

# Skill Bias, Financial Frictions, and Selection into Entrepreneurship

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## Motivation

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- Financial frictions lower TFP and thus GDP per capita.
  - Misallocate entrepreneurial talent, discourage entrepreneurship, etc.
  - Entrepreneurs **hire** wage workers to produce.  
(e.g., Buera et. al, 2011; Midrigan and Xu, 2014)
- However, microcredit RCTs in developing countries only find “modestly positive effects” on income and welfare (Banerjee et. al, 2015).
  - The majority of entrepreneurs **do not hire** anyone.
  - They account for  $\approx 80\%$  of the labor force in low-income countries.

## This Paper

- Distinguishes between two types of entrepreneurs using micro data from 77 countries across all income levels
  - Employers: self-employed and hire at least one paid employee
  - Own-account workers: independent workers without paid employees
- Introduces skill-biased technological change to account for the patterns
- Overlooking own-account entrepreneurs in poor countries significantly overestimates the effects of removing financial frictions
- ⇒ Reconciles diverse findings on entrepreneurship and development

## This Paper: Empirical Findings

- Labor force share patterns
  - Log GDP per capita  $\uparrow$  1 unit is associated with
    - Own-account employment  $\downarrow$  20 p.p.
    - Employers' share  $\uparrow$  1.4 p.p.

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    - Employers' share  $\uparrow$  1.4 p.p.
- Selection on education into entrepreneurship
  - *Negative* selection into own-account workers
  - *Positive* selection into employers

## This Paper: Model

- Two-sector model with occupational choices
  - Modern sector with rewards to ability (employers, wage workers)
  - Traditional sector without rewards to ability (own-account workers)
  - Agents are heterogeneous in ability and wealth
  - Self-employed face financial frictions in terms of *borrowing constraints*

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  - Traditional sector without rewards to ability (own-account workers)
  - Agents are heterogeneous in ability and wealth
  - Self-employed face financial frictions in terms of *borrowing constraints*
- Exogenous differences across countries
  - Skill-biased technological progress: modern-to-traditional productivity
  - Financial development level: collateral constraints
- Calibrated model accounts for the cross-country empirical findings

## This Paper: Preview of Quantitative Results

Upon removing financial frictions in low-income countries,

- Calibrated model predicts GDP per capita  $\uparrow$  **20%**
  - 20% increase in modern-sector TFP (vs. 2%  $\uparrow$  traditional-sector TFP)



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- Mechanism: reallocation of employment
  - Within the modern sector
  - Between two sectors: 6%  $\downarrow$  in own-account employment
- Alternative skill-neutral model
  - underpredicts own-account employment (by  $> 60\%$ )
  - overpredicts output gain by 12 p.p.

- Entrepreneurship and financial frictions in macroeconomics
  - Buera et. al (2011), Midrigan and Xu (2014), Moll (2014), etc.
  - Herreno and Ocampo (2021), Allub and Erosa (2019), Gu (2021)
- Evaluation of microcredit projects
  - *Micro (RCT)*: Angelucci et al. (2015), Attanasio et al. (2015), Augsburg et al. (2015), Banerjee et al. (2015, 2017), etc.
  - *Macro*: Buera et. al (2020): do not consider own-account workers
- Labor share patterns across countries
  - Gollin (2007), La Porta and Schleifer (2014), etc.
  - Poschke (2019): focus on self-employment versus unemployment

## Outline

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Empirical Findings

Model

Calibration

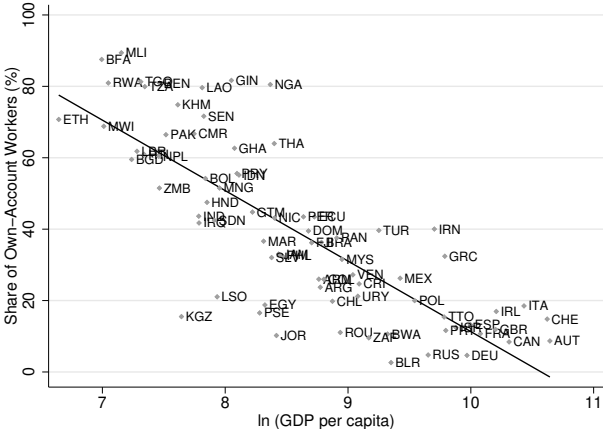
Counterfactual Experiments

## Data

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- Main data: IPUMS-International
  - National representative census and surveys
  - 246 country-year surveys across 77 countries
- Three occupations [Detailed Categorization](#)
  - Own-account workers: self-employed without employees
  - Employers: self-employed with at least one employee
  - Wage workers
- Benchmark analysis covers all industries, and the results are robust within each industry.

# Own-account Workers and Development



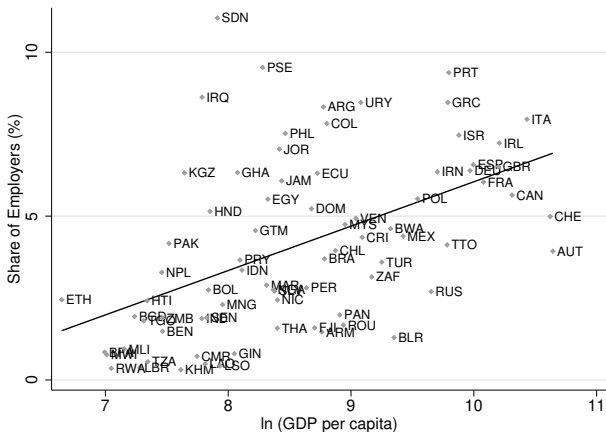
Regression Results

Sectoral Analysis

Sectoral Regression

U.S. Time-series

## Employers and Development



Regression Results

Sectoral Analysis

Sectoral Regression

U.S. Time-series

## Selection into Two Types of Entrepreneurship

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Multinomial probit model to estimate education's effect on occupational choices

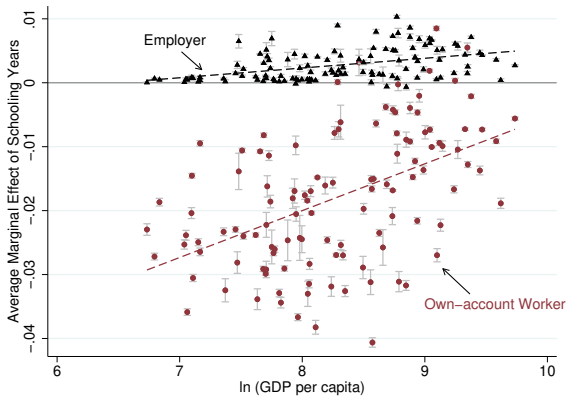
$$v_i = \arg \max_{j \in \{o, w, e\}} \{v_{io}^*, v_{iw}^*, v_{ie}^*\}$$

$$v_{ij}^* = \alpha_j + \beta_j yrs_i + \eta_j X_i + \epsilon_{ij}$$

- *Number of Years of Schooling* as the measure of education,  $yrs_i \in \{0, 1, \dots, 18\}$
- Control variables include age, age squared, nativity status, urban status
- 117 country-year surveys



## Average Marginal Effects of Edu. on Occupational Choices



Secondary School Completion

U.S.

## Outline

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Empirical Findings

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## Model

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- A continuum of infinitely lived agents with measure 1
  - Heterogeneous ability  $h \sim cdf \mu(h)$  with constant hazard rate  $1 - \lambda$
  - Heterogeneous wealth  $a$

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- Production
  - Traditional Sector:  $y_T = A_T k^\eta$  ( $\eta = 0$  in benchmark)
  - Modern Sector:  $y_M = A_M h \left( l^\alpha k^{1-\alpha} \right)^\gamma$

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  - Modern Sector:  $y_M = A_M h \left( l^\alpha k^{1-\alpha} \right)^\gamma$
- Preference

$$u(c_T, c_M) = \frac{1}{1 - \sigma} [\theta c_T^{1-1/\rho} + (1 - \theta) c_M^{1-1/\rho}]^{\frac{\rho(1-\sigma)}{\rho-1}}$$

## Occupational Choice

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The flow income of the individual indexed by ability  $h$  and wealth  $a$  is

- Own-Account Worker:  $I^o(h, a) = p_T y_T$  s.t.  $k \leq \phi a$
- Wage Worker:  $I^w(h, a) = wh$
- Employer: financial friction is summarized by  $\phi \geq 1$

$$I^e(h, a) = \max_{k, l > 0} A_M h \left( I^\alpha k^{1-\alpha} \right)^\gamma - wl - (r + \delta)k$$

s.t.  $k \leq \phi a$

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$$\text{s.t.} \quad k \leq \phi a$$

The value function is

$$v(h, a) = \max_{j \in \{o, w, e\}} \{v^o(h, a), v^w(h, a), v^e(h, a)\} \quad (1)$$
$$v^j(h, a) = \max_{c_T, c_M, a'} u(c_T, c_M) + \beta \{ \lambda v(h, a') + (1 - \lambda) \mathbb{E}_{h'} [v(h', a')] \}$$
$$\text{s.t.} \quad p_T c_T + c_M + a' \leq I^j(h, a) + (1 + r)a$$

## Stationary Equilibrium

A stationary competitive equilibrium is composed of an invariant distribution of ability and wealth  $G(h, a)$ ; agents' policy functions  $c_T(h, a)$ ,  $c_M(h, a)$ ,  $a'(h, a)$  and  $j(h, a)$ ; employers' policy function  $l(h, a)$  and  $k(h, a)$ ; and prices  $p_T$ ,  $w$  and  $r$  such that:

1. Given prices  $p_T$ ,  $w$  and  $r$ , the policy functions  $c_T(h, a)$ ,  $c_M(h, a)$ ,  $a'(h, a)$ ,  $j(h, a)$ ,  $k(h, a)$  and  $l(h, a)$  solve individuals' problem (1);
2. Asset, labor, traditional and modern sector goods markets clear, respectively,

$$K \equiv \int_{\{(h,a)|j(h,a)=e\}} k(h, a)G(dh, da) = \int_{h,a} a(h, a)G(dh, da), \quad (\text{Asset})$$

$$\int_{\{(h,a)|j(h,a)=e\}} l(h, a)G(dh, da) = \int_{\{(h,a)|j(h,a)=w\}} hG(dh, da), \quad (\text{Labor})$$

$$\int_{h,a} c_T(h, a)G(dh, da) = \int_{\{(h,a)|j(h,a)=o\}} A_T G(dh, da),$$

(Traditional Sector Goods)

$$\int_{h,a} c_M(h, a)G(dh, da) + \delta K = \int_{\{(h,a)|j(h,a)=e\}} A_M h (l^\alpha k^{1-\alpha})^\gamma G(dh, da);$$

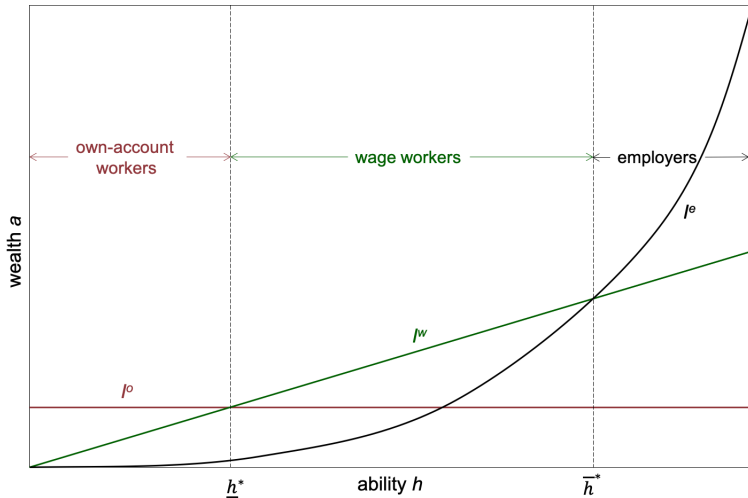
(Modern Sector Goods)

3. The joint distribution of ability and wealth is stationary:

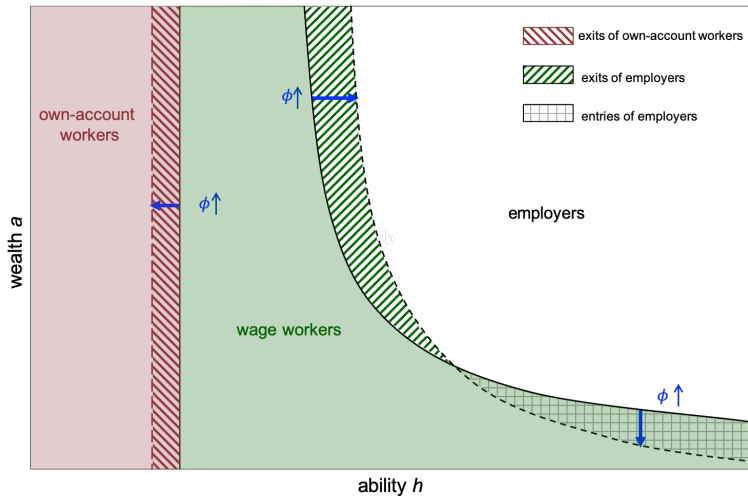
$$G(h, a) = \lambda \int_{\{(\tilde{h}, \tilde{a})|\tilde{h} \leq h, a'(\tilde{h}, \tilde{a}) \leq a\}} G(d\tilde{h}, d\tilde{a}) + (1-\lambda)\mu(h) \int_{\{(\tilde{h}, \tilde{a})|a'(\tilde{h}, \tilde{a}) \leq a\}} G(d\tilde{h}, d\tilde{a}).$$



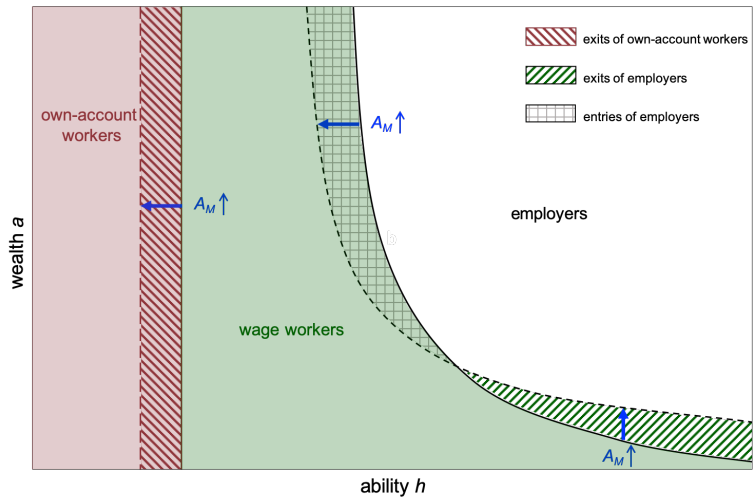
Model Prediction: No Financial Frictions,  $\phi \rightarrow \infty$



## Comparative Statics: When $\phi$ Increases



## Comparative Statics: When $A_M$ Increases



## Outline

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Empirical Findings

Model

Calibration

Counterfactual Experiments

## Calibration Strategy

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- Calibrate to match
  - key moments of the U.S. economy in 2000/2001
  - cross-country pattern of own-account employment
- Assess model predictions of non-targeted moments
  - employers' share and GDP per capita
  - private debt to GDP ratio and GDP per capita
- Test three cases of exogenous cross-country differences
  1. Varying both  $A_M/A_T$  and  $\phi$
  2. Varying only skill-biased technology  $A_M/A_T$
  3. Varying only employers' borrowing constraint  $\phi$

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  - employers' share and GDP per capita
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- Test three cases of exogenous cross-country differences
  1. Varying both  $A_M/A_T$  and  $\phi \leftarrow$  Benchmark
  2. Varying only skill-biased technology  $A_M/A_T$
  3. Varying only employers' borrowing constraint  $\phi$

## Calibration - Parameter Values

Parameter	Description	Value
<b>Panel A: Assigned Parameters</b>		
$\beta$	Discount factor	0.92
$\delta$	Depreciation rate	0.06
$\sigma$	Risk aversion	1.5
$E(h)$	Mean of ability	1
$A_T$	Productivity of traditional sector	1
<b>Panel B: Calibrated Parameters</b>		
$A_M^{US}$	Productivity of traditional sector	1.6
$\gamma$	1-entrepreneur profit share	0.77
$\alpha$	Labor share	0.56
$Var(h)$	Variance of ability distribution	0.22
$\lambda$	1-hazard rate	0.91
$\theta$	Traditional goods share	0.21
$\rho$	Elasticity of substitution	2.3

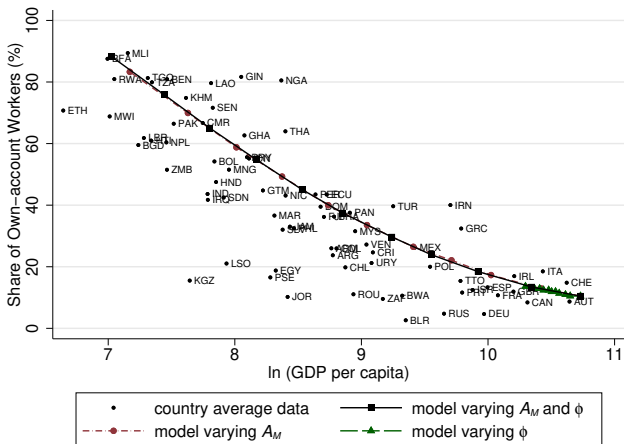
## Calibration - Model and Data Moments

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Moments	Model	Data
U.S. own-account labor force share	10%	10%
U.S. employers' labor force share	7.2 %	7.1%
U.S. Capital share	0.33	0.33
U.S. GINI index	40	40
U.S. employers' exit rate	8.2%	8.3%
U.S. Expenditure share	2.8%	< 5%
Slope of own-account employment	-0.21	-0.20

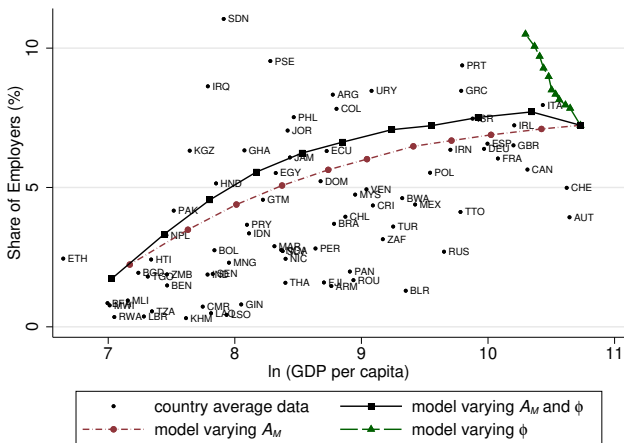


# Calibration of $\rho$ : Cross-country Pattern of Own-account Employment



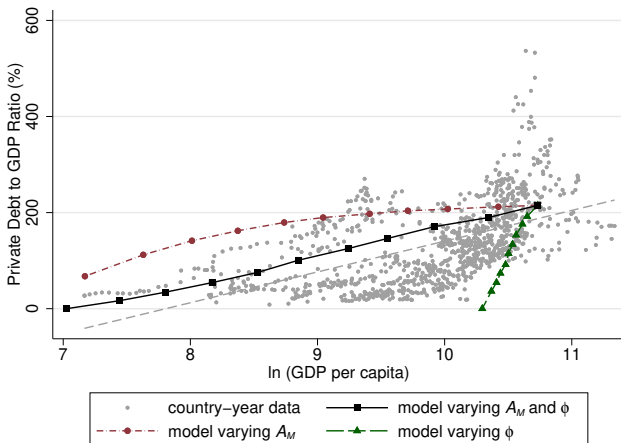
# Not Targeted Quantitative Predictions 1

Employers' Share with development  $\Leftarrow$  Skill-biased tech dominates



## Not Targeted Quantitative Predictions 2

Private debt to GDP ratio with development  $\leftarrow$  Both forces jointly



source: Financial Structural Database: Version September 2019

## Outline

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Empirical Findings

Model

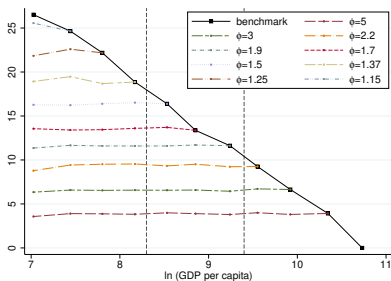
Calibration

Counterfactual Experiments

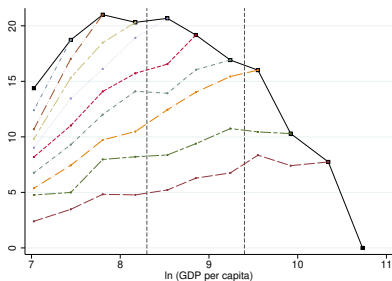
## Effects of Alleviating Financial Frictions in Benchmark

- Labor reallocation effects
    - Own-account workers' share decreases globally (largest decline in low income countries, 6%)
    - Employers' share decreases in most countries, but increases in the poorest country (0.5%)
- Figure

(a) Change in Modern Sector TFP (%)

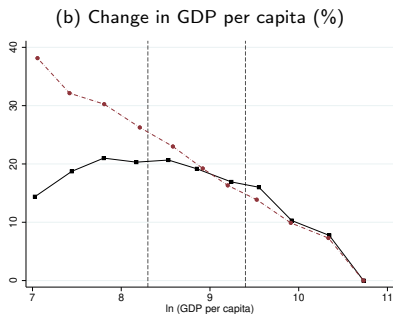
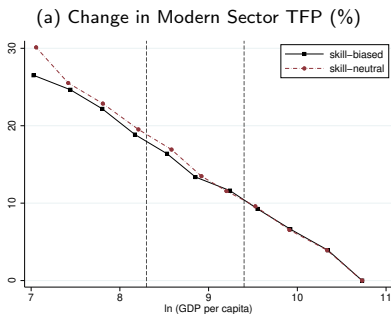


(b) Change in GDP per capita (%)



## Comparison with Skill-neutral Technological Progress

- Skill-neutral technological progress: fixed  $A_M/A_T$  at the U.S. level
- The same set of borrowing constraints as in the benchmark
- $\Rightarrow$  Underestimate own-account employment in developing countries  
- 30% in the model vs. 80% in the data



## Extended model

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- Consider the effects of removing financial frictions in the traditional sector in low-income countries (microfinance projects)
- A extended model where own-account workers rent capital to produce and face financial constraints

$$l^o(h, a) = \max_{k>0} p_T A_T k^\eta - (r + \delta)k$$
$$s.t. \quad k \leq \phi a$$

- Assign a traditional-sector capital share of  $\eta = 0.1$  (Gollin et al., 2007)
- Redo the calibration which yields  $\rho = 2.5$  and  $A_M^{US} = 1.3$

## Policy Implications: Removing Financial Frictions in *India*

- Calibrate to India 1990s while keeping the same preference parameters

India moments and parameters

Experiment	$\phi_T \rightarrow \infty$	$\phi_M \rightarrow \infty$	$\phi_T, \phi_M \rightarrow \infty$
Own-account workers' share (p.p.)	2.5	-6.3	-6.1
Employers' share (p.p.)	-0.31	0.36	0.31
Traditional-sector capital usage (%)	188	-2.5	23
Modern-sector capital usage (%)	1.6	22	28
Traditional-sector TFP (%)	1.1	0.9	1.1
Modern-sector TFP (%)	4.6	19	19
GDP per capita (%)	1.6	22	20

- Consistent with RCT literature: only modest gain from removing financial frictions in the traditional sector



## Conclusion

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- Two types of distinct entrepreneurs: own-account workers and employers
- Across-country patterns accounted for by skill-biased technological change and financial development
- The failure to account for the large share of own-account workers leads to considerable overestimation of the aggregate output gain
- Consistent with microfinance projects: only modest gain from removing financial frictions in the traditional sector

Thank you!

## Occupation Categorization

Own-account worker	Wage worker	Employer	Unpaid family worker
Working on own account			
Own account, agriculture			
Domestic worker, self-employed			
Subsistence worker, own consumption			
Own account, other			
Own account, without temporary/unpaid help	Wage/salary worker	Employer	Unpaid family worker
Own account, with temporary/unpaid help			
Member of cooperative			
Sharecropper			
Sharecropper, self-employed			
Sharecropper, employed			
Kibbutz member			
Self-employed, not specified			

Note: Our benchmark empirical analysis excludes the unpaid family workers because they account for negligible shares of the labor force. All our results still hold when we include them.

## Regression Results

	All Surveys		All Country Averages	
	Own-account	Employer	Own-account	Employer
ln (GDP per capita)	-0.19*** (0.009)	0.016*** (0.001)	-0.20*** (0.015)	0.014*** (0.002)
R <sup>2</sup>	0.63	0.28	0.64	0.25
Obs.	246	246	77	77

Note: \*\*\* indicate statistical significance at the 1-percent level.

own-account

employer

## Regressions by Sector

- Agriculture sector: agriculture, fishing and forestry
- Manufacturing sector: manufacturing, construction, mining, utility,
- Service sector: wholesale and retail trade; hotels and restaurants; transportation, storage and communications; financial services and insurance; services not specified; business services and real estate; education, health and social work; other services; and private household services.

	Agriculture Sector		Manufacturing, etc.		Service Sector	
	Own-account	Employers	Own-account	Employers	Own-account	Employers
ln (GDP per capita)	-0.136*** (0.026)	0.023*** (0.006)	-0.133*** (0.018)	0.011*** (0.002)	-0.119*** (0.011)	0.019*** (0.003)
$R^2$	0.257	0.190	0.442	0.211	0.535	0.347

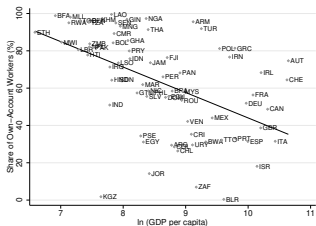
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own-account

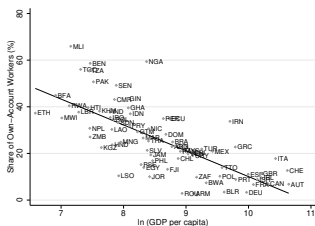
employer

# Own-account Employment by Sector

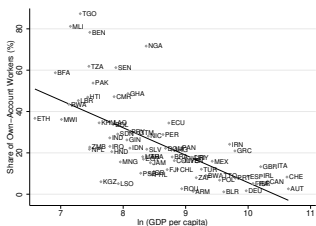
(a) Agriculture



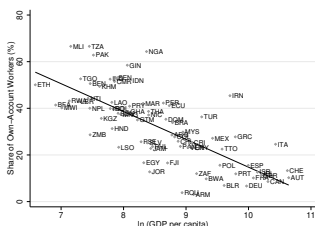
(b) Non-agriculture



(b1) Manufacturing, Construction, Mining, Utilities



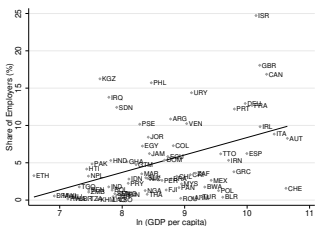
(b2) Service



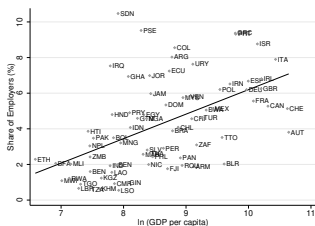
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# Employers' Share by Sector

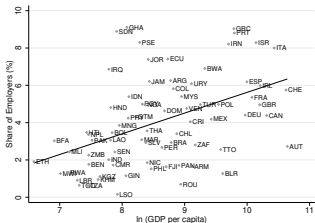
(a) Agriculture



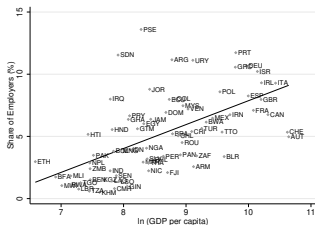
(b) Non-agriculture



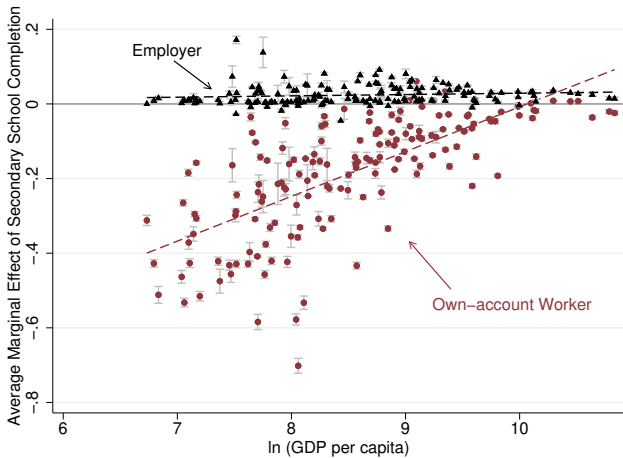
(b1) Manufacturing, Construction, Mining, Utilities



(b2) Service



## Selection on Secondary School Completion



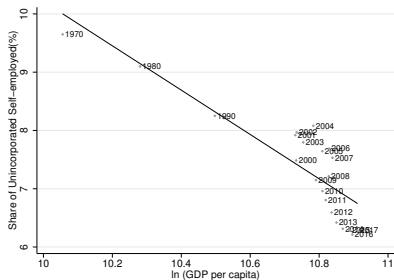
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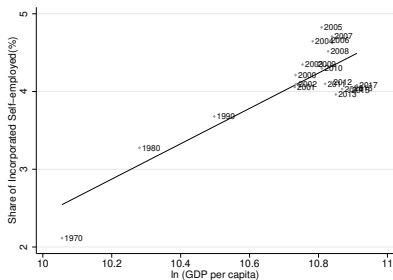
## Evidence from the U.S. Data over Time

- Integrated Public Use Microdata Series, USA: Version 10.0 (IPUMS-USA)
  - Federal State Censuses (1970-2000), American Community Survey (CPS) (2001-2017)
- Incorporated self-employed, unincorporated self-employed and wage workers

(a) Share of Unincorporated Self-employment



(b) Share of Incorporated Self-employment

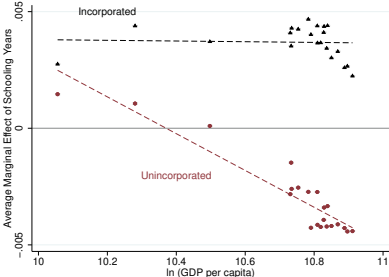


own-account

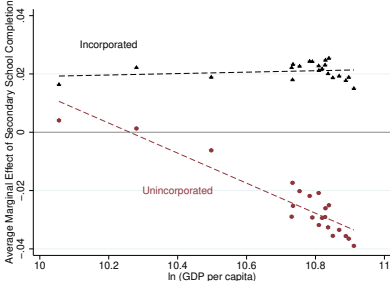
employer

# Evidence from the U.S. Data over Time

(a) Selection on Years of Schooling into Unincorporated/Incorporated



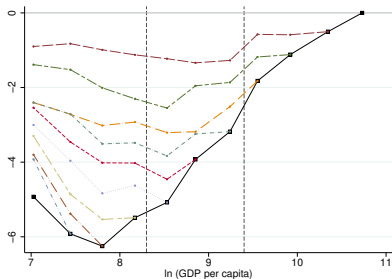
(b) Selection on Secondary School Completion into Unincorporated/Incorporated



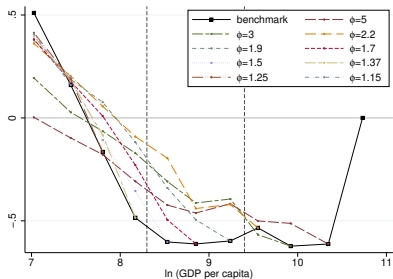
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## Effects of Alleviating Financial Frictions in Benchmark

(a) Change in Share of Own-account Workers (p.p)



(b) Change in Share of Employers (p.p)



[back](#)

## India Moments and Parameters

Moments	Data	Model	Parameters
Own-account labor force share	43%	43%	$A_M^{IND} = 0.3$
Employers' labor force share	2.1%	2.3%	$\gamma = 0.87$
GINI index	32	35	$Var(h) = 0.1$
Employers' exit rate	4.7%	4.6%	$\lambda = 0.93$
Capital to output ratio	1.9	1.8	$\beta = 0.89$
Private debt to GDP ratio	0.31	0.30	$\phi = 1.21$

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