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# The Distributive Impact of Reforms in Credit Enforcement: Evidence from Indian Debt Recovery Tribunals

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# The Distributive Impact of Reforms in Credit Enforcement: Evidence from Indian Debt Recovery Tribunals

*Work in Progress: Very Preliminary*

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**Abstract**

It is generally presumed that strengthening the enforcement of lender rights expands the set of incentive compatible loan contracts, resulting in increased access to credit for all types of borrowers. This is based on an implicit assumption of infinitely elastic supply of loans. With inelastic supply, strengthening enforcement can result in greater exclusion of poor borrowers from credit markets and a reallocation of credit from poor to wealthy borrowers. Using a dataset of capital project loans given by a large Indian bank to firms of varying asset sizes, we find evidence of such adverse distributional impacts of a reform to strengthen lender rights implemented across Indian states in the 1990s.

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# 1 Introduction

It is commonly believed that weak enforcement of credit contracts adversely affects the functioning of credit markets. If borrower liabilities in the event of default are not effectively enforced, borrowers cannot credibly commit to repay their loans. As a consequence, lender risks are high and borrowers are confronted *ex ante* with a high cost of credit, which lowers their access to credit and reduces the volume of loans. Stronger enforcement lowers the cost of credit and increases access. In contract-theory parlance, it enlarges the set of incentive-compatible credit contracts, allowing the utility possibility frontier to move outwards.

Some empirical evidence supports this hypothesis. In cross-country studies, La Porta et al. (1997, 1998) show that weak investor protection is correlated with thinner debt markets. Gropp et al. (1997) find that higher exemption limits for consumer bankruptcy across different US states were associated with greater exclusion of poor borrowers. Visaria (2007) uses a micro-panel of loans to assess the impact of debt recovery tribunals (DRTs) set up in different Indian states at varying dates in the 1990s. She finds that stricter enforcement of lender's rights in the event of default significantly improved repayment behavior, and subsequently lowered interest rates on new loans.

Similar arguments have been used more broadly for enforcing well-defined property rights. For example, it has been argued that awarding land titles to squatters in Peru allows borrowers to pledge property as collateral, increasing their access to credit (De Soto, Field 2007).

This paper argues that the traditional presumption may need to be qualified considerably: the effects of stronger enforcement of property rights are more nuanced. First, at a theoretical level we shall argue that with realistic forms of borrower heterogeneity, stronger enforcement of property rights have ambiguous effects. In particular, it can have adverse distributional impacts, and they do **not** always constitute a Pareto improvement. The redistributive effects arise due to a general equilibrium (GE) effect of the reform that has been overlooked by the conventional argument based entirely on partial equilibrium (PE) reasoning.

Second, we conduct an empirical analysis of the effect of a legal reform in India studied previously in Visaria (2007), focusing particularly on the distributive impacts on access and cost of credit for borrowers of varying size. In this reform, new specialized courts called debt recovery tribunals were set up to reduce delays in debt recovery suits. Visaria (2007) shows suggestive evidence that they effectively lowered case processing times and thus increased the amount recovered by banks from defaulting loans. In this paper we show that the reform had adverse distributional impacts, consistent with the GE effects postulated by our theoretical model. In our sample consisting of firms borrowing from a leading private sector bank in India to finance capital construction projects, we find that the bottom three quartiles of firms (in terms of asset size) experienced a significant reduction in their access to credit: the probability of getting a new loan as well as average loan size for the bottom three quartiles fell after DRTs were established. These results are robust to controls for national level time trends in credit volume as well as time-invariant state and industry-specific unobservable characteristics.

The GE effect can be explained as follows. Improving the enforcement of credit contracts enlarges the set of incentive compatible debt contracts, thus shifting outwards the incentive-constrained demand function for credit. This increases the equilibrium profit rate earned by lenders, which subsequently raises the cost of credit. This GE effect causes a reduction in credit granted, offsetting the original, partial equilibrium (PE) effect of superior enforcement. The PE effect is (proportionately) greater for wealthier borrowers, while the GE effect affects all borrowers uniformly. Hence the poorest borrowers may experience increased cost of credit, and lose credit access. Wealthier borrowers experience larger PE effects, which overwhelm the GE effect, thus enlarging their access to credit. Hence the enforcement reforms can result in a redistribution of credit.

In a competitive credit market, the extent to which this redistribution occurs depends on the elasticity of supply of loans. If the supply is perfectly elastic, the profit rate is unaffected, and there is no GE effect. In that case there is a Pareto improvement, with an improvement in credit access for all borrowers. The traditional presumption is set in this context. On the other hand, if credit supply is sufficiently inelastic, the GE effect becomes more powerful, implying a regressive redistribution in access to credit. As a result, the aggregate efficiency impacts of the reform are ambiguous. If the marginal productivity of loans is higher for poorer borrowers, then a decrease in their access to credit will lower efficiency. Clearly, the overall impact is an empirical matter: it depends on the supply elasticity of loans, in combination with the wealth distribution among borrowers and properties of the technology. Our empirical analysis confirms that such an adverse distributional impact characterized the Indian DRT reform in the 1990s.

The paper proceeds as follows. Section 2 describes the relation of this paper to existing literature. Section 3 develops the theoretical model. Section 4 describes the Indian DRT reform and the project-loan database we use to construct our borrower-quarter panel data. Section 5 presents the empirical results. In section 6 we consider an alternative theoretical explanation of the empirical findings, and attempt to use the empirical findings to differentiate between the two explanations. Finally, Section 7 concludes.

## 2 Related Literature

In this paper, the main forces are based on the tension between partial and general equilibrium effects. This is modeled in a similar fashion to the Walrasian characterization of contracts in stable matching of lenders and borrowers outlined in von Lilienfeld-Toal and Mookherjee (2007). There, loans were subject to *ex ante* moral hazard in addition to the possibility of voluntary default, and the focus was on the effects of reform in personal bankruptcy law (e.g. changes in borrower exemption limits). Instead, this paper focuses on a reform which strengthened the legal enforcement of lender rights, the 1993 Indian law establishing debt recovery tribunals. The two types of reforms have quite distinct distributional impacts: a lowering of exemption limits results in an equal absolute increase in borrower liability, whereas strengthening enforcement results in a higher increase in liability for wealthier borrowers. The lowered exemption limit therefore tends to increase credit access for poor borrowers relative to wealthier borrowers, whereas we argue here that the DRT reform could lower relative credit access for the poor.

Biasi and Mariotti (2006) also model the general equilibrium effects of changes in firm bankruptcy law. However, they assume a fixed project size, thus ruling out the possibility of redistribution of credit. Instead, our paper delivers and empirically tests predictions of credit redistribution. However, their and our models generate similar implications for redistribution of rents, for essentially similar reasons.

Visaria (2007) empirically investigates the impact of the DRT reform in India, using the same database of project loans made by a large Indian bank. In contrast to the effects of the reform on repayment behavior and interest rates on the average loan studied in that paper, this paper focuses on credit redistribution across borrowers of different asset sizes. Nevertheless, as will become clear later, we draw upon some of her results to justify our empirical analysis and argue that the effects are identified.

In our primary model, in the absence of any GE effects, strengthening contract enforcement induces credit expansion and payoff improvement for all borrowers. This result depends critically on contractual completeness, i.e., the assumption that borrower liabilities can be specified to be fully state-contingent in advance. With incomplete contracts, defaults arise in equilibrium and strengthening lender protection may result in payoff losses and credit contraction for risk-averse borrowers. We show in Section 6 that this is an alternative explanation for our empirical findings on credit allocation. This argument is related to the explanation provided informally by Gropp et al. (1997) for their finding that higher bankruptcy exemption limits across US states were associated with a credit redistribution from poor to wealthier borrowers. The empirical analysis in this paper has the advantage of using a panel data set rather than relying on a single cross-section. Also, the staggered, exogenous introduction of DRT across Indian states allows the clean identification of the effects of changing liability rules.

# 3 Model

Consider an economy populated by risk neutral borrowers, differentiated by (collaterizable) fixed assets $W$, distributed according to cdf $G$ over support $[\underline{\Omega}, \bar{\Omega}]$. Each borrower seeks to invest in a project at scale $\gamma \geq 0$. A project of scale $\gamma$ requires upfront investments of $\gamma \cdot I$. It generates returns of $y \cdot f(\gamma)$, where $y \in \{y_s, y_f\}$ is a borrower-specific productivity shock, and $f$ is an increasing, continuously differentiable, S-shaped function with $\frac{f(\gamma)}{\gamma}$ rising until $b$ and falling thereafter, for some $b \geq 0$. Hence $f'(\gamma)$ is rising over some initial range $(0, b')$ and falling thereafter, where $b' < b$. We assume the borrower does not have any liquid wealth to pay for the upfront investments. In contrast to von Lilienfeld-Toal and Mookherjee (2007), we simplify by abstracting from project moral hazard: the probability of success ($y = y_s$) is given and denoted $e$. It is useful to introduce $\bar{y} \equiv e \cdot y_s + (1 - e) \cdot y_f$.

## 3.1 Complete Contracts

A loan contract stipulates the amount borrowed $(\gamma \cdot I)$, and the amount $T_k$ to be repaid in state $k \in \{s, f\}$. We say *contracts are complete* (CC) if the repayment obligation $T_k$ can vary with the state $k \in \{s, f\}$. Otherwise they are said to be *incomplete*. In this section we focus on complete contracts; a later section considers the case of incomplete contracts.

Each borrower may decide to default on the loan *ex post*. Should a borrower default, lenders can seize the fraction $\theta$ of *ex post* assets owned by the borrower. Ex post assets equal $W + \nu \cdot y_k \cdot f(\gamma)$. Here, $1 - \nu$ is the fraction of firm's returns diverted by the entrepreneur. We shall treat $\nu$ as a parameter and assume that $\nu < I/(\bar{y} \cdot \theta \cdot f'(b'))$. This limits the extent to which the returns from the project itself can serve as a significant source of collateral; the borrower's assets remain the primary source of collateral.

We are interested in the enforcement of credit contracts should the borrower default. The enforcement institution is represented by $\theta$, incorporating delays and/or uncertainties in the collection process. Enforcement is affected by judicial reforms such as DRT. The main focus is thus on the effects of raising $\theta$.

Should the entrepreneur repay his loan, he obtains ex-post utility $W + y_k \cdot f(\gamma) - T_k$ in state $k \in \{s, f\}$. In contrast, utility in case of default in state $k \in \{s, f\}$ is given as $(1 - \theta) \cdot [W + \nu \cdot y_k \cdot f(\gamma)] + (1 - \nu) \cdot y_k \cdot f(\gamma) - d$ where $d$ is an additional default cost incurred by the borrower (reputation loss, legal costs etc). The entrepreneur will not default in state $k$ if and only if

$$T_k \leq \theta[W + \nu \cdot y_k f(\gamma)] + d. \tag{$IC_k$}$$

It is a standard result that with complete contracting there cannot be any default in an optimal contract: any contract that induces default will be dominated by another which lowers the repayment obligation in the default state to avoid default and its attendant deadweight losses.

## 3.2 Supply

We consider a 'competitive' supply of loans, represented by a supply curve of loanable funds given as

$$L_s(\pi) = \begin{cases} a + \delta \cdot \pi, & \text{if } \pi \geq \alpha; \\ 0, & \text{else,} \end{cases}$$

where $\pi$ is the return per rupee loaned, and $\alpha \geq 0, a \geq 0, \delta \geq 0$. The linearity of the supply curve is for expositional convenience alone; our results carry over to any upward sloping supply curve.[4] To avoid a vacuous analysis, assume that $\bar{y} \cdot f(b)/b > I(1+\alpha)$, i.e. some projects will be funded in the absence of any enforcement problems.

$\delta = \infty$ corresponds to the case of a perfectly elastic supply of funds: in that case the equilibrium rate of profit is fixed at $\alpha$. And the supply is completely inelastic (above profit rate $\alpha$) if $\delta = 0$. The elasticity of the supply of funds will play a key role in our analysis, which we will treat as an empirical matter. From one perspective, globalized financial markets guarantee an infinitely elastic supply of capital to any given economy and hence $\delta = \infty$. We shall refer to this case as involving *no GE effects*. An alternative view emphasizes the role of 'local knowledge' and 'monitoring loans' matter for financial intermediaries, which are in restricted supply. In that case $\delta < \infty$: financial markets are not perfectly integrated, and enforcement reforms will entail *GE effects* that operate through the effect on the equilibrium profit rate.

It should be noted that the credit market is only one example where general equilibrium effects may play a role. Conceivably, the firm needs to use some (other) input factors to produce output, for example labor (this framing is used in Biais and Mariotti (2006)). Then, our results carry over if there are GE effects in the labor market. In that case, reforming credit enforcement would have spill-overs to the labor market. The implications for credit redistribution would be similar to our set-up.

### 3.3 Demand

As a benchmark, we start with the *first-best* demand $\gamma^F(\pi)$ which solves

[4]The following microfoundation of credit supply can be given. A given lender incurs loan monitoring (screening/collection) costs of $c$ per rupee loaned, which has to be subtracted from the gross rate of return $\pi$ on loans to obtain the net profit. Each lender is capacity constrained and a lender with monitoring cost $c$ has capacity to lend upto $L(c)$. Monitoring costs are distributed according to a given distribution $H(.)$ over $c$. Hence, if the going rate of return on loans is $\pi$, lenders are only willing to lend if $c \leq \pi$. As a result, $L_s(\pi) \equiv \int_0^\pi L(c)dH(c)$.

$$\max_{\gamma}[\bar{y}f(\gamma) - \gamma I(1+\pi)], \tag{FB}$$

with $\bar{y} \equiv ey_s + (1-e)y_f$.

The *first-best* is not always implementable due to the no-default incentive constraint (IC). The relevant demand thus takes these constraints into account:

**Definition 1** *In a $\pi$-incentive compatible loan contract, each borrower $i$ with assets $W$ demands credit $\gamma_i(W, \theta, \pi)$ which solves*

$$\max_{\gamma, T_s, T_f} e[y_s f(\gamma) + W - T_s] + (1-e)[y_f f(\gamma) + W - T_f]$$

*subject to*

$$T_k \leq \theta[W + \nu y_k f(\gamma)] + d, k = s, f \tag{IC}$$

*and*

$$eT_s + (1-e)T_f \geq \gamma I(1+\pi) \tag{PC}$$

*Aggregate incentive compatible demand for credit is then given as $L_d(\theta, \pi) = \sum_i \gamma_i(W, \theta, \pi)$.*

Adding up the $IC$ and $PC$ constraints, it becomes clear that a project size $\gamma$ is implementable if and only if

$$\theta[W + \nu \bar{y} f(\gamma)] + d \geq \gamma I(1+\pi). \tag{IC'}$$

Condition (IC') reduces to the existence of a credit ceiling. To see this note that it can be rewritten as

$$\theta.W + d \geq \gamma I(1+\pi) - \theta.\nu \bar{y} f(\gamma). \tag{IC''}$$

The assumption that $\nu < I/(\bar{y} \cdot \theta \cdot f'(b'))$ implies that the right-hand-side of (IC") is increasing in project scale $\gamma$. In other words, since the returns on the project do not serve as a substantial source of collateral (owing to the low value of $\nu$), larger project scales are more difficult to implement. A borrower with given wealth $W$ will face a credit ceiling uniquely defined by the value of $\gamma$ which solves the equality version of (IC"). We shall denote this project scale ceiling by $\gamma_i^H(W, \theta, \pi)$. It is increasing in $W, \theta$, and decreasing in $\pi$.

To characterize the optimal demand for credit, the following definitions are useful:

**Definition 2** *First best asset threshold:* $W^F(\pi) \equiv \{\gamma I(1+\pi) - d\}/\theta - \nu\bar{y}f(\gamma^F)$.

*Maximum project size:* $\gamma_i^H(W, \theta, \pi)$ *which solves* $\theta[W + \nu\bar{y}f(\gamma)] + d = \gamma I(1+\pi)$

*Minimum project size:* $\gamma^L(\pi)$ *is the smallest solution to* $\bar{y} \cdot f(\gamma)/\gamma = I \cdot (1+\pi)$

*Minimum viable asset threshold:* $W_L(\pi, \theta)$ *solves* $\gamma_i^H(W, \theta, \pi) = \gamma^L(\pi)$.

At a given profit rate $\pi$, it is clear that a firm will operate and gain access to a loan only if its maximum project size $\gamma_i^H$ exceeds the minimum viable project scale $\gamma^L$. This translates into a wealth threshold $W_L$ below which borrowers are excluded from the credit market altogether. Those above $W_L$ will operate at a scale given by the smaller of the first-best scale and its ceiling $\gamma_i^H$. This translates into the first best asset threshold $W^F$. Hence those between $W_L$ and $W^F$ obtain a loan but are rationed with regard to the scale of the loan, while those above $W^F$ are not rationed.

Of course this is at a given profit rate $\pi$, so it does not yet describe the equilibrium credit allocation, which requires us to determine the equilibrium profit rate. Accordingly the preceding discussion pertains to the incentive-constrained demand function for loans:

**Lemma 3** *The incentive-constrained demand function for credit is*

$$\gamma_i(W, \pi; \theta) = \begin{cases} 0, & \text{if } W < W_L(\pi, \theta); \\ \gamma_i^H(W, \theta, \pi), & \text{if } W_L(\pi, \theta) < W < W^F(\pi); \\ \gamma^F(\pi), & \text{if } W > W^F(\pi). \end{cases}$$

### 3.4 Market Equilibrium

We consider a competitive market for loan contracts and use a standard Walrasian equilibrium notion, where the profit rate is determined by the equality of aggregated supply and incentive-constrained demand:

**Definition 4** *An incentive-constrained Walrasian allocation is a credit allocation in which each borrower receives his incentive-constrained demand corresponding to a profit rate* $\pi^*$*, which has the property that supply of loans at* $\pi^*$ *equals incentive-constrained demand at* $\pi^*$ *aggregating across all borrowers.*

It can be shown (along the lines of Lilienfeld-Toal and Mookherjee (2007)) that Walrasian allocations characterize stable allocations of a matching market between borrowers and lenders, under suitable assumptions on the distribution of lenders. [5]

Since market demand changes with $\theta$, the equilibrium profit rate $\pi^*$ will be a function of $\theta$ and denoted by $\pi(\theta)$ where required.

### 3.5 Effects of Increasing $\theta$ with No GE Effects

Consider first the case where there are no GE effects: $\delta = \infty$. Then the equilibrium profit rate is fixed at $\alpha$, and the equilibrium credit allocation is given by borrower demands evaluated at the profit rate $\alpha$.

In this case the effect of raising $\theta$ is straightforward: see Figure 1. Incentive constraints are relaxed, permitting an expansion of credit ceilings for every borrower. The proportion of firms excluded from the market must fall, as the minimum project scale does not change with $\theta$. Borrowers that were previously credit-constrained will obtain larger loans, and thus attain higher payoffs. Those that were not constrained will be unaffected, and the same is true for lenders. The result is a Pareto improvement, and a favorable distributional impact as poorer borrowers gain access to credit. Borrowers are better off because every contract implementable under weak enforcement is also implementable under strong enforcement. [6] This is the basis of the conventional intuition concerning the benefits of strengthening enforcement institutions.

[5] Specifically, a sufficient condition is the *Competitive Supply Assumption*, which states that for any lender with cost $c$ and lending capacity $L(c)$, there exists other borrowers with cost at or below $c$ with aggregate lending capacity of at least $L(c)$. An example of a situation where this holds is that there exist at least two lenders of any given 'type'. Under this assumption, the gross rate of return $\pi$ on lending must be equalized across all active lenders, owing to a Bertrand-like competition among lenders.

[6] It should be noted that this is a pretty general result. In particular, even if $T_k$ cannot be conditioned on $k$ because the state $k$ is costly to verify, it will still be true in a costly state verification problem. This result has the logic of a mechanism design problem, where a higher $\theta$ relaxes incentive constraints. On the other hand, however, the result does not apply if contracts are incomplete and payments cannot vary for exogenous reasons.

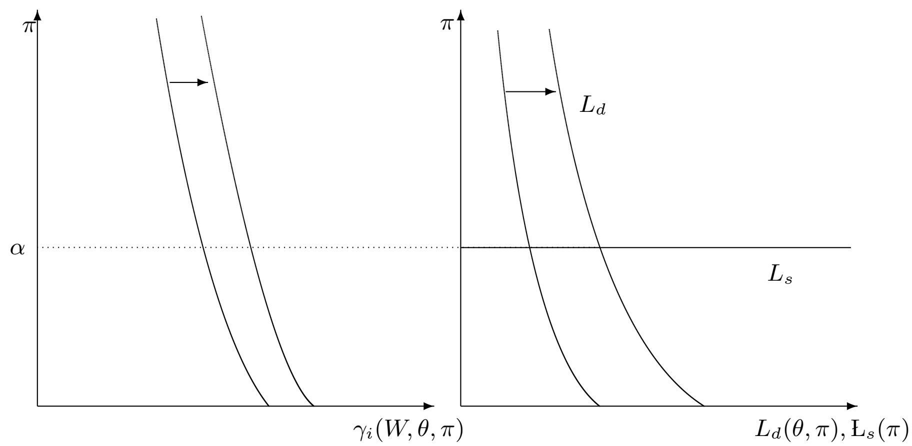


Figure 1: Impact of changing liability law absent GE effects.

### 3.6 Effects of Increasing $\theta$ with GE Effects

Now consider the case where the supply of funds is not perfectly elastic. An increase in $\theta$ will shift the aggregate credit demand function outwards, and thus raise the equilibrium profit rate. This GE effect will choke off some demand, in order to clear the credit market. The total effect on credit allocation will now be composed of a PE effect (which relaxes credit ceilings at any given profit rate), and a GE effect which involves a rise in the profit rate that shrinks credit ceilings, raises the minimum viable project scale, and lowers the first-best project scale.

As a first step, we consider the case where the supply of funds is 'nearly' perfectly elastic, so the GE effect is sufficiently weak:

**Proposition 5** *Consider an increase in $\theta$ from $\underline{\theta}$ to $\bar{\theta} > \underline{\theta}$. Then for $\delta$ finite but sufficiently large:*

1. *the proportion of firms excluded from the market falls (i.e., the minimum asset threshold $W_L$ falls)*
2. *the first-best project scale (and hence credit allocated to sufficiently wealthy borrowers) falls, and*

*3. for borrowers with intermediate asset sizes the credit allocated rises.*

**Proof.** The argument is based on noting that the increase in the equilibrium profit rate can be made arbitrarily small if $\delta$ is sufficiently large. This implies the result since a sufficiently small rise in the profit rate will imply that the project ceiling $\gamma^H$ will rise (by at least a certain amount) for all borrowers owing to the given rise in $\theta$, while the rise in the minimum viable project scale $\gamma^L$ will be small enough. Hence the expansion of the credit ceiling (for borrowers near the minimum asset threshold $W_L$) will outweigh the increase in the minimum viable project scale, resulting in a reduction of exclusion, and an increase in credit ceiling for all active borrowers. However, the first-best project scale will decline owing to the rise in the profit rate.

We construct an upper bound for the rise in the equilibrium profit rate $\pi(\bar{\theta}) - \pi(\underline{\theta})$ and then argue that this upper bound becomes arbitrarily small as $\delta$ increases. If $\delta > 0$, $L_s^{-1}()$ exists, i.e. $L_s$ is invertible and let $\bar{\pi} = L_s^{-1}(L_d(1,0))$. Here, $L_d(1,0)$ is an upper bound for credit demand (with $\theta = 1$ and $\pi = 0$). Note that $\bar{\pi} \geq \pi(\bar{\theta})$ and $\pi(\underline{\theta}) > a$. Then $\bar{\pi}$ is decreasing in $\delta$ and approaches $a$ as $\delta$ becomes large. As a result, $\bar{\pi} - a$ converges to zero for large $\delta$ and since $\bar{\pi} - a > \pi(\bar{\theta}) - \pi(\underline{\theta})$, $\pi(\bar{\theta}) - \pi(\underline{\theta})$ also approaches zero for large $\delta$. Hence, for large enough $\delta$, $\pi(\bar{\theta}) - \pi(\underline{\theta})$ is arbitrarily small. ■

The effects of an increase of $\theta$ in the case of nearly-perfectly elastic supply of loans is similar to the case where GE effects are totally absent. Yet there are some important differences. There is a distributional shift of credit in favor of poorer borrowers, away from wealthy borrowers. The effect is not a Pareto improvement: the wealthiest borrowers are worse off owing to the rise in the profit rate. On the other hand, the borrowers at the bottom end of the asset distribution that gain access to the market are made better off. For intermediate sized borrowers, the effects are ambiguous: their credit limits are relaxed and so they can expand the scale of their projects. On the other hand, they pay higher interest rates.

Now turn to the other extreme where the supply of funds is perfectly inelastic ($\delta = 0$). To obtain sharp results, we focus on the case where $\nu = 0$: only the borrowers initial assets serve as collateral. Also we assume that the upper bound of the wealth distribution is low enough that no borrower attains the first-best project scale. Then the project ceiling for a borrower with wealth $W$ is

$$\gamma^H(W, \pi; \theta) = \frac{\theta W + d}{I(1 + \pi)}$$

Suppose $\theta$ rises to $\theta'$ and suppose the corresponding equilibrium profit rate rises from $\pi$ to $\pi'$. Then note that if the project ceiling does not fall for some borrower with wealth $W$:

$$\Delta(W) \equiv \gamma^H(W;\pi';\theta') - \gamma^H(W;\pi;\theta) \geq 0$$

then it must rise (and will be bigger) for all higher wealth borrowers with higher wealth $W' > W$, i.e., $\Delta(W') > \Delta(W) \geq 0$.[7]

Now it must be the case that the proportion of borrowers that are excluded must rise. Otherwise the minimum asset threshold $W_L$ remains the same or it falls. Since the minimum viable scale has risen, it must be the case that a borrower at the previous minimum threshold $W_L$ must have experienced a rise in the project ceiling. This implies that all borrowers must also experience a rise in their ceilings. Since (by assumption) there is no borrower wealthy enough to achieve the first-best scale, the credit allocated to every active borrower must have risen. This contradicts the fact that the supply of funds is perfectly inelastic.

Hence there must be a rise in the incidence of exclusion at the bottom end of the asset distribution, and those borrowers must be worse off. Since the aggregate supply of funds is fixed, there must exist wealthier borrowers who receive a larger supply of funds. Indeed, the above argument shows that there must exist a cutoff wealth level $\hat{W}$ whose credit allocation is unaffected, above which credit expands, and below which credit contracts. So there must be a regressive redistribution of credit across borrowers.

We summarize the preceding discussion as follows.

**Proposition 6** *With CC and GE, suppose $\bar{\Omega} < W(\pi(1))$, $\nu = 0$, and supply is perfectly inelastic ($\delta = 0$). If $\theta$ increases, the profit rate and the proportion of borrowers excluded rises. Moreover, there exists threshold asset size $\hat{W}$ such that:*

*(a) If $W < \hat{W}$, credit falls, and the borrower is worse off*

*(b) If $W > \hat{W}$, credit rises.*

We now have a regressive redistribution of credit among the set of credit-constrained borrowers. The intuition underlying this result is depicted in Figure 2. On the right side of the figure,

[7]This follows since $\Delta(W) = W[\frac{\theta'}{I(1+\pi')} - \frac{\theta}{I(1+\pi)}] + d[\frac{1}{I(1+\pi')} - \frac{1}{I(1+\pi)}]$. Since $\pi' > \pi$, we have $d[\frac{1}{I(1+\pi')} - \frac{1}{I(1+\pi)}] < 0$. So $\Delta(W) \geq 0$ implies $\frac{\theta'}{I(1+\pi')} - \frac{\theta}{I(1+\pi)} > 0$, and then the result follows.

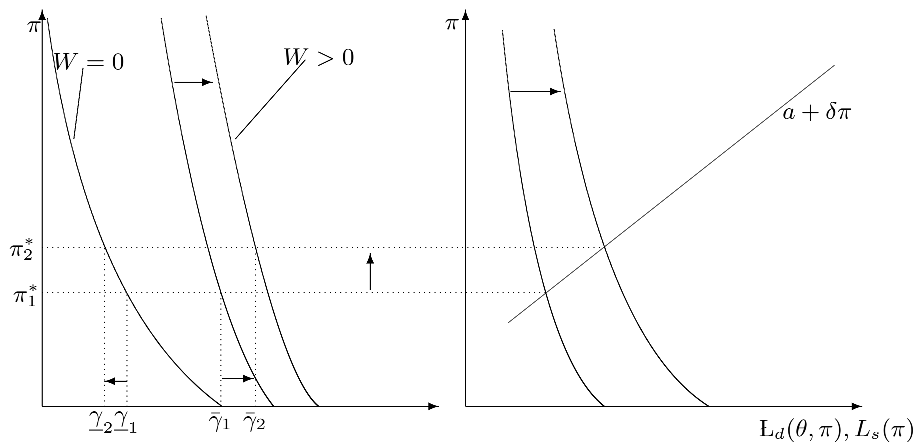


Figure 2: Impact of changing liability law with GE effects.

we see that aggregate demand increases which implies an increase in the equilibrium profit rate $\pi^*$. However, firms with different assets are differently affected, which is mirrored in the left side of figure 2. The leftmost demand function corresponds to a firm with the smallest possible assets, i.e., $W = 0$. For a firm with zero assets, changing $\theta$ does not lead to a change in the demand for credit. Hence, the same function represents demand for credit, both before and after the reform.

In contrast to this, individual demand for firms with $W > 0$ shifts outward. The middle and rightward demand functions in the left side of figure 2 represent incentive compatible demand for the same firm with assets $W > 0$ both, before and after the change of $\theta$. Demand prior to the change corresponds to the demand function in the middle of the left side of figure 2. This demand function is then shifted outward to the rightmost demand function in the left side of figure 2.

This asymmetric effect has the following implication for changes in equilibrium demand: The firm with $W = 0$ cannot benefit from the increase in $\theta$ and its demand curve is not shifted outward. At the same time, the firm now faces a higher profit rate. As a result, its demand for credit decreases from $\underline{\gamma}_1$ to $\underline{\gamma}_2$.

The firm with $W > 0$ does benefit from the increase in $\theta$. As a consequence, it's demand curve is shifted outward. It also faces a higher interest rate which potentially reduces demand.

However, the outward shift of the demand curve dominates the profit rate effect and demand increases from $\bar{\gamma}_1$ to $\bar{\gamma}_2$. Hence, small firms demand less credit, large firms get more credit due to the change in $\theta$.

Our results are summarized in figure 3. Panel A depicts the redistributive effect of increasing $\theta$ absent any (GE) effects. Then, $\pi$ incentive compatible demand shifts outward for all borrowers who operate at their credit ceiling. Some excluded borrowers can now also participate and exclusion is reduced. For sufficiently small (GE) effects, all credit constrained borrowers receive more credit: exclusion is reduced and the credit ceiling is shifted outward. In contrast to this, those who work at the first best project scale reduce demand for credit since credit has become more expensive. For sufficiently strong (GE) effects, the effects become more ambiguous. Exclusion may increase. Moreover, smaller firms get less credit and medium sized firms get more credit. Large firms, i.e. borrowers operating at the first best reduce their demand for credit due to the price increase.

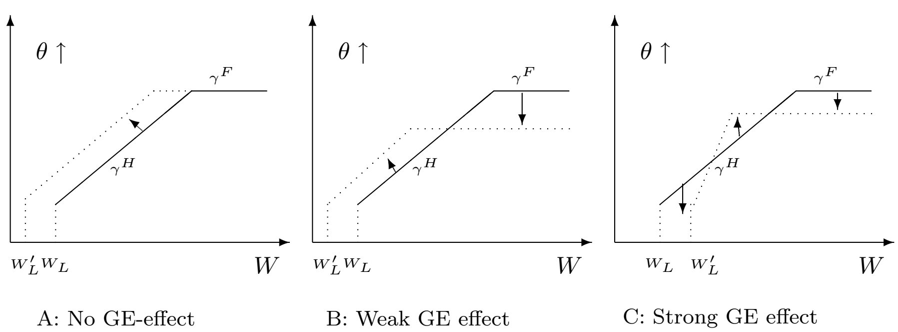


Figure 3: Impact of changing liability law with GE effects.

Predictions for interest rates are also worth noting. If we interpret the interest rate to correspond to the success state $k$, then

$$\frac{T_k}{\gamma \cdot I} = \theta \nu y_k \frac{f(\gamma)}{\gamma . I} + \frac{\theta W + d}{\gamma \cdot I}$$

The interest rate rises for poor borrowers for whom $\gamma$ falls.[8] The change in the interest rate is ambiguous for others whose project scale expands.

[8]This is because the minimum viable project must be below $b$, where the average return to the project scale $\frac{f(\gamma)}{\gamma}$ is maximized. Hence $\frac{f(\gamma)}{\gamma}$ must be locally rising in $\gamma$. The rest follows from the fact that $\theta$ rises.

## 4 Context for Empirical Work: DRT Reform

In 1993, the Indian government passed a national law establishing new specialized tribunals for debt recovery. Before these tribunals, civil courts were responsible for trying all debt recovery suits. There, they were processed according to the Code for Civil Procedure, and it was extremely common for cases to continue for extremely long. Nearly 40% of the pending debt recovery cases in civil courts in 1985-86 had been pending for longer than 8 years (Law Commission of India 1988). Instead, DRTs follow a new streamlined procedure. Defendants are given less time to respond to summonses, they must provided a written defense, and they can only make counter-claims against the bank at the first hearing. DRTs are also authorized to make interim orders to prevent defendants from disposing off their assets before the case is closed, and in some circumstances may also issue a warrant for the defendant's arrest. Substantive laws governing the cases did not change. Suggestive evidence in Visaria (2007) shows that DRTs effectively reduced the time taken to process cases, and thus may have increased the (present discounted) value of the amount recovered from defaulting loans. Therefore, we interpret the introduction of a DRT in a state as an increase in the parameter $\theta$ from our model.

Although the DRT law allowed for tribunals to be set up across the entire country, in practice there were significant delays in the establishment of DRTs across different states. Although the first DRT was set up in 1994, the introduction was not complete until 1999. Visaria (2007) argues that legal hurdles and questions about the constitutional validity of the DRT law were primarily responsible for these delays. She also empirically investigates the relationship between state-level economic, judicial and political variables and the pattern of DRT incidence. She is unable to reject the hypotheses that these variables did not affect the timing of DRT establishment. We therefore rely on the exogeneity of DRT establishment to argue that we have identified the causal effects of stronger lender rights on credit allocation and interest rates for borrowers.

Note that the DRT law only applies to debt recovery claims larger than Rupees 1 million. Claim size is related the size of overdues on a loan and therefore depends not only on the size of the loan but also on past repayment. However, to the loans larger than Rupees 1 million are more likely to also generate overdues larger than Rupees 1 million, we should expect that very small loans would be less likely to fall under the purview of DRTs. We will show later that 90 percent of the loans in this sample are larger than this threshold, and therefore can potentially be exposed to DRTs. Importantly, we find no significant differences in the DRT effect on repayment behavior for borrowers of different asset sizes. Therefore, we proceed on the assumption that DRT establishment increased the value of $\theta$ for all borrowers by the same amount.

### 4.1 Data

Since DRTs operate at the state-level, $\theta$ is determined at the state-quarter level. We use data on the timeline of DRT establishment across states to determine which borrower-quarters are exposed to DRTs.

We use data on credit contracts collected from a large private bank's project loan database. In addition to basic borrower-level characteristics, this database contains detailed information on the interest rate charged, loan duration, and project location for each project loan given by this bank until the date of data collection in June 2003.[9] We use this to construct a balanced borrower-level panel dataset for the period 1982-2002. Since DRTs were established during the period 1994-1999, this gives us three years of data where no states had DRTs, six years where DRTs were being established in different states in different years, and three years of data where all states had DRTs. A borrower exists in the data set if it received a loan in any quarter between 1982 and 2002.

Unfortunately, we do not observe loan applications. Therefore, we are unable to separate lack of access to credit from a lack of demand for credit. If we do not observe any new loan given to a borrower in a given quarter, we set new credit received by this borrower in this quarter to zero. Since large project loans are not taken that frequently, less than 10 percent of the borrower-quarter pairs are associated with a new loan.

The database does not report the date when the firm was established or date when it closed. Therefore we cannot ascertain if a particular borrowing firm existed before it received the first loan in the database or after it received the last loan in the database.[10] We proceed on the assumption that a firm does not exist before it receives its first loan, and that once it enters the

[9] Note, there is some censoring of data due to a change in the database system in 2001. As a result, all loans which were no longer active (i.e. all repayment was complete) at the time of the switch were dropped from the database. It is therefore possible that the older loans we observe are better at repayment than the true distribution.

[10] In future work, we hope to match this database to a database from another source where we can observe the date of firm establishment.

dataset it continues to exist.

From our theory, it becomes clear that asset size of the borrowing firm may affect the impact of DRT. However, there is a potential endogeneity problem of asset size. Firms which receive credit are more likely to become large or continue to remain large firms in the future. We address this problem by using two different versions of historical asset size. In the first version, we use asset size lagged four quarters back. However, given the long time period in our data, even this measure of asset size can be affected by DRT. In other words, for an observation that occurs 5 quarters after the DRT was introduced, the asset size lagged four quarters is still endogenous to the DRT. Another problem is that there are many years where asset data for a given borrower is missing.

In order to address both these problems, we use a second measure of asset size. Asset size is measured in the first quarter the borrower received a loan, and this value is held constant throughout the sample. We drop the first-quarter observation from the regression. This mitigates missing data problems substantially. With borrower fixed effects, this second version utilizes only pre-DRT asset size measures, thus addressing potential endogeneity of asset size. With borrower fixed effects, however, we miss possible effects of DRT on entry of new borrowers. A potential problem here is that this asset size measure could be from many years ago and could therefore be a poor proxy of current asset size.

Descriptive statistics are shown in table $0A$ and $0B$, also broken down by quartiles of firms assets. As discussed before, if credit is positive, more than 90 percent of all loans given out were above 1 million rupees. Small firms receive considerably smaller credit (Rs. 30.7 million) as compared to large firms (Rs. 270 million). Furthermore, interest rates were on average 15 percent with little variation across firms of different size, with the exception of the largest firms who paid somewhat smaller interest rates (14.4 percent). Also, the loan contracts are long term and last more than six years on average.

## 4.2 Empirical specification

Our empirical analysis is based on a differences-in-difference strategy, which relies on the staggered introduction of DRTs across states. Thus, suppose that a DRT was introduced in state $i$ in year $t$, when state $j$ had still not received a DRT. Our empirical strategy then estimates the difference between the change in credit volume (or credit access or interest rates) between year $t-1$ and $t$ in state $i$ with the same change in state $j$. The difference is attributed to the DRT.

The effects are identified if DRT introduction across states was not correlated with unobserved state-level changes in credit access, credit volume and interest rates. As discussed earlier, Visaria (2007) argues persuasively that DRT introduction was influenced by legal hurdles and debate rather than state-level factors.

Accordingly, we run the following regressions.

$$y_{ijt} = \alpha_0 + \alpha_1 \cdot D_{jt} + \alpha_2 \sum(size_i) + \alpha_3 \sum(D_{jt} \cdot size_i) + state_j + quarter_t + industry_i + \epsilon.$$

The first dependent variable is $y_{ijt}$ defined as total new credit received by borrower $i$ located in state $j$ in quarter $t$. We also run regressions for access to credit, and average interest rate (on all new credit received by the borrower in that quarter).

Here, $D_{jt}$ is the DRT dummy for state $j$ in quarter $t$, $D_{jt} = 1$ if state $j$ has introduced DRT by quarter $t$ and zero otherwise. Our definition of borrower location is influenced by the DRT law's stipulation of a tribunal's territorial jurisdiction. According to the law, a claim can be filed against a borrower either in the state where the defendant resides, or in the state where the cause of action arose. In our data, this can be interpreted as either the state where the borrowing firm's head quarters are located, or the state where the project is located. In our sample, 25 percent of borrowers have projects in multiple states, and this phenomenon is concentrated among the larger firms. Project sites may themselves be endogenously chosen in response to DRTs, and so we assign borrower location on the basis of the firm's head quarters.

Our theory predicts differential effects for borrowers of different sizes, and therefore we use categorical variables for asset size to test the hypotheses. Size classes $size_i$ are defined on the basis of the fixed assets of firm $i$ in a previous quarter $t'$. We run two different specifications for size class measures: above or below the median, or four classes, using quartiles as the thresholds. The interaction of asset size categories with the DRT dummy pick up the differential DRT effects by borrower size class.

In all regressions, we include quarter fixed effects to control for national-level time trends in the dependent variable. State fixed effects control for observable and unobservable time-invariant state-specific economic, social or political conditions that may influence credit contracts. Similarly, industry fixed effects control for any industry-specific factors that could cause credit volumes to be larger or smaller, or interest rates to differ (say, due to industry-specific risk factors).

We run different sets of regressions, all in two varieties: First, we run regressions on the pooled cross-section of observations, while including industry, state and quarter fixed effects. Second, we run borrower fixed effect regressions to control for time-invariant unobserved borrower characteristics that may confound the results. In each regression, we correct for serially correlated errors by clustering standard errors at the state-quarter level, and at the borrower level separately.

We estimate two additional regressions. In one, the endogenous variable is $r_{ijt}$ and is defined as the average interest rate that borrower $i$ located in state $j$ pays for loans received in quarter $t$. We also run a logit for credit exclusion, i.e. whether or not a borrower received credit in a given quarter. The endogenous variable is then $\hat{y}_{ijt} = 1$, if $y_{ijt} > 0$ and $\hat{y}_{ijt} = 0$ if $y_{ijt} = 0$. For both $r_{ijt}$ and $\hat{y}_{ijt}$, we use the same set of explanatory variables and also run the regressions with our two datasets (one year lagged assets vs. assets from first observation). Note that $\hat{y}_{ijt}$ is estimated using logit and conditional logit models.

# 5 Empirical results

We discuss our empirical results along the lines of proposition 6.

**Reduced credit for small firms** Table 1A and 1B report the results of estimating the redistributive impact of DRT introduction with respect to total credit received. It turns out that small firms receive significantly less credit due to DRT. The impact can be seen in all eight different regressions we run and all but one (table 1A, quartiles) are statistically significant. These eight regressions are the result of the different combinations of OLS regressions vs. borrower fixed effects regressions, using median vs. quartiles as asset size classes and using dataset 1 (lagged asset data) and dataset 2 (historical asset data from first observation).

The negative impact is economically highly significant and differ depending on the dataset we use. The results from dataset 1 with lagged asset data suggest that for firms with assets below the median, credit shrinks by Rs. 4 Mi. (average credit is Rs. 9.5 Mi.). Results for the same firms using dataset 2 (historical asset data from first observation) imply a reduction of approx. Rs. 2 Mi. (average credit is Rs. 5.5 Mi.). Regressions using quartile classes deliver similar results. One interesting aspect of the quartile regressions is that the lowest 3 asset size classes are facing a reduction in credit received.

**Increased exclusion for small firms**

Tables 3A and 3B report results of logit regressions for the variable *credit positive* which is one if credit is positive and zero otherwise. Corresponding to the pooled OLS regressions, we run a simple logit regression using state, quarter and industry fixed effects; again for dataset 1 and dataset 2. The results indicate that small firms are more often excluded once DRT is introduced. In contrast to the amount of credit received, the coefficients are not always significant even though always negative.

**Increased credit for large firms**

Proposition 6 predicts that firms with large enough asset size (though below $W^F$) receive more credit due to DRT. This prediction is not supported in the regressions using two asset size classes above/below the median. Note that the results presented report the overall effect on large firms (i.e. $\alpha_1 + \alpha_3$).

This missing increase in credit received for large firms may be due to the wrong cutoffs for asset size. Indeed, the three lowest asset size quartiles have less credit due to DRT. Moreover, firms from the highest asset quartile indeed receive more credit in the regressions using quartile classes. Note that the results are not always significant and for the borrower fixed effects regressions only hold at the 10% level in one regression.

**Reduced exclusion for large firms**

Similar to credit received, exclusion is not reduced in regressions using two asset size classes above/below the median. With four quartile classes, large firms tend to receive credit more often and these results are significant in the logit regressions. Conditional logit regressions with borrower fixed effects are only significant if dataset 2 is used.

**Effects on interest rates**

The interest rates regressions as reported in table 2A and 2B again suggest that large and small firms were differently affected by DRT. Small firms pay higher interest rates due to DRT in the OLS regressions. However, using borrower fixed effects, this increase in the interest rate is not statistically significant from zero. Interest rates for large firms do not increase (the coefficient is negative but not statistically different from zero).

The effects on the interest rate may be due to general equilibrium effects as proposed in proposition 6. However, we have to be careful with this interpretation since the impact in the borrower fixed effects regressions is not statistically different from zero. An alternative explanation may be that the introduction of DRT allows more risky firms to enter the market. The increased interest rate would then reflect the different risk characteristics of these firms. Unfortunately, we cannot further differentiate on this dimension.

# 6 Incomplete Contracts: An Alternative Explanation?

We now wish to explore the question of the channels by which the adverse impact on credit access for small borrowers may have resulted. In this section we present an alternative explanation based on incomplete contracting, which may potentially also explain this result. Subsequently we try to examine contrasting predictions of the two theories and assess their relative empirical validity. The incomplete contract channel we develop here borrows ideas from Gropp et al (1997) and Bolton and Rosenthal (2002), who stress an insurance value to borrowers of weak enforcement.[11]

The main idea is the following. If the debt contract is not state-contingent, firms may default in equilibrium following adverse shocks. The likelihood of such default and the related deadweight losses of default is greater for smaller firms. As a result, smaller firms decide to borrow less when there is stronger enforcement of credit contracts. The stronger enforcement of credit contracts increases the burden of default costs that has to be borne by the firm. A weaker bankruptcy law then serves as an insurance device against adverse shocks since defaulting borrowers are punished less harshly.

We now formalize this argument in the context of a variation on the model studied in section 3. Consider a version of that model with $\nu > 0$. The most important departures are:

1. Contracts are **incomplete**: $T_s = T_f \equiv T$.

2. No GE effect: the profit rate is fixed $\pi = \alpha$.

3. $\theta\nu > e$

[11] This aspect of bankruptcy law is stressed in several other contributions, e.g. Livshits et al. (2007) or Chatterjee et al. (2007).

4. $y_f = 0$.

5. The production function is concave: $b = 0$

The last two assumptions simplify the exposition substantially. We discuss the role of this assumption in due course. We abstract from GE effects in order to separate the story based on incomplete contracts from the story based on GE effects. Note that an incomplete contract cannot be state-contingent for *exogenous* reasons.

In an incomplete contract, default in state $k$ occurs if $T > \theta[W + \nu y_k f(\gamma)] + d$. This gives rise to two possible kind of contracts:

1. *Safe contract*: The firm never defaults: $T \leq \theta W + d$

2. *Default contract*: The firm defaults only in state $f$ and hence $T \in (\theta W + d, \theta\{W + \nu y_s f(\gamma)\} + d]$

We first derive the optimal safe contract: $\gamma^S$ maximizes $f(\gamma)\bar{y} - \gamma I(1+\alpha)$, subject to $\gamma \leq \frac{\theta W + d}{I(1+\alpha)}$. If the firm is credit constrained (i.e., if the first best contract cannot be implemented using a safe contract), $\gamma^S = \frac{\theta W + d}{I(1+\alpha)}$. Hence, the optimal safe contract does not differ from the optimal complete contract.

Next, consider the optimal default contract. For similar reasons as in the GE model, the PC constraint is always binding. Hence, $T = \gamma \cdot I \cdot (1+\alpha)$. The no-default in state $s$ constraint implies that $T \leq \theta[W + \nu y_s f(\gamma)] + d$. These constraints together imply

$$\gamma \leq \frac{\theta[W + \nu y_s f(\gamma)] + d}{I(1+\alpha)}$$

Note that the scale restriction in the default contract does not bind, because $\theta\nu > e$. To see this, note that the first-best scale maximizes $\bar{y} \cdot f(\gamma) - \gamma \cdot I \cdot (1+\alpha)$. With $\theta\nu > e$, the LHS of the $IC_f$ increases by more than the RHS of the $IC_f$ constraint, since $\theta\nu > e$. Hence $\gamma^D = \gamma^F$, independent of $\theta, W$.

**Lemma 7** *There exists an asset size $\tilde{W}$ such that:*

1. *All borrowers with $W \geq \tilde{W}$ choose the safe contract.*

2. *All borrowers with $W < \tilde{W}$ choose the default contract.*

The reasoning is based on comparing borrower's payoffs between the best safe and default contracts. In the best safe contract, the borrower's payoff is $f(\gamma^S)\bar{y} - \gamma^S \cdot I(1+\alpha) + W$. In the best default contract it is: $f(\gamma^F)\bar{y} - \gamma^F \cdot I(1+\alpha) - (1-e)d + W$. Hence the borrower prefers the safe contract if

$$(1-e)d > f(\gamma^D)\bar{y} - \gamma^D \cdot I(1+\alpha) - \{f(\gamma^S)\bar{y} - \gamma^S \cdot I(1+\alpha)\}$$

The drawback of the default contract is the default cost $(1-e)d$, which is independent of $W$. The benefits of using the safe contract is that it allows a higher project scale. However, $\gamma^S$ is increasing in $W$ and the difference between $\gamma^D(=\gamma^F)$ and $\gamma^S$ is decreasing in $W$. As a result, for a firm with project scale $\gamma^S$ sufficiently close to $\gamma^F$, the benefits of the default contract are too small to outweigh the costs and this firm (and all firms with higher $W$) choose the safe contract.

We can now state the main result of the incomplete contracting model:

**Proposition 8** *Consider an improvement of contract enforcement (from $\underline{\theta}$ to $\bar{\theta}$). Then, there exist asset sizes $W' < W'' < W'''$ such that:*

1. *Credit for all firms with $W < W'$ remains unchanged.*
2. *Credit for all firms with $W \in [W', W'']$ decreases.*
3. *Credit for all firms with $W > W'''$ (weakly) increases.*

As $\theta$ rises, the scale of the safe contract expands. This motivates borrowers of intermediate wealth to switch to the safe contract: as a result *their borrowing falls*. Poor borrowers are unaffected because their safe contract is still too restrictive in project size, so they do not switch to the safe contract. In contrast, wealthy borrowers who already employ the safe contract expand their project scale, since the latter is increasing in $\theta$.

Note that if borrowers are risk-neutral the payoff effects are similar to that of the complete contracts in the absence of any GE effects. Increasing $\theta$ then constitutes a Pareto improvement. If borrowers are risk-averse then default is a source of insurance for small borrowers, which gets reduced as $\theta$ rises. In this case small borrowers may become worse-off, and a Pareto improvement no longer results.

Are there any predictions of the incomplete contract model which contrast with those of the complete contract model? One difference concerns effects on interest rates. Interest rates in the default contract are

$$\frac{T}{\gamma^D.I} = \frac{1}{e}[1 + \alpha - (1 - e)\frac{\theta W}{\gamma^D.I}]$$

Note that the interest rate is *decreasing* in $\theta$, since stronger enforcement motivates a switch towards the safe contract. In contrast the complete contract model predicts a rise in the interest rate for small borrowers, resulting from a rise in the equilibrium profit rate and the shrinkage in project scale.

Unfortunately, the empirical results do not enable us to differentiate between the two theories on this basis. There is a tendency for interest rates for small borrowers to rise (consistent only with GE effect). However, the rise is not statistically significant in the borrower fixed effect regressions; it is significant in the pooled OLS regressions.

# 7 Conclusion and Future Directions

We have documented a puzzling effect of contraction of credit volume (and higher cost) for small borrowers following a credit enforcement reform in India. We provide two possible explanations for this shrinkage of credit: GE effects in a complete contract model, and default-avoidance in an incomplete contract model. The empirical results do not clearly discriminate in favor of one hypothesis over another. It is also conceivable that both GE effects and default-avoidance were operative.

The empirical and theoretical results cast doubt on the general presumption that strengthening lender collection rights or expanded scope for collateral will relax credit market imperfections for most borrowers, or that aggregate efficiency/output will rise. While lenders are generally better off due to an increase in credit enforcement, borrowers may be worse off. Our empirical results suggest that three quarters of all borrowers experienced reduced access to credit as a result of the reform. Hence, there may be substantial political obstacles and economic losses resulting from strengthening enforcement of credit contracts.

In future research, we plan to investigate possible cross-state spillovers of the DRT reform. This is another way of examining the role of GE effects in explaining the effects of the reform. It is also interesting in its own right, examining the extent to which capital flows across states can be explained by institutional reforms in credit enforcement.

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**Table 0A: Summary Statistics** **Lagged Asset data**

| | Whole sample | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
|---|---|---|---|---|---|
| Average asset size ('10millions) | 167.53 | 5.85 | 17.16 | 45.96 | 570.26 |
| | (850.89) | (2.67) | (4.37) | (14.93) | (1589.07) |
| Fraction observations where credit received (%) | 7.89 | 6.10 | 6.71 | 8.38 | 10.14 |
| | (26.96) | (23.93) | (25.03) | (27.71) | (30.18) |
| Fraction observations where credit above 1 million | 97.09 | 94.25 | 96.53 | 97.90 | 98.34 |
| | (16.82) | (23.29) | (18.31) | (14.35) | (12.79) |
| Average volume of credit ('10millions) | 0.95 | 0.19 | 0.21 | 0.45 | 2.81 |
| | (9.74) | (8.00) | (1.56) | (2.65) | (16.97) |
| Volume of credit if positive ('10m) | 12.06 | 3.07 | 3.12 | 5.36 | 27.77 |
| | (32.71) | (32.25) | (5.22) | (7.58) | (46.37) |
| Average duration of loan (days) | 1868.62 | 1969.40 | 1924.48 | 1842.96 | 1799.43 |
| | (1145.98) | (923.68) | (968.61) | (1132.78) | (1344.74) |
| Average interest rate (%) | 15.21 | 15.38 | 15.96 | 15.55 | 14.40 |
| | (4.40) | (4.80) | (4.06) | (4.14) | (4.45) |
| *N* | *65228* | *15688* | *15876* | *16468* | *17196* |

Note: Standard deviation in parentheses.

**Table 0B: Summary Statistics** **Historical asset data from first observation**

| | Whole sample | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
|---|---|---|---|---|---|
| Asset size ('10millions) | 51.77 | 1.90 | 5.50 | 11.90 | 185.40 |
| | (485.07) | (0.92) | (1.29) | (2.90) | (951.70) |
| Fraction obs where credit received (%) | 4.91 | 4.37 | 4.33 | 4.88 | 6.06 |
| | (21.62) | (20.44) | (20.35) | (21.54) | (23.85) |
| Fraction obs where credit above 1 million | 94.51 | 94.09 | 92.07 | 94.65 | 96.42 |
| | (22.71) | (23.58) | (27.03) | (22.51) | (18.59) |
| Volume of credit ('10millions) | 0.55 | 0.24 | 0.35 | 0.40 | 1.22 |
| | (7.94) | (6.19) | (7.57) | (5.06) | (11.38) |
| Volume of credit if positive ('10m) | 11.28 | 5.41 | 8.12 | 8.18 | 20.08 |
| | (34.09) | (29.14) | (35.50) | (21.49) | (41.96) |
| Duration of loan (days) | 1892.68 | 1852.50 | 1865.50 | 1912.90 | 1923.57 |
| | (1158.55) | (1026.68) | (1026.68) | (1191.89) | (1276.01)) |
| Interest rate (%) | 15.06 | 15.77 | 15.14 | 15.15 | 14.44 |
| | (4.58) | (4.69) | (4.60) | (4.38) | (4.56) |
| *N* | *143936* | *35270* | *35829* | *36408* | *36429* |

Note: Standard deviation in parentheses.

**Table 1A** **Own state DRT Effect**
**Dependent variable: Volume of credit, Lagged Asset data**

| | OLS | | Borrower Fixed Effects | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | -0.563 | | -0.441 | |
| | 0.000 *** | | 0.002 *** | |
| | 0.000 *** | | 0.000 *** | |
| DRT Effect on Large | 0.071 | | -0.152 | |
| | 0.642 | | 0.362 | |
| | 0.728 | | 0.457 | |
| DRT Effect on Quartile 1 | | -0.274 | | -0.359 |
| | | 0.241 | | 0.192 |
| | | 0.190 | | 0.007 *** |
| DRT Effect on Quartile 2 | | -0.596 | | -0.543 |
| | | 0.000 *** | | 0.000 *** |
| | | 0.001 *** | | 0.000 *** |
| DRT Effect on Quartile 3 | | -0.674 | | -0.558 |
| | | 0.000 *** | | 0.000 *** |
| | | 0.001 *** | | 0.001 *** |
| DRT Effect on Quartile 4 | | 0.612 | | 0.282 |
| | | 0.030 * | | 0.284 |
| | | 0.071 * | | 0.321 |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *65228* | *65228* | *65228* | *65228* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.

**Table 1B** **Own state DRT Effect**
**Dependent variable: Volume of credit, Historical Asset data from first observation**

| | OLS | | Borrower Fixed Effects | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | -0.225 | | -0.226 | |
| | 0.005 *** | | 0.005 *** | |
| | 0.020 ** | | 0.024 ** | |
| DRT Effect on Large | 0.028 | | 0.006 | |
| | 0.686 | | 0.941 | |
| | 0.774 | | 0.954 | |
| DRT Effect on Quartile 1 | | -0.330 | | -0.346 |
| | | 0.002 *** | | 0.001 *** |
| | | 0.010 *** | | 0.005 |
| DRT Effect on Quartile 2 | | -0.120 | | -0.106 |
| | | 0.119 | | 0.298 |
| | | 0.296 | | 0.460 |
| DRT Effect on Quartile 3 | | -0.199 | | -0.244 |
| | | 0.001 *** | | 0.000 *** |
| | | 0.035 ** | | 0.017 ** |
| DRT Effect on Quartile 4 | | 0.256 | | 0.253 |
| | | 0.037 * | | 0.076 * |
| | | 0.103 | | 0.124 |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *143936* | *143936* | *143936* | *143936* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.

**Table 2A** **Own state DRT Effect**
**Dependent variable: Interest rate, Lagged Asset data**

| | OLS | | Borrower Fixed Effects | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | 0.758 | | 0.327 | |
| | 0.012 ** | | 0.261 | |
| | 0.025 ** | | 0.396 | |
| DRT Effect on Large | 0.237 | | 0.031 | |
| | 0.395 | | 0.898 | |
| | 0.434 | | 0.917 | |
| DRT Effect on Quartile 1 | | 0.98 | | 0.283 |
| | | 0.021 ** | | 0.567 |
| | | 0.047 ** | | 0.64 |
| DRT Effect on Quartile 2 | | 1.43 | | 0.401 |
| | | 0.267 | | 0.214 |
| | | 0.311 | | 0.348 |
| DRT Effect on Quartile 3 | | 0.916 | | 0.254 |
| | | 0.378 | | 0.35 |
| | | 0.485 | | 0.463 |
| DRT Effect on Quartile 4 | | -0.082 | | -0.145 |
| | | 0.284 | | 0.597 |
| | | 0.301 | | 0.656 |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *5146* | *5146* | *5146* | *5146* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.

**Table 2B** **Own state DRT Effect**
**Dependent variable: Interest rate, Historical Asset data from first observation**

| | OLS | | Borrower Fixed Effects | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | 0.41 | | 0.007 | |
| | 0.115 | | 0.98 | |
| | 0.161 | | 0.983 | |
| DRT Effect on Large | 0.114 | | -0.093 | |
| | 0.646 | | 0.654 | |
| | 0.679 | | 0.748 | |
| DRT Effect on Quartile 1 | | 0.704 | | 0.218 |
| | | 0.013 ** | | 0.43 |
| | | 0.036 ** | | 0.554 |
| DRT Effect on Quartile 2 | | 0.468 | | -0.217 |
| | | 0.903 | | 0.567 |
| | | 0.909 | | 0.634 |
| DRT Effect on Quartile 3 | | 0.421 | | -0.033 |
| | | 0.266 | | 0.91 |
| | | 0.33 | | 0.929 |
| DRT Effect on Quartile 4 | | -0.168 | | -0.143 |
| | | 0.962 | | 0.553 |
| | | 0.966 | | 0.664 |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *7073* | *7073* | *7073* | *7073* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.

**Table 3A** **Own State DRT Effect**

**Dependent variable: Credit positive, Lagged Asset data**

| | Logit | | Conditional Logit | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | -0.209 | | -0.106 | |
| | 0.029 ** | | 0.505 | |
| | 0.033 ** | | 0.321 | |
| DRT Effect on Large | 0.063 | | 0.056 | |
| | 0.307 | | 0.449 | |
| | 0.411 | | 0.499 | |
| DRT Effect on Quartile 1 | | -0.043 | | -0.101 |
| | | 0.771 | | 0.671 |
| | | 0.755 | | 0.521 |
| DRT Effect on Quartile 2 | | -0.336 | | -0.109 |
| | | 0.001 *** | | 0.454 |
| | | 0.002 *** | | 0.355 |
| DRT Effect on Quartile 3 | | -0.057 | | 0.050 |
| | | 0.470 | | 0.609 |
| | | 0.569 | | 0.630 |
| DRT Effect on Quartile 4 | | 0.173 | | 0.061 |
| | | 0.023 ** | | 0.498 |
| | | 0.057 * | | 0.515 |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *65228* | *65228* | *65228* | *65228* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.

**Table 3A** **Own State DRT Effect**

**Dependent variable: Credit positive, Historical Asset data from first observation**

| | Logit | | Conditional Logit | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DRT Effect on Small | -0.174 | | -0.141 | |
| | 0.023 ** | | 0.328 | |
| | 0.029 ** | | 0.095 | |
| DRT Effect on Large | 0.011 | | 0.021 | |
| | 0.858 | | 0.819 | |
| | 0.867 | | 0.768 | |
| DRT Effect on Quartile 1 | | -0.069 | | -0.022 |
| | | 0.515 | | 0.892 |
| | | 0.490 | | 0.834 |
| DRT Effect on Quartile 2 | | -0.270 | | -0.257 ** |
| | | 0.429 | | 0.144 |
| | | 0.007 *** | | 0.017 |
| DRT Effect on Quartile 3 | | -0.157 | | -0.159 |
| | | 0.167 | | 0.214 |
| | | 0.097 * | | 0.106 |
| DRT Effect on Quartile 4 | | 0.141 | | 0.163 |
| | | 0.017 ** | | 0.046 ** |
| | | 0.088 * | | 0.056 * |
| *Fixed effects* | *I, S, Q* | *I, S, Q* | *Q* | *Q* |
| *N* | *14396* | *14396* | *14396* | *14396* |

Note: First row = p value for state x quarter clustering, Second row = p value for borrower clustering.