest "export") to be channelled through the banking system. The breakdown of the informal market tightened capital controls as it became more difficult to send capital abroad through the black market. Third, a perceived fear of what the US and other western economies might do to private capital held by Pakistanis abroad led a large number of investors to bring back their foreign savings into Pakistan - the economy experienced large net inflows of capital through this reverse capital flight.

Figure IIIa plots the monthly flow of remittances into Pakistan, and shows the dramatic increase in these inflows following 9/11. In a two year span between June 2001 and June 2003, remittances went up by almost 300%. A net consequence of liquidity inflow was the dramatic rise in foreign exchange reserves shown in Figure IIIb. The reserves reached an all time high of $10 Billion by December 2002 - an increase of over $7 Billion and almost 5 times in less than two years. The black market premium in informal currency markets (Figure IIIc) also declined precipitously and was eliminated as foreign exchange was no longer in short supply. Commercial banks also saw a large expansion in deposits and recorded an average yearly increase of 16% from December 2001 to December 2003 - the highest sustained growth in over ten years.

The surge in liquidity supply was accompanied by a dramatic drop in interest rates. This dramatic drop reflects two forces at work. First, the central bank no longer felt a need to defend its currency against speculation. Second, for reasons we shall explore in great detail, the economy (e.g. the banking sector) found it difficult to quickly absorb the new liquidity flowing into Pakistan. The net result is shown in Figure IIId that plots domestic interest rates over time. The average interest rate fell from 11% in June 2001 to about 2.5% by June 2003. The rapid drop in interest rates is important in order to test for the comparative statics outlined in our conceptual framework.

Positive Aggregate Demand Shock

The immediate period after 9/11 was likely detrimental to firms due to heightened uncertainty in the region and the threat of war in neighboring Afghanistan. However, the situation rapidly changed in the weeks and months that followed, and the overall effect of 9/11 on aggregate demand in Pakistan was positive. Pakistan's cooperation with the US after 9/11 saw the lifting of financial sanctions and provided greater economic opportunities.

Figure IVa shows investment trends aggregated for a sample of listed firms and for the economy as a whole. Both show a relative increase in investment after 9/11. Figure IVb plots the Karachi Stock Exchange price index for publicly listed firms, and shows a sharp and persistent rise in stock prices following 9/11. Another measure of improvement in firm quality can be seen from figure IVc which shows the time-trends in loan default. For each time period it plots the proportion of all borrowing firms in the economy that declare default for the first time during that period. As the figure suggests, the propensity to default goes down after 9/11, which is reflective of the likely positive demand shock experienced by firms on average. Thus, apart from the influx of liquidity, a second impact of 9/11 was a positive overall shift in aggregate demand.

C. Macro Impact

Given the low cost of funds and positive demand one would expect an increase in overall bank lending to firms, absent any lending constraints. In reality, the macro evidence is extremely stark and shows little change in corporate lending despite such a large and positive net demand shock.

Figure Va examines the change in bank lending at the firm level as a result of 9/11. It plots the quarter by quarter firm specific growth rate of loans over time. The growth rate between quarters t and $t+1$ is computed separately for each firm borrowing at time t, and the average of these growth rates over all firms is then plotted over time separately for small (below median borrowing size) and large firms. A firm's borrowing from all banks is aggregated up before computing the firm-specific growth rates.

The figure shows that despite the large drop in the cost of capital and the positive demand shock in the economy, there is relatively little change in overall lending to firms. While the growth rates are generally positive after 9/11, they are not any higher than the pre-9/11 growth rates. Given that the cost of capital dropped significantly post-9/11, one would have expected to see an increase in loan growth. Moreover, if we "de-trend" the growth rates post-9/11 with the pre-9/11 growth rates (or proxy for "normal" growth rates a firm experiences), we see no increase in lending to firms.

The lack of increase in loan growth despite a large drop in interest rates and aggregate demand increase is already suggestive of significant borrowing constraints for firms. In order to rationalize the negligible increase in loan growth without resorting to borrowing constraints, one will have to assume a very low value of the interest elasticity of capital - or equivalently a very steep marginal product curve.

One could argue that perhaps the increase in liquidity led to growth of loans to new firms (extensive margin), rather than increased lending to existing firms in figure Va. If an economy faces few credit constraints, the cost of capital drop and positive productivity shock are also likely to lead to greater entry as firms which did not have viable growth opportunities before, now do. Similarly, one would expect lower exit rates, as borrowers who were previously considering reducing their borrowing now likely also face better investment prospects. Figures Vb and Vc illustrate quarterly entry and exit rates and again show little evidence of increased entry and decreased exit in the post-9/11 quarters. Taken together the results in figure V are highly suggestive of the presence of significant borrowing constraints in the economy.

One may wonder where the excess liquidity went given that it was not being provided to firms. While part of this liquidity went to real estate and equity markets, a significant part of the story is a net outflow back of capital in terms of both increased foreign reserves and the current account position. Figures VIa and VIb show that both in terms of gross capital transfers and the current account balance, the economy became a net exporter of capital after 9/11.

II Conceptual Framework and Methodology

We introduce a simple model of borrowing constraints that generates loan-level comparative statics relevant for our environment and illustrates our empirical methodology. In doing so, we discuss the assumptions needed to identify these constraints and outline various validity checks for these identifying assumptions.

A. Basic Set Up

Consider an economy with N_f firms and N_b banks, indexed by i and j respectively. Each firm has access to a production technology (Y_i) that requires investment (K_i) up front. A firm finances this investment with internal wealth (W_i) and external debt (D_i) from banks. We introduce financial frictions in external financing by assuming that a firm may choose to strategically default *ex post*.

In particular, firms can choose to hide their revenue from banks and courts at a non-monetary cost c_i per unit of capital investment ($0 \leq c_i \leq 1$). One can think of c_i as a measure of firm's "reliability" or (inverse of) the level of financial frictions a firm experiences. This setup, which is a common way of introducing financial frictions (see e.g. Aghion et al, 1999), gives the convenient result that banks require internal wealth (i.e. collateral) ω_i for every dollar of capital invested.[1] Firms thus differ in the degree of collateral constraints they face.

The purpose of collateral requirements is to discourage firms from hiding their revenue *ex post*. Consequently there is no strategic default in equilibrium and all firms face the same interest rate R. The equilibrium level of firm-level investment is determined by solving the first order condition subject to the collateral constraint. We parametrize firm production, Y_i, as a diminishing returns technology with,

$$Y_i = \Lambda_i \frac{K_i^{\left(1-\frac{1}{\gamma}\right)}}{\left(1-\frac{1}{\gamma}\right)} \tag{1}$$

where Λ_i reflects firm-specific productivity and γ represents the elasticity of capital with respect to the cost of capital. The unconstrained demand for capital, $\widetilde{K}_i$, is given by the FOC:

$$\widetilde{K}_i = \left(\frac{\Lambda_i}{R}\right)^{\gamma} \tag{2}$$

(2) represents the unconstrained or ideal level of investment for a firm. However, only firms with sufficient internal wealth can invest $\widetilde{K}_i$. Other firms will be bound by their total wealth $\overline{W}_i$, implying that they can only invest capital up to $\overline{K}_i = \frac{\overline{W}_i}{\omega_i}$. Thus wealthier firms, and more "reputable" firms (i.e. firms with higher c_i) are able to borrow more.

The above discussion implies that the equilibrium amount of capital invested by firm i is given by $K_i = Min(\widetilde{K}_i, \overline{K}_i)$. Since external debt is proportional to capital, we can equivalently write down the solution as $D_i = Min(\widetilde{D}_i, \overline{D}_i)$, where $\widetilde{D}_i = (1-\omega_i)\widetilde{K}_i$ and $\overline{D}_i = (1-\omega_i)\overline{K}_i$. The advantage of writing the solution in terms of external debt is that $\overline{D}_i$ has a natural economic interpretation. It represents a firm's "debt capacity" or "credit limit" as determined by a bank after reviewing the firm's reliability (c_i) and available collateral ($\overline{W}_i$).

[1] Solving, we get $\omega_i = \left(\frac{R-c_i}{R}\right)$, and thus the collateral requirement is decreasing in c_i, with $0 < \omega_i \leq 1$.

We have deliberately kept our setup flexible, without relying too much on specific functional form assumptions. For example, the production process (1) allows for heterogeneity in firm level productivity.[2] There is also flexibility in how financially constrained firms are, as determined by their total internal wealth $\overline{W}_i$ and collateral constraints ω_i.

B. Comparative Statics

In order to identify the presence of these debt capacity constraints, we generate testable predictions regarding how constrained firms would respond to specific economic shocks. Based on the consequences of 9/11 for Pakistan (see section I), we consider two types of economic shocks in our model: an economy wide drop in the cost of capital, ϕ_t, and a firm specific productivity/demand shock, η_{it}. Let t index time, and consider shocks hitting the economy between periods $t-1$ and t. For the analysis that follows, it will be convenient to convert all variables to log form, with lower case alphabets representing the log of respective upper case variables.[3] The dynamics for productivity and cost of capital are given by:

$$\begin{aligned} \alpha_{i,t} &= \alpha_{i,t-1} + \eta_{it} \\ r_t &= r_{t-1} - \phi_t \end{aligned} \tag{3}$$

where without loss of generality, we assume η_{it} to have a symmetric distribution with positive mean, and $\phi_t > 0$ is an economy wide constant. The economic shocks force firms to re-evaluate their first order conditions.

We now consider the impact of these shocks on a firm's borrowing. If a firm is unconstrained, the change in (log of) bank debt is given by,

$$\Delta \widetilde{d}_{it} = \gamma(\eta_{it} + \phi_t) \tag{4}$$

where $(\eta_{it} + \phi_t)$ is the "net demand" shock hitting a firm. For a given net demand shock, the change in bank debt is proportional to the elasticity of capital, γ. The change in debt is

[2] As will become clear later on, introducing fixed costs or other similar forms of convexities in the production function will also not change any of our results. Since our analysis will focus on response of firms to economic shocks, all we need is for the production function to have diminishing returns *at the margin*.

[3] α represents the log of Λ,and r, the log of R.

the joint result of a movement along the marginal product curve due to the price drop ϕ_t, and a shift in the marginal product curve due to the productivity shock η_{it}.

In contrast, the change in bank debt for firms that face borrowing constraints will not only depend on the size and direction of net demand shock $(\eta_{it} + \phi_t)$ as before, but *also* on the firm's initial "financial slackness", defined as $s_{i,t-1} = \left(\overline{d}_{i,t-1} - d_{i,t-1}\right)$ i.e. the (log) distance between the debt capacity of a firm and its actual bank borrowing. The latter holds because, to the extent a firm's initial credit limit $\overline{d}_{i,t-1}$ is fixed in the short run, even when faced with a large net demand shock the firm will only be able to borrow upto this limit.The rigidity in credit limit is a natural consequence of the nature of financial frictions: The *ex post* enforcement concern implies that a firm's debt capacity is a function of its existing reputation, c_i, and total wealth, $\overline{W}_i$. Since both these variables change slowly over time, it is reasonable to assume that credit limit is fixed in the short run.

More formally, we obtain the following result:

> **Result 1:** Assuming, the firm specific demand/productivity shock η_{it} is uncorrelated with initial financial slackness $s_{i,t-1}$, the change in bank debt varies positively with $s_{i,t-1}$ if and only if firms face borrowing constraints.

While the proof is relegated to the appendix, Figure I offers a simple illustration. The x-axis traces the magnitude of the net demand shock, and the y-axis represents the actual change in a firm's bank debt. The unconstrained firm's borrowing change, as given in equation (4), is represented by a line of slope γ passing through the origin (line A). In contrast, the change in borrowing for a constrained firm is capped by how much financial slack they have, as represented by the dashed line B for a firm with some positive slack.[4]

Figure I therefore shows that if firms are unconstrained, they can borrow as much as they desire and in particular, financial slackness plays no role. However, a constrained firm's borrowing will vary positively with the extent of their financial slackness. This is easiest to see for large enough demand shocks where all firms will expand borrowing exactly as much as their limit allows.

[4] Figure I also illustrates the case of a constrained firm that is already facing binding credit-constraints (i.e. $s_{i,t-1} = 0$). Such firms cannot take advantage of positive demand shocks at all and their response is given by curve C. The response to negative shocks for such firms is also muted since they were not borrowing as much as they would have liked in period $t-1$.

C. Empirical Specification

Given Result 1, we can run the following empirical specification to test for debt capacity constraints:

$$\triangle d_{it} = \alpha + \beta_1 s_{i,t-1} + \varepsilon_{it} \tag{5}$$

where $\triangle d_{it}$ is change in bank debt for firm i. If firms are not financially constrained, we should estimate a zero slope; conversely credit constraints imply a positive slope i.e. a positive coefficient β_1. However, as result 1 states, this is true provided that the estimate of β_1 is unbiased or in other words, $Corr\ (s_{i,t-1}, \varepsilon_{it}) = 0$. Strictly speaking we just need to ensure that $Corr\ (s_{i,t-1}, \varepsilon_{it}) > 0$ since a negative correlation would only lower our ability to establish credit constraints (i.e. β_1 would be underestimated). We will discuss such identification concerns below, but first lets expand on the bivariate relationship in (5).

Figure II illustrates this relationship using a simulation exercise based on the actual distribution of $s_{i,t-1}$ and plausible demand shocks. Figure IIa shows that the change in firm borrowing is uncorrelated with initial slackness in the absence of financial constraints.[5] In comparison, when firms are financially constrained, the bivariate relationship clusters along the 45^0 line i.e. firms can only respond to positive shocks to the extent allowed by their initial credit limits. β_1 in (5) is therefore the slope of the fitted line in the simulation exercises of Figure II. However, the magnitude of β_1 is not readily interpretable without imposing further structure on the model and size of the shocks.

While in theory one could estimate (5) in any time period, the ability to capture the underlying financial constraint on the average firm is much better in the face of large and positive demand shocks. Put another way, if the average positive demand shock is small, then despite firms facing debt capacity constraints, the typical firm may still be able to borrow as much as it desires since it has enough slack. In terms of Line B in Figure I, such a firm would be moving along the (initial) 45^0 line and not hitting its limit.

In our context this suggests that while we could estimate (5) in the time-series, our ability to

[5] One might question how $s_{i,t-1}$ can be defined for firms that are not constrained. However, $s_{i,t-1}$ can still be defined since it is the distance between a bank's credit limit and actual borrowing. The only difference is that bank credit limit is no longer tied to a firm's internal wealth, but instead will fluctuate according to firm's credit demand.

capture the significance of financial constraints will be enhanced if we focus on the large positive net demand shock induced by the events of 9/11. So while we will also present results from time-series regressions, our primary specification will be the cross-sectional equivalent of (5), where we collapse the firm data into two equal time-periods - a pre-period (6 quarters before the 9/11 quarter) and a post-period (6 quarters after the 9/11 quarter). Our dependent variable is the (log) change in a firm's (average) borrowing over the two periods and $s_{i,t-1}$ is the firm's financial slack right before 9/11. This time-collapsing of data has the advantage of reducing noise and also our standard errors are robust to concerns of auto-correlation (see Bertrand, Duflo and Mullainathan, 2004). Moreover, since we still have quarters before the "pre-period", we can construct and control for lagged values (i.e. values in the "pre-pre-periods"). Finally, while we have imposed a linear relationship, we will also non-parametrically estimate the relationship between a firm's borrowing change and it's pre-shock financial slack.

Before discussing identification concerns, the previous discussion also suggests additional comparative statics with respect to the size of demand shocks and the extent of collateral constraints. These are summarized below.

> **Result 2:** Suppose the firm specific demand/productivity shock η_{it} is uncorrelated with initial financial slackness $s_{i,t-1}$. Then the sensitivity between change in bank debt and $s_{i,t-1}$ is greater for firms with larger demand shocks and firms with stricter borrowing constraints.

The first part of the result holds since lending differences between firms with different values of $s_{i,t-1}$ are larger if the desired growth in credit demand is higher. Conversely, if this change is small, it will only constrain the borrowing of firms who have little or no financial slack left, whereas all other firms (with differing financial slack) will not be constrained and be able to borrow as much as they need. The second part follows once we recognize that firms with lower financial frictions (ω_i) are likely to have higher expected financial slack (due to higher reputation etc.) or equivalently, their credit limits are more readily changed and therefore the initial credit limits are not as binding. Either way, this implies that such firms will show less borrowing sensitivity to their initial financial slack. Formal proofs are given in the appendix.

Result 2 suggests that we can modify specification (5) and estimate:

$$\triangle d_{it} = \alpha + \beta_1 s_{i,t-1} * X_i + \gamma_t X_i + \varepsilon_{it} \tag{6}$$

where X_i is an attribute that captures whether a firm is of the type that faces stricter borrowing constraints or is likely to have larger demand shocks. As before we will estimate this primarily in the (first-differenced) cross-sectional data where we focus on the average change pre and post 9/11. Note that, (6) has the additional advantage that it offers falsification tests to provide support for our identification strategy i.e. β_1 should be positive for financially constrained firms but not for unconstrained ones.

D. Identification Concerns

While our first-difference specification has the advantage that a firm's change in borrowing in response to economic shocks does not depend on firm unobservables such as initial productivity ($\alpha_{i,t-1}$) and financial frictions (ω_i), identification issues arise if a firm's initial financial slack is correlated with its future demand shocks.[6] Since the former is determined both by firm quality/reputation (in so far as that affects credit limit determination) and the past history of demand shocks, this is tantamount to assuming that future shocks are uncorrelated with such measures of firm quality or with the past history of shocks.

A priori one can imagine scenarios that produce a *negative* correlation between $s_{i,t-1}$ and η_{it}. For example, it is possible that firms that benefit more from the improving economic environment: Firms with larger η_{it}, had higher productivity/quality to begin with and thus had greater demand for loans, making them more likely to face binding borrowing constraints. Moreover, if we think that borrowing constraints are important from a macro perspective, then it has to be true in equilibrium that many high quality firms with high rates of return are forced to borrow less than their desired amount.

However, since we are interested in finding out whether the true β_1 is positive or not, negative correlation is not an issue (since it makes it less likely we will estimate a positive β_1) and it is sufficient to address the concern that $s_{i,t-1}$ and η_{it} might be positively correlated. We can broadly consider two categories of such concerns: (i) initial financial slack is correlated with firm quality; (ii) initial slack is correlated with a firm's future demand shocks either due

[6]The other shock, ϕ_t, (cost of capital drop) is a constant for all firms and thus is uncorrelated with $s_{i,t-1}$ by definition.

to anticipation effects or more mechanically, mean reversion type concerns. While we will discuss how we address these in detail after presenting our main results, we briefly outline these concerns and our methodology for addressing them.

Slack Positively Correlated with Firm Quality

Suppose there is an unobserved firm quality attribute q_i, such that firms with better quality have greater financial slack $s_{i,t-1}$. For instance, perhaps when dealing with better quality firms, banks continuously set credit limits that are substantially higher than the firm's normal anticipated demand. If such high q_i firms are also in a better position to take advantage of the improving economic environment due to 9/11, then q_i and η_{it}, and hence $s_{i,t-1}$ and η_{it}, will be positively correlated.

One way to test for this concern is to directly include measures of firm quality and see whether our estimate of interest (β_1) is affected. We will do so both by using direct measures of firm quality such as as past credit history (low quality/productivity firms are more likely to miss payments), and indirect measures. An indirect measure is common board membership across firms. Since we have information on a firm's directors, to the extent that directors determine management and overall firm quality, we can non-parametrically control for management quality by putting in common-director fixed effects. This amounts to only comparing those firms for estimating $\widehat{\beta}_1$ that have a director in common. If $\widehat{\beta}_1$ is biased upwards due to unobserved firm quality q_i then putting in these controls should lower $\widehat{\beta}_1$. Finally, we can make use of time variation by forcing comparisons within the *same* firm i.e. include firm fixed effects in specification (5). If firm quality is a time-invariant attribute, any biases arising from unobserved quality are addressed by the firm fixed effect. This last strategy does not dominate the others since it requires us to make use of shocks other than those introduced by 9/11. As we discuss below, shocks during other (non-9/11) periods may not be unanticipated and could introduce other concerns.

Slack Positively Correlated with Future Credit Growth

This concern could mechanically arise due to mean reversion in loan demand. Imagine that at any given time a firm may experience high or low credit demand, but that its average loan demand is fixed over time. Then firms that experience low demand in period $t-1$ will have high $s_{i,t-1}$, and are also more likely (on average) to receive a larger loan demand shock in period t. Such mean reversion will artificially generate a positive correlation between $s_{i,t-1}$ and $\triangle d_{it}$.

However, we can correct (and check) for mean reversion by including lagged changes in bank debt, $\triangle d_{i,t-1}$ as controls in (5).

A different concern that could also generate a similar correlation arises due to anticipation effects. If firms correctly anticipate increases in future loan demand *and* can convince banks to provide them with greater *current* financial slack, then $s_{i,t-1}$ and η_{it} will be positively correlated. Note first that to the extent the anticipated loan demand growth is correlated with firm quality q_i, our previous checks will get at this concern.

However, anticipated loan demand growth may be uncorrelated with fixed firm quality q_i.In general this is much harder to deal with unless one can argue that the demand shock in question was in fact unanticipated. The advantage of focusing on 9/11 is that it is very unlikely any firm could have anticipated either the event or the net demand shock it generated, especially given how sudden the reversal in the economy was due to the events that followed 9/11. In fact, if there is still a concern that part of the 9/11 shock was predicted in the sense that it also includes the regular shocks the economy faced, we can "net out" the impact of such anticipated components. We can do so by making use of prior (to 9/11) shocks in the time-series and asking whether 9/11 had an even bigger impact (in terms of the correlation between financial slack and loan growth).

Finally, several of the tests where we examine the heterogeneity of β_1 - such as across firms that face differing financial constraints - offer falsification tests. For example, prudential regulations allow exporters to use future orders as loan collateral. Under our story, we would expect loan growth for such firms to not be affected by their initial financial slack. However, both the unobserved firm quality and anticipated loan demand would predict as large or an even stronger effect for such firms, since exporters are generally better quality firms.

III Data

The sudden and sharp nature of the liquidity and demand shocks induced by 9/11 makes Pakistan an ideal case for testing the presence of borrowing constraints as outlined in section II. We use loan level data for our analysis that comes from the Central Information Bureau (CIB) of the Central Bank of Pakistan. This data is used by the central bank to supervise and regulate all banking activity in Pakistan. The data is collected at quarterly frequency and covers the entire universe of corporate lending in Pakistan between June 1996 and June 2003. It follows the history of each loan with information on the amount and type of loan outstanding, default amounts and duration. In addition, it has information on the name, location and board of directors of the borrowing firm and its bank. We supplement this data with annual bank balance sheets and firm annual reports for the subset of listed firms.

Pakistan's banking sector had opened up to private competition in 1990-91. Government, local private and foreign banks made up 44.4%, 31.3% and 24.3% of total lending (excluding non-performing loans) to private firms at the end of 2000 respectively. In terms of data quality, our personal examination of the collection and compilation procedures, as well as consistency checks on the data suggest that it is of very good quality. CIB was part of a large effort by the central bank to setup a reliable information sharing resource that all banks could access. Perhaps the most credible signal of data quality is the fact that all local and foreign banks refer to information in CIB on a daily basis to verify the credit history of prospective borrowers. We checked with one of the largest and most profitable private banks in Pakistan and found that they use CIB information about prospective borrowers explicitly in their internal credit scoring models. We also ran several internal consistency tests on the data such as aggregation checks, and found the data to be of excellent quality. As a random check, we also confirmed the authenticity of the data from a bank branch by comparing it to the portfolio of that branch's loan officer.

Table I presents summary statistics for the variables of interest for the CIB loan data-base and the bank and firm balance sheets. The summary statistics are presented at the firm-level, and separately for three equal time intervals, each consisting of 6 quarters. Two of these periods are prior to 9/11 and one post-9/11. The loan data is averaged over each period by taking time-series averages of loans. The time-series averages are taken after converting all values to real 1995 rupees. As discussed in section II, our preferred estimator is run in the time-averaged data.

Panel A summarizes the CIB database and provides information on loan size, credit limit, and financial slack (i.e. difference between log of credit limit and actual borrowing). For the most part we restrict to non-defaulting firms that borrow in at least the post-9/11 and first pre-9/11 period. This leaves us with a sample of 23,010 firms.

Panel B presents summary statistics on bank-level deposits, advances, and government security investments for the commercial banks in our lender sample. The increase in deposits after 9/11 is indicative of the positive inflow of liquidity into Pakistani banks. However, loan advances do not show a similar expansion. The firm level data will explore if this is due to firm level debt capacity constraints.

Panel C reports some salient statistics from the listed firm balance sheets. The sample size is much smaller since this data is compiled from firm annual reports that are generally only available for listed firms. Comparing mean values across time, the table shows evidence of the positive productivity shock highlighted in section I - listed firms experience substantial growth in assets, sales, investment, and profits after the 9/11 shock.

A. Financial Slack

The credit limit variable is of particular interest to us given the framework in section II. Unfortunately information on credit limit was only collected by the central bank from the second half of 1998, till the first half of 2001. Hence we do not have credit limit data after 9/11. However, as the conceptual framework highlighted previously, it is the pre-9/11 credit limit that is critical for conducting our empirical tests.

Generally measuring financial slack, $s_{i,t-1}$, is difficult since commonly used datasets do not report credit limits set by banks for individual firms. Credit limit in our data (i.e. $\overline{D}_i$ in the language of section II) is a firm's debt capacity as determined by a bank after reviewing the firm's reputation, collateral, etc. A useful feature of loan financing in Pakistan is that a firm can costlessly borrow up to its credit limit. The fact that credit limit is a free option for a firm implies that every firm wants to get as large a credit limit as possible.

The central bank's "prudential regulations" provide strict guidelines to banks in terms of how credit limits should be determined for applicants. These guidelines are very conservative in terms of collateral requirement, and bind a firm's credit limit to its past cash-flows. For example, total unsecured lending for a given firm cannot exceed 500,000 Rs (about 8,500 \$). A firm's total debt cannot exceed 4 times its total equity, and a firm's current assets to current liability ratio cannot drop below 0.75.

While the central bank's lending guidelines are very conservative and all banks must comply with these, banks often voluntarily impose even more conservative collateral and financial ratio restrictions. This can be seen from the credit manuals of one large private domestic bank, and two foreign banks that we got access too. Banks provide additional constraints such as historical cash-flow to debt service cannot drop below a threshold. Similarly, bank manuals emphasize that collateral must have high liquidations value and preferably very liquid.[7]

Thus a credit line is bounded only by a bank's perception of a firm's debt capacity, which is precisely what we want to measure from a theoretical perspective. The distance between a firm's credit limit and its actual borrowing prior to 9/11 is then an appropriate measure of financial slack, $s_{i,t-1}$. We can construct $s_{i,t-1}$ for the universe of private borrowing in Pakistan (for both working capital and longer term loans) and can thus observe financial slack for the entire distribution of firms in the economy. While lending rules on paper impose strict restrictions on credit limits, one could argue that banks find enough loopholes (or fudge data) in practice to get around them. We do not reject this view outright, and our empirical tests later on can also be seen as tests for whether banks allow credit limits to be very flexible.

Slack "Stickiness"

An implication of financial slack influencing future lending is that banks do not readily increase credit limits (if they did $s_{i,t-1}$ would not matter in specification (5)). The previous discussion suggested why this would be the case. However, we can directly show that credit limits are indeed sluggish and often do not adjust even when firms that are pushing against their limits experience net positive demand for credit.

Panel A in Table II shows how financial slack is correlated with firm attributes. Consistent with sticky credit limits, financial slack is tighter if previous credit growth was high. Similarly, consistent with the notion that smaller firms are more credit constrained, smaller firms have tighter financial slack. However, financial slack is *not* correlated with firm attributes that reflect firm quality or how 9/11-induced demand shocks affected them. This is useful for us later on in arguing that omitted variables are not generating spurious results.

Panel B shows further evidence on the stickiness of credit limits, particularly for smaller firms that are more likely to face constraints. Almost half the firms don't experience any change in their limit (even nominally) from one year to the next, suggesting that limits are infrequently updated. This is all the more surprising since column (2) in Panel B shows that more than a third of small firms are actually facing binding limits (i.e. have no financial slack).

[7] For example, the following quote comes from one of the bank manuals, "(the applicant must provide) liquid and readily convertible security with more than adequate margin; readily marketable collateral fully under bank's control having high value which can withstand volatile market conditions."

Panel C conducts a further test of this sluggishnes by showing that credit limits do not respond appreciably to economic shocks in the pre-9/11 period (when we have limit data throughout). Column (1) shows that the credit limit does not increase more for firms in industries that experienced a net positive growth over the period (as also evidenced by their loan growth in Column (2)).

The sluggishness is not that surprising given the banking regulations we discussed. Moreover, it is not uncommon in other emerging economies. Banerjee and Duflo (2004) draw on data from an Indian bank to document how loan officers rarely change their lending even to existing clients, despite changing opportunities faced by these clients.

IV Results: Financial Slack & Borrowing

A. Time-series Evidence

Before turning to the time-averaged data, we present evidence for financial constraints using the full time-series. We estimate specification (5) in section II i.e. test whether initial financial slack predicts next period loan growth.

Figure VII first presents the results non-parametrically. We first categorize firms each period into "high" slack and "low" slack based on whether they are in the top and bottom quartiles of initial financial slack respectively for that period. To reduce noise we use the firm's average slack in the three previous quarters as its initial financial slack.[8] We then plot the average quarterly borrowing for both types of firms. To allow for cross-sectional comparisons, we demean a firm's borrowing in a given quarter by taking out its average borrowing during its entire history (i.e. use firm fixed effects)

Conditional on the economy facing a (large & unanticipated) net positive demand shock, if there are financial frictions we would expect that high slack firms will increase borrowing while slow slack firms would not. This suggest that the two curves should generally be at the same level and only diverge (the high slack curve increases) when an (unanticipated) net positive demand shock hits. The largest unanticipated net positive demand shock during this period, as detailed previously, was after 9/11. Consistent with there being financial constraints

[8]Since we do not have financial slack data after 9/11, we use the average slack over three immediate quarters prior to 2001Q3 as our post-9/11 slack measure for each firm.

figure VII indeed shows a divergence between the two firms types after 9/11 (the vertical line at quarter 21) with the low-slack firms showing little increase despite the large positive shock, while high slack firms increase their borrowing substantially. The figure also offers support for our identification strategy, since it shows no significant pre-trend differences between the two types of firms.[9] Hence, the post-9/11 differences are unlikely to be driven by pre-existing differential trends in high and low slack firms. Nevertheless, we will explore in detail later the possibility that the post-9/11 differences may be driven by unobserved firm attributes that are correlated with initial slack.

Figure VIII conducts the same exercise parametrically. We first run a modified version of specification (5) where we estimate a separate β_1 for each time-period. The figure then plots these coefficients (and confidence intervals). Thus each coefficient is the parametric analogue of the difference between the two curves in Figure VII. Financial constraints would imply a significant positive coefficient during periods when the economy experiences a net positive demand shock. The result bears this out - there is a sharp upward trend in the coefficients immediately following 9/11. Moreover, the confidence intervals confirm that almost all regression coefficients prior to 9/11 are not significantly different from zero, whereas they are after 9/11.

B. Primary Specification

We now turn to our primary cross-sectional specification where we estimate (5) in the time-averaged data with one post-911 period and two pre-911 periods.

Figure IX first presents the non-parametric kernel plot of the relationship between lending growth pre and post-9/11 and pre-9/11 financial slack, and shows a monotonically increasing trend, suggesting the presence of borrowing constraints. The graph shows that increases in the degree of credit constraints decrease loan growth linearly.

Table III then presents the primary regression results. The dependent variable is a firm's average borrowing change pre and post 9/11 and the variable of interest is the coefficient on a firm's initial (pre-911) financial slack. Column (1) shows that a 1% increase in financial slack pre-9/11 leads to a 0.21% increase in loan growth. The result is significant at the 1% level.

[9] While it is harder to readily argue for similar net demand shocks pre-9/11, Figure IIId did show a drop in the cost of capital around early 2000 as well. While it is not obvious whether this drop was unanticipated and not accompanied by countervailing (negative demand) shocks, Figure VII does show a slightly higher growth for high-slack firms after this period (the blue vertical line) as well.

Column (2) shows that this effect is robust to non-parametrically allowing for differences across firm location, industry, and lead-bank fixed effects. There are a total of 134 city, 75 industry and 119 dominant bank fixed effects, where dominant bank is where a firm has the largest share of its borrowing.

An immediate interpretational concern that needs to be addressed is whether this differential growth rate is mechanical. Imagine that at any given time a firm may experience high or low credit demand. As Table II showed, firms that experienced high demand are likely to be closer to their limit while those that experience low demand are further away. Our credit constraint measure may therefore mechanically generate differential growth due to such differences in prior demand shocks. Columns (3) addresses this concern by adding a control for a firm's loan growth rate two periods prior to 9/11. The results show some evidence of "mean reversion" (the coefficient on lagged growth rate is negative). However, the coefficient of interest on credit limit utilization drops only slightly. In fact as Column (4) shows this drop is on account of the sample restriction (we have to restrict to firms that are borrowing two periods prior to 9/11 as well so that one can construct lagged loan growth rates) than the control.

C. Robustness Concerns

In section II we had highlighted the primary identification concern arises if initial financial slack is positively correlated with future credit demand due to unobserved firm quality or anticipated demand type concerns. We now present results to show that these concerns are not likely.

Firm Quality

The concern here is that higher quality firms both may have higher initial slack and higher expected credit demand. Thus our estimate is not picking up the presence of financial constraints but rather, that higher quality firms can take better advantage of the 9/11 induced events. Note first that to the extent that prior loan demand is a sign of firm productivity, our Table II results suggest that better quality firms in fact are likely to have *lower* financial slack at any given time. Hence, if anything, not being able to control for firm quality may make it less likely for us to find an effect (since slack may be in fact be negatively correlated with firm quality).

Nevertheless, Table IV performs robustness checks based on introducing controls for firm quality. Column (1) controls for firm quality using a firm's late payment history. To do so we consider firms that are not in default in the period immediately preceding 9/11 and look at whether these firms were late in making interest payments at some earlier point. The negative coefficient on this variable shows that it indeed offers a reasonable proxy for a firm's quality: Firms that have been late in making payments in the past have lower loan growth. However, what is important is that the coefficient on our variable of interest - financial slackness - does not change when we include the late payment indicator.

We then test for firm quality issues using management (common ownership) fixed effects. Management fixed effects are constructed using firm director information, with firms that share directors considered to be under the same management. Thus table IV compares the impact of differing financial slackness on future loan growth for two firms that share the same management, suggesting that these differences are unlikely to be driven by unobserved firm quality attributes. We do not have director information for 1,009 firms. Column (2) repeats our standard specification on the remaining 14,397 firms to ensure that management fixed effects results are not driven by this sample selection. Column (3) then includes management fixed effects and shows that our coefficient of interest remains unchanged. 72% of the firms do not share a director with another firm in the sample of 14,397 firms. Therefore these firms are completely absorbed by the management fixed effects. Another 12% (1,748 firms) are all linked together in one management group through the common directorship chains. The management fixed effect has therefore little bite for these firms. The remaining 16% of firms share 2 to 16 firms through the common director relationship chain (8% share a director with only one other firm). Column (4) repeats our standard regression for these 2,272 firms and shows the sample selection does not significantly effect our coefficient of interest. Column (5) then puts in (865) management fixed effects in this sub-sample and shows that our coefficient of interest remains unchanged.

Column (6) takes these robustness checks further by forcing comparisons only within the *same* firm by including firm fixed effects in the first-difference specification to control for all time-invariant measures of firm quality. In order to do so we introduce an additional "pre-period" before the 9/11 period. Thus for each firm we now have two observations in the first-differenced specification - its loan growth pre and post-9/11 (as before) and also its loan growth over the "pre-pre" and pre-9/11 periods. The RHS variable - is the initial financial slack of the firm over both of these growth intervals. Our variable of interest is the coefficient on the interaction term between 9/11 and financial slack. If firm quality is a time-invariant attribute, then any biases arising from unobserved quality are addressed by the firm fixed effect. The result shows that financial constraints indeed matter even after we control for all firm-level unobservables.

Expected Credit Growth

Column (3) in Table III already showed that mechanical concerns arising due to mean reversion in loan demand are unlikely. The remaining potential concern due to anticipation effects – firms correctly anticipate increases in future credit demand *and* convince banks to provide them with greater *initial* financial slack - is also addressed by our results. First, note that it is extremely unlikely that the average firm could have anticipated the events that followed 9/11 given how quickly they impacted the economy. Thus by focusing only on this shock, our cross-sectional results in table III are already less likely to suffer from anticipation concerns. However, Column (6) in Table IV addresses such concerns further. If part of the 9/11 shock also included the predictable shocks the economy regularly faces, such anticipated components are "netted out" in the fixed effects specification where we added a pre-pre-9/11 period.

The results in Tables III and IV together provide compelling evidence that firms are indeed credit constrained - Banks are unable to increase lending to these firms in the face of a drop in the cost of capital and a positive demand shock, due to a reluctance to increase credit limits. We now explore whether this result varies across different firm types, and in doing so provide further support for our identification strategy.

V Results: Heterogeneity

Result 2 in section II showed that firms with differing degrees of credit constraints and demand shocks will show differential responsiveness of borrowing to financial slack. This section estimates specification (6) using different firm type attributes that proxy for the financial constraints or demand shock magnitudes the firm faces.

A. Exporters

An examination of banking regulations in our context suggests that, all else equal, exporting firms face lower debt capacity constraints as compared to non-exporters. Central bank's prudential regulations explicitly allow banks to ignore usual collateral and financial ratio restrictions when lending to exporting firms[10]. Banks may impose stricter guidelines nonetheless. However, examination of the private credit manuals of three banks shows that banks are also willing to have more relaxed lending policies for exporting firms. One important reason is that the future sales of exporters are considered sufficient collateral by banks because the export orders are often coming from reputable international firms with verifiable information.

The relaxation of lending rules for exporters suggests that exporting firms will be less constrained by balance sheet variables and may be able to expand as much as needed when faced with a positive demand shock, since they can use the export order likely to be generated in the demand shock as collateral. Non-exporting firms however, will remain constrained for the reasons discussed previously.

Columns (1) and (2) in Table V show that this is indeed the case by splitting our sample and estimating our primary specification (5) separately for non-exporters and exporters. Column (1) shows the same large effect on non-exporters, but Column (2) shows that exporting firms have no correlation between initial financial slack and future borrowing (both the point estimate and standard errors are small).

Column (3) shows the same result but in the pooled sample where we interact initial financial slack with a firm being a non-exporter. Column (4) shows that this effect is robust to non-parametrically allowing for differences across firm location, industry, and lead-bank fixed effects. Column (5) takes a further step to ensure that the effect is not driven by comparing firms of different sizes, since one may be concerned that exporters are larger than non-exporters. We do so by not only including dummies for each firm decile but interacting each of these with initial financial slack. The coefficient on financial slack for non-exporting firms remains large and significant.

The results in table V offer a useful falsification test for our identification strategy as well, since we would predict no (or a small) effect of initial financial slack on exporters but a large effect on non-exporters. However, alternate explanations would predict the opposite or at best, no difference between the two. Recall one of our primary concerns was that our effect may be

[10]For example, quoting from prudential regulations, "For the purpose of this regulation, following shall be excluded / exempted from the per party limit of Rs 500,000/- on the clean facilities:
(a) Facilities provided to finance the export of commodities eligible under Export Finance Scheme.
(b) Financing covered by the guarantee of Pakistan Export Finance Guarantee Agency."

biased due to unobserved firm quality. Since exporting firms are generally of better quality than non-exporters (and do have lower default rates in our data as well), if quality concerns were significant one would expect the coefficient on financial slack to be even larger for exporters. Similarly if there were mechanical mean reversion or anticipation effects, one would expect these results to be just as important, if not more, for exporters. The fact that exporting firms show no effect, is therefore more consistent with our financial constraints explanation since we know that, due to prudential regulations, exporters are unlikely to be constrained by initial conditions.

B. Firm Size

Next, we consider whether the degree of credit constraints vary by firm size. While not directly suggested by regulations, as was the case for exporters, it is likely that larger firms are also less constrained since they have better reputation and "hard" collateral to offer.

We divide firms into size deciles based on their total borrowing pre-9/11. The results in Column (1) of Table VI show that the coefficient on a firm's credit-limit utilization is the lowest and quite small for the largest decile (the omitted decile) but gets progressively larger for smaller size deciles. In other words, smaller firms tend to be more credit constrained than larger ones. Column (2) shows that this effect is robust to non-parametrically allowing for differences across firm location, industry, and lead-bank fixed effects. Column (5) ensures further that the effect is not driven by comparing firms in different industries, since firm size may vary across industries. We do so by also including industry fixed effects interacted with initial financial slack.

Figure X plots these coefficients and shows a clear upward trend by initial borrowing size. This result is consistent with the findings in Zia (2006a), who examines the impact of an exogenous removal of subsidized export credit for textile firms in Pakistan, and finds that compared to large firms, smaller firms are unable to substitute to market-rate bank lending, and are thus financially constrained.

C. Demand Shocks

We had shown in result 2 that the impact of financial constraints was greater in the face of larger (and positive) net demand shocks. While this justifies our focus on the periods immediately before and after 9/11 as a means of testing for the presence of financial constraints, we can exploit this further. While 9/11 was a positive demand shock on average, it affected industries differentially. For example, the cement, energy, and construction sectors received a disproportionately larger boom due to reconstruction efforts in Afghanistan. This allows us to categorize firms as facing high or low demand shocks due to 9/11 based on the demand shock experienced by their industry.

For firms that receive low demand shocks, the difference in lending between those closer to their credit limit as compared to those further away will be small, since even those closer to the limit may have enough slackness to obtain their desired increase in borrowing. As such the coefficient on financial slack in specification (5) will be small. However, for firms experiencing a large demand shock, it is likely that only those firms with substantial financial slackness will be able to obtain their desired financing - the coefficient on financial slack will be large.

The results in Table VII show that this is indeed the case. Columns (1)-(2) separately estimate specification (5) for firms experiencing relatively high and low demand shocks. The main effect of high demand shock industries is 0.22, whereas it is only 0.11 for low demand shock industries. Column (3) pools the two types of firms and shows that the difference between the two is statistically significant. Column (4) ensures that the result is robust to industry, location, and lead-bank fixed effects. Column (5) adds firm size decile dummies interacted with financial slack to ensure that the demand shock heterogeneity is not driven by comparisons across different firm sizes.

Note that to the extent that these industry-level shocks themselves are orthogonal to firm quality - which is likely since the shocks are due to an event that was not only unexpected but whose impact was also not foreseeable - these results offer a further robustness check on our identification: Both unobserved quality or anticipation effects, would not readily generate the result that firms that unexpectedly got greater demand shocks, show greater sensitivity of initial financial slack to future loan growth.

VI Conclusion and Discussion

This paper exploits a large exogenous liquidity shock to the financial sector in an emerging economy, and investigates changes in bank lending behavior as well as in firm-level realizations. Specifically, the events of 9/11 led to a large inflow of capital into formal financial markets in

Pakistan due to reverse capital flight and increased remittances, with deposits rates falling by a half in just over a year. However, despite this sharp reduction in the cost of capital and evidence of an accompanying economic recovery, we find that banks did not increase their lending to the corporate sector.

What explains why banks, both private and public, behave so conservatively? While one could resort to inefficiencies arising due to bank organizational structures that make them highly conservative and unable to quickly respond to changing economic situations (see Stein, 2002), this behavior could still be a constrained efficient respond. For example, banks could be doing the best they can given the informational and regulatory environment they face. One could interpret our findings as arising due to prudential regulations (especially since we find little differences across bank types) that limit how quickly banks can act.

Nevertheless, whether banks are (constrained) efficiently lending or not, one can ask what the aggregate costs to the economy are of not being able to take advantage of the positive financial shock i.e. what are the costs of having absorptive capacity constraints. While precise estimates are hard, our micro results offer a rough back of the envelope calculation.

The counter-factual to be estimated is the aggregate return on the amount of money that was not lent to firms due to borrowing constraints. First one has to estimate the amount of this "missed lending". Since firms with higher slack are less and less likely to be constrained, let's assume that firms with financial slack $s_{i,t-1}$ equal or greater than 1 are completely unconstrained (10.6% of all firms), i.e. they can borrow as much as they like *given* the range of shocks experienced as a result of 9/11.

We can then compute missing loans as follows. Consider a firm with a given $s_{i,t-1}$, and loan size, $L_{i,t-1}$. Take the estimated coefficient $\widehat{\beta}_1$ to be 0.2. Since $s_{i,t-1} = 1$ reflects unconstrained growth, the unconstrained growth of firm i would have been $(1 - s_{i,t-1}) * 0.2$. The total missing loan is then $(L_{i,t-1} * (1 - s_{i,t-1}) * 0.2)$. Since the estimated $\widehat{\beta}_1$ also varies by firm size decile significantly, it is better to allow for this heterogeneity. Total missing loans (ML) are then given by the sum:[11]

$$\sum_i (L_{i,t-1} * (1 - s_{i,t-1}) * \widehat{\beta}_{1j}) \tag{7}$$

[11] When (1-s) is negative for a firm, we set it equal to zero

for firm i in size decile j. Computing this in our sample, gives us a total of 45.4 billion rupees in missing loans.

What is the cost of this missed lending? While one could make different assumptions about this return, it is simpler to present a higher bound where the unlent amount is assumed to generate zero net returns i.e. the economy just gains the book value. The investment distortion is therefore losing future streams of income generated had the amount been lent to firms. Given the market price of a firm reflects the present value of its underlying assets, we can impute this net present value by subtracting book from market value. Using this approach and a Market to Book ratio for Pakistan estimated at 2.96 (IFC emerging market database — EMDB), we get the net present value of the return to the missed investment would have been Rs. 45.4*1.96=88.9 billion rupees, or 2.3% of GDP in 2000.

We should caution that these estimates suffer from both biases that could over or underestimate the true effect. Overestimates could arise if they are adverse GE effects were this amount to be actually lent (cost of capital increases, price effects). Underestimates are possible since the rates of return may be even higher for constrained firms and there may be additional costs arising from distributional consequences of financial constraints.

These distributional implications arise as smaller firms face more borrowing constraints, allowing larger and possibly not as efficient firms to survive at the expense of smaller more innovative ones. Moreover, these firms are likely to be more reliant on bank financing to begin with as larger firms can take advantage of alternate means of financing. In the Pakistani context, in the aftermath of 9/11 the larger listed firms increased their investments significantly, but did so by decreasing their bank borrowing and substituting towards equity, taking advantage of the unprecedented investment boom in the stock market.

The Pakistani experience, and one that seems to be borne out in other emerging markets, also suggests that there may be stark and unwelcome implications of *positive* financial shocks in emerging markets: sudden liquidity surges may spur excessive speculation. As banks could not lend rapidly enough, investors in Pakistan quickly turned to other markets such as equity and real-estate, where prices increased sharply. In a two year period not only did the stock market index increase five-fold to an all time record high, but housing prices appreciated at well over a 100% a year. Evidence that this was a speculative bubble is becoming increasingly apparently with the recent collapse of the real estate market and a noticeable cooling off in the equity markets.

Our results therefore offer a note of caution that in the absence of well-functioning financial markets, too much money too soon may generate limited gains for the economy with liquidity either escaping to more speculative (and less regulated) markets or to the global market.

VII Appendix

A. Solving for collateral requirement, ω_i :

A firm finances its investment K_i with external debt D_i and internal wealth W_i, i.e. $K_i = D_i + W_i$. Given the ex-post threat of strategic default, the following I.C. condition must be satisfied for all firms.

$$Y_i - c_i K_i \leq Y_i - (K_i - W_i)R \tag{8}$$

where $R > 1$ is gross lending interest rate. Condition (8) implies that for a given investment level K_i, a firm must invest minimum internal funds given by,

$$W_i \geq \left(\frac{R - c_i}{R}\right) K_i \tag{9}$$

A firm would want to put in the minimum possible internal funds for diversification reasons. Thus (9) holds in equilibrium, and we get $\omega_i = \frac{W_i}{K_i} = \left(\frac{R-c_i}{R}\right)$. Since no firm defaults in equilibrium, R is constant across all firms.

B. Proof of Result 1:

First consider an unconstrained firm. For this firm its change in borrowing is given by: $\Delta d_{it} = \Delta\widetilde{d}_{it} = \gamma(\eta_{it} + \phi_t)$. Therefore, $\frac{\partial E(\Delta d_{it})}{\partial s_{i,t-1}} = 0$. Now consider a firm that faces financial constraints. In this case the solution to the firm's borrowing change in response to a net demand shock, illustrated in Figure I, can be written down more formally as:

$$\Delta d_{it} = \left\{ \begin{array}{c} s_{i,t-1} \text{ if } \left(\Delta\widetilde{d}_{it} \geq s_{i,t-1}\right) \\ \Delta\widetilde{d}_{it} \text{ if } \left(\Delta\widetilde{d}_{it} < s_{i,t-1}\right) \ \& \ s_{i,t-1} > 0 \\ Min\{0, \Delta\widetilde{d}_{it} - (\overline{d}_{i,t-1} - \widetilde{d}_{i,t-1})\} \text{ if } \left(\Delta\widetilde{d}_{it} < 0 \ \& \ s_{i,t-1} = 0\right) \end{array} \right\}$$

What is of relevance to us though is that $\frac{\partial \Delta d_{it}}{\partial s_{i,t-1}} = 1$ when $\Delta\widetilde{d}_{it} \geq s_{i,t-1}$, and 0 otherwise. Given a distribution for η_{it} with a CDF $F(.)$ and using $\Delta\widetilde{d}_{it} = \gamma(\eta_{it} + \phi_t)$ this allows us to solve for the expected value of this gradient i.e. $\frac{\partial E(\Delta d_{it})}{\partial s_{i,t-1}} = 1 - F(\frac{1}{\gamma} s_{i,t-1} - \phi_t) \geq 0$.

C. Proof of Result 2:

If firms are financially constrained, the previous proof shows that $\frac{\partial E(\Delta d_{it})}{\partial s_{i,t-1}} = 1 - F(\frac{1}{\gamma}s_{i,t-1} - \phi_t)$. Now consider two sets of firms with differing distribution of demand shocks. An easy way to parameterize firms that faced more positive demand shocks is using FOSD i.e. $F_{high}(x) \leq F_{low}(x)\ \forall\ x$. This immediately implies that $\frac{\partial E(\Delta d_{it})}{\partial s_{i,t-1}}|_{high} \geq \frac{\partial E(\Delta d_{it})}{\partial s_{i,t-1}}|_{low}$.

For the second part of the result note that, all else being equal, firms with stricter financial constraints i.e. a higher value of ω_i, will have lower credit limits $\overline{D}_i$ and therefore lower $s_{i,t-1}$. Since $\frac{\partial^2 E(\Delta d_{it})}{\partial^2 s_{i,t-1}} \leq 0$ this in turn implies $\frac{\partial^2 E(\Delta d_{it})}{\partial \omega_i \partial s_{i,t-1}} \geq 0$.

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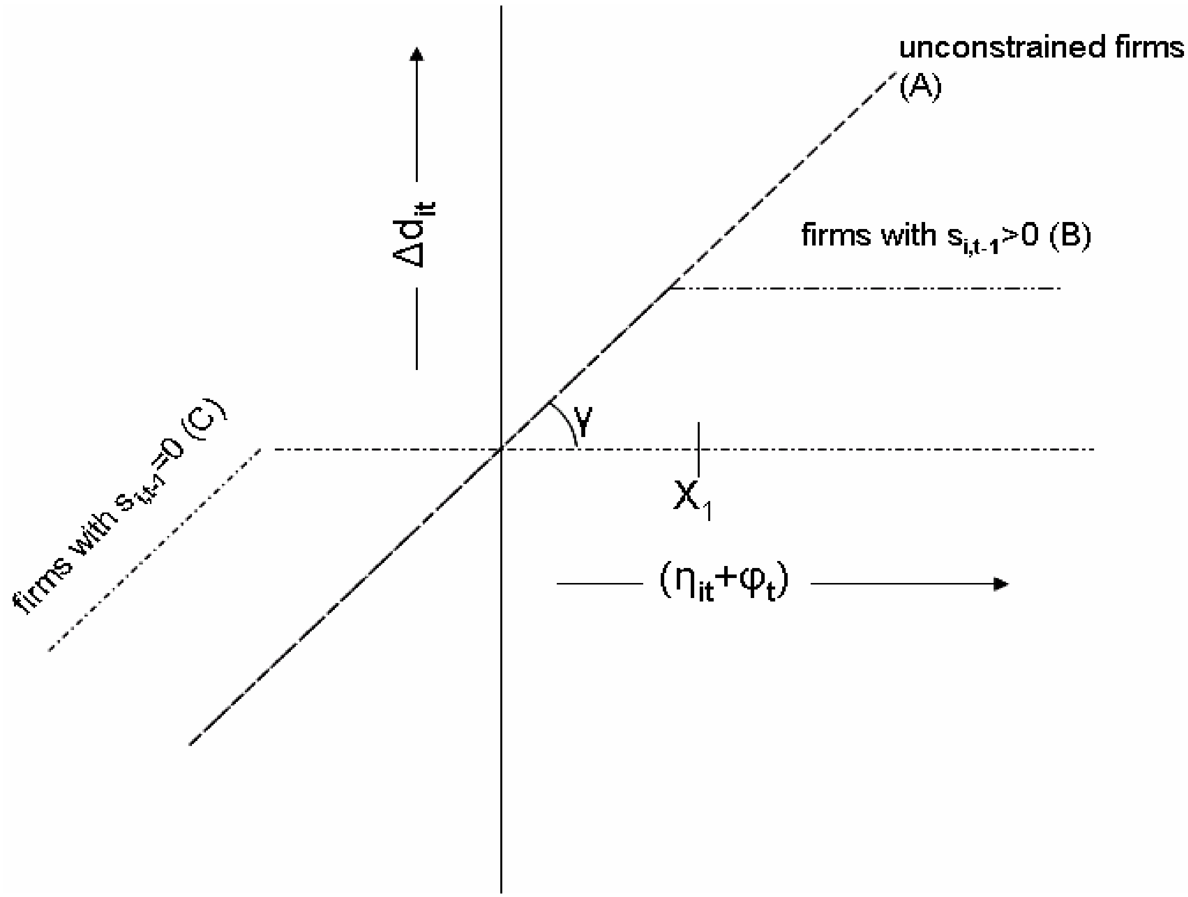
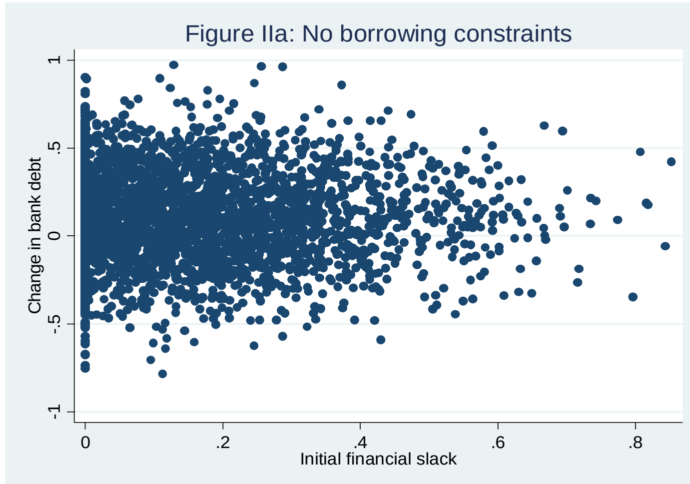
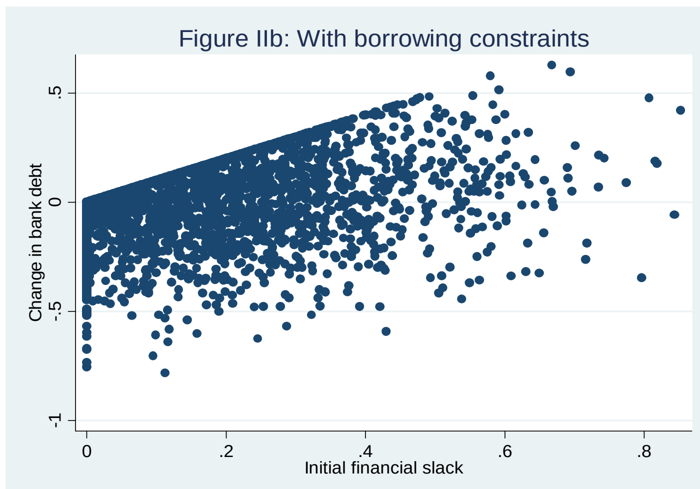
Figure I: Relationship Between Change in Bank Debt and Credit Demand Shocks



This Figure illustrates how bank lending responds to shocks for constrained and unconstrained firms. The horizontal axis represents the magnitude of the net demand shock for a firm, and the y-axis represents the change in the firm's bank debt. Line A represents the relationship between demand shocks and change in bank debt for unconstrained firms. The path for constrained firms depends on their intial financial slack, s(i,t-1). Constrained firms with zero initial financial slack will be on path C, whereas those firms with positive slack will be on path B.

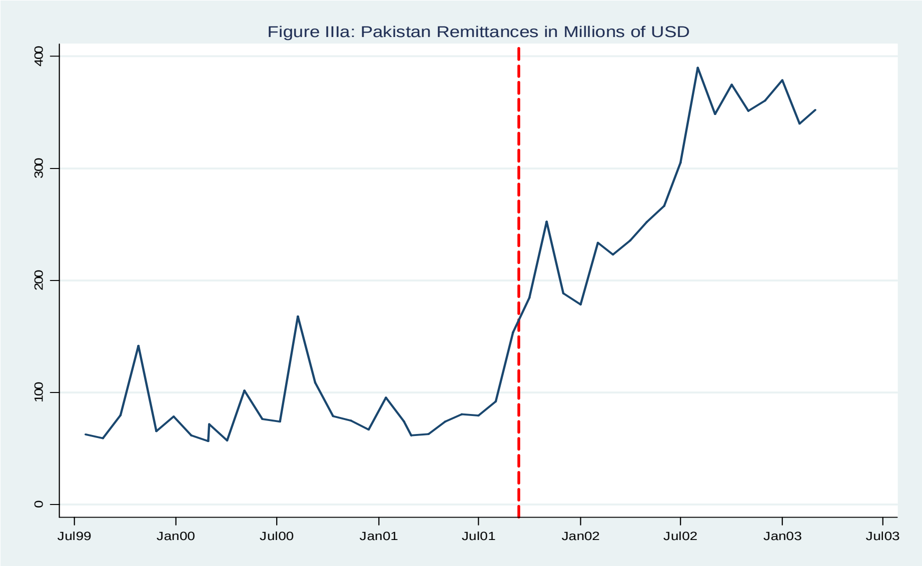
Figures IIa-b: Relationship Between Change in Bank Debt and Initial Financial Slack

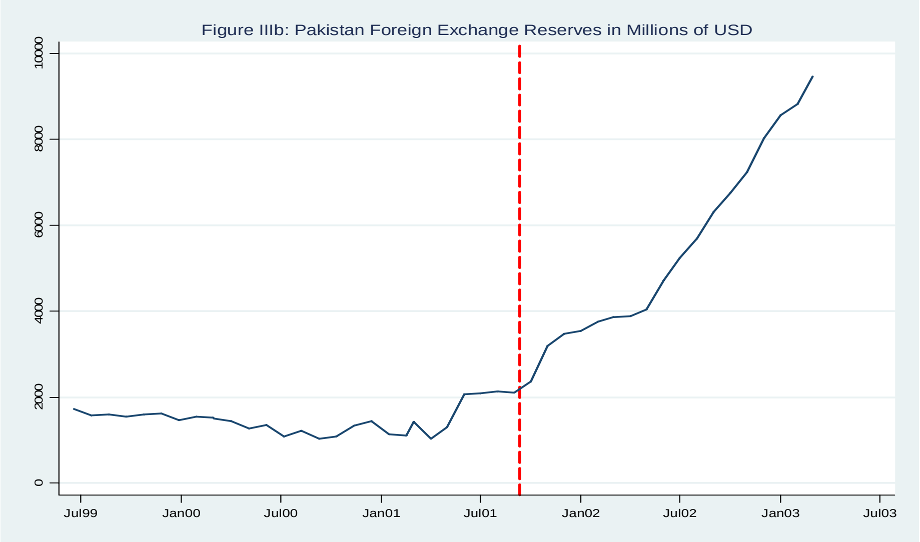




These Figures plot the empirical relationship between change in bank debt and initial financial slack with and without borrowing constraints, based on a simulation exercise. The simulation was conducted using the actual distribution of initial financial slack, and plausible values of demand shocks.

Figures IIIa-b: Establishing Magnitude of Financial Inflows After 9/11





These Figures plot the time-series movements in remittance inflows into Pakistan and foreign exchange reserves of the country. The vertical dashed line represents September 2001.

Figures IVa-c: Establishing Positive Demand Shock After 9/11

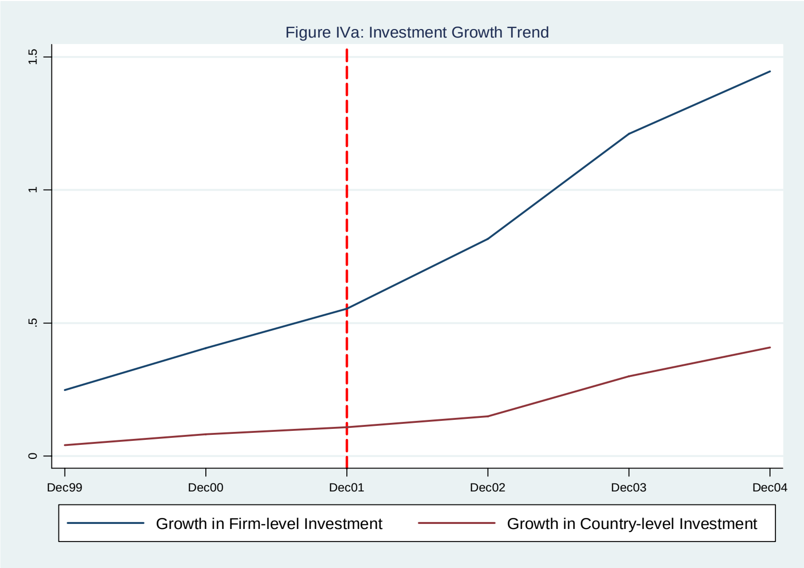


Figure IVa: Investment Growth Trend

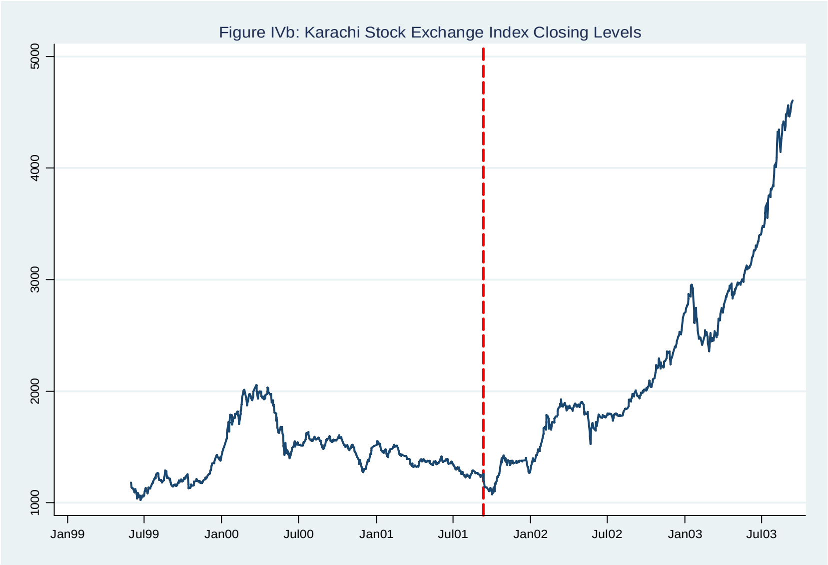


Figure IVb: Karachi Stock Exchange Index Closing Levels

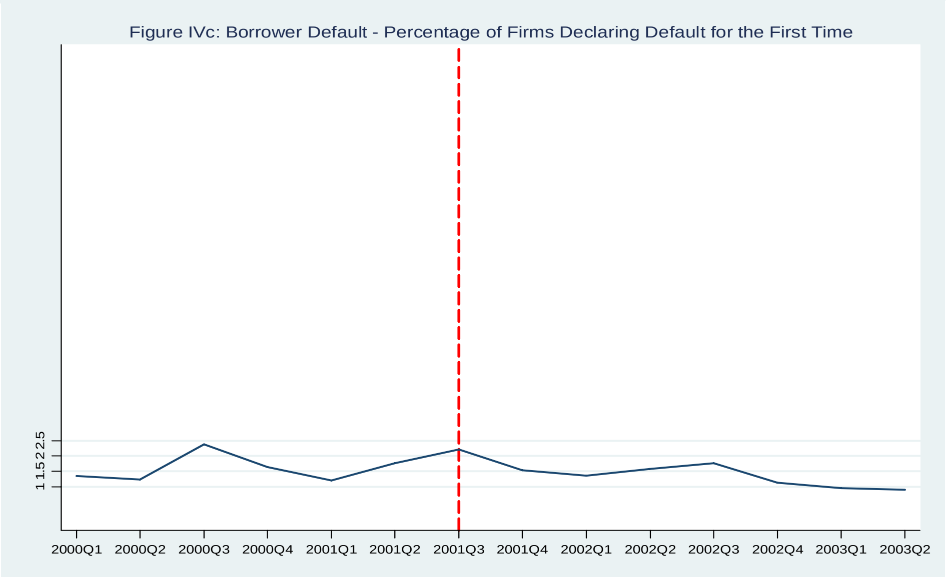
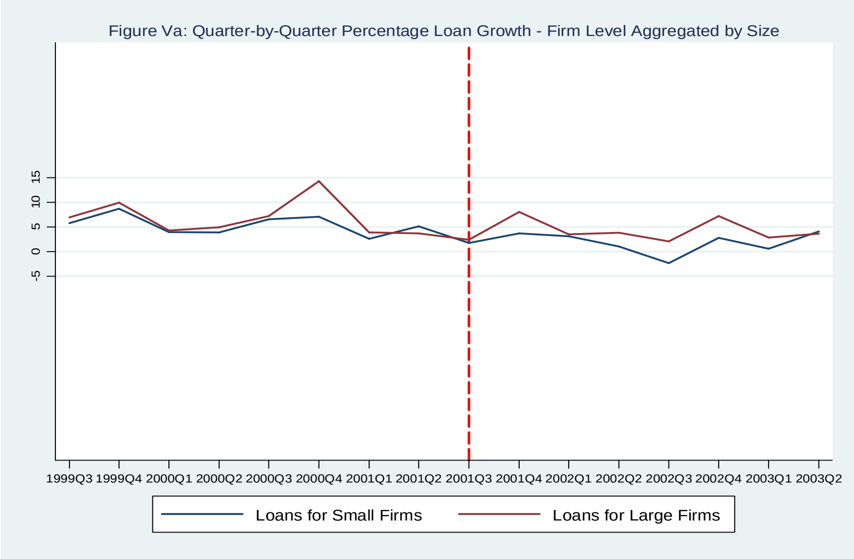
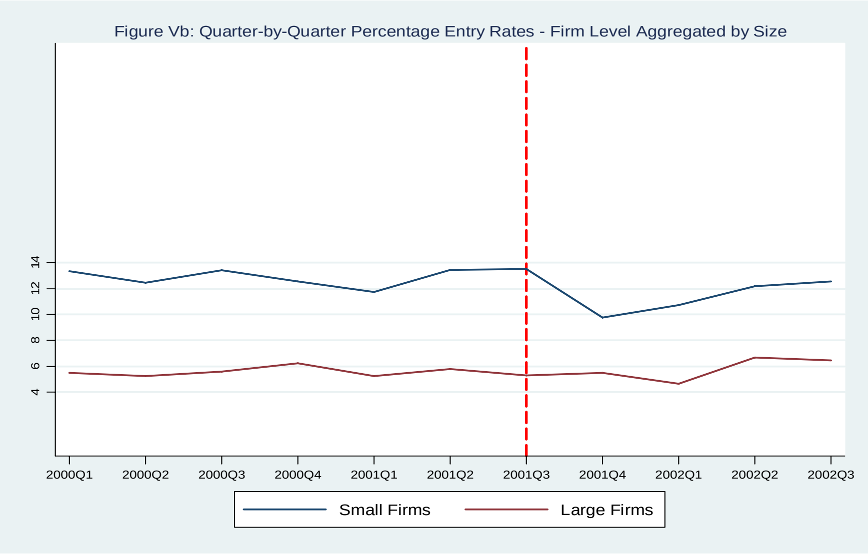


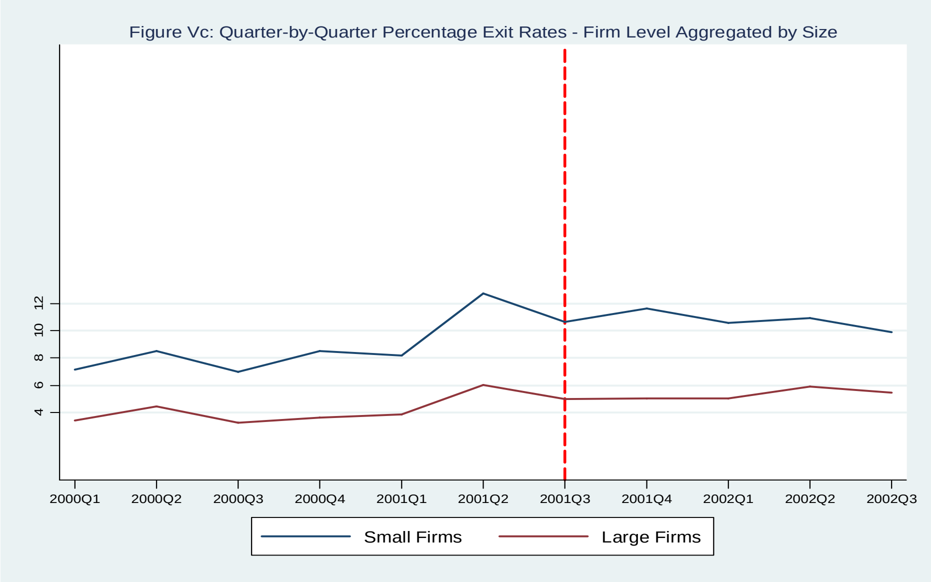
Figure IVc: Borrower Default - Percentage of Firms Declaring Default for the First Time

These Figures plot the time-series movements in firm- and country-level investment, the Karachi Stock Exchange index, and percentage of borrower default. The vertical dashed line represents September 2001.

Figures Va-c: Changes in Bank Lending

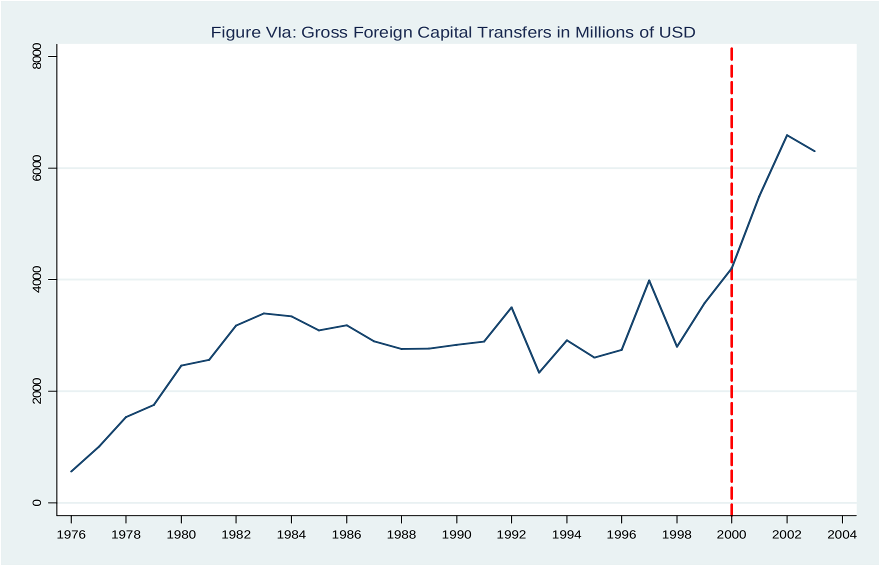


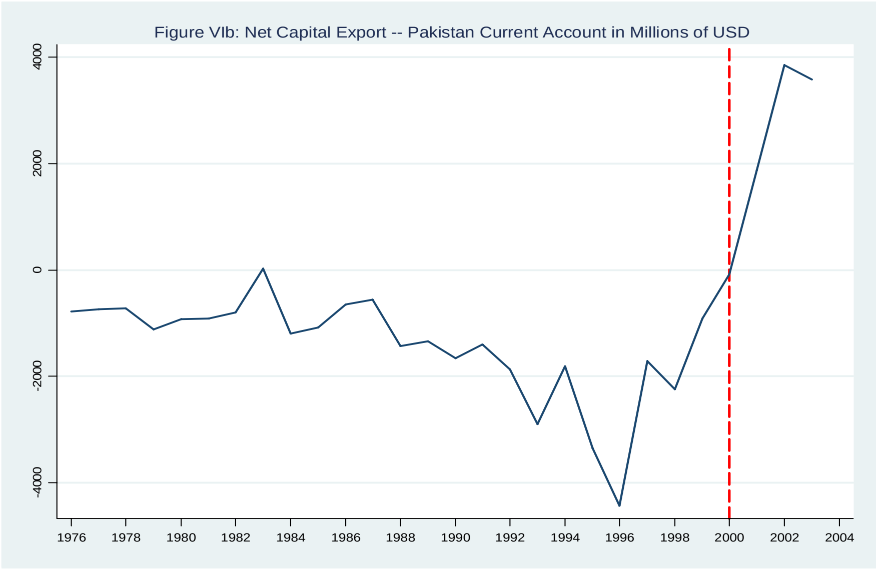




These Figures plot the time-series change in bank lending, both for the intensive margin and the extensive margin. The intentsive margin for firms is defined as loan growth for existing customers, whereas the extensive margin for firms is defined as entry into and exit from bank loan relationships. The vertical dashed line represents September 2001.

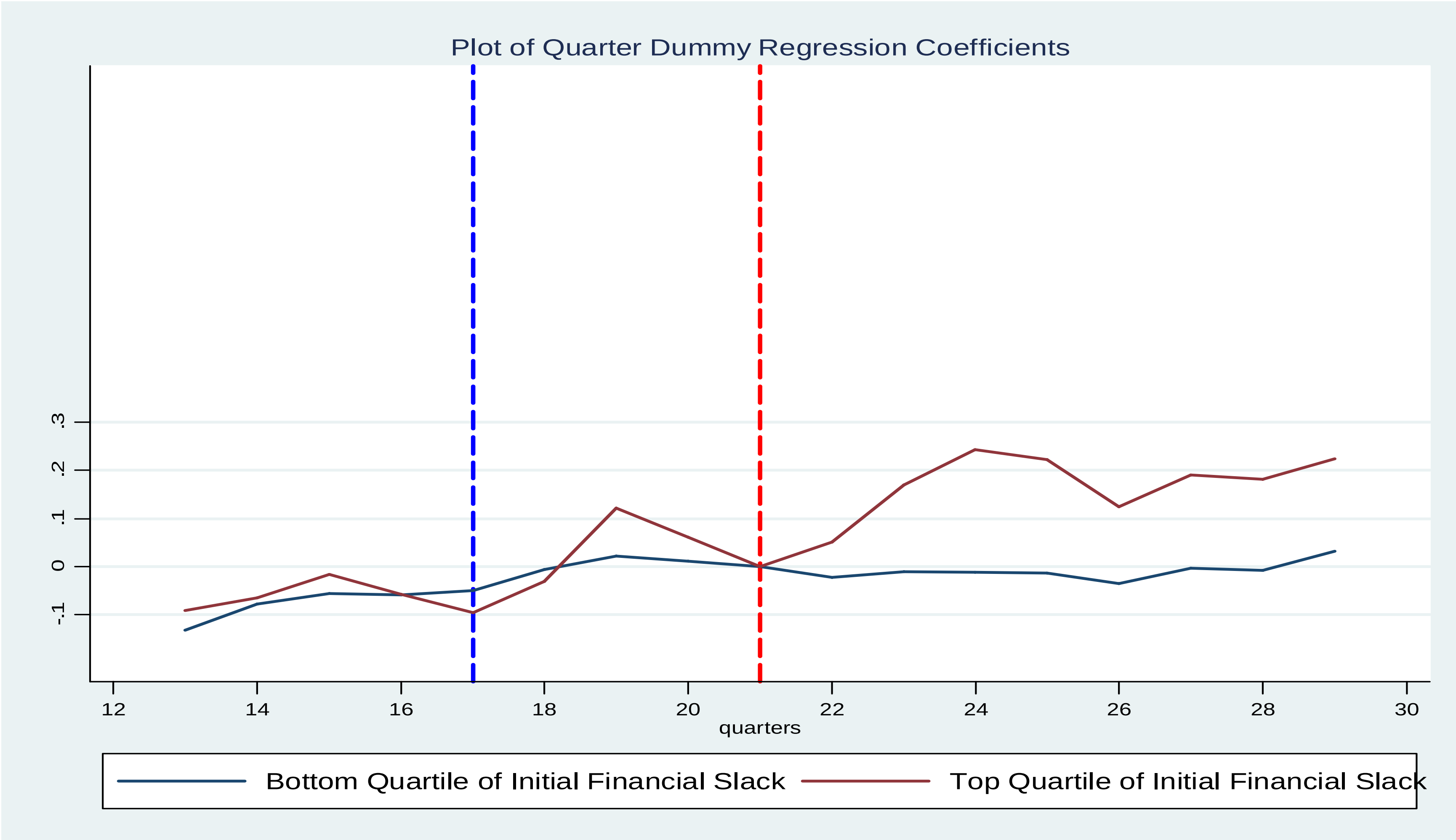
Figure VI a-b: Pakistan Capital Flow Trend





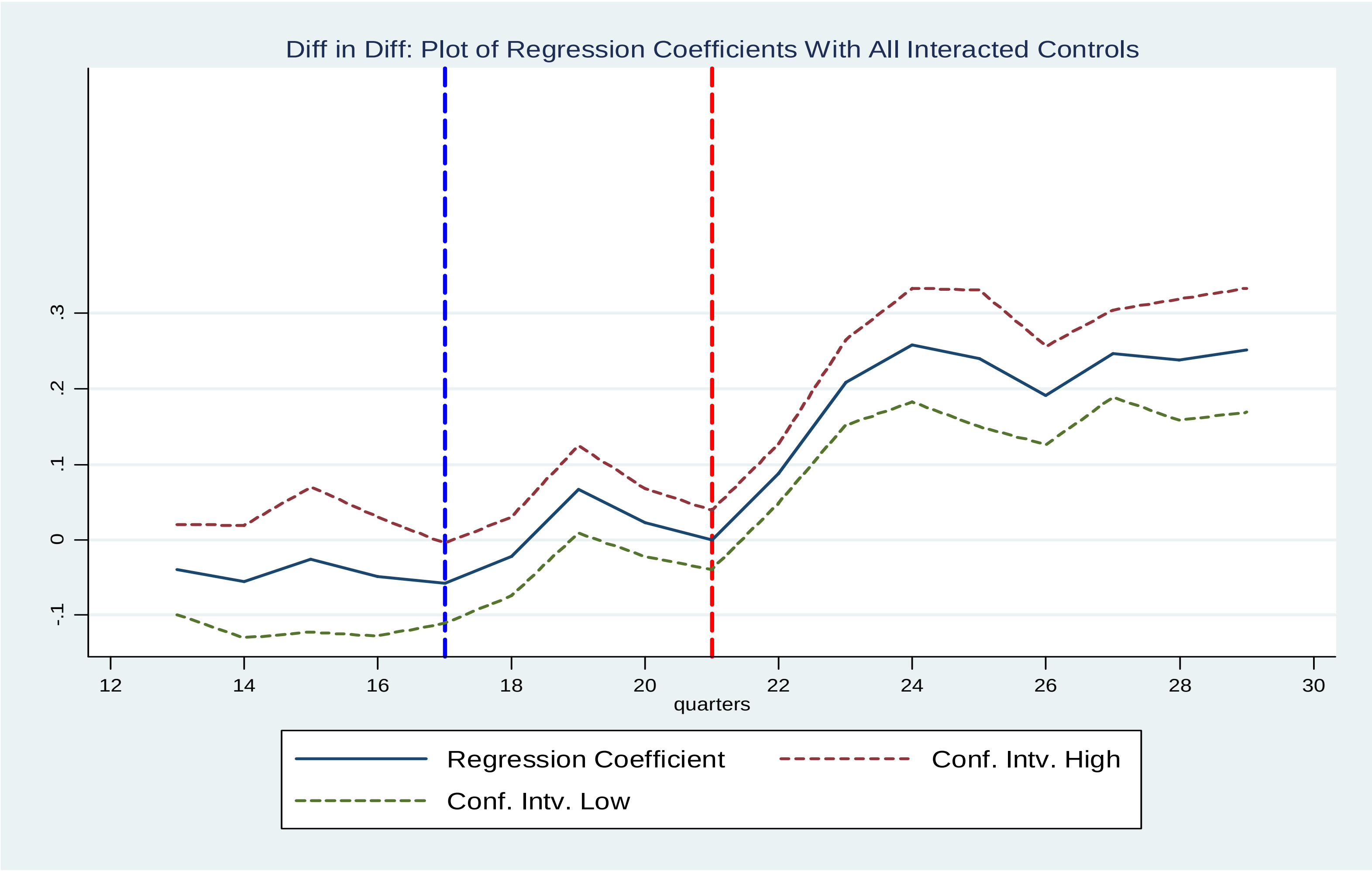
These Figures plot the trends in foreign capital flow to and from Pakistan. Both figures are based on annual data, and the red vertical dashed line separates the pre- and post-9/11 periods.

Figure VII: Cumulative Loan Growth Regression Coefficients - High vs. Low Slack Firms



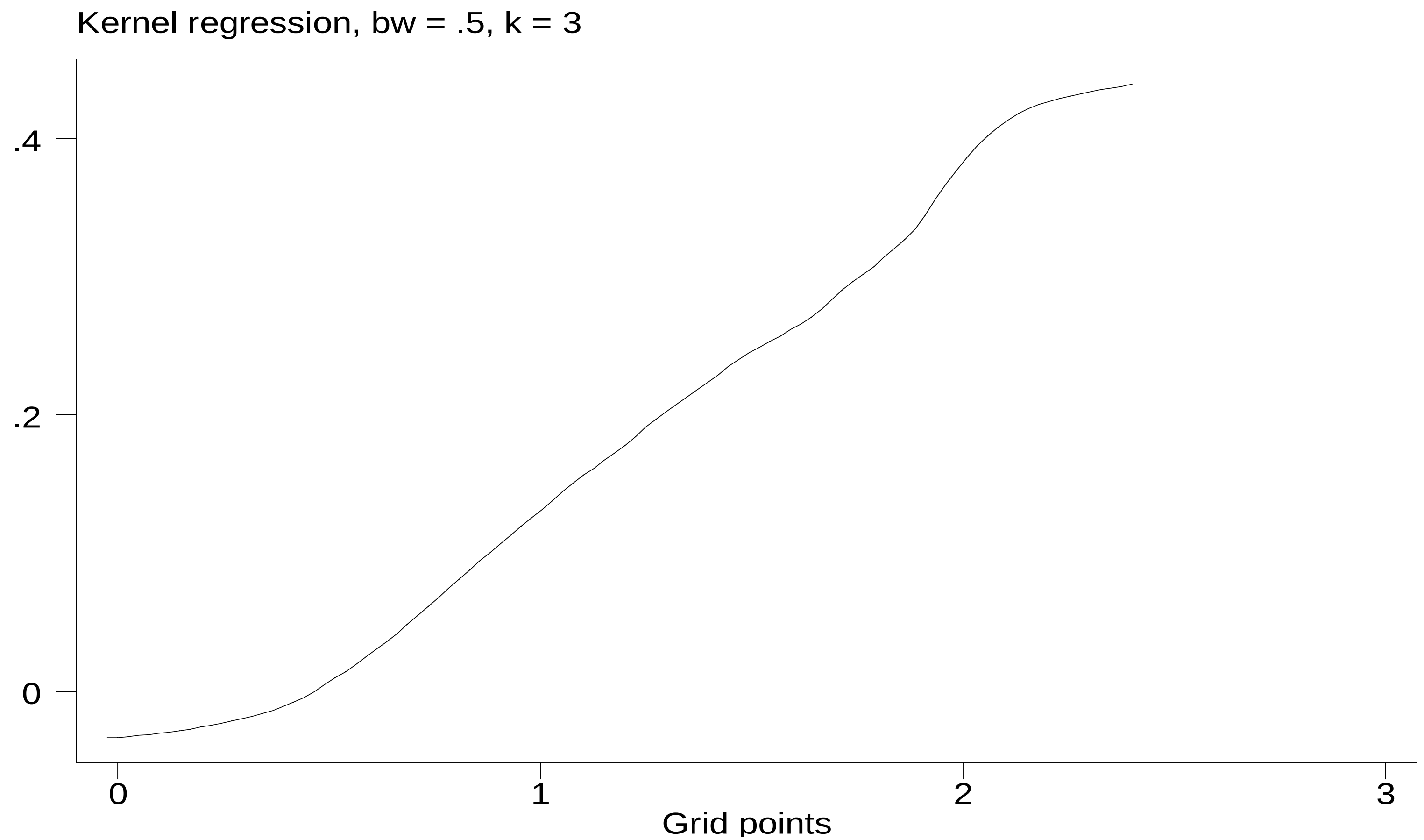
This Figure plots the quarter-by-quarter regression coefficients for all quarter dummies from the regression of cumulative loan growth on quarter dummies, separately for top and bottom quartile firms based on initial financial slack. Cumulative loan growth is the de-meaned value of the log of loans for each firm.

Figure VIII:Cumulative Loan Growth Regression Coefficients



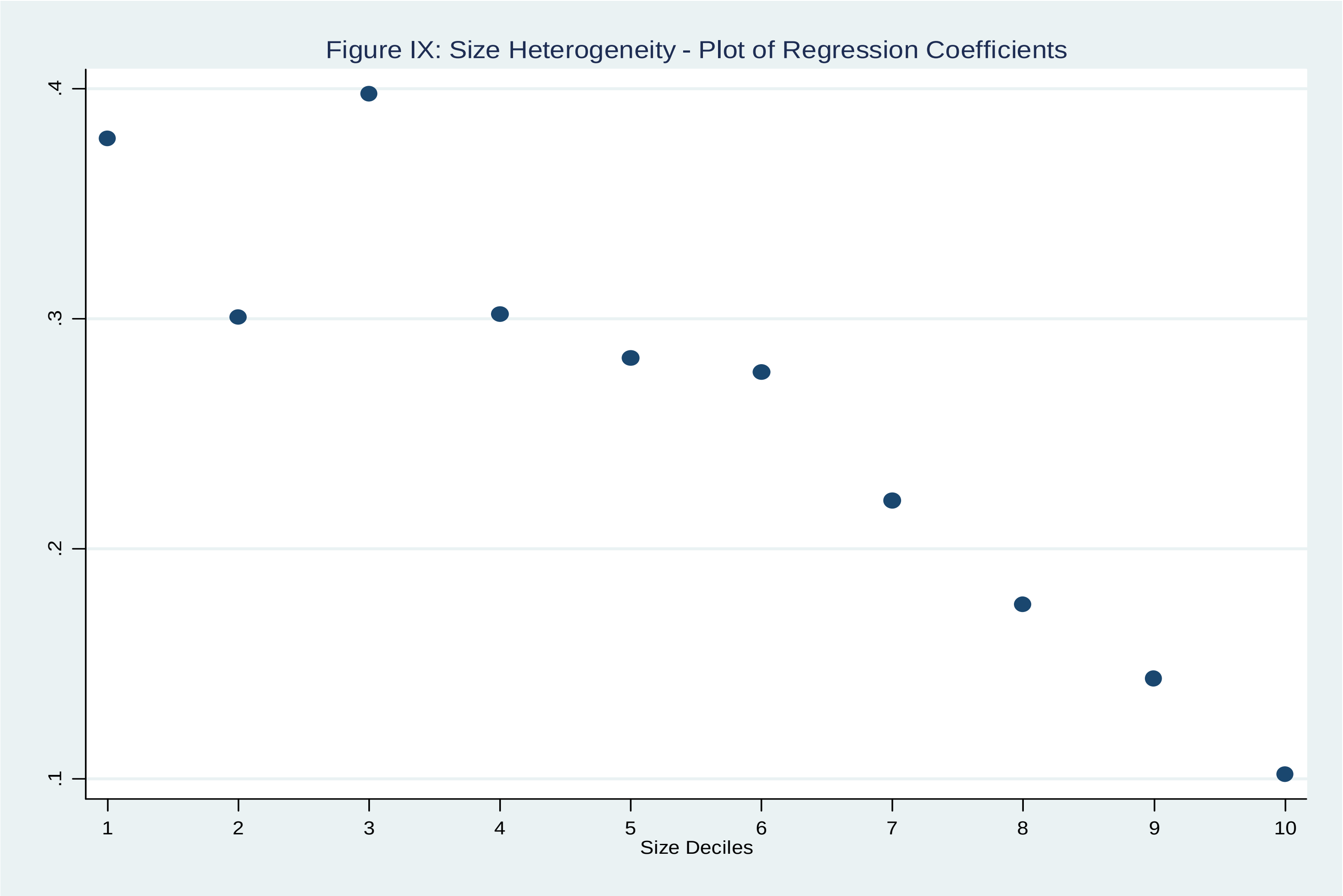
This Figure plot the continuous quarter-by-quarter regression coefficients from the regression of cumulative loan growth on all quarter dummy interactions with initial financial slack. Cumulative loan growth is the de-meaned value of the log of loans for each firm. The coefficients on these interaction terms are then plotted, along with a 95% confidence interval band. The regression also include all quarter dummy interactions with firm level controls such as size, industry, location, and dominant bank.

Figure IX: Kernel Plot of Loan Growth Against Initial Financial Slack



This Figure plots the non-parametric kernel regression of lending growth on initial financial slack.

Figure X: Firm Size Heterogeneity



This Figure plots the regression coefficients on the interactions of firm size decile dummies with initial financial slack. The regression is loan growth on these interactions, and the coefficients are also presented separately in Column (1) of Table VI.

Table I: Summary Statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre 2: 1998Q3-1999Q4			**Pre 1: 2000Q1-2001Q2**			**Post: 2001Q4-2003Q2**		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
PANEL A: CIB DATA - FIRM LEVEL *(000's Rs.)*									
Loan Size	21,812	102,681	1,388,379	23,010	133,099	1,754,643	23,010	168,524	2,586,862
Credit Limit	21,812	191,087	4,483,736	23,010	182,627	2,031,540			
Financial Slack	21,812	0.37	0.47	23,010	0.39	0.49			
PANEL B: BANK BALANCE SHEET DATA *(000's Rs.)*									
Deposits	50	44,989,840	74,350,210	50	51,846,990	83,993,900	50	65,902,470	99,584,370
Advances	50	25,770,860	41,393,550	50	33,117,890	52,008,220	50	37,379,000	52,440,840
Liquid Assets	50	21,284,660	35,268,670	50	20,845,340	34,285,270	50	33,488,640	53,619,040
PANEL C: FIRM BALANCE SHEET DATA *(000's Rs.)*									
Assets	1,177	1,210,000	5,110,000	1,169	1,480,000	5,390,000	1,002	1,870,000	6,710,000
Sales	997	1,170,000	4,310,000	1,005	1,830,000	8,840,000	857	2,470,000	11,800,000
Investment	427	105,000	440,000	428	130,000	482,000	405	252,000	1,070,000
Profit Before Tax	805	3,329	586,000	842	26,100	742,000	771	38,900	854,000

Panel A presents statistics for the loan level data from September 1998 to June 2003. The data is aggregated at the firm level for three equal time periods: Pre1, Pre2, and Post; where Post represents all quarters after September 2001. The loan data is averaged over each period by first converting all values to real 1995 Rupees, and then taking time-series averages of loans over all quarters in each period. "Log Distance to Limit" is the difference in logs between credit limit and actual borrowing. Panel B contains summary statistics for all 50 commercial banks in our lender sample. Panel C reports statistics from balance sheets of publicly listed firms. The sample size is much smaller since this data is compiled from firm annual reports, which are only available for listed firms.

Table II: Credit Limit and Financial Slack Attributes

PANEL A : CORRELATION OF FINANCIAL SLACK WITH FIRM ATTRIBUTES (No. of observations:23,010)

	(1)
	Financial Slack
Lagged Loan Growth	-0.307***
Log Firm Size	0.044***
Exporting Firm	0.001
Late Payment in Pre-Period	-0.009
Hi Demand Shock Industry	-0.015

PANEL B : CREDIT LIMIT STICKINESS

	(1)	(2)
	Limit Unchanged	Limit Usage Ratio Binds
Small Firms	46.62	35.09
Large Firms	17.95	26.05

PANEL C : DEMAND SHOCK VARIATION

	(1)	(2)
	Log(Credit Limit Post 2000) - Log(Credit Limit Pre 2000)	Log(Loans Post 2000) - Log(Loans Pre 2000)
Hi Shock Industry (defined in 2000)	0.018	0.046
	(0.017)	(0.021)
Constant	0.067	-0.002
	(0.013)	(0.013)
Observations	21812	21812

This table characterizes the financial slack and credit limit variables. Panel A presents cross sectional correlations of financial slack with various firm attributes, with significance levels indicated by the asteriks. Panels B establishes the "stichiness" of credit limits through a simple counting exercise. Panel C explores variation in credit limit and loan growth around January 2000, by high and low demand shock industries.

Table III: Does Financial Slack Predict Credit Growth?

	(1)	(2)	(3)	(4)
Dep Var = Loan Growth	All Firms		Firms with Non-Missing Lagged Loan Growth	
Initial Financial Slack	0.206	0.193	0.185	0.178
	(0.020)	(0.015)	(0.017)	(0.015)
Lagged Loan Growth				-0.021
				(0.015)
Industry, City, and Bank FEs		YES	YES	YES
Observations	23010	23010	15406	15406
R-squared	0.032	0.102	0.089	0.089

These regressions test the relationship between loan growth due and credit limit constraints. The dependent variable is the first difference in log(loans) for 6 quarters before and 6 quarters after 2001Q3. "Log Distance to Limit" is the log difference between a firm's credit limit and its borrowing for 6 quarters prior to 2001Q3. "Lagged Loan Growth" is the first difference in log(loans) for 6 quarters before and 6 quarters after 2000Q1. Regression specifications in columns (2), (3), and (4) also include dummies for each of the 134 cities/towns firms are located in, 75 industry dummies, and 119 dominant bank dummies, where dominant bank is where each firm has the largest share of borrowing. Standard errors in all specifications are clustered at the dominant bank level.

Table IV: Robustness Checks - Firm Quality

Dep Var = Loan Growth	(1)	(2)	(3)	(4)	(5)	(6) Pooled Sample:Firms appearing in all 3 periods
Financial Slack	0.193	0.19	0.19	0.19	0.21	0.555
	(0.014)	(0.021)	(0.027)	(0.020)	(0.029)	(0.037)
Late Paymen History?	-0.108					
	(0.019)					
Financial Slack *9/11 period						0.228
						(0.018)
9/11 Period						-0.189
						(0.018)
Industry, City, and Bank FEs	YES	YES	YES	YES	YES	--
Management FEs			YES (4,994 FEs)		YES (4,993 FEs)	
Firm FEs						YES
Observations	23,010	10,888	10,888	8,031	8,031	31,339
R-squared	0.103	0.1	0.5	0.09	0.68	0.59

These regressions conduct robustness checks of firm quality with parametric and non-parametric controls. Parametric controls include a measure of firm quality, "Late Payment in Pre-period?", which is a dummy =1 if a firm has ever been late on its repayment of loans prior to 2001Q3. Non-parametric controls include management fixed effects and firm fixed effects. Management fixed effects are constructed using firm director information: firms that share common directors are considered to be under the same management. Column (2) repeats our standard specification for firms that are part of multi-firm groups , and Column (3) then includes management fixed effects in the specification. Columns (4) and (5) repeat this exercise but excludes the super-group that includes 2,857 firms. Columns (6) introduces firm fixed effects by using an underlying pooled sample of three 6-quarterly time periods. The dependent variable is the first difference in log(loans) for 6 quarters before and 6 quarters after 2001Q3, except column (6) where it also includes growth rates over the previous 6 quarter periods as well. "Log Distance to Limit" is the log difference between a firm's credit limit and its borrowing for 6 quarters prior to 2001Q3, except column (6) where it also includes the difference over the previous 6 quarters periods as well. All regression specifications except column (6) also include dummies for each of the 134 cities/towns firms are located in, 75 industry dummies, and 119 dominant bank dummies, where dominant bank is where each firm has the largest share of borrowing. Standard errors in all specifications are clustered at the dominant bank level. There are 75 industry, 134 city, 119 bank fixed effects when included.

Table V: Exporter Heterogeneity

	(1)	(2)	(3)	(4)	(5)
Dep Var = Loan Growth	Non-Exporting Firms	Exporting Firms		Full Sample	
Financial Slack	0.213	-0.007	-0.007	-0.005	--
	(0.020)	(0.033)	(0.033)	(0.034)	
Non-Exporting Firms *Financial Slack			0.22	0.206	0.166
			(0.038)	(0.036)	(0.032)
Constant	-0.062	0.059	0.059	0.141	-0.139
	(0.022)	(0.027)	(0.027)	(0.112)	(0.136)
Industry, City, and Bank FEs				YES	YES
Firm Size FEs and All Interactions with Financial Slack					YES
Observations	22,039	971	23,010	23,010	23,010
R-squared	0.035	0.001	0.034	0.103	0.11

These regressions test for heterogeneous effects across exporters and non-exporters. Columns (1) and (2) present regression results separately for non-exporting and exporting firms, respectively, and Columns (3)-(5) repeat this exercise in the pooled data. The dependent variable is the first difference in log(loans) for 6 quarters before and 6 quarters after 2001Q3. "Financial Slack" is the log difference between a firm's credit limit and its borrowing for 6 quarters prior to 2001Q3. The specifications in columns (3)-(5) also include a "Non-Exporting Firm" Dummy. The specifications in columns (4) and (5) also include dummies for each of the 134 cities/towns firms are located in, 75 industry dummies, and 119 dominant bank dummies, where dominant bank is where each firm has the largest share of borrowing. The specification in column (5) also includes all firm size decile dummies and their interactions with "Financial Slack". Standard errors in all specifications are clustered at the dominant bank level.

Table VI: Firm Size and Bank Type Heterogeneity

	(1)	(2)	(3)
Dep Var = Loan Growth			
Financial Slack	0.102	0.102	--
	(0.028)	(0.030)	
Foreign Bank * Financial Slack			
Private Bank * Financial Slack			
Size Decile 1 *Financial Slack	0.276	0.274	0.282
	(0.039)	(0.042)	(0.046)
Size Decile 2 * Financial Slack	0.199	0.193	0.205
	(0.052)	(0.059)	(0.059)
Size Decile 3 *Financial Slack	0.296	0.243	0.243
	(0.041)	(0.048)	(0.051)
Size Decile 4 * Financial Slack	0.200	0.154	0.156
	(0.048)	(0.042)	(0.043)
Size Decile 5 * Financial Slack	0.181	0.143	0.141
	(0.057)	(0.044)	(0.046)
Size Decile 6 * Financial Slack	0.175	0.149	0.145
	(0.056)	(0.045)	(0.049)
Size Decile 7 * Financial Slack	0.119	0.094	0.095
	(0.037)	(0.034)	(0.034)
Size Decile 8*Financial Slack	0.074	0.078	0.077
	(0.038)	(0.037)	(0.040)
Size Decile 9 * Financial Slack	0.042	0.05	0.035
	(0.038)	(0.039)	(0.036)
Industry, City, and Bank FEs		YES	YES
All Interactions of Industry FEs with Financial Slack			YES
Observations	23010	23010	23010
R-squared	0.043	0.109	0.114

These regressions test for heterogeneous effects based on firm size deciles. The dependent variable is the first difference in log(loans) for 6 quarters before and 6 quarters after 2001Q3. "Financial Slack" is the log difference between a firm's credit limit and its borrowing for 6 quarters prior to 2001Q3. The specifications in columns (2)-(3) also include dummies for each of the 134 cities/towns firms are located in, 75 industry dummies, and 119 dominant bank dummies, where dominant bank is where each firm has the largest share of borrowing. The specifications in Column (3) also includes the interactions of all industry dummies with "FInancial Slack". Standard errors in all specifications are clustered at the dominant bank level, where dominant bank is where each firm has the largest share of borrowing.

Table VII: Varying Demand Shocks Across Industries

Dep Var = Loan Growth	(1) High Demand Shock	(2) Low Demand Shock	(3) Full Sample	(4) Full Sample	(5) Full Sample
Financial Slack	0.219	0.108	0.108	0.109	--
	(0.020)	(0.022)	(0.022)	{0.019)	
High Demand Shock * Financial Slack			0.111	0.096	0.075
			(0.025)	(0.021)	(0.021)
Constant	-0.066	0.006	0.006	-0.029	-0.285
	(0.023)	(0.018)	(0.017)	(0.188)	(0.218)
Industry, City, and Bank FEs				YES	YES
Firm Size FEs and All Interactions with Financial Slack					YES
Observations	20291	2719	23010	23010	23010
R-squared	0.037	0.008	0.033	0.103	0.11

These regressions test for heterogeneous effects across industries that were hit by varying degrees of demand shocks after 9/11. "High Demand Shock" industries primarily include cement, energy, and construction sectors, and "Low Demand Shock" industries primarily include textiles and chemicals. Columns (1) and (2) present regression results separately for high and low demand shock industries, respectively, and columns (3)-(5) repeat this exercise in a continuous specification. The dependent variable is the first difference in log(loans) for 6 quarters before and 6 quarters after 2001Q3. "Financial Slack" is the log difference between a firm's credit limit and its borrowing for 6 quarters prior to 2001Q3. The specifications in columns (3)-(5) also include a "High Demand Shock" Dummy. The specifications in columns (4) and (5) also include dummies for each of the 134 cities/towns firms are located in, 75 industry dummies, and 119 dominant bank dummies, where dominant bank is where each firm has the largest share of borrowing. The specification in column (5) also includes all firm size decile dummies and their interactions with "Financial Slack". Standard errors in all specifications are clustered at the dominant bank level.