Credit Enforcement, Misallocation, and Income Disparities across Indian States: A Heterogeneous Agents framework

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Abstract

This paper studies how cross-state differences in credit contract enforcement contribute to income disparities in India. I develop and calibrate a dynamic heterogeneous-agents general equilibrium model with voluntary and involuntary entrepreneurs, where state-specific enforcement shapes borrowing constraints, occupational choices, and factor allocation. I also develop an extension with a common credit market to capture capital mobility across states. Stronger enforcement reduces misallocation and raises output; calibrated results indicate it explains about 6 percent of income differences in 2017-18. Using NSS data and a judicial reform that expedited civil case resolution, I find improved enforcement shifts individuals away from voluntary entrepreneurship toward wage work and involuntary self-employment.

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1 Introduction

Research over the past several decades has pointed to the importance of financial frictions, broadly, in explaining a significant part of the disparities in per capita incomes across countries. A key challenge remaining from this research is identifying the particular frictions and assessing their quantitative importance. In this paper, I address this challenge by studying the importance of enforcement of credit contracts in driving per capita income differences across Indian states. I develop a quantitative general equilibrium model to study the mechanisms linking enforcement and income disparities and use empirical evidence to validate the model's implications.

In my theoretical analysis, I develop and calibrate a dynamic heterogeneous-agents general equilibrium model with three occupational types — voluntary entrepreneurs, involuntary entrepreneurs, and workers. The model features an endogenous borrowing constraint that depends on the degree of credit contract enforcement and links differences in enforcement to per capita income disparities through the mechanism of factor misallocation. Quantitatively, the model highlights how improved enforcement reallocates resources toward more productive entrepreneurs, raising aggregate output and income. The data on speed of resolution of civil suit cases by state courts is used as a proxy for credit contract enforcement, and is incorporated in the calibration exercise.

To validate the model's implications on occupational reallocation, I complement the theoretical analysis with an empirical exercise exploiting cross-state variation in the implementation of a major judicial reform in 2002—the amendment to the Code of Civil Procedure—that improved judicial speed and, consequently, the enforcement of credit contracts. The empirical strategy follows a difference-in-differences approach to identify the causal impact of improved enforcement on occupational allocation. The results are broadly consistent with the model's predictions.

Studying disparities across Indian states contributes to the macro-development literature for two reasons. First, these disparities are substantial—per capita incomes differ by a factor of seven between the three richest and the three poorest states.[1] Second, examining variation within a single country allows implicit control for several institutional and structural factors that are difficult to hold constant in cross-country analyses - such as laws, legal origins, national policies, and other country-wide characteristics. This within-country framework is advantageous not only for empirical identification but also for the quantitative calibration of the theoretical model, as it enables a consistent comparison of state-level outcomes under a common macroeconomic and institutional environment while allowing enforcement of credit contracts to vary across states.

A key feature of both the theoretical model and the empirical analysis is the distinction between

[1] In 2017–18, the average per capita GDP of the top three richest states (Goa, Sikkim, and Delhi) was nearly seven times that of the bottom three (Bihar, Uttar Pradesh, and Manipur).

voluntary and involuntary entrepreneurs. This distinction is motivated by the fact that India has a large number of very small firms—classified here as involuntary firms—accounting for roughly 30 percent of the working population and typically owned by individuals who are self-employed because they cannot find wage employment. There is clear evidence in the literature that enforcement of credit contracts affects access to credit and the performance of both voluntary and involuntary firms in India (Lilienfeld-Toal et al., 2012a; Chemin, 2012).[2]

The theoretical model evaluates the impact of credit contract enforcement on per capita GDP and other macroeconomic outcomes by aggregating its effects on individual-level decisions and incomes. State-level enforcement capacity determines individual's ability to rent capital, the scale of firms they can operate, and the profits they can earn as firm owners. The effects of enforcement are heterogeneous across individuals, depending on their asset holdings, entrepreneurial ability, and labor market opportunities. Occupational choice lies at the core of the model's mechanism: in a general-equilibrium setting where wages and interest rates adjust endogenously, variation in credit enforcement alters the relative returns to different occupations, inducing a reallocation of individuals across them and, in turn, shaping aggregate productivity and income.

Involuntary entrepreneurs are introduced in the model through labor-market frictions that govern an individual's probability of finding a wage job. Individuals who wish to work but cannot secure employment operate small, subsistence-level firms out of necessity rather than choice. These firms can be credit-dependent, as even subsistence operations require some minimum level of working capital. The large share of credit-dependent involuntary entrepreneurs in the workforce therefore reinforces the link between credit contract enforcement and aggregate productivity differences across states.

Each period, individuals are heterogeneous in entrepreneurial productivity, asset holdings, and labor-market opportunity. They make three key decisions: (i) optimal choice of capital and labor if they have to operate a firm, (ii) the occupational choice, and (iii) the consumption–savings decision. Asset accumulation is determined endogenously through the forward-looking savings problem. Individuals with a labor opportunity compare the potential incomes from wage work (a fixed wage) and from firm ownership (constrained optimal profits) to choose their occupation. Those without a labor opportunity have no option but to establish a firm. If profits from firm ownership are below the prevailing wage, they are classified as involuntary entrepreneurs; otherwise, they are voluntary entrepreneurs.

Stronger enforcement of credit contracts raises both wages and interest rates by increasing

[2]Lilienfeld-Toal et al. (2012a) find that improved enforcement of credit contracts increases the borrowings and profits of voluntary firms on average, while Chemin (2012) finds that faster judicial processes enhance credit access and investment for involuntary firms.

the aggregate demand for labor and capital. Its effect on access to finance is heterogeneous across individuals, depending on which force dominates—the relaxation of borrowing constraints or the rise in input costs. For talented but asset-poor individuals, the easing of borrowing constraints dominates, expanding their access to credit and enabling them to operate at a larger scale. For low-skill individuals with low desired capital, however, the increase in borrowing costs and wages dominates, effectively tightening their access to finance. These distributional differences in credit access and production costs alter relative potential incomes across occupations, leading to a reallocation of individuals in equilibrium: the share of voluntary entrepreneurs declines, while the shares of involuntary entrepreneurs and workers increase. Overall, the more talented individuals are now in the voluntary entrepreneurship category, operating larger and more productive firms. This selective reallocation reduces misallocation of talent, capital, and labor across production units, thereby improving aggregate efficiency and raising per capita output.

The calibration exercise proceeds by first estimating national parameters common to all states and then calibrating the state-specific degree of credit contract enforcement, ϕ_s using two complementary approaches: (i) where ϕ_s is directly inferred from state-level civil case disposal speeds, and (ii) where ϕ_s is chosen such that the model-generated external finance-to-GDP ratio matches observed values in the RBI Handbook of Statistics on Indian States (2017–18). For each specification, the model is solved separately for every state to generate implied values for GDP per capita and average voluntary firm size. Under Approach 1, a regression of data GDP per capita on model-predicted GDP per capita yields an R-squared of 0.06,indicating that cross-state differences in enforcement alone explain about 6 percent of income disparities in 2017–18. Approach 2 suggests that variation in credit-market access linked to enforcement accounts for 3.5 percent of the cross-state variation in per-capita income. In both cases, the model reproduces broad differences in average voluntary firm size observed across states.

In the empirical exercise – using multinomial logit regressions, I estimate the causal impact of change in judicial speed–on individuals' occupational choices across Indian states. The empirical identification relies on a difference-in-differences (DiD) design following Chemin (2012), which exploits cross-state variation in the implementation intensity of the 2002 Civil Procedure Code (CPC) Amendment Act in India. The CPC governs the procedures of civil courts, and the 2002 reform introduced multiple measures to expedite judicial processes, including mandatory time limits at various stages of litigation, restrictions on the right to appeal, empowerment of courts to refer disputes to alternative dispute resolution mechanisms, and reduced adjournments. Since individual states possess legislative authority to amend the CPC, several had already enacted similar procedural amendments before 2002, thereby receiving different "policy doses" when the national reform

was implemented. This heterogeneity in pre-reform adoption generates the variation exploited for identification.

I use individual-level data from three rounds of the *National Sample Survey Employment and Unemployment Surveys*—the 50$^{\text{th}}$ (1993–94), 55$^{\text{th}}$ (1999–2000), and 61$^{\text{st}}$ (2004–05) rounds—which together represent pre- and post-reform periods around the 2002 Civil Procedure Code Amendment Act (two pre-periods and one post period). Occupations are classified into three mutually exclusive categories: voluntary entrepreneurs (employers hiring labor), involuntary entrepreneurs (own-account workers without hired labor), and workers (wage employees). The regression results indicate a statistically siignicant decline in voluntary entrepreneurship and a rise in involuntary entrepreneurship and workers in states that experienced larger gains in judicial efficiency. Placebo interactions using the 1994 pre period show no significant differential shifts by treatment intensity, supporting the parallel-trends assumption. Education enters with the expected composition effects: higher schooling raises the probability of voluntary entrepreneurship, lowers the probability of involuntary entrepreneurship, and raises the probability of wage work. These findings reinforce the model's central mechanism: improvements in credit contract enforcement, proxied by faster judicial systems, reshape occupational allocation through general-equilibrium effects on wages and entry thresholds for entrepreneurship.

This paper contributes to two strands of literature. First, it adds to the body of quantitative models that link financial development and credit frictions to aggregate productivity and output in developing economies. Second, it contributes to the empirical literature examining how credit contract enforcement shapes access to finance, firm performance, and the occupational choices of individuals.

A growing body of quantitative work links financial development and aggregate economic performance through heterogeneous-agent models with endogenous occupational choice. Buera et al. (2011) explain cross-country income disparities by calibrating a two-occupation model with heterogeneous agents facing borrowing constraints arising from imperfect enforcement of credit contracts. Their framework endogenizes financial frictions and demonstrates how weak enforcement generates persistent productivity gaps and misallocation of capital across firms. Extending this logic, Dabla-Norris et al. (2017) disentangle three sources of financial frictions—participation costs, limited commitment, and asymmetric information—within a general equilibrium structure and show how relaxing each friction has distinct implications for the intensive and extensive margins of credit access. Giné and Townsend (2003) embed borrowing and lending into a two-sector general equilibrium model to evaluate Thai financial liberalization from 1976–1996, finding heterogeneous welfare effects: talented but credit-constrained potential entrepreneurs gain the most, whereas low-

productivity agents experience welfare losses. More recent quantitative studies such as Midrigan and Xu (2014), Buera et al. (2021), and Greenwood et al. (2019) emphasize that the interaction of financial frictions with firm heterogeneity is central to explaining aggregate TFP gaps and slow structural transformation in developing economies.

The inclusion of an involuntary (or "necessity") entrepreneurial sector has been more recently explored to capture self-employment driven by poor labor-market opportunities rather than entrepreneurial talent. Buera et al. (2020) introduce such involuntary entrepreneurs via a stochastic labor productivity shock that compels low-productivity workers to operate small informal firms. Their analysis of microfinance interventions shows that the aggregate effects depend critically on how credit access reshapes the composition between voluntary and involuntary entrepreneurs. My model builds on this insight by incorporating a similar labor-opportunity shock process to generate involuntary entrepreneurs; however, unlike Buera et al. (2020), agents who receive a poor labor opportunity draw in my model cannot work for wages and can only operate as constrained entrepreneurs. This formulation more closely mirrors the empirical phenomenon of necessity-driven entrepreneurship observed in labor-surplus developing economies such as India.

Empirically, the role of credit contract enforcement in shaping financial access and firm outcomes has been documented in both cross-country and within-country settings. La Porta et al. (1997a) show that weak investor protection correlates with thinner debt and equity markets, while Gropp et al. (1997) demonstrate that limited borrower liability can restrict credit availability for low-wealth individuals. Within India, Lilienfeld-Toal et al. (2012b) exploit the staggered establishment of Debt Recovery Tribunals (DRTs) across states and find that improved enforcement boosted borrowing, capital investment, and profits across firms, though disproportionately benefiting larger firms. Chemin (2012) studies the 2002 Civil Procedure Code (CPC) reform and shows that faster courts encouraged investment and improved financial access for small unregistered firms. More recent evidence by Ponticelli and Alencar (2014) and Rajan and Ramcharan (2020) confirms that judicial efficiency significantly influences credit reallocation, loan recovery, and firm dynamism.

The link between credit enforcement and occupational choice has also been explored in microfounded empirical models. Levine and Rubinstein (2018) estimate a three-occupation multinomial logit model with incorporated and unincorporated entrepreneurs and wage workers, showing that human capital, liquidity constraints, and labor-market skills jointly determine occupational sorting. My empirical analysis adapts this framework by combining it with a difference-in-differences identification strategy exploiting cross-state variation in judicial speed induced by the 2002 CPC Amendment Act. This approach enables the estimation of how improvements in contract enforcement translate into changes in the relative shares of voluntary entrepreneurs, involuntary

entrepreneurs, and wage workers across Indian states.

The remainder of the paper is organized as follows: Section 2 describes the model and its mechanisms. Section 3 describes the calibration strategy and results. Section 4 describes the empirical analysis on the impact of judicial speed on occupational choices of the working population in India. Section 5 concludes.

2 The Model

This section develops a dynamic general equilibrium model with heterogeneous agents in which credit enforcement frictions distort occupational choices and firm scale, leading to measurable effects on TFP and per capita output. The model features three key elements: (1) agents who choose between voluntary entrepreneurship, involuntary entrepreneurship, and wage employment based on heterogeneous productivity draws; (2) endogenous borrowing constraints tied to state-specific enforcement efficiency (ϕ); and (3) labor market frictions (χ) that generate involuntary involuntary firms. Each state is modeled as a closed economy, with its own labor and capital markets, allowing us to capture cross-state variation in institutional quality and its aggregate implications.

The model economy consists of a continuum of infinitely lived individuals of measure N. In each period, individuals consume, save, and earn income either by operating a firm or by supplying labor to another firm. There are three markets in the economy: a goods market, a labor market, and a capital rental market. Goods are produced by firms, which are categorized into two types: voluntary and involuntary . Both firms produce the same type of good. These goods are consumed by all individuals, and their price is normalized to one, serving as the numeraire. Firm owners demand capital and labor, while workers supply labor, and individual assets collectively form the economy's capital supply. Each individual participates in the markets of their own state, which is modeled as a closed economy —labor and capital markets clear within each state.

Every period, individuals receive a draw of a two-dimensional vector $\mathbf{z} = \{z, \ell\}$, where z represents entrepreneurial productivity, $\ell \in \{0, 1\}$ indicates access to wage employment. log(z) follows an AR(1) process with persistence ρ and variance of error term σ. The labor opportunity shock ℓ captures frictions in the wage labor market: with probability χ, $\ell = 1$ and the individual can find a wage job; with probability $1-\chi$, $\ell = 0$ and the individual cannot find wage work. Individuals choose savings and occupational status each period to maximize the expected discounted sum of utility over an infinite horizon. Individuals who choose to operate firms each period rent capital and hire labor optimally, subject to credit enforcement frictions. In addition to households and firms, the economy features competitive financial intermediaries—such as banks—that accept deposits

from households and rent capital to firm owners.

Subsections 3.1 and 3.2 describe the model's structure in detail, while Subsection 3.3 discusses the core mechanisms that drive the model's results.

2.1 Individual's Optimization Problem

2.1.1 Preferences and Technology

Individuals choose a sequence of consumption c_t in order to maximise the expected utility function over the infinite horizon:[3]

$$U(c) = E\sum_{t=0}^{\infty} \beta^t u(c_t)) \tag{1}$$

$$u(c_t) = \frac{1}{1-\gamma}(c_t^{1-\gamma} - 1) \tag{2}$$

where β is the discount factor and γ is the coefficient of relative risk aversion.

Individuals make an occupational choice each period, and that provides them with an income. If $\ell = 1$, the individual's occupational choice set is $\{W, F\}$, where W = Worker and F = Firm Owner. If $\ell = 0$, the individual's occupational choice set is $\{F\}$.

The possible occupations are described as follows:

1. *Worker (W)*: Individual provides one unit of labor and a earns fixed wage w. He may choose to work if he can find a job opportunity, which is possible only if he gets $\ell = 1$. All individuals are assumed to have the same productivity as a worker.

2. *Firm owner (F)* : Individual sets up a firm, employs capital and labor, earns profit.

The model distinguishes between two types of firm owners:

i) *Voluntary entrepreneur*: A firm owner earning a profit greater than the ongoing wage rate w.

ii) *Involuntary entrepreneur*: A firm owner earning a profit less than the ongoing wage rate w.

Individuals who decide to set up a firm rent capital k, hire labor l in that period.

Production function of a firm owner with entrepreneurial productivity z is given by:

$$f(k, l, z) = zk^{\alpha}l^{\theta} \tag{3}$$

Here, α and θ denote the output elasticities with respect to capital and labor, respectively. The condition $\alpha + \theta < 1$ implies decreasing returns to scale in the combined use of capital and labor.

[3]The t in the subscript refers to time

The rental price of capital is R, wage rate is w. Profit of a firm owner is given by:

$$\pi(k, l, R, w, r) = zk^{\alpha}l^{\theta} - Rk - wl \tag{4}$$

2.1.2 Financial Intermediaries and Imperfect Enforcement of Credit Contracts

There are competitive financial intermediaries, such as banks, who receive deposits from individuals and pay an interest rate r on them. These intermediaries rent capital k to firms at a rental rate R. Capital rental occurs within the period, and individuals are not allowed to hold negative assets, i.e., $a \geq 0$. Financial intermediaries are assumed to earn zero profits. Letting δ denote the depreciation rate of capital, the zero-profit condition implies:

$$R = r + \delta \tag{5}$$

That is, if banks pay an interest rate r on deposits, the capital rental rate R must compensate for both the interest and the depreciation, i.e., $R = r + \delta$; thus, banks earn zero profits in equilibrium.

The parameter $\phi \in [0, 1]$ captures the degree of enforcement of credit contracts. A higher value of ϕ indicates more efficient enforcement, with $\phi = 1$ representing perfect enforcement. When $\phi < 1$, enforcement is imperfect, and firm owners may choose to renege on their credit obligations. In such cases, they retain a fraction $(1-\phi)$ of the undepreciated capital and revenues net of labor payments. The sole penalty for default is the loss of their collateral assets a, which have been deposited with financial intermediaries. To ensure that firm owners have no incentive to renege on their credit contracts, financial intermediaries impose an upper bound $\bar{k}(a, z, \phi)$ on the capital rented to each firm in a given period. This bound satisfies an incentive compatibility constraint, ensuring that the value of honoring the contract exceeds the gains from reneging.

$$\underbrace{\max_{l}\{zk^{\alpha}l^{\theta} - wl\} - Rk + a(1+r)}_{\text{Gain from Not Reneging}} \geq \underbrace{(1-\phi)[\max_{l}\{zk^{\alpha}l^{\theta} - wl\} + (1-\delta)k]}_{\text{Gain from Reneging}} \tag{6}$$

This condition requires that the capital rented to firm owners by financial intermediaries be limited such that the incentive to comply with credit contracts exceeds the gain from reneging. Specifically, the gain from compliance is the sum of operating profit and the recovery of assets posted as collateral. In contrast, the gain from reneging is the share $(1-\phi)$ of revenues net of labor payments and undepreciated capital that the firm can expropriate.

The constraint on capital $\bar{k}(a, z, \phi)$ is increasing in collateral assets a, productivity z, and enforcement quality ϕ. Appendix C.1 provides graphical illustrations of these relationships.

2.1.3 Individual's dynamic optimization problem

An individual's optimization problem is to maximize lifetime utility, as defined in Equation (2), by choosing asset holdings, occupational status, and—if operating a firm—capital and labor inputs, subject to capital rental constraints arising from imperfect credit contract enforcement. This decision is made each period over the infinite horizon.

At the beginning of each period, the individual observes their state variables: current asset holdings a, idiosyncratic productivity z, and labor market access indicator $\ell \in \{0, 1\}$. They then choose next period's asset level a', and an occupational choice o. If $\ell = 0$, the individual cannot access the labor market and must operate a firm in the current period, i.e. $o = F$. The value associated with this choice is $v^F(a, z, \ell)$—representing total utility from obtained by choosing to set up a firm in the current period. If $\ell = 1$, the individual can choose to be either a worker or a firm owner. In this case, they compare the value of each occupation and choose the one that yields the highest utility, i.e: between $v^F(a, z, \ell)$ and $v^W(a, z, \ell)$, with the corresponding occupational choice in the current period $o = F$ or $o = W$. Equations (8) - (13) describe the individual's dynamic optimization problem, including budget constraints, occupational value functions, and the evolution of state variables:

$$v(a, z, \ell) = max\{v^W(a, z, \ell), v^F(a, z, \ell)\} \cdot 1\{\ell = 1\} + v^F(a, z, \ell) \cdot 1\{\ell = 0\} \tag{7}$$

$$v^W(a, z, \ell) = \max_{c, a' \geq 0} u(c) + \beta E_{z'\ell'}[v(a', z', \ell')] \tag{8}$$

$$c + a' \leq w + (1 + r)a \tag{9}$$

$$v^F(a, z, \ell) = \max_{c, a', k, l \geq 0} u(c) + \beta E_{z'\ell'}[v(a', z', \ell')] \tag{10}$$

$$c + a' \leq zk^\alpha l^\theta - Rk - wl + (1 + r)a \tag{11}$$

$$k \leq \bar{k}(a, z, \phi) \tag{12}$$

The occupational choice problem is static. In each period, individuals choose their occupation

by comparing the contemporaneous income across options. Since wages are fixed and the firm's profit-maximization problem does not depend on future state variables, occupational income is independent of future outcomes. As a result, occupational decisions are made statically each period.

If $\ell = 1$ the individual faces a choice between being a worker or a firm owner. He chooses to become a firm owner only if the profit from operating a firm exceeds the fixed wage w; otherwise, he works as a wage laborer. All individuals who choose to operate firms under this condition are referred to as voluntary entrepreneurs. If $\ell = 0$, the individual can only choose to operate a firm. If the profit from doing so exceeds the wage w, he is classified as a voluntary entrepreneur; otherwise, he is an involuntary entrepreneur—that is, someone who operates a firm but would have preferred to work for a wage had that option been available. Firm owners rent capital and hire labor in each period to maximize static profits, as defined in equation (5), subject to capital rental constraints given by equation (7).[4]

Let k^u and l^u denote the unconstrained profit-maximizing choices of capital and labor, respectively. These represent the optimal input choices of a firm owner in the absence of enforcement frictions, i.e., when the enforcement parameter $\phi = 1$.

$$k^u, l^u = \underset{k,l}{\operatorname{argmax}}\, zk^\alpha l^\theta - Rk - wl \tag{13}$$

Let k^o and l^o denote the firm owner's profit-maximizing choices of capital and labor, respectively, under the imperfect credit contract enforceability constraint specified in equation (7).

$$k^o, l^o = \underset{k \le \bar{k}(z,a,\phi)}{\operatorname{argmax}}\, zk^\alpha l^\theta - Rk - wl \tag{14}$$

$$k^o = \min(k^u, \bar{k}(z, a, \phi)) \tag{15}$$

2.2 Stationary Competitive Equilibrium

The stationary competitive equilibrium consists of:

- an invariant joint distribution of assets, entrepreneurial productivity, and labor opportunities, denoted by $G(a, z, \ell)$;

- policy functions: asset holdings $a'(a, z, \ell)$, occupational choice $o(a, z, \ell)$, labor demand $l(a, z, \ell)$, and capital demand $k(a, z, \ell)$;

- rental limits $\bar{k}(a, z, \phi)$; and

[4]The profit maximization problem is static. Individuals do not accumulate capital; they rent capital and hire workers anew each period.

- prices (w, R, r)

such that the following conditions hold:

i) Given prices (w, R, r) and rental limits $\bar{k}(a, z, \phi)$, the policy functions $a'(a, z, \ell)$, $o(a, z, \ell)$, $l(a, z, \ell)$, and $k(a, z, \ell)$ solve the individual's optimization problem defined by equations (8)–(13).

ii) Capital Market Clearing: The demand for capital arises from all firm owners, while the supply of capital is given by the aggregate asset holdings of individuals. The capital market clears when:

$$\underbrace{\sum_{\ell=0}^{1} \int k(a, z, \ell) G(a, z, \ell) da dz}_{\text{Demand for Capital}} = \underbrace{\sum_{\ell=0}^{1} \int a G(a, z, \ell) da dz}_{\text{Supply of Capital}} = \frac{K}{\sum N} \tag{16}$$

iii) Labor Markets Clearing: The demand for labor comes from all firms, while the supply of labor comes from all individuals choosing to be workers. The labor market clearing condition is:

$$\underbrace{\sum_{\ell=0}^{1} \int l(a, z, \ell) G(a, z, \ell) da dz}_{\text{Demand for Labor}} = \underbrace{\sum_{\ell=0}^{1} \int_{o(a,z,\ell)=W} G(a, z, \ell) da dz}_{\text{Supply of Labor}} \tag{17}$$

2.3 Model Mechanisms

This section presents the model mechanisms that link the degree of credit contract enforcement to occupational choices, the scale of firms, resource allocation, and aggregate outcomes. The key parameter of interest is ϕ, which governs the enforcement of credit contracts and, consequently, which impacts the extent to which firm owners can borrow against collateral. A higher ϕ relaxes borrowing constraints, allowing more productive but asset-poor individuals to access capital, operate larger firms, and earn higher profits.

These micro-level effects induce reallocation across occupations. In partial equilibrium, individuals who would otherwise be involuntary entrepreneurs or workers may now enter voluntary entrepreneurship. At the same time, firms expand in scale, leading to more efficient use of entrepreneurial talent and capital. In general equilibrium, the increased demand for capital and labor raises the interest rate and the wage, which further shapes individual incentives and the occupational distribution.

Together, these forces shift production toward larger, more productive firms and reallocate capital and labor toward individuals with higher entrepreneurial ability, ultimately raising aggregate output per capita. The rest of the section traces these effects in detail, focusing solely on the implications of ϕ while holding all other model parameters constant.

To do so, it is important to first outline how the general equilibrium of the model is determined. The general equilibrium solution of the model requires jointly solving for the equilibrium prices of labor and capital— w and r—as well as the individual-level policy functions: capital demand k, labor demand l, occupational choice o, and asset accumulation a'. The key model outcomes—such as income per capita, capital per capita, occupational shares, and firm size distributions—are derived by aggregating these policy functions over the stationary joint distribution of individual states at the equilibrium prices.

To understand how changes in credit enforcement ϕ affect these outcomes, we must examine how ϕ influences both the policy functions and the general equilibrium prices r and w. I proceed in two steps. First, I analyze the partial equilibrium effects of ϕ—how enforcement affects individual decisions when prices are held fixed. Then, I turn to the general equilibrium effects, showing how these individual responses influence aggregate factor demands, thereby altering equilibrium prices, which in turn feed back into occupational choices, resource allocation, and aggregate output.

2.3.1 Partial Equilibrium effects of ϕ

We begin by analyzing the effects of contract enforcement ϕ in partial equilibrium, holding general equilibrium prices r and w fixed. This isolates the direct impact of ϕ on agents' decisions without incorporating feedback from aggregate factor markets.

The key mechanisms operate through the individual policy functions. Recall that individuals differ in their asset level a, entrepreneurial productivity z, and labor opportunity ℓ. Given these state variables and fixed prices, individuals first evaluate their optimal choices of capital and labor, if they had to set up a firm. Then, comparing their incomes in the current period between the possible choices of occupation they have, choosing the one that gives them maximum income, they are either a voluntary entrepreneur, involuntary entrepreneur, or a worker. All individuals choose how much to save for the next period.These decisions are encoded in the policy functions k(a,z,ℓ), l(a,z,ℓ), o(a,z,ℓ), and a'(a,z,ℓ).

(a) **Individual Policy Functions at Fixed Prices**

i. Capital Demand $k(a, z, \ell)$ and Labor Demand l(a,z,ℓ):

We begin by examining the policy functions for capital and labor demand $k(a, z, \ell)$ and l(a,z,ℓ). When $\ell = 1$ the individual has the option to become either a firm owner or a worker. For a given pair (a,z), if the potential profits by being a firm owner are less than w, the individual chooses to work, and both capital and labor demands are zero, (i.e., k = 0 and l = 0). If instead the firm

ownership yields higher returns, the individual optimally chooses k and l for his firm, subject to the collateral constraint.

If $\ell = 0$, the individual cannot be a worker and must set up a firm. In this case, capital and labor demands are always chosen optimally, given the borrowing constraint.

For every combination of a, z, and ℓ; k and l are increasing in ϕ, as $\bar{k}$ is increasing in ϕ.

ii. Occupational Choice $o(a, z, \ell)$ **:**

Figure 1: Occupational Choice Policy Functions - Partial Equilibrium

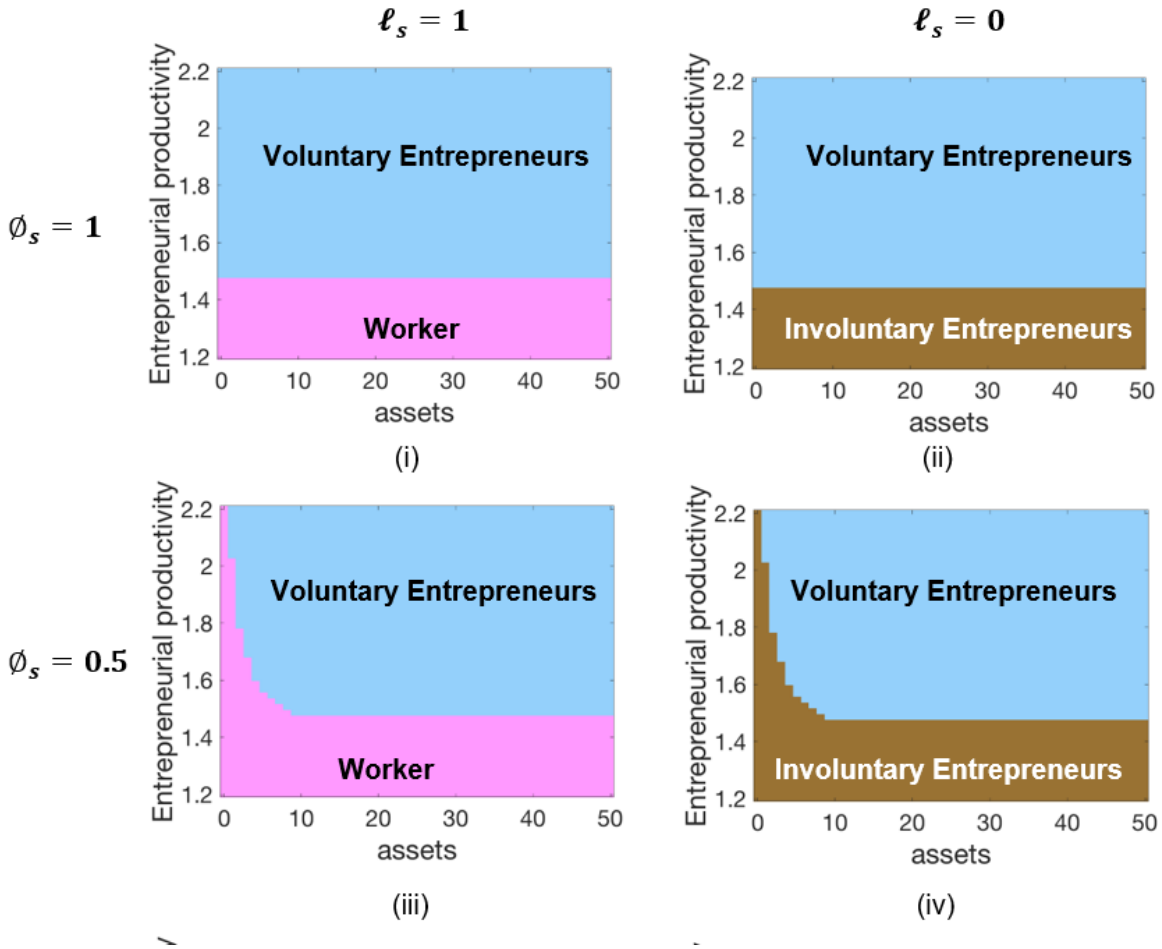


Figure 1 presents the occupational choice policy functions under four combinations of ϕ's and ℓ's respectively: (i) $\ell = 1$, $\phi = 1$, (ii) $\ell = 0$, $\phi = 1$, (iii) $\ell = 1$, $\phi = 0.5$, (iv) $\ell = 0$, $\phi = 0.5$, for a given fixed set of w and r. In each panel, occupational choice is represented as a function of the individual state variables: assets a (x-axis), productivity z (y-axis), and labor opportunity ℓ (column grouping). The shaded regions indicate the occupation type: pink for workers, blue for voluntary entrepreneurs, and brown for involuntary entrepreneurs. When $\ell = 1$ individuals choose to be workers if the profits from voluntary entrepreneurship are less than the wage w; otherwise,

they choose to be firm owners. When $\ell = 0$, they have no option but to become firm owners. In this case if profits are greater than w they are voluntary entrepreneurs, otherwise they are involuntary entrepreneurs. Cases (i) and (ii) (and similarly (iii) and (iv)) share the same cut-off in (a,z) space for entry into voluntary entrepreneurship, since involuntary entrepreneurs are precisely those who would have chosen to be workers had they access to the labor market.

Diagrams (i) and (ii) in figure 1 represent the case of perfect enforcement of credit contracts (i.e., $\phi = 1$), where the borrowing constraint is fully relaxed and capital rental is unconstrained. Consequently, firm owners rent the unconstrained optimal quantities of capital and labor—denoted by k^u and l^u respectively — as determined in equation (14). Since the collateral constraint does not bind, the resulting profits from firm ownership are independent of the individual's asset level a.

Given fixed w and r, when $\phi = 1$, occupational choice depends only on entrepreneurial productivity z. In both cases—$\ell = 0$ (no labor market access) and $\ell = 1$ (labor market access)—the condition $z(k^u)^\alpha(l^u)^\theta - Rk^u - wl^u > w$ defines the cutoff value of z that separates voluntary entrepreneurs from workers (when $\ell = 1$) or from involuntary entrepreneurs (when $\ell = 0$).

In cases (iii)–(iv), where there is imperfect enforcement of credit contracts, profits from firm ownership are determined by renting constrained optimal levels of capital and labor, as described in equations (15)–(16). In these scenarios, the profit function and hence the occupational choice depend jointly on an individual's asset level a and productivity z. When assets are sufficiently high, the collateral constraint derived from condition (7) does not bind, allowing the entrepreneur to rent the unconstrained optimal levels of capital and labor. In such cases, profits are independent of a and depend solely on z, leading to a productivity-based cutoff for selecting into voluntary entrepreneurship—analogous to cases (i) and (ii). In contrast, when assets are low and the constraint binds, the entrepreneur's ability to operate a voluntary firm is limited by available collateral, making both a and z jointly relevant for determining whether firm profits exceed the wage w. As asset holdings decline, a higher level of productivity z is required to compensate for the tighter constraint. Moreover, a lower enforcement parameter ϕ exacerbates this effect by tightening the borrowing limit further, thus raising the productivity threshold needed for low-asset individuals to become voluntary entrepreneurs.

iii. Asset Choice $a'(a, z, \ell)$:

Holding wages w and and interest rates r, an increase in the enforcement parameter ϕ, relaxes the borrowing constraint. As a result, firm owners are able to rent more capital k and hire more labor l. This expansion in firm scale raises profits and incomes for all existing firm owners and also induces some individuals to switch from wage employment to firm ownership in partial equilibrium.

Higher incomes translate into higher savings, so the next-period asset level a' tends to rise when ϕ increases. However, when enforcement is weak (ϕ is low), individuals with low assets but high productivity z face tight collateral constraints and have a strong incentive to self-finance. For these individuals, a lower ϕ raises the marginal value of savings because accumulating collateral is a precondition for scaling up production in the future. This effect pushes a' upward when ϕ decreases.

Thus, the net effect of a change in c on an individual's savings decision depends on the balance between:

The income effect: Higher ϕ increases profits and raises savings mechanically.

The precautionary/self-financing effect: Lower ϕ increases the shadow value of collateral and induces higher saving among constrained but productive agents.

Which force dominates will depend on the agent's current asset level, productivity draw, and how close they are to the collateral constraint.

2.3.2 Impact of ϕ on general equilibrium r and w

At the stationary equilibrium, the interest rate r and wage w jointly clear the capital and labor markets. Given r and w, aggregate demand for capital and labor is the sum of all firm owners input demands of capital and labor respectively, while aggregate supply of capital equals total asset holdings, and aggregate supply of labor equals the mass of individuals choosing to work.

At a given r and w, an increase in ϕ increases aggregate demand for both capital and labor - as relaxed borrowing constraints allow entrepreneurs to rent more capital, operate at a larger scale, and induce some workers to switch to entrepreneurship. At a given r and w, an increase in ϕ may increase/decrease aggregate supply of capital based on which effect between -income/precautionary/self-financing effect is stronger in aggregate, whereas aggregate supply of labor decreases as fewer individuals choose wage work. Since the increase in aggregate demand dominates the change in supply, both r and w rise as ϕ rises in general equilibrium.

2.3.3 Impact of ϕ on general equilibrium outcomes

Figure 2 presents the occupational choice policy functions in the general equilibrium case, with the regions for constrained and unconstrained voluntary and involuntary entrepreneurs demarcated. Panels (i) and (ii) depict individual occupational choices for $\ell = 1$ and $\ell = 0$, respectively, under the case where the economy-wide enforcement parameter $\phi = 1$. Panels (iii) and (iv) present the corresponding choices when $\phi = 0.5$.

The key difference relative to Figure 1 is that, as ϕ increases, the equilibrium wage w rises,

which increases the productivity cutoff z for entry into voluntary entrepreneurship. Under perfect enforcement (panels (i) and (ii)), no firm owners face borrowing constraints. Under imperfect enforcement (panels (iii) and (iv)), individuals with lower asset holdings are more likely to be capital constrained.

Figure 2: Occupational Choice Policy Functions - General Equilibrium

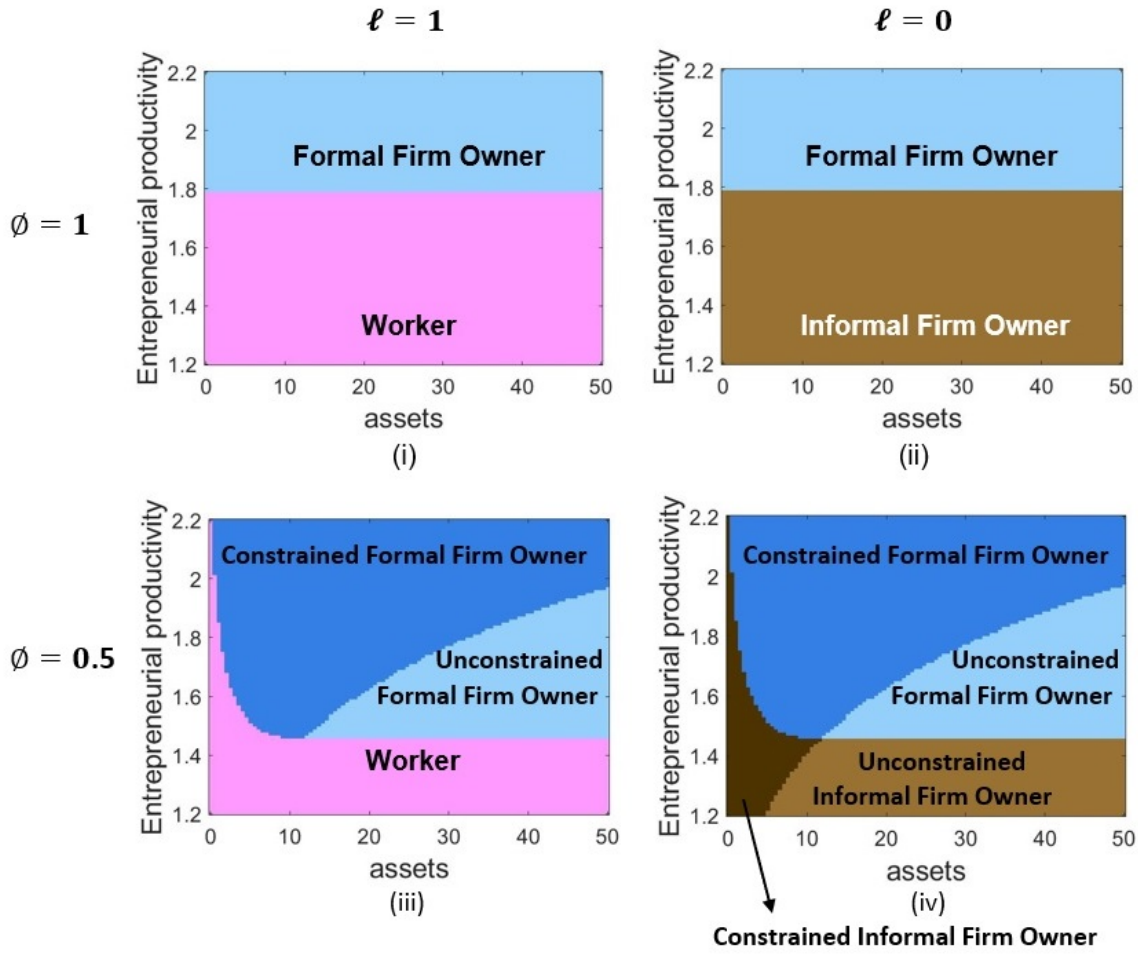


Table 1 presents the model-generated simulations for different ϕ's. With increasing ϕ, both r and w rise, as discussed above. However, the impact of increasing ϕ on access to credit is heterogeneous across individuals. A higher ϕ relaxes the borrowing constraint, allowing individuals to rent more capital, but it also raises r, which makes borrowing more expensive. These two effects work in opposite directions.

The net effect depends on the individual's type:

High-ability individuals with low assets benefit the most. For them, the loosening of the borrowing constraint dominates the rise in r, enabling them to access more credit and expand firm size. Low-ability individuals may actually be worse off. Because their unconstrained optimal

demand for capital is already low, the rise in r may have a stronger effect relative to the loosening of the constraint. As a result, their effective access to credit may decline as ϕ increases.

Overall, with improved borrowing ability and a higher wage rate, individuals reallocate across occupations in the economy. Only those individuals who can generate profits exceeding the higher wage (and who can still cover the increased interest and wage costs) choose to operate as voluntary firms. The average ability, profit levels, scale of operations, and output of voluntary entrepreneurs are substantially higher compared to when ϕ was lower.

The share of voluntary entrepreneurs may decline as ϕ increases. Higher wages raise the entry threshold for voluntary entrepreneurship, discouraging marginal entrants. Although improved access to credit enables some talented but previously constrained involutary entrepreneurs and workers to enter voluntary entrepreneurship category, the wage-threshold effect typically dominates, resulting in a lower share of voluntary entrepreneurs at higher ϕ.

With rising wages and interest rates, less-talented individuals who previously operated as voluntary entrepreneurs may exit that category. Since their profits are squeezed by higher input costs and their access to external credit is reduced, they are more likely to shift either into wage employment (worker category) or into involuntary entrepreneurship. As a result may lead to a relative expansion in the shares of workers and involuntary entrepreneurs in the occupational distribution.

Overall, output per capita increases with rising ϕ. As credit frictions are relaxed, more productive individuals become less constrained in their ability to borrow, allowing them to operate firms at larger and more efficient scales. This reallocation of resources away from low-productivity to high-productivity agents reduces misallocation in the economy, thereby raising aggregate efficiency and boosting per-capita output. Total capital in the economy rises with increasing ϕ. On the demand side, reduced financial frictions allow firms to expand scale, raising the aggregate demand for capital. On the supply side, higher incomes translate into greater savings, which further relaxes capital constraints and expands the overall supply of assets. Together, these forces generate an increase in the total capital stock as ϕ rises.

2.4 Model Extension - Common Capital Market and Shared Interest Rate

To explore the implications of financial integration across states, I extend the model to a setting in which there are two states that share a common capital market—that is, they face a uniform equilibrium interest rate r, determined by the joint supply and demand for capital across both regions, while labor markets continue to clear within individual states. This setup represents a case of partial financial integration: capital markets are nationally integrated, ensuring a common

Table 1: Impact of Changing ϕ: General Equilibrium

ϕ	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**
r	0	0	0	0.03	0.06	0.07
w	1.86	2.26	2.65	3.17	3.83	3.96
Y (Output per Capita)	3.25	3.97	4.96	5.98	7.19	7.34
Y (Output per Capita - Voluntary Entrepreneurs)	3.19	3.86	4.83	5.77	7.04	7.21
Y (Output per Capita - Involuntary Entrepreneurs)	0.06	0.11	0.13	0.21	0.15	0.13
K (Capital per Capita)	2.60	3.51	5.41	8.49	14.56	15.82
L (Worker Share)	0.54	0.57	0.58	0.60	0.60	0.60
Share of Voluntary Entrepreneurs	0.12	0.08	0.07	0.04	0.04	0.04
Share of Involuntary Entrepreneurs	0.33	0.35	0.35	0.36	0.36	0.36
Mean Talent (Voluntary Entrepreneurs)	5.48	6.65	7.38	12.03	12.03	12.03

Note: For the simulations in this table, the value of and χ parameters are taken to be 0.75 and 0.62, respectively. Other parameters are set the same values as mentioned in Table 4]

Table 2: Impact of Changing ϕ: 2 states, common capital market, GE, $\phi_2 = 0$

ϕ	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**
r	0	0	0	0	0.04	0.05
w	1.83	2.16	2.50	3.16	3.83	4.16
Y (Output per Capita)	3.29	4.14	5.19	6.22	7.67	7.94
Y (Output per Capita - Voluntary Entrepreneurs)	3.24	4.07	5.06	5.98	7.50	7.92
Y (Output per Capita - Involuntary Entrepreneurs)	0.05	0.07	0.13	0.24	0.17	0.15
K (Capital per Capita)	2.64	3.69	5.63	9.40	17.52	20.21
L (Worker Share)	0.54	0.55	0.57	0.60	0.60	0.60
Share of Voluntary Entrepreneurs	0.13	0.11	0.08	0.04	0.04	0.04
Share of Involuntary Entrepreneurs	0.33	0.34	0.35	0.37	0.37	0.37
Mean Talent (Voluntary Entrepreneurs)	5.37	5.79	6.91	12.03	12.03	12.03

Table 3: Impact of Changing ϕ: 2 states, common capital market, GE, $\phi_2 = 1$

ϕ	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**
r	0.05	0.05	0.06	0.06	0.07	0.07
w	1.99	2.25	2.52	3.17	3.70	3.96
Y (Output per Capita)	3.19	3.75	4.83	5.79	7.17	7.34
Y (Output per Capita - Voluntary Entrepreneurs)	3.13	3.54	4.62	5.62	7.02	7.20
Y (Output per Capita - Involuntary Entrepreneurs)	0.06	0.20	0.21	0.17	0.15	0.14
K (Capital per Capita)	2.19	2.52	4.32	7.85	13.85	15.82
L (Worker Share)	0.55	0.60	0.60	0.60	0.60	0.60
Share of Voluntary Entrepreneurs	0.11	0.04	0.04	0.04	0.04	0.04
Share of Involuntary Entrepreneurs	0.34	0.36	0.36	0.36	0.36	0.36
Mean Talent (Voluntary Entrepreneurs)	5.66	12.03	12.03	12.03	12.03	12.03

price of credit across states, but enforcement institutions and production remain localized. Firms are geographically immobile—they hire labor and produce only within their home state—but they can borrow from the shared pool of credit supplied by national financial intermediaries. In this environment, savers in either state can deposit funds that are then allocated to entrepreneurs in both regions according to expected returns, equalizing the equilibrium interest rate across states.

This formulation allows credit to flow from the low-enforcement to the high-enforcement state, as weaker contract enforcement depresses the marginal return to capital locally and induces capital outflows. Consequently, the local interest rate rises in the weak-enforcement state—reflecting the scarcity of domestic funds—while it falls in the strong-enforcement state, where inflows expand credit availability and lower the cost of borrowing. Through this reallocation, capital-market integration transmits enforcement-driven shocks across states, even though firms and production remain geographically fixed. Relative to the autarkic benchmark, where each state determines its own r_s the introduction of a shared r thus generates offsetting adjustments: the weak-enforcement state experiences higher borrowing costs (higher r) and lower investment, while the strong-enforcement state benefits from an inflow of savings and a lower cost of credit (lower r). The integrated equilibrium interest rate lies between the two autarkic rates, and aggregate capital is more efficiently allocated across entrepreneurs according to enforcement quality rather than geographical boundaries.

Table 2 and 3 highlight this pattern. Table 2 reports results for the case where the partner state has very weak enforcement ($\phi_2 = 0$), whereas Table 3 reports results for the case where the partner state has very strong enforcement ($\phi_2 = 1$). On comparison with Table 1, which is the

autarky case, the interest rate is systematically lower for all values of ϕ when the state has stronger enforcement vs the partner state which has very weak enforcement(Table 2), and systematically higher for all values of ϕ when the state has weaker enforcement vs the partner state which has very strong enforcement (Table 3).

In the strong-enforcement state, cheaper access to capital enables productive entrepreneurs to expand their scale of operation, increasing both aggregate capital and output. Lower borrowing costs also encourage entry by moderately talented individuals who were previously constrained, thereby raising the share of voluntary firms but reducing the mean talent among them. The relaxation of credit constraints thus expands the extensive margin of entrepreneurship, while slightly diluting average ability at the intensive margin. Worker and involuntary entrepreneurship shares decline relative to the autarky case, as more individuals transition into voluntary production. These patterns are clearly reflected in the comparison of Table 2 with Table 1.

In contrast, in the weak-enforcement state, higher borrowing costs compress entrepreneurial profits and discourage voluntary entrepreneurship. As credit constraints tighten, a larger share of individuals remain in wage employment or move into involuntary entrepreneurship. This pattern is clearly visible in the decline in voluntary entrepreneurship and the corresponding increase in worker and involuntary entrepreneur shares in Table 3 relative to Table 1. Both capital per capita and per-capita output decline as investment contracts. Among the remaining voluntary entrepreneurs, average talent rises, as only the most productive individuals can sustain operation under higher borrowing costs—consistent with the sharper talent selection observed in Table 3 versus Table 1.

Overall, because the integrated market reallocates credit toward jurisdictions with stronger enforcement, capital and income per capita diverge across the two states, with the high-enforcement state accumulating a larger capital stock and generating higher average earnings. Output produced by voluntary entrepreneurs rises sharply in this state, while the weak-enforcement state experiences reduction in voluntary output and a rising share of involuntary entrepreneurs and workers.

3 Quantitative Analysis

In this section, I first present the calibration strategy. The key parameter of interest for explaining disparities in income across states is the degree of credit contract enforcement, ϕ, which I allow to vary across Indian states. All other model parameters are held constant across states. I outline the approach used to calibrate the common national parameters, and then the state-parameter ϕ.

In the results section, I then compare the model's predictions for key outcomes—GDP per capita and the average size of voluntary firms—with their empirical counterparts. I assess the

extent to which cross-state differences in ϕ can account for the observed disparities in per capita income, and examine how the calibrated ϕ parameters relate to state-level measures of judicial efficiency. I also do a version of the calibration in which I use the state-level measures of judicial efficiency directly in the calibration exercise - this version is presented in the appendix.

3.1 Calibration

I assume that all model parameters other than ϕ are common across Indian states. These common "national" parameters are: two technology parameters α and θ; the AR(1) parameters of entrepreneurial productivity (ρ, σ); the discount factor β; the coefficient of relative risk aversion γ; the depreciation rate δ; and the labor-opportunity parameter χ. Among these, the values of γ, and δ are taken from the literature; β and ρ are set to 0.92 and 0.9 respectively, based on conventional values in the Macro literature. α and θ are directly set equal to the capital and labor income shares in India for 2017–18, based on data from the National Accounts Statistics (NAS). The parameters χ and σ are calibrated by matching model-generated moments to their empirical counterparts: specifically, χ is set to match the share of workers in the labor force[5], and σ is set to match the standard deviation of log firm size[6].[7] Table 4 reports the values of all national parameters, along with the model and data moments used for the calibrated parameters.

I calibrate the state-level enforcement parameter, ϕ_S, using two complementary approaches. The first approach directly maps ϕ_S from judicial efficiency data to capture institutional variation in contract enforcement across Indian states. The second approach infers ϕ_S by matching the model-generated external finance–to–GDP ratio with its empirical counterpart and then examines its correlation with judicial efficiency indicators. Taken together, the two methods provide both a structural and a quantitative validation of the role of enforcement in shaping financial access and income disparities across states.

The calibration focuses on 21 major Indian states for which consistent data on judicial performance and bank credit are available. [8]

The measure of judicial efficiency is proxied by the average age of disposed civil suit cases in district and sessions courts across Indian states in 2018, as reported in the National Judicial Data

[5]Source: Periodic Labour Force Survey (PLFS), 2017–18

[6]Source: Annual Survey of Industries (ASI), 2017–18

[7]The target moments are matched conditional on setting the value of ϕ such that the model reproduces India's external finance-to-GDP ratio.

[8]The North-Eastern states of Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim are excluded from the quantitative analysis because of limited coverage in industrial and judicial datasets. Their small manufacturing base, low formal credit penetration, and incomplete reporting in the National Judicial Data Grid make consistent calibration of enforcement quality and credit intensity infeasible. Union Territories, including Delhi and Jammu & Kashmir, are also excluded.

Table 4: National Parameters

Parameter	Value	Target / Source	Model	Data
Directly set from National Accounts (data-imposed)				
α	0.28	Capital income share in GDP (NAS 2017–18)	—	
θ	0.32	Wage income share in GDP (NAS 2017–18)	—	
Disciplined by explicit targets				
χ	0.62	Share of workers (PLFS 2017–18)	0.57	0.57
σ	0.75	SD of log firm size (ASI 2017–18)	1.3	1.5
Set from literature / Conventional values				
ρ	0.90	Conventional in macro/firm dynamics	—	
β	0.92	Buera et al. (2011)	—	
γ	1.50	Standard CRRA	—	
δ	0.06	Standard depreciation	—	

Grid (NJDG). The NJDG compiles real-time data from courts across India, providing comprehensive information on case pendency, filing, and disposal patterns. Focusing on civil suit cases is appropriate, as these commonly involve contract and credit enforcement disputes that directly affect firms' ability to recover dues and enforce financial claims. A higher average age corresponds to slower judicial processes and weaker enforcement, while a lower value indicates faster case resolution and stronger contract enforcement.[9]

Approach 1: Judicial-Efficiency Mapping. In the baseline calibration, ϕ_S is derived from observed judicial efficiency—proxied by the average duration of civil case disposal in district and subordinate courts. The mapping follows a logistic functional form,

$$\phi(s) = \frac{1}{1 + e^{(\alpha + \beta speed)}},$$

where *speed* denotes the average age of disposed cases (in years) in 2018. Lower values of *speed* imply faster courts and hence stronger enforcement. The parameters (α, β) are pinned down by two empirical anchors: I select two representative states—one with highest judicial efficiency and one with low efficiency — and assign them target enforcement levels $(\bar{\phi}_H, \bar{\phi}_L)$ consistent with their

[9]District and sessions courts account for nearly 87.5 percent of all pending cases in India, making their disposal speed a representative proxy for state-level judicial efficiency.

relative positions in the data. The resulting pair (α, β) determines the implied ϕ_S for each state.[10] This procedure anchors the model in observable institutional variation and yields a state-specific measure of enforcement quality grounded in judicial performance.

The parameters $\alpha = -1.04$ and $\beta = 0.55$ are chosen such that $\phi_{\text{Haryana}} = 0.5$ at a judicial speed of 1.89 years, and $\phi_{\text{Bihar}} = 0.1$ at a judicial speed of 5.9 years. Table 7 lists the calibrated values of ϕ_S for each state, derived from the observed average age of disposed civil cases.

Approach 2: Matching Model-Implied External Finance. As a complementary calibration, ϕ_S is also obtained by matching the model-generated ratio of external finance to GDP with its empirical counterpart for each state. In the model, aggregate external finance is defined as

$$\int (k - a) \cdot 1(k > a)\, da\, dz,$$

where $(k - a)$ represents net borrowing by an individual, and $1(k > a)$ is an indicator function equal to one when the individual borrows. Empirically, external finance is measured as the sum of credit extended by state scheduled commercial banks and regional rural banks relative to state GDP.[11] Data on bank credit and state GDP are drawn from the *RBI Handbook of Statistics on Indian States.*[12] for the year 2017–18. Table 7 reports the calibrated values of ϕ_S obtained from this approach.

3.2 Results

Table 8 reports the model-predicted outcomes for GDP per capita[13] , external finance-to-GDP, and the average size of voluntary firms across states, alongside the corresponding data for 2017–18, when model ϕ_S are calibrated under Approach 1 (ϕ_S calibrated directly from observed judicial efficiency, proxied by the average duration of civil case disposal). Firm size is measured by the number of workers employed per establishment. Firms reported in the Annual Survey of Industries (ASI) are treated as representative of voluntary, entrepreneur-owned firms.[14]. External finance-to-GDP is

[10]The logistic specification provides a smooth, monotonic mapping bounded on $(0, 1)$, and flexible curvature, whereas other functional forms such as exponential decay offer less control over slope and asymptotic limits.

[11]This sum serves as the empirical counterpart of external finance available at the state level in India. Other potential sources of external finance include non-banking financial companies (NBFCs), cooperative banks, and capital-market instruments such as bonds or debentures. However, comparable state-level data for these sources are not systematically available, and hence the measure is restricted to bank credit from scheduled commercial and regional rural banks.

[12]Link:`https://m.rbi.org.in/Scripts/AnnualPublications.aspx?head=Handbook+of+Statistics+on+Indian+States`

[13]State-level GDP data are drawn from the RBI Handbook of Statistics on Indian States.

[14]The Annual Survey of Industries (ASI) covers registered manufacturing establishments under the Factories Act, 1948—units employing 10 or more workers with power or 20 or more without power. These firms hire labor, maintain

measured as the sum of credit extended by state scheduled commercial banks and regional rural banks relative to state GDP in the data. Figures 3, 4, 5 display scatter plots of the data against the model-predicted values for per capita output, external finance-to-GDP, and the average size of voluntary firms, respectively.

To quantify the contribution of credit contract enforcement in explaining disparities in income across Indian states, I regress the data on GDP per capita against the model-predicted GDP per capita. The resulting positive relationship and an R-squared of 0.06 indicates that differences in ϕ—the degree of credit contract enforcement—accounts for approximately 6 percent of the variation in GDP per capita across states.

As a validation exercise, I examine the relationship between the model-implied ratio of external finance to GDP and firm sizes to their empirical counterparts across states under Approach 1. As seen in Figure 4 and 5, the correlation is positive, indicating that the calibration successfully reproduces cross-state variation in financial depth observed in the data. This suggests that the enforcement heterogeneity embedded in the calibrated ϕ_S parameters is economically meaningful and consistent with observed credit availability. Similarly, a regression of the data on average firm sizes against the model-predicted firm sizes shows a positive relationship and yields an R-squared of 0.072, validating the model predictions of firm sizes.

The model's quantitative results are consistent with its core mechanism linking credit contract enforcement to aggregate productivity through the easing of borrowing constraints and the reallocation of resources. Higher values of the enforcement parameter relax collateral constraints faced by productive but asset-poor entrepreneurs, enabling them to operate at larger scales and expand output. This process raises average firm size and aggregate income, as reflected in the positive association between model-predicted and observed GDP per capita across states. At the same time, stronger enforcement generates general-equilibrium feedbacks: higher wages and interest rates—driven by greater demand for labor and capital—alter firm's entry and scale decisions. More productive entrepreneurs expand as borrowing constraints loosen, while marginal or low-productivity firms contract or exit in response to higher input costs. The resulting reallocation shifts resources toward larger, more efficient enterprises, raising aggregate productivity even without an increase in the total number of firms. Accordingly, states with stronger enforcement and faster judicial systems exhibit both higher per-capita output and larger firm sizes in the data, and the positive correlation between model-implied and observed external-finance-to-GDP ratios further validates the calibration and its mechanism.

accounts, and operate at commercial scale, making them a suitable empirical proxy for "voluntary entrepreneur" firms in the model. In contrast, own-account and household enterprises below these thresholds, typically representing subsistence self-employment, are covered in the National Sample Survey (NSS) unorganized-sector rounds.

When the model is solved using the calibrated parameters under Approach 2, the results closely mirror those obtained under Approach 1. A regression of observed state-level GDP per capita on the model-predicted values yields an R-squared of 0.035, suggesting that cross-state differences in ϕ the degree of credit contract enforcement—account for approximately 3.5 percent of the variation in income per capita. Likewise, the correlation between model-implied and observed average firm sizes is positive, reinforcing the consistency of the calibration with empirical patterns and confirming that the enforcement mechanism captures meaningful cross-state heterogeneity in both output and firm size.

I further assess the relationship between the model-calibrated, state-level ϕ parameters and the average age of disposed civil suit cases in district and session courts in 2018. Table 11 reports state-wise data on the average age of disposed cases, and Figure 8 plots the calibrated ϕ values against the reciprocal of this measure (used as an index of judicial speed). Their is a positive correlation of 0.26 between the two.The correlation between the two is positive (0.26), indicating that states with faster judicial processes tend to exhibit higher calibrated enforcement parameters, consistent with the interpretation ϕ_S of as capturing the strength of credit contract enforcement.[15]

While the overall patterns under Approaches 1 and 2 are broadly similar, minor differences arise from the distinct calibration sources for the enforcement parameter. In Approach 1, ϕ_S is directly mapped from observed judicial efficiency, capturing institutional heterogeneity in the speed and reliability of credit contract enforcement. In contrast, Approach 2 infers ϕ_S by matching the model-generated external-finance-to-GDP ratio to its empirical counterpart. Since the empirical measure of external finance is restricted to bank credit—excluding other channels such as non-banking financial institutions, cooperative credit, and capital-market instruments—it may not fully capture the underlying enforcement environment. Consequently, the distribution of ϕ_S and its explanatory power for income variation differ slightly across the two approaches. Nonetheless, the strong qualitative consistency of results across both exercises underscores the robustness of the model's central mechanism linking effective credit contract enforcement to improved allocation and aggregate productivity.

[15] Judicial speed serves as the primary determinant of credit contract enforcement, as faster case resolution directly strengthens the credibility and timeliness of legal recourse available to lenders. Nevertheless, enforcement outcomes also depend on complementary institutional features—such as the effectiveness of judgment execution, local governance quality, and the presence of informal enforcement networks—as well as credit-market characteristics like banking depth, information infrastructure, and lender competition. Together, these elements influence the overall ease of enforcing credit contracts and accessing finance across Indian states.

4 Judicial Speed and Occupational Choice: Empirical Evidence

The goal of this section is to empirically analyze the impact of judicial speed on individuals occupational choices. The speed of resolution of civil cases by courts serves as a practical and observable proxy for credit contract enforcement. The identification strategy follows a difference-in-differences (DiD) approach, similar to that employed by Chemin (2012), exploiting cross-state variation in the implementation of the Civil Procedure Code Amendment Act of 2002 in India.

Subsection 4.1 below describes characteristics and definitions of the three occupation types. Subsection 4.2 gives an overview of the identification strategy. Subsection 4.3 lays out the empirical model. Subsection 4.4 gives details of the datasets and variables used in the empirical exercise. Subsection 4.5 describes the regression results.

4.1 Occupation Type Categorization

In this subsection, I discuss the definitions and characteristics of the three main occupation types: voluntary entrepreneur, involuntary entrepreneur, and worker.

Voluntary entrepreneurs are the traditional entrepreneurs—the epitome of "modern capitalist development", the "agents of innovation", the disruptive economic leaders (Schumpeter (1911)) who undertake costly and risky investments (Knight (1921)) and develop new goods, services, and production processes (Schumpeter (1911)). They shape the productivity of firms (Murphy et al. (1991)), facilitate economic growth and create jobs.

The idea of what we call involuntary entrepreneurship can be traced back to W. Arthur Lewis mid-1950s description of surplus labor in developing economies. Lewis characterized a large segment of the population engaged in low-productivity self-employment, often because they lacked access to better opportunities. Tokman (2007) argues that involuntary entrepreneurs arise largely due to "a failure of the economic system to create enough productive employment," suggesting that many would choose salaried work if available. De Mel et al. (2010) find that on measures of ability and cognitive skills, these entrepreneurs score significantly lower than those running larger enterprises, underscoring that involuntary entrepreneurship is often associated with lower human capital.

The third occupational category is worker, defined as individuals employed in the enterprises of others and earning a fixed wage or salary in return for their labor.

From the labor force surveys, we classify entrepreneurs based on the work status of the firm owner. Individuals whose work status is 'employer', defined as a person who runs their own enterprise (alone or with partners) and primarily runs it by hiring labor, are classified as voluntary entrepreneurs. In contrast, individuals whose work status is "own-account worker"—those who

operate their own enterprise (alone or with partners) but typically do so without hiring labor—are categorized as involuntary entrepreneurs. Economically, this distinction separates opportunity-driven entrepreneurship from necessity-driven entrepreneurship. Employers are more likely to have chosen entrepreneurship to exploit a business opportunity, given that they hire labor and typically operate at a larger scale. Own-account workers, by contrast, often engage in self-employment due to lack of wage-employment opportunities, with low capital intensity and minimal labor hiring, making their activity closer to subsistence employment.

The work status of being a worker - individuals employed in the enterprises of others and earning a fixed wage, can be clearly identified in the labor-force surveys.

4.2 Identification Strategy

To identify the impact of judicial speed on individuals occupational choices, I follow the empirical strategy proposed by Chemin (2012). This approach exploits cross-state variation in the implementation of the Civil Procedure Code (CPC) Amendment Act of 2002 in India.

Originally enacted in 1908, the CPC is the primary procedural law governing civil litigation in India. Its objective is to consolidate and standardize the processes followed by civil courts. The code sets out the procedures for filing cases, defines the jurisdictional boundaries of civil courts, prescribes rules and time limits for proceedings, outlines the rights of plaintiffs and defendants, and specifies the powers of courts to issue decrees, orders, appeals, reviews, and revisions. The Amendment Act of 2002 sought to streamline and accelerate the procedural handling of civil cases under the CPC.

The Act comprised 88 amendments to the Code of Civil Procedure (CPC) applicable to the functioning of civil courts across all states in India.[16] The amendments introduced several procedural reforms, including: (i) prescribing time limits for plaintiffs to serve summons on defendants; (ii) granting courts the authority to refer disputes to alternative dispute resolution mechanisms such as Lok Adalats, arbitration, conciliation, and mediation; (iii) restricting the right to appeal; (iv) imposing mandatory time limits at various stages of litigation; and (v) reducing the number of permissible adjournments to discourage frivolous litigation.

Although the act targeted procedural improvements for all civil cases, its effects can be reasonably assumed to apply to the subset of civil cases concerning credit contract enforcement.This assumption is grounded in the fact that the vast majority of credit contract disputes are adjudi-

[16]Structurally, the CPC comprises 158 sections and 51 orders with rules. The sections set out the general principles defining the powers and jurisdiction of civil courts, while the orders and rules prescribe detailed procedures governing civil proceedings. Each order is tied to a section that specifies the original jurisdiction of the relevant court. Any amendment to the CPC is typically an amendment to one or more rules within an order.

cated in civil courts. Reforms that accelerate the resolution of all civil cases would, therefore, also shorten the expected resolution time for credit contract cases. Moreover, faster resolution of other civil disputes would free up court capacity, indirectly reducing the waiting time for credit contract cases.

Individual states have the power to amend the CPC, which allows them to modify the procedures governing civil courts within their jurisdiction. Consequently, several states had already enacted amendments to various orders and rules of the CPC in the years prior to 2002. Some of these earlier reforms overlapped with the provisions introduced by the 2002 Amendment Act. As a result, the effective "dose" of the 2002 reform differed across states, depending on the extent to which they had already adopted similar measures. This cross-state variation in reform exposure provides the key source of identification for estimating the causal impact of judicial speed on individuals occupational choices.

Chemin (2012) systematically evaluates each of the 88 amendments contained in the 2002 Amendment Act and identifies 57 amendments as having a likely effect on court speed. For each of these 57 amendments, he assigns a score of +1 if the amendment is expected to increase court speed[17] and a score of –1 if the amendment is expected to slow down court proceedings. Summing across all 57 amendments yields a total score of +38, leading Chemin to conclude that, on net, the 2002 reforms are likely to increase court speed.

In his construction of the treatment intensity measure, all states are initially assigned a baseline score of +38, representing the full potential impact of the 2002 Amendment Act. Chemin then examines, for each state, whether the relevant orders or rules had been amended in earlier years. If a state had enacted the exact same amendment prior to 2002, the total score for that state is reduced by one point to reflect the fact that the 2002 Act did not generate a marginal change for that provision.[18] When a state had implemented a similar but not identical amendment, Chemin adjusts the score to reflect only the incremental effect of the 2002 Act for that state.

For instance, Order 20, Rule 1 specifies the timeline for pronouncing judgments after the close of case hearings. The 2002 Amendment Act changed the limit from 15 days (30 days in exceptional circumstances) to 30 days (60 days in exceptional circumstances). This change was coded as –1 because it lengthens the time allowed for delivering judgments and thereby slows case disposal. However, Tamil Nadu, Pondicherry, and Andhra Pradesh had, as early as 1930, removed all time limits on judgment delivery. Since the 2002 Act reintroduced time limits in these states, Chemin assigns them a net +2 score for this amendment (–1 + 2 = +1 net effect), reflecting that the reform

[17]The change in speed is assessed relative to a counterfactual state that had not implemented a similar amendment to the same order (rule) prior to 2002.

[18]Chemin (2012, p. 467) provides examples of such prior enactments.

actually tightened procedures and improved court speed for these states relative to their pre-reform status.

In this way, Chemin evaluates a total impact score of the 2002 Amendment Act for each state.[19] These scores lie in the range 34-40.[20] [21] This variation in the total impact of the 2002 amendment act can be incorporated in a difference-in-differences exercise to isolate the impact of judicial speed on economic outcomes. Taking differences in the outcomes of interest, between states which are less and more influenced by the 2002 Amendment Act, before and after the reform—and then differencing between these differences, we can identify the causal impact of the judicial speed on the probabilities of choosing particular occupations.

4.3 Occupational Choice Regressions

To identify the causal impact of improvements in judicial speed on occupational choices, I employ a difference-in-differences (DID) identification strategy as outlined in Section 4.2. Specifically, I use data from the 55th and 61st rounds (conducted in 1999–2000 and 2004–2005, respectively) of the Employment and Unemployment Surveys of the National Sample Survey (NSS), administered by the National Sample Survey Office (NSSO).[22] These surveys are the primary source of nationally representative labor force indicators at both national and state levels in India. Since the amendment act of interest was implemented on July 1, 2002, the 55th round serves as the pre-treatment period and the 61st round as the post-treatment period for the DID design. The 55th round survey was conducted between July 1999 and June 2000, and the 61st round between July 2004 and June 2005. To verify the validity of the parallel trends assumption prior to the reform, I additionally make use of the 50th round survey (July 1993–June 1994).

I estimate multinomial logit regressions of the following form:

[19]The states of Jammu & Kashmir and Nagaland are not a part of this calculation in my paper as the Code of Civil Procedure was not applicable in these States.

[20]The states of Uttaranchal, Jharkhand and Chattisgarh were newly created out of Uttar Pradesh, Bihar and Madhya Pradesh respectively in November 2000. Also, no related amendments were passed in Uttaranchal, Jharkhand, Chattisgarh and new Uttar Pradesh, Bihar, and Madhya Pradesh between 2000 and 2002. Chemin assumes no prior amendments to Uttaranchal, Jharkhand and Chattisgarh between 1908 and 2002 and makes no adjustment to their total impact scores. But since Uttaranchal, Jharkhand and Chattisgarh were old parts of Uttar Pradesh, Bihar and Madhya Pradesh, I assign scores of Uttar Pradesh, Bihar and Madhya Pradesh to Uttaranchal, Jharkhand and Chattisgarh respectively, reflecting the improvement in the judicial speed of the courts in these States.

[21]Chemin(2012) gives a detailed example of a how he gets a score of 34 for Uttar Pradesh, taking into account all previous related amendments implemented in the state, see his Table A1 on page 484.

[22]The NSSO functions under the Ministry of Statistics and Programme Implementation (MOSPI). It conducts large-scale socio-economic surveys covering employment, consumer expenditure, health, and other topics.

$$\ln\left(\frac{p_{Jist}}{p_{Wist}}\right) = \alpha_{J0} + \alpha_{Js} + \lambda_J^{1994} \cdot 1994_t + \lambda_J^{2005} \cdot 2005_t + \beta_J^{1994} \cdot (1994_t \times 2002AmendmentAct_s)$$
$$+ \beta_J^{2005} \cdot (2005_t \times 2002AmendmentAct_s) + \gamma_J \cdot edu_{ist} + \mathbf{x}_{ist}\delta_J + \mathbf{d}_{st} \cdot \eta_J + \epsilon_{ist} \tag{18}$$

In equation (1), the subscript J denotes either voluntary entrepreneur or involuntary entrepreneur, while W denotes worker; i refers to the individual, s to the state, and t to time. The term p_{Jist} represents the probability that individual i in state s at time t chooses occupation J, and p_{Wist} the probability of choosing to be a worker. The dependent variable $Ln\frac{p_{Jist}}{p_{Wist}}$ is the log odds-ratio of the probability of an individual i choosing to be a voluntary entrepreneur (if J=voluntary entrepreneur) or an involuntary entrepreneur (if J= involuntary entrepreneur) rather than a worker at time t.

The term α_{J0} is an intercept, while α_{Js} captures unobserved, time-invariant state-level heterogeneity (state fixed effects). The base year is 2000. The dummy variable 1994_t equals 1 if t=1994 and 0 otherwise, and the dummy variable 2005_t equals 1 and 0 otherwise. These time dummies control for common time shocks relative to 2000.

The variable $2002AmendmentAct_s$ is the state-level total impact score of the 2002 Amendment Act, as constructed in Section 2.2. The coefficient β_J of the interaction 2005_t X $2002AmendmentAct_s$ identifies the causal effect of a one-unit improvement in judicial speed on the log odds of choosing voluntary entrepreneurship over worker (or involuntary entrepreneurship over worker). The interaction 1994_t X $2002AmendmentAct_s$ is used as a pre-treatment placebo test: if its coefficient is statistically insignificant, it supports the validity of the parallel trends assumption underlying the difference-in-differences design.

The variable edu_{ist} is a categorical variable that increases with years of education. The variable $\mathbf{x}_{ist}$ denotes a vector of other individual specific controls such as age, gender, religion, marital status, social group etc. Sector of employment controls for Manufacturing/Services are added. State-level controls $\mathbf{d}_{st}$ are included to control for coincidental changes at the state-level that could influence occupational choice behavior. The main alternative dispute resolution mechanism apart from civil courts is the Lok Adalat (people's courts). Therefore, I include the per capita number of cases disposed by Lok Adalats at the state level in the regressions to control for any coincidental improvement in the quality of the Lok Adalats. I also include the growth rate of state-level net domestic product per capita to control for coincidental economic changes. Standard errors are clustered at the state level to account for potential serial correlation within states over time.

4.4 Data

The NSS Employment and Unemployment Surveys served as the primary source of data on labour force indicators at both the national and state levels in India until 2012. These large-scale surveys were typically conducted every five years.[23] The datasets provide detailed information on individual's economic activity status, household and demographic characteristics, and the enterprises in which workers are employed. For this study, I use the 55th round (July 1999–June 2000) and the 61st round (July 2004–June 2005). These are repeated cross-sections, not panel data.

The surveys contain detailed information on individual's occupations. The key variable of interest for measuring occupational outcomes is the "Activity Status." Broad categories include employed, unemployed, and not in the labour force, with further subdivisions such as own-account worker, employer, helper, regular worker, casual worker, unemployed (seeking/available for work), and not working and not available for work.

In mapping these categories to the structural model—which distinguishes between voluntary entrepreneurs, involuntary entrepreneurs, and workers — I proceed as follows. Individuals classified as employers - operating enterprises with hired labor, are assigned to the voluntary entrepreneur category. Those classified as own-account workers- operating enterprises without hired labour) are assigned to the involuntary entrepreneur category. Casual workers and regular workers are combined into a single worker category.[24] Individuals classified as helpers (unpaid family labour), unemployed, or not in the labour force are excluded from the analysis. I also exclude people employed in agriculture from the analysis.

I construct a categorical dependent variable for occupational choice, taking the value 1 for involuntary entrepreneurs, 2 for voluntary entrepreneurs, and 3 for workers.

The surveys contain no direct measures of individual assets or availability of labour-market opportunities. Education may be considered as a proxy for entrepreneurial ability. Other individual-level controls include age, sex, marital status, religion, and social group.[25].

Data on the number of cases resolved through Lok Adalats are obtained from data.gov.in. Information on state-level growth rates and population is drawn from the RBI Handbook of Statistics on Indian States.

[23]Since 2017–18, the Employment and Unemployment Surveys have been replaced by the Periodic Labour Force Surveys (PLFS), which are designed to be conducted annually from 2018–19 onwards.

[24]Regular workers are employed in others' enterprises and receive wages on a regular basis; casual workers are employed on short-term or periodic contracts with wages determined accordingly.

[25]Social group classifications include Scheduled Tribe, Scheduled Caste, Other Backward Class, and Others

4.5 Results

4.5.1 Summary Statistics

Table 5 summarizes the outcome and key explanatory variables in both the pre-policy year (2000) and post-policy year (2005) across low- and high-dose state categories. The low-dose category comprises individuals belonging to states that received an impact score between 34 and 37 under the 2002 Amendment Act, while the high-dose category includes individuals in states with an impact score between 38 and 40.

On average, voluntary entrepreneurs constitute about 2 percent, involuntary entrepreneurs about 30–40 percent, and workers around 55–70 percent of the working population in India (outside of agriculture) across these categories.[26] In the pre-policy period (2000), the interaction term $2005_t \cdot 2002AmendmentAct_s$ takes a value of zero, since the post-reform dummy $2005_t = 0$. In the post-policy period (2005), this interaction variable ranges between 34 and 40, reflecting each state's reform intensity.

Education is coded as a categorical variable from 1 to 6 (1 = not literate; 2 = below primary school; 3 = primary and middle school; 4 = secondary education; 5 = higher secondary education; 6 = graduate and above). On average, individuals have completed schooling upto primary/middle-school level, with considerable heterogeneity across the sample. The sex variable equals 1 for males and 0 for females. Female representation in the working population is relatively low—below 20 percent.

Table 5: Summary Statistics

Year	2000		2005	
	High Dose (38–40)	Low Dose (34–37)	High Dose (38–40)	Low Dose (34–37)
Voluntary Firm Owner	0.0139	0.0096	0.0173	0.0151
	(0.117)	(0.098)	(0.130)	(0.122)
Involuntary Firm Owner	0.317	0.383	0.349	0.409
	(0.465)	(0.486)	(0.477)	(0.492)
Workers	0.669	0.607	0.633	0.576
	(0.471)	(0.488)	(0.482)	(0.494)
2005 · 2002AmendmentAct	0	0	38.027	35.841
	(0)	(0)	(0.230)	(1.087)
Education	3.377	3.329	3.388	3.337
	(1.580)	(1.698)	(1.617)	(1.693)
Sex	0.819	0.882	0.806	0.870
	(0.385)	(0.323)	(0.396)	(0.336)

Note: Standard deviation in parentheses.

[26] In the data, workers are roughly equally distributed between regular and casual categories.

4.6 Regression Results

Table 6: Marginal Effects of Judicial Speed on Occupational Choice (Multinomial Logit)

	Voluntary Entrepreneur (Employer)		Involuntary Entrepreneur (Own-Account Type)		Worker	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Post-Reform						
(2005 · 2002AAct)	-0.0027***	-0.0030***	0.0023	0.0023	0.0004	0.0006
	(0.0009)	(0.0011)	(0.0054)	(0.0054)	(0.0056)	(0.0057)
Panel B: Pre-Reform						
(1994 · 2002AAct)	-0.0027	-0.0030	0.0041	0.0040	-0.0014	-0.0010
	(0.0019)	(0.0022)	(0.0047)	(0.0050)	(0.0052)	(0.0059)
Edu	0.0051***	0.0051***	-0.0401***	-0.0401***	0.0350***	0.0350***
	(0.0002)	(0.0002)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Time, State FE	Yes	Yes	Yes	Yes	Yes	Yes
Indiv Controls	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	No	Yes	No	Yes	No	Yes
Sector Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	286165	286165	286165	286165	286165	286165
Pseudo R^2	0.0804	0.0809	0.0804	0.0809	0.0804	0.0809

Average marginal effects (`margins`) after multinomial logit.
Standard errors in parentheses. Significance: $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

Table 6 reports the marginal effects estimated from multinomial logit regressions of occupational choice on the interaction between the 2002 Amendment Act's state-level impact measure and the post-reform (2005) and pre-reform (1994) periods. Columns (1)–(2) present results for voluntary entrepreneurs (employers), columns (3)–(4) for involuntary entrepreneurs (own-account workers), and columns (5)–(6) for workers. Odd-numbered columns exclude state-level controls, while even-numbered columns include them. All specifications control for individual characteristics (education, age, sex, marital status, religion, and social group), sector controls, state fixed effects, and a common time effect.

The coefficient on the interaction term $2005 \cdot 2002 AmendmentAct$ captures the impact of improved judicial enforcement on occupational choice. The estimated marginal effects correspond to the change in the predicted probability of being in each occupation associated with a one-unit increase in the policy dose, i.e., a one-point improvement in the 2002 Amendment Act impact score. The results indicate a statistically significant decline in voluntary entrepreneurship and a

rise in involuntary entrepreneurship in states that experienced larger gains in judicial efficiency. Specifically, a one-unit increase in the policy dose is associated with a 0.27–0.33 percentage point reduction in the probability of being a voluntary entrepreneur, significant at the 1 percent level, and a 0.30 percentage point increase in the probability of being an involuntary entrepreneur. The marginal effect for workers is positive but relatively small and statistically insignificant.

While these marginal effects appear numerically small, they represent economically meaningful reallocations given India's large working-age population. Interpreted within the model's general equilibrium framework, these results are consistent with the predicted reallocation mechanism: an increase in judicial efficiency (increase in ϕ) relaxes borrowing constraints, which raises both interest rates and wages. The higher cost of labor and capital reduces profitability for marginal voluntary entrepreneurs—particularly those operating near their borrowing limits—prompting exit from formal entrepreneurship and movement into own-account self-employment (involuntary entrepreneurs) or wage work. At the same time, high-ability entrepreneurs expand their scale of operation.

The pre-reform interaction term $1994 \cdot 2002 AmendmentAct$ serves as a placebo test for parallel trends and is statistically insignificant across all occupational groups, indicating that treated and untreated states followed comparable trajectories before the 2002 reform. This reinforces the validity of the difference-in-differences identification.

Education also has a strong and significant effect on occupational outcomes. A higher education level increases the likelihood of being a voluntary entrepreneur, while decreasing the likelihood of being an involuntary entrepreneur. In this context, education can be interpreted as a proxy for entrepreneurial ability—encompassing both cognitive and non-cognitive skills—which further determines the scale of operations and hence the voluntary/involuntary nature of entrepreneurship.

Taken together, these empirical findings are strongly aligned with the mechanisms of the structural model in Section 3. In the model, a higher ϕ raises equilibrium wages and borrowing costs, shifting marginal voluntary entrepreneurs toward informal self-employment, while enabling the most productive firms to expand. The empirical evidence therefore supports the model's central prediction: stronger judicial enforcement leads to a compositional shift within entrepreneurship—away from small voluntary entrepreneurship toward involuntary entrepreneurship (own-account enterprises) or worker—reflecting the transitional adjustment that accompanies financial deepening and better contract enforcement.

5 Conclusion

This paper develops and quantifies a general equilibrium framework to evaluate the role of credit contract enforcement in shaping income disparities across Indian states. The model introduces heterogeneous agents who fall in occupational categories of voluntary entrepreneurship, involuntary entrepreneurship, or wage work, subject to credit enforcement and labor market frictions. State-specific enforcement capacity governs the extent of borrowing constraints, thereby determining the scale of firm operations and the allocation of resources across production units.

Quantitatively, the calibrated model reproduces key cross-state patterns in GDP per capita and firm size distributions. Differences in the degree of credit contract enforcement explain about 6.5 percent of the variation in income per capita across Indian states in 2017–18. States with higher model-implied enforcement parameters also exhibit faster judicial systems, as measured by the speed of resolution of civil cases, confirming that the calibration captures meaningful institutional variation. The model's general equilibrium mechanisms imply that stronger enforcement relaxes credit constraints for productive but asset-poor entrepreneurs, leading to reallocation toward larger and more efficient firms, higher wages, and greater aggregate output.

The empirical analysis corroborates these mechanisms using microdata from three rounds of the National Sample Survey Employment and Unemployment Surveys (1993–94, 1999–2000, and 2004–05) and exploiting cross-state variation in the implementation of the 2002 Civil Procedure Code Amendment Act. The multinomial logit regressions show that improvements in judicial efficiency reduce the likelihood of voluntary entrepreneurship, while increasing the likelihood of on involuntary entrepreneurship and wage work, although the later results are insignificant. Together, the empirical results validate the model's prediction that improvements in enforcement tighten the entry margin for entrepreneurship and increase the average quality of entrepreneurs.

Overall, the findings demonstrate that institutional quality in credit markets—specifically, the effectiveness of contract enforcement—has measurable implications for occupational allocation, resource efficiency, and income disparities. Strengthening the enforcement of credit contracts, through judicial and procedural reforms that accelerate dispute resolution, can thus enhance the productivity of entrepreneurship and narrow regional income gaps. Future work could extend this framework to incorporate dynamic policy reforms, heterogeneity in informal credit enforcement, and interactions with labor and land market frictions to better capture the multifaceted nature of institutional development in emerging economies like India.

A Tables and Figures from Quantitative Analysis

A.1 Tables and Figures from Calibration Approach 1

A.1.1 Tables

Table 7: Mapping State-Level Judicial Speed to Enforcement Parameter (ϕ_S)

State	**Avg. Age of Disposed Cases (yrs.)**	$\boldsymbol{\phi_S}$
Andhra Pradesh	2.81	0.38
Assam	2.48	0.42
Bihar	5.90	0.10
Chhattisgarh	4.80	0.17
Goa	4.25	0.22
Gujarat	5.31	0.13
Haryana	1.89	0.50
Himachal Pradesh	2.65	0.40
Jharkhand	5.00	0.15
Karnataka	3.14	0.34
Kerala	2.16	0.46
Madhya Pradesh	2.80	0.38
Maharashtra	3.91	0.25
Odisha	4.27	0.21
Punjab	2.26	0.45
Rajasthan	4.36	0.21
Tamil Nadu	3.04	0.35
Telangana	3.56	0.29
Uttar Pradesh	4.83	0.17
Uttarakhand	2.85	0.37
West Bengal	5.26	0.14

Table 8: Model-Predicted Outcomes vs Data (Approach 1)

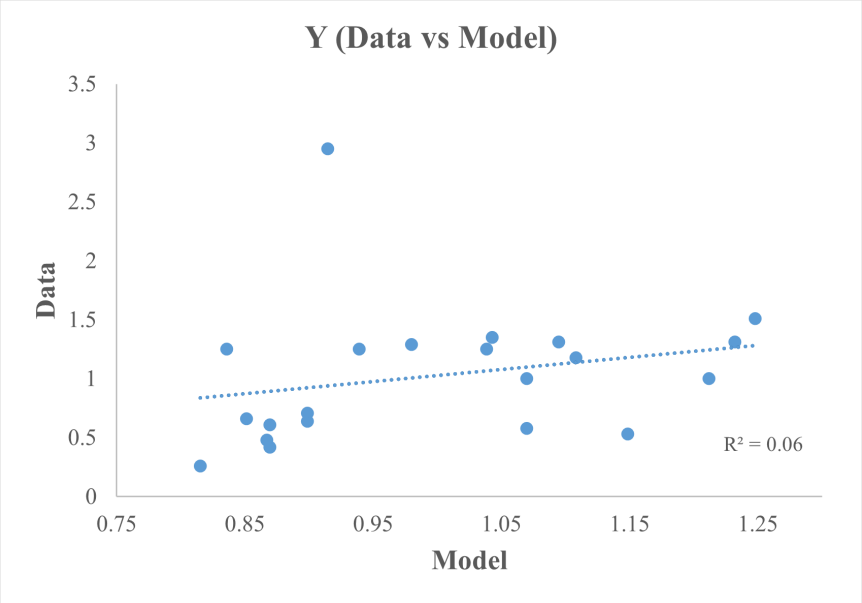
State	ϕ_S	Y^*_{Model}	Y^*_{Data}	**External Finance/ GDP (Model)**	**Bank Credit (Commercial + Regional Rural) / GDP (Data)**	**Avg. voluntary Firm Size* (Model)**	**Avg. voluntary Firm Size* (Data - ASI)**
Andhra Pradesh	0.38	1.07	1.00	0.57	0.42	1.09	0.80
Assam	0.42	1.15	0.53	0.65	0.21	1.10	0.49
Bihar	0.10	0.82	0.26	0.12	0.25	0.61	0.39
Chhattisgarh	0.17	0.87	0.61	0.22	0.31	0.72	0.90
Goa	0.22	0.91	2.95	0.29	0.25	0.95	0.99
Gujarat	0.13	0.84	1.25	0.17	0.37	0.67	1.16
Haryana	0.50	1.25	1.51	0.88	0.34	2.43	1.35
Himachal Pradesh	0.40	1.11	1.18	0.61	0.20	1.16	0.82
Jharkhand	0.15	0.87	0.48	0.19	0.21	0.62	1.05
Karnataka	0.34	1.04	1.35	0.49	0.45	1.06	1.33
Kerala	0.46	1.23	1.31	0.74	0.43	1.11	0.61
Madhya Pradesh	0.38	1.07	0.58	0.59	0.32	1.09	0.96
Maharashtra	0.25	0.94	1.23	0.34	1.03	0.99	1.06
Odisha	0.21	0.90	0.64	0.28	0.25	0.94	1.41
Punjab	0.45	1.21	1.00	0.72	0.48	1.11	0.89
Rajasthan	0.21	0.90	0.71	0.28	0.33	0.94	0.89
Tamil Nadu	0.35	1.04	1.25	0.72	0.56	1.05	1.18
Telangana	0.29	0.98	1.29	0.28	0.62	1.03	1.17
Uttar Pradesh	0.17	0.87	0.42	0.53	0.30	0.72	0.80
Uttarakhand	0.37	1.09	1.31	0.53	0.21	1.09	1.66
West Bengal	0.14	0.85	0.66	0.53	0.39	0.62	1.12

Notes: *Re-scaled values, mean value set to 1.

Calibrated ϕ_S from logistic fit using Bihar (low) and Haryana (high) as reference points.

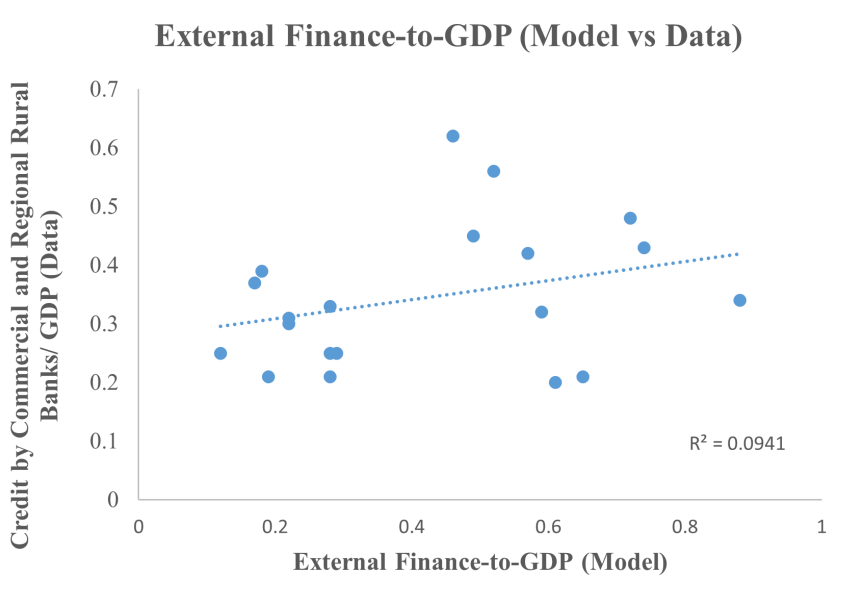
A.1.2 Figures

Figure 3: Predicted vs Observed Output per capita (Approach 1)



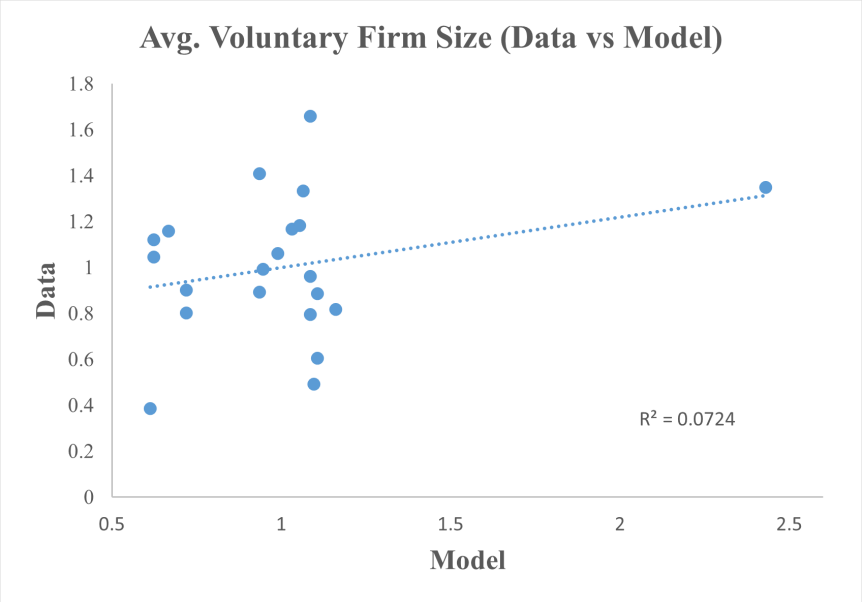
Note: Values on both axis are re-scaled, mean set to 1

Figure 4: Predicted vs Observed Credit-to-GDP (Approach 1)



Note: Maharashtra, identified as an outlier with a disproportionately high credit-to-GDP ratio due to the concentration of national headquarters and financial institutions, has been excluded from this scatter plot.

Figure 5: Predicted vs Observed Avg. Voluntary Firm Size (Approach 1)



Note: Values on both axis are re-scaled, mean set to 1

A.2 Tables and Figures from Calibration Approach 2

A.2.1 Tables

Table 9: Calibrated ϕ_S

State	**Data Moment** (Ext. Fin/GDP)	**Model Moment** (Ext. Fin/GDP)	$\boldsymbol{\phi_S}$
Andhra Pradesh	0.42	0.42	0.30
Assam	0.21	0.21	0.16
Bihar	0.25	0.25	0.19
Chhattisgarh	0.31	0.31	0.23
Goa	0.25	0.25	0.19
Gujarat	0.37	0.37	0.27
Haryana	0.34	0.34	0.25
Himachal Pradesh	0.20	0.20	0.15
Jharkhand	0.21	0.21	0.16
Karnataka	0.45	0.45	0.31
Kerala	0.43	0.43	0.30
Madhya Pradesh	0.32	0.32	0.24
Maharashtra	1.03	1.03	0.56
Odisha	0.25	0.25	0.19
Punjab	0.48	0.48	0.33
Rajasthan	0.33	0.33	0.24
Tamil Nadu	0.56	0.56	0.38
Telangana	0.62	0.62	0.40
Uttar Pradesh	0.30	0.30	0.22
Uttarakhand	0.21	0.21	0.16
West Bengal	0.39	0.39	0.26

Table 10: Data vs. Model-Predicted Outcomes (Approach 2)

State	Y^*_{Model}	Y^*_{Data}	**Avg. voluntary Firm Size* (Model)**	**Avg. voluntary Firm Size* (Data)**
Andhra Pradesh	1.05	1.00	1.11	0.80
Assam	0.89	0.53	0.87	0.49
Bihar	0.95	0.26	0.81	0.39
Chhattisgarh	0.98	0.61	1.00	0.90
Goa	0.95	2.95	0.81	0.99
Gujarat	1.02	1.25	1.09	1.16
Haryana	0.98	1.51	1.11	1.35
Himachal Pradesh	0.91	1.18	0.70	0.82
Jharkhand	0.89	0.48	0.87	1.05
Karnataka	1.06	1.35	1.12	1.33
Kerala	1.05	1.31	1.11	0.61
Madhya Pradesh	0.99	0.58	1.02	0.96
Maharashtra	1.37	1.23	2.64	1.06
Odisha	0.95	0.64	0.81	1.41
Punjab	1.07	1.00	1.18	0.89
Rajasthan	0.99	0.71	1.02	0.89
Tamil Nadu	1.12	1.25	1.21	1.18
Telangana	1.16	1.29	1.22	1.17
Uttar Pradesh	0.96	0.42	1.06	0.80
Uttarakhand	0.89	1.31	0.87	1.66
West Bengal	1.00	0.66	1.08	1.12

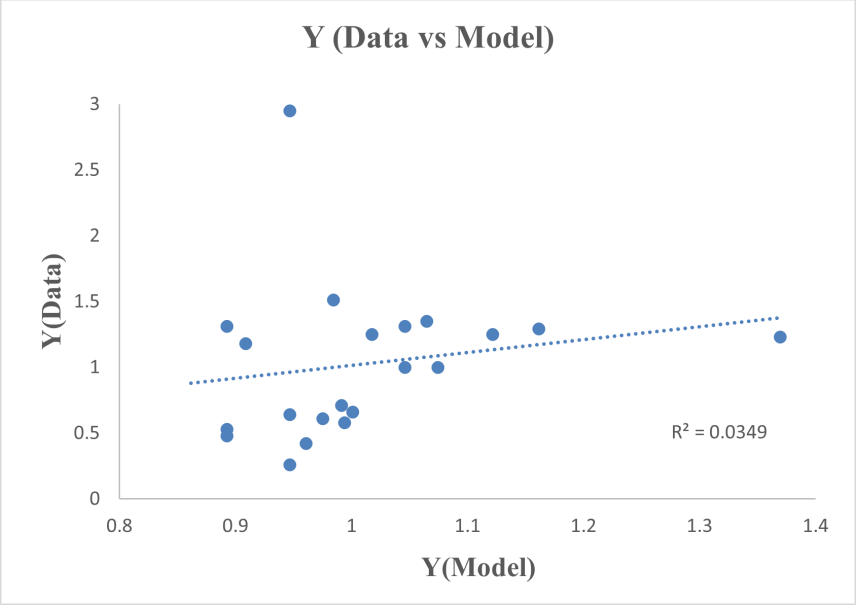
Notes: *Re-scaled values, median State value set to 1.

Table 11: State-level Data on Judicial Speed and Calibrated ϕ_S (Approach 2)

State	$\boldsymbol{\phi_S}$	**Avg. Age of Disposed Cases (yrs.)**
Andhra Pradesh	0.30	2.81
Assam	0.16	2.48
Bihar	0.19	5.90
Chhattisgarh	0.23	4.80
Goa	0.19	4.25
Gujarat	0.27	5.31
Haryana	0.25	1.89
Himachal Pradesh	0.15	2.65
Jharkhand	0.16	5.00
Karnataka	0.31	3.14
Kerala	0.30	2.16
Madhya Pradesh	0.24	2.80
Maharashtra	0.56	3.91
Odisha	0.19	4.27
Punjab	0.33	2.26
Rajasthan	0.24	4.36
Tamil Nadu	0.38	2.98
Telangana	0.40	3.56
Uttar Pradesh	0.22	4.83
Uttarakhand	0.16	2.85
West Bengal	0.26	5.26

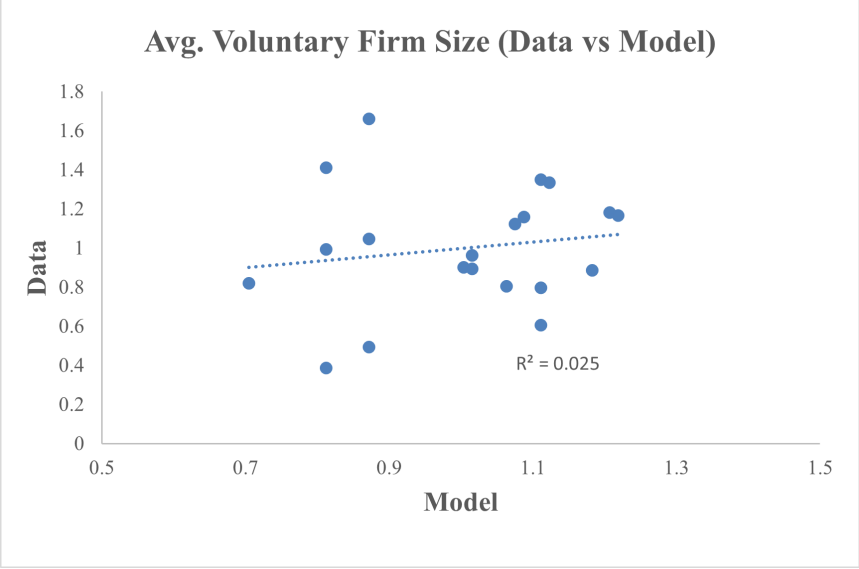
A.2.2 Figures

Figure 6: Predicted vs Observed Output per capita (Approach 2)



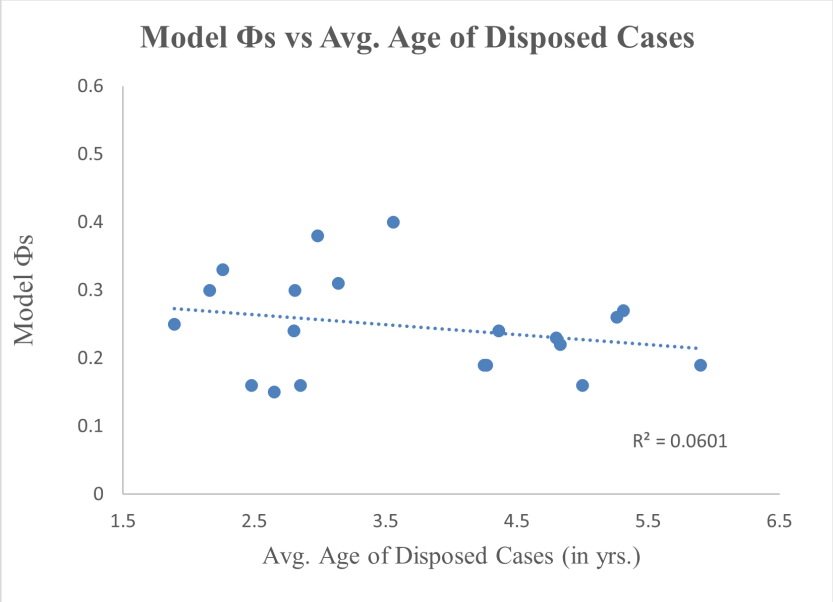
Note: Values on both axis are re-scaled, mean set to 1

Figure 7: Predicted vs Observed Avg. Voluntary Firm Size (Approach 2)



Note: Maharashtra, identified as an outlier with a disproportionately high credit-to-GDP ratio due to the concentration of national headquarters and financial institutions, and therefore has a disproportionately high calibrated (ϕ_S), has been excluded from this scatter plot.

Figure 8: Model Calibrated (ϕ_S) vs State-Level Judicial Speed (Approach 2)



Note: Values on both axis are re-scaled, mean set to 1

Note: Maharashtra, identified as an outlier with a disproportionately high credit-to-GDP ratio due to the concentration of national headquarters and financial institutions, and therefore has a disproportionately high calibrated (ϕ_S), has been excluded from this scatter plot.

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