Lack of Selection and Limits to Delegation: Firm Dynamics in Developing Countries

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Motivation

- Recent literature: Firm dynamics in poor countries show striking differences to those of rich countries
Figure 1: Plant Employment by Age in the Cross-Section

Sources: 1994-1995 ASI-NSS (India), 2003 Economic Census (Mexico), and 2002 Manufacturing Census (U.S.).
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Employment (Age < 5=1)

Age

Sources: 1994-1995 ASI-NSS (India), 2003 Economic Census (Mexico), and 2002 Manufacturing Census (U.S.).
Selection in the US vs (Lack) of selection in India

Share of Small Establishments (Count)

![Graph showing the share of small establishments in the US vs India by age.](image-url)
Selection in the US vs (Lack) of selection in India

**SHARE OF SMALL ESTABLISHMENTS (EMPLOYMENT)**

![Graph showing the share of small establishments in India and the US across different age groups. The graph illustrates a distinct pattern for each country, with India showing a higher share of small establishments in younger age groups compared to the US.](image-url)
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- No intention and/or ability to grow
- Want to keep the business within the family.
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**Transformative entrepreneurs:**
- Create businesses with the intention to innovate and grow
- Create employment for other workers and value added for the economy.
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- No intention and/or ability to grow
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Transformative entrepreneurs:
- Create businesses with the intention to innovate and grow
- Create employment for other workers and value added for the economy.

Why do transformative entrepreneurs not grow in India?
Lack of Selection

- Micro-evidence by Bloom et al:
  - Outside managers misappropriate assets due to weak rule of law.
  - Span of control of the owner is a binding constraint in developing countries.
  - Family size is one of the best predictors of firm size in India.
Lack of Selection

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This paper

Research Question: How much of the observed differences across countries can be explained by delegation frictions?
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1. Theory: Model of growth with limits to managerial delegation
     - Predicts selection and firm-dynamics given firms’ growth incentives
   - Inside: Failure to delegate to outside managers.
     - Links delegation frictions to growth incentives

2. Quantitative exercise
   - Calibrate model to US and Indian microdata
   - Quantify effect of delegation frictions on firm dynamics
Part 1: Theoretical Model
The Model: Environment

- Single consumption good, closed economy

- Two categories of agents
  1. Production workers (mass one)
     - occupational choice: workers or managers
  2. New entrepreneurs enter at the exogenous rate $z$
     - two types: Transformative vs subsistence

- Tractability: Individuals are short-lived
Firms, Innovation, Selection and Growth

- Final good: $\ln Y_t = \int_0^1 \ln y_{jt} dj$

A firm is a collection of production units:

- $q_{j}$: quality level
- $f$: sector
- $f_{1}$, $f_{2}$: firms

Production requires managerial effort $e_{j}$.

Profit in line $j$ is concave in $e_{j}$:

$$\pi_{jft} = e_{\sigma j},$$

where $\sigma \in (0, 1)$. 
Firms, Innovation, Selection and Growth

- Final good: \( \ln Y_t = \int_0^1 \ln y_{jt} \, dj \)
- A firm is a collection of production units:

![Diagram showing quality levels and sectors with firms]
Final good: $\ln Y_t = \int_0^1 \ln y_{jt}dj$

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Firms, Innovation, Selection and Growth

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The supply of managerial effort

Managerial effort $e_j$ provided by

1. entrepreneur
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   - $T$ units of effort
The supply of managerial effort

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- entrepreneur
  - $T$ units of effort
  - inelastically provided
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2. outside managers ("delegation")
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1. entrepreneur
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2. outside managers ("delegation")
   - $\zeta$ units of net effort
Self-employed firms without outside managers

Optimal effort allocation without delegation:

\[
\sum_{j=1}^{n} e_{jft} = T \Rightarrow e_{jft} = e = T / n
\]

Value of the firm is:

\[
\tilde{V}_{self}^t(n) = n \tilde{\pi}_{self}^t = n \left( \frac{T}{n} \right) \sigma = n \left( 1 - \frac{\sigma}{T} \right)
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Self-employed firms without outside managers

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Lucas (78) Firms

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Hiring Outside Managers

- The owner (entrepreneur) can increase managerial services by hiring outside managers.
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Each outside manager brings $\xi$ units of net effort:

$$e_j = \frac{T}{n} + m_j\xi$$
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- $\zeta$ is country-specific delegation benefit and depends on:
Hiring Outside Managers

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$\xi$ is country-specific delegation benefit and depends on:

- rule of law and contractual system
- managerial human capital
- financial development ...
Then the hiring decision of the entrepreneur is

\[ \tilde{V}(n) = \sum_{j}^{n} \max_{m_j \geq 0} \left\{ \left( \frac{T}{n} + \zeta m_j \right)^{\sigma} - \omega m_j \right\} \]

\[ m_j = 0 \text{ if } n < n^* = \left\lceil \frac{T}{\sigma \xi} \right\rceil \]

\[ m_j = \left[ \frac{\sigma \omega}{\sigma - \xi} \right] \text{ if } n \geq n^* \]
Hiring Outside Managers II

- Then the hiring decision of the entrepreneur is
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- Extensive margin of hiring:
  \[ m_j = 0 \text{ if } n < n^* \equiv \left[ T \left( \frac{\omega}{\sigma \xi} \right) \right]^{\frac{1}{1-\sigma}} \]
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The Value of the Firm

- Value of firms with no delegation, \( n < n^* \):

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The Value of the Firm

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- Value of firms with outside managers, $n \geq n^*: $

$$\tilde{V}_t^{\text{manager}} (n) = \frac{\omega T}{\zeta} + n (1 - \sigma) \left( \frac{\zeta \sigma}{\omega} \right)^{\frac{\sigma}{1-\sigma}}$$
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→ Value function is **linear**
Value Function as delegation ($\zeta$) gets easier

$V(n)$ vs. # of product lines, $n$

$V_{self}(n)$
Value Function as delegation ($\xi$) gets easier
Value Function as delegation ($\zeta$) gets easier

Remark: Delegation is crucial to fight decreasing returns.
Value Function as delegation ($\zeta$) gets easier

\[ V(n) = n^* (\xi_L) \]

\[ V_{self}(n) \]

\[ V_{manager}(n) \]

Remark: Delegation is crucial to fight decreasing returns.
Implications of static delegation frictions for dynamic growth incentives
Firm dynamics, selection and creative destruction

- Firms

Grow by stealing products from other firms, shrink if other firms steal products from them, exit if they lose their last product.

Aggregate degree of selection is determined by individual firms’ growth incentives.
Firm dynamics, selection and creative destruction

- Firms
  - grow by stealing products from other firms
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Aggregate degree of selection is determined by individual firms’ growth incentives
Firm types: Innovation potential

- Upon entry, each new entrant draws a firm type $\theta$

$$\theta = \begin{cases} 
\theta^H & \text{with probability } \alpha \\
\theta^L & \text{with probability } 1 - \alpha 
\end{cases}$$

$\theta^H$: Transformative entrepreneurs  
$\theta^L$: Subsistence entrepreneurs

- Cost function for innovation

$$X = \theta R^\zeta n^{1-\zeta}.$$ 

- We set $\theta_L = 0$ for simplicity.
Firm Expansion

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Firm Dynamics in Developing Countries
November 20, 2015
Firm Expansion

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Firm Dynamics in Developing Countries

November 20, 2015 25
Entrepreneur’s Expansion Decisions

\[ W = \max_X \left\{ X \tilde{V}(n + 1) + (1 - X) \tilde{V}(n) - X^{\frac{1}{\zeta}} n^{1 - \frac{1}{\zeta}} \theta^{-\frac{1}{\zeta} \zeta} \right\} \]

which delivers the optimal innovation decision as

\[ X = \theta^{\frac{1}{1-\zeta}} \left[ \tilde{V}(n + 1) - \tilde{V}(n) \right]^{\frac{\zeta}{1-\zeta}} \]
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Balanced Growth Path Eqm exists and it is unique.
Theoretical Predictions/Results

- Balanced Growth Path Eqm exists and it is unique.
- (i) Small \(n\) (firm), (ii) large \(T\) (family size), or (iii) firms in low \(\xi\) (ROL, trust) economies are less likely to delegate.

Family size is strongly correlated with firm size; less so when regional trust is higher.

Firm growth declines in firm size; less so when regional trust is higher.

As \(\xi\) improves, (i) share of low type firms declines, and (ii) average firm size increases.
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\[ m_j = 0 \text{ if } n < n^* \equiv T \left( \frac{\omega}{\sigma \xi} \right)^{\frac{1}{1-\sigma}} \]

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) \\
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<tbody>
<tr>
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<td>Log Growth of Employment</td>
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<td>Log employment</td>
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Plant Level Evidence from India

\[ m_j = 0 \text{ if } n < n^* \equiv \left[ T \left( \frac{\omega}{\sigma \xi} \right)^{\frac{1}{1-\sigma}} \right] \]

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Question:
How powerful is the *managerial delegation mechanism* quantitatively?

I.e., How would the US life-cycle look like if 
\[ \zeta_{US} \rightarrow \zeta_{IND} \]
Data

- Census data from US, Manufacturing Sector
  - Business Dynamics Statistics (BDS)
  - based on Longitudinal Business Database (LBD)

- Firm-level data from India, Manufacturing Sector
  - ASI: Formal manufacturing firms (+20 employees)
  - NSS: Informal manufacturing firms

- US and Cross-country data on management
  - International IPUMS
  - ≈ 50 countries
  - Managerial occupations and human capital
### Table 2: Estimation for the U.S.

#### A. Moments Targeted for the U.S.

<table>
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<tr>
<td>M₁. Entry rate</td>
<td>7.3%</td>
<td>7.3%</td>
</tr>
<tr>
<td>M₂. Mean employment for 21-25 year old firms</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>M₃. Employment share of 21-25 year old firms</td>
<td>8.1%</td>
<td>6%</td>
</tr>
<tr>
<td>M₄. Relative exit rate (age:21-25 to age:1-5 ratio)</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>M₅. Share of manager compensation</td>
<td>49.0%</td>
<td>49.0%</td>
</tr>
<tr>
<td>M₆. Average mark-up</td>
<td>20.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>M₇. Share of managers in workforce</td>
<td>12.6%</td>
<td>12.6%</td>
</tr>
<tr>
<td>M₈. Aggregate growth rate</td>
<td>1.7%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

#### B. Parameters of the U.S.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Interpretation</th>
<th>Target</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ξ</td>
<td>Delegation benefit</td>
<td>Managerial employment share</td>
<td>0.726</td>
</tr>
<tr>
<td>α</td>
<td>Share of high type</td>
<td>Age vs exit profile</td>
<td>0.590</td>
</tr>
<tr>
<td>σ</td>
<td>Curvature of efficiency</td>
<td>Managerial compensation</td>
<td>0.756</td>
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<tr>
<td>T</td>
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<td>Share of non-managerial firms</td>
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</tr>
<tr>
<td>β</td>
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<td>Empl. share of old firms</td>
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<tr>
<td>θ</td>
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<td>Life-cycle</td>
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<tr>
<td>z</td>
<td>Entry flow rate</td>
<td>Rate of entry</td>
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</tr>
<tr>
<td>γ</td>
<td>Innovation step size</td>
<td>Aggregate growth rate</td>
<td>1.167</td>
</tr>
</tbody>
</table>
### Table 2: Estimation for the U.S.

#### A. Moments Targeted for the U.S.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Data</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_1$. Entry rate</td>
<td>7.3%</td>
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</tr>
<tr>
<td>$M_2$. Mean employment for 21-25 year old firms</td>
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<td>2.5</td>
</tr>
<tr>
<td>$M_3$. Employment share of 21-25 year old firms</td>
<td>8.1%</td>
<td>6%</td>
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<tr>
<td>$M_4$. Relative exit rate (age:21-25 to age:1-5 ratio)</td>
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<td>1.6</td>
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<tr>
<td>$M_6$. Average mark-up</td>
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<tr>
<td>$M_7$. Share of managers in workforce</td>
<td>12.6%</td>
<td>12.6%</td>
</tr>
<tr>
<td>$M_8$. Aggregate growth rate</td>
<td>1.7%</td>
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#### B. Parameters of the U.S.

<table>
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<th>Parameter</th>
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<td>1.167</td>
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</table>
## Table 3: Estimation for India

### A. Moments Targeted for India

<table>
<thead>
<tr>
<th>Moment</th>
<th>Data</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>$M_1$. Entry rate</td>
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</tr>
<tr>
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<td>1.1</td>
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<td>$M_3$. Employment share of 21-25 year old firms</td>
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<td>1.1</td>
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<td>$M_5$. Share of managers in workforce</td>
<td>1.5%</td>
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</tr>
<tr>
<td>$M_6$. Aggregate growth rate of TFP</td>
<td>2.6%</td>
<td>2.6%</td>
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</tbody>
</table>

### B. Parameter Calibration for India

<table>
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<th>Parameter</th>
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<th>Target</th>
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<tbody>
<tr>
<td>$\xi$</td>
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<td>$\alpha$</td>
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## India Estimation

### Table 3: Estimation for India

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Notes: In Panel A we report both the data moments (column 1) and the corresponding moments in the model (column 2). The share of managers in the workforce is calculated from IPUMS. The aggregate growth rate is an estimate of the Indian growth rate from the Penn World Tables for the years 1980-2005. All remaining moments stem directly from the 2010 microdata of Indian manufacturing plants, i.e. the ASI and the NSS. See Appendix for details. In Panel B we report the corresponding parameter estimates that yield the moments reported in the column 2 of panel A.

24 Entering firms in India have the ability to expand (compared to around 60% in the US) and their technology to expand is quite unproductive as $\theta_{\text{IND}} < \theta_{\text{US}}$.

25 In Figure 6 we again compare the entire life-cycle profile with the one observed in the data. As was the case for the US, the model essentially matches the observed life-cycle even though we only calibrated to the target moment of the 21-25 year old firms in Table 3.

Non-targeted Moments

The model is also broadly consistent with additional non-targeted moments. Consider first the aggregate importance of firms, who do not delegate decision power. The model predicts that in India firms without any outside managers should have an employment share of 79%. As the Indian microdata contains information on managerial hiring we can calculate this moment in the data. We find that firms without any managers account for 78% of aggregate employment.

25 In the US, the model predicts an employment share of firm without delegation of zero, i.e. in equilibrium all firms are hiring outside managers. This difference in the extensive...
Implied Lifecycles

Figure 5: Life Cycle of US Plants

Figure 6: Life Cycle of Indian Plants

Notes: The figure depicts the cross-sectional age-size relationship, i.e. average plant employment as a function of age. Figure 5 focuses on the US. The data corresponds to the population of US manufacturing plants in 2012 and is taken from the BDS. The model corresponds to the US parametrization reported in Table 2. Figure 6 focuses on India. The data corresponds to the Indian manufacturing plants in 2010 and is taken from the ASI and the NSS. The model corresponds to the Indian parametrization reported in Table 3.

Managerial compensation, as the Indian data for informal firms in the NSS does not allow us to convincingly calculate profits. Therefore we keep $T$ and $\sigma$ constant at their respective US values when calibrating the model to the Indian data and only calibrate the six remaining parameters. We will, however, discuss the model’s implication for these two non-targeted moments below and we provide additional robustness checks in Section C.3.1 in the Appendix.

The results for India calibration are contained in Table 3 below. The first four moments again pertain to the process of firm dynamics. While the entry rate and the employment share of old plants in India is in fact almost the same as in the US, both the life-cycle and the age-profile of exit rates differ markedly. While 21-25 year old plants in the US are about 2.5 times as big as young plants, old plants in India are hardly bigger than young plants - on average they grew by 12% conditional on survival. One reason for this shallow profile is that there is less selection in India. In particular, in contrast to the US, young plants exit almost at the same rate as old plants conditional on size. In our model, this fact implies that the share of high types within a cohort does not strongly increase as the cohort ages, that is the economy is characterized by little selection.

Finally, the share of managerial employment is only 1.5% and the rate of aggregate TFP growth between 1980 and 2005 about 2.5%.

Column 2 of Panel A in Table 3 shows that we can calibrate the model to match the Indian moments exactly. The resulting parameters are contained in Panel B. In particular, the delegation benefits $\xi_{IND}$ are estimated to be substantially lower than the US level to successfully match the small share of outside managers. The other main differences between India and the US relate to the importance of high-type firms ($\alpha$) and the costs to expansion ($\theta$). Specifically, merely 13% of...
Implied Selection

Figure 7: Share of Small Firms (Data vs Model)

Notes: Figure 7 shows the share of small firms by age in the model (solid lines) and the data (dashed lines).
For the US we define small firms as all plants with 1-4 employees. For India we define small firms as all plants with a single hired employee. The data for the US corresponds to the population of US manufacturing plants in 2012 and stems from the BDS. The data for India corresponds to the Indian manufacturing plants in 2010 and is taken from the ASI and the NSS. The parameters for the respective models are contained in Tables 2 and 3.

Figure 8 plots this share both for the US and India. There are two results that stand out. First, the share of high-type firms in the US is significantly bigger among the entering cohort as $\alpha_{US} > \alpha_{IND}$. Second, high-type firms grow faster in the US creating a much stronger selection force. While the share of high-type firms with age 20+ is essentially 100% in the US, high-types are still in the minority among old plants in India: even for 30 year old plants, more than half of them are low types in India. How much of this lack of selection is due to the fact that there are simply very few high-type firms in India to begin with? The answer to this question is depicted by the light blue line in Figure 8, where we simulate a counterfactual cohort in the US economy, which starts with the initial type distribution of India, i.e. where the initial share of high-types was $\alpha_{IND}$. It is clearly seen that the missing growth incentives of existing high-types in India are a key aspect of the selection dynamics. By the age of 25, the cohort would again be only populated by high-type firms despite the few high-type firms in the beginning. Hence, as long as existing innovative firms have the right playing field, few of these firms might be enough to create quantitatively important selection dynamics by pushing out low-type firms quickly.

Finally, we summarize some of the quantitative implications in Table 4. As suggested by Figure 8, high type firms are of limited importance for the Indian economy. In the stationary distribution in the US, around 90% of firms are high types (compared to roughly 60% at the time of entry) and they have a combined market share of 96% as they are bigger on average. In India high type firms account for only for 32% of firms and 40% of aggregate employment. The reason for these differences is of course that dynamic firms in the US have a substantially higher average innovation rate than in India. These missing expansion incentives for high-type firms in India allow low-type firms...
Implied Selection

![Graph showing the share of high-type firms over age. The x-axis represents age in years (0 to 30), and the y-axis represents the share of high-type firms (0 to 1). The graph indicates an increasing share of high-type firms with age, peaking around age 15-20 before stabilizing. A line marked 'US' is present, suggesting a comparison to a specific country or dataset.](image-url)
Implied Selection

The figure illustrates the share of high-type firms over age for different countries. The x-axis represents the age of firms, while the y-axis shows the share of high-type firms. Two lines are depicted: one for the US (black) and another for India (red). The line for the US shows a steady increase in the share of high-type firms with age, reaching nearly 1 by age 30. In contrast, the line for India is much lower and shows a slower increase, remaining below 0.5 even at age 30.
Implied Selection

![Graph showing the share of high-type firms over age for India, US, and US with IND.](graph)

- **India**
- **US**
- **US with IND**

**Axes:**
- **X-axis:** Age (0, 5, 10, 15, 20, 25, 30)
- **Y-axis:** Share of High-Type Firms (0.2, 0.4, 0.6, 0.8, 1)

**Legend:**
- Red circles: India
- Black circles: US
- Blue circles: US with IND

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Firm Dynamics in Developing Countries

November 20, 2015 35
Implied Selection

The graph illustrates the mean employment for different age groups in India and the US. The data shows a consistent increase in employment with age, with the US having higher employment rates compared to India, especially in the +26 age group.

Explains 30-40% of the observed gap.

Akcigit, Alp, Peters
Firm Dynamics in Developing Countries
November 20, 2015

36
Explains 30-40% of the observed gap.
If the US economy had the same managerial share as the Indian economy, what would be the corresponding $\zeta$ and how would that affect the firm life cycle?

**Strategy:**
- Keep all parameters at the US level except $\zeta_{IND}$.
- Change $\zeta_{IND}$ to hit Indian managerial share.
- Plot the life-cycle with this new $\zeta_{IND}$. 
Implied Selection

![Graph showing mean employment by age for US, India, and US with \( \xi_{\text{IND}} \).](image)

- **US**
- **India**
- **US w/ \( \xi_{\text{IND}} \)**

**Age Categories:**
- 0-5
- 6-10
- 11-15
- 16-20
- 21-25
- +26
Implied Selection

![Graph showing the relationship between mean employment and age, with lines for US, India, US w/ $\xi^{P}$, US w/ $\xi_{IND}$, and US w/ $\xi_{IND}$ representing different scenarios or conditions. The graph illustrates the varying trends in mean employment across different age groups.](image-url)
Why do we need lower $\xi$ for India?

Counterfactual Exercise 1

- Keep the delegation environment at the US level

Resulting managerial employment share is 13.1%, which is even higher than the US level.
Why do we need lower $\xi$ for India?

**Counterfactual Exercise 1**

- Keep the delegation environment at the US level
- Recalibrate $(\alpha, \theta, z, \beta)$, to match Indian firm dynamics, except the managerial employment share.
Why do we need lower $\xi$ for India?

**Counterfactual Exercise 1**

- Keep the delegation environment at the US level
- Recalibrate $(\alpha, \theta, z, \beta)$, to match Indian firm dynamics, except the managerial employment share.
- Resulting managerial employment share is 13.1%, which is even higher than the US level.
Why do we need lower $\xi$ for India?

Counterfactual Exercise 2: Other Possible Margins
Decomposing Delegation Benefits $\zeta$

- Try to decompose delegation benefit $\zeta$ into:
  
  \[ c = \beta_0 + \beta_1 \times \text{ROL} + \beta_2 \times \text{HC} + \beta_3 \times \text{FinDev} \]

  How to estimate $\beta$'s?
Decomposing Delegation Benefits $\zeta$

- Try to decompose delegation benefit $\zeta$ into:
  - rule of law
Decomposing Delegation Benefits $\zeta$

- Try to decompose delegation benefit $\zeta$ into:
  - rule of law
  - human capital

Accounting exercise using $c = \beta_0 + \beta_1 \times ROL_c + \beta_2 \times HC_c + \beta_3 \times FinDev_c$

How to estimate $\beta$'s?
Decomposing Delegation Benefits $\xi$

- Try to decompose delegation benefit $\xi$ into:
  - rule of law
  - human capital
  - financial development

Accounting exercise using $c = \xi (HC, ROL, FD)$

More specifically:

$$c = \beta_0 + \beta_1 \times ROL + \beta_2 \times HC + \beta_3 \times FinDev$$

How to estimate $\beta$'s?
Decomposing Delegation Benefits $\zeta$

- Try to decompose delegation benefit $\zeta$ into:
  - rule of law
  - human capital
  - financial development

- Accounting exercise using

$$\zeta_c = \zeta(HC_c, ROL_c, FD_c)$$

How to estimate $\beta$'s?
Decomposing Delegation Benefits \( \zeta \)

- Try to decompose delegation benefit \( \zeta \) into:
  - rule of law
  - human capital
  - financial development

- Accounting exercise using
  
  \[ \zeta_c = \zeta(HC_c, ROL_c, FD_c) \]

- More specifically:
  
  \[ \zeta_c = \beta_0 + \beta_1 \times ROL_c + \beta_2 \times HC_c + \beta_3 \times FinDev_c \]
Decomposing Delegation Benefits $\zeta$

- Try to decompose delegation benefit $\zeta$ into:
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- Accounting exercise using
  \[ \zeta_c = \zeta(HC_c, ROL_c, FD_c) \]

- More specifically:
  \[ \zeta_c = \beta_0 + \beta_1 \times ROL_c + \beta_2 \times HC_c + \beta_3 \times FinDev_c \]

- How to estimate $\beta$’s?
Estimating $\beta$ using "GMM"

- 53 countries
- Match the cross-country data on managerial employment shares as closely as possible given the data on HC, ROL and FD.
- Keep all other structural parameters at the US benchmark.
- Bootstrap
Decomposing the US life-cycle
Table: Decomposition of Life-Cycle Differences by Cohort Age

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
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<tbody>
<tr>
<td></td>
<td>6-10</td>
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<tr>
<td>Human Capital</td>
<td>53.5</td>
</tr>
<tr>
<td>Rule of Law</td>
<td>43.8</td>
</tr>
<tr>
<td>Financial Development</td>
<td>2.60</td>
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</tbody>
</table>
Decomposing the US life-cycle (21-25 year old Firms)
Conclusion

- A new model of firm dynamics with
  - Selection effects
  - Frictions to managerial delegation
- Theoretical mechanism: Delegation, decreasing returns and growth incentives
- Delegation margin is quantitatively important for cross-country differences in firm dynamics
Identification I

- $\alpha$: probability of being high type

*Exit and Age conditional on size (1-4 Worker Establishments)*
Identification I

- $\alpha$: probability of being high type
- ξ: delegation benefit
- Target: share of managers
Example of a Contractual Game: How is $\zeta$ determined?
Imperfect Managerial Contracts

- Each manager gets paid $w$
- Manager can shirk on the job: effort $\in \{0, 1\}$
- Each manager brings $\eta$ (in terms of managerial time) if effort $= 1$
- Shirking has private benefit of $bw$
- Owner can monitor the manager
  - By spending $s$ units of time, manager is caught with probability $\phi s$
  - Court (correctly) concludes that manager was shirking with probability $\kappa$
  - If court decides in favor of the owner, the manager does not need to be paid
Managerial incentive constraint: Exert effort iff

\[ w \geq bw + w (1 - \kappa s\phi) \]

Manager behaves as long as

\[ s \geq \frac{b}{\kappa \phi} \]
The (Net) Benefit of Delegation

- Total managerial effort when hiring $m$ managers:

$$e = \frac{T}{n} + \eta m_j - s m_j$$

$$= \frac{T}{n} + \left( \eta - \frac{b}{\kappa \phi} \right) m_j$$

$$= \frac{T}{n} + \xi (\eta, \phi, \kappa) \times m_j$$

- Delegation benefit $\xi$ is large if
  1. legal system works well ($\kappa$ high)
  2. managerial human capital is high ($\eta$ high)
  3. the monitoring technology is efficient ($\phi$ high)
Importance of Endogenous Exit


Exit Rates by Age

(Source: Hsieh and Klenow (2014))
Importance of Selection, $\alpha$
Exit of 1-product Firms by Age

Figure: ROLE OF $\alpha$

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Appendix
Lack of selection in India

- Avg firm in India is small because tiny producers do not exit
Lack of selection in India

- Avg firm in India is small because tiny producers do not exit

![Graph showing share of small firms by age](image-url)

Share of small Firms by Age

- Share of firms with at most 2 workers
- Age

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Firm Dynamics in Developing Countries

November 20, 2015
Lack of selection in India

- Avg firm in India is small because tiny producers do not exit

![Graph showing share of small firms by age](image)

- Small firms also enter in the US ... but they exit quickly (Hurst, Pugsley 2012)
Selection in the US

- Many small firms also in the US ....
- ... but they do not matter as much and exit quickly

**Small Entrepreneurs in the US (Hurst and Pugsley, 2012)**

<table>
<thead>
<tr>
<th></th>
<th>Share of firms with less than 20 employees</th>
<th>Share of aggregate employment in firms with less than 20 employees</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>0-10 Years Old</td>
<td>10-25 Years Old</td>
</tr>
<tr>
<td>U.S (2005)</td>
<td>85.5</td>
<td>71.5</td>
</tr>
<tr>
<td>India (1995)</td>
<td>99.3</td>
<td>99.5</td>
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</tbody>
</table>

**Table 1: Importance of small firms across age: US versus India**
Figure 3: Average Product and Firm Size

value-added/capital
value-added/worker
gross output/
intermediate inputs

India (2011)

Data source: Hsieh and Olken (2014)
Alternative Story: Size-dependent Policies?

Labor market regulations at 100 employees.

Data source: Akcigit, Alp, Peters (2014)
## Table: Matrix of %ΔMoments / %ΔParameters

<table>
<thead>
<tr>
<th></th>
<th>$z$</th>
<th>$\alpha$</th>
<th>$\sigma$</th>
<th>$T$</th>
<th>$\theta$</th>
<th>$\gamma$</th>
<th>$\xi$</th>
<th>$\beta$</th>
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<td>mean employment 26+</td>
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<td>-25</td>
<td>0</td>
<td>14</td>
<td>-7</td>
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<td>7</td>
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<tr>
<td>employment share 26+</td>
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<td>-2</td>
<td>-0</td>
<td>1</td>
<td>-1</td>
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<td>-0</td>
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<td>aggregate growth</td>
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<td>0</td>
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<td>-20</td>
<td>-0</td>
<td>0</td>
<td>-0</td>
<td>14</td>
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<td>entry rate</td>
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<td>-29</td>
<td>0</td>
<td>16</td>
<td>-7</td>
<td>11</td>
<td>-2</td>
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<td>1</td>
<td>10</td>
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<td>exit ratio</td>
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<td>-14</td>
<td>-12</td>
<td>2</td>
<td>-5</td>
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<td>-6</td>
<td>-12</td>
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<tr>
<td>share of selfemployed</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Job Destruction from Establishment Exit by Firm Age

DATA SOURCE: HALTIWANGER ET. AL. (2013)
Selection in the Data (2)

**Exit and Age conditional on size (Establishments)**

Data source: Haltiwanger et. al. (2013)
Part 2: Theoretical Predictions and Empirical Correlations
Theoretical Predictions

Prediction 1  
*Everything else equal, the probability of hiring an outside manager and, conditional on hiring, the number of outside managers is*

*(i) increasing in firm size \( n \),
(ii) decreasing in the owner’s time \( T \), and
(iii) increasing in the rule of law \( \kappa \).*
Theoretical Predictions

Prediction 2  Average firm size $n$
(i) increases in the owner’s time $T$,
(ii) increases in the rule of law $\kappa$, and
(iii) the positive relationship between firm size $n$ and the owner’s time $T$ becomes weaker as the rule of law $\kappa$ improves.
Theoretical Predictions

Prediction 3  *Firm growth decreases in firm size, more so when the rule of law $\kappa$ is weaker.*
Management and Contracts: Cross-country evidence

- **Contractual frictions:**
  1. reduce aggregate importance of managerial position
  2. increase reliance of self-employment
  3. reduce delegation of authority within firms
## Cross-Country Variation

### Managerial Employment Share

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
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<td>rule of law</td>
<td>0.044**</td>
<td>0.036*</td>
<td>0.042*</td>
<td>0.066***</td>
<td>0.062**</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.020)</td>
<td>(0.023)</td>
<td>(0.020)</td>
<td>(0.023)</td>
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<td>human capital</td>
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<td></td>
<td></td>
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<td></td>
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<td>(0.006)</td>
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</tr>
<tr>
<td>bank deposits</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(0.007)</td>
<td>(0.015)</td>
<td></td>
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<tr>
<td>N</td>
<td>46</td>
<td>45</td>
<td>37</td>
<td>43</td>
<td>35</td>
</tr>
<tr>
<td>R2</td>
<td>0.60</td>
<td>0.60</td>
<td>0.61</td>
<td>0.64</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Notes: All specifications control for log GDP per capita.
### Cross-Country Variation (Rajan & Zingales, 1998)

<table>
<thead>
<tr>
<th>Employment Share (1)</th>
<th>Share of Managers (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{Rule of law} \times \text{managerial dependence} )</td>
<td>0.817***</td>
</tr>
<tr>
<td>( \text{managerial dependence} )</td>
<td>(0.160)</td>
</tr>
</tbody>
</table>

| N       | 815 | 697 |
| R2      | 0.59 | 0.41 |

Notes: All specifications control for country and sector fixed effects.
## Cross-Country Variation

<table>
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<td>0.70</td>
</tr>
</tbody>
</table>

Notes: All specifications control for log GDP per capita.
## List of Occupations in IPUMS

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislators, senior officials and managers</td>
<td>Plant and machine operators and assemblers</td>
</tr>
<tr>
<td>Professionals</td>
<td>Elementary occupations</td>
</tr>
<tr>
<td>Technicians and associate professionals</td>
<td>Armed forces</td>
</tr>
<tr>
<td>Clerks</td>
<td>Other occupations, unspecified or n.e.c.</td>
</tr>
<tr>
<td>Service workers and shop and market sales</td>
<td>Response suppressed</td>
</tr>
<tr>
<td>Skilled agricultural and fishery workers</td>
<td>Unknown</td>
</tr>
<tr>
<td>Crafts and related trades workers</td>
<td>NIU (not in universe)</td>
</tr>
</tbody>
</table>

Table 2: List of occupations
Occupations in Indian Manufacturing

- Manufacture of market basketry
- Manufacture of cotton
- Manufacturing of structural wooden goods
- Manufacture of jewellery of gold
- Manufacture of furniture made of wood
- Zari work and other ornamental trimmings
- Embroidery work
- Flour milling
- Manufacture of bidi
- Custom tailoring

Share