

Financial Frictions, Occupational Choice, and Economic Inequality

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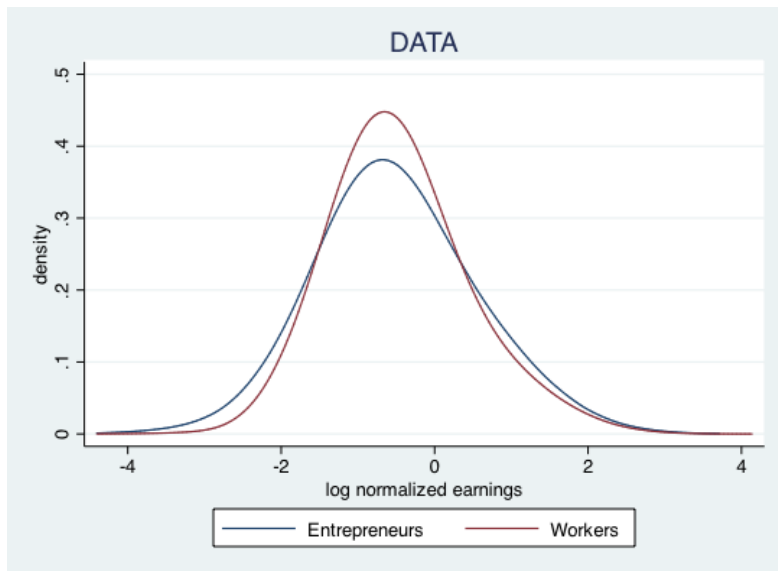
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Motivation

- What accounts for differences in **productivity** across countries?
- The role of financial frictions in the misallocation of resources
 - ▶ Erosa (2001), Jeong and Townsend (2007), Amaral and Quintin (2010), Buera, Kaboski, and Shin (2010), Buera and Shin (2011), Greenwood, Sanchez, and Wang (2007), Clementi, McDonald and Rui Castro, Midrigan and Xu (2014) and many more...
- However, these theories are inconsistent with key facts on entrepreneurship in developing countries

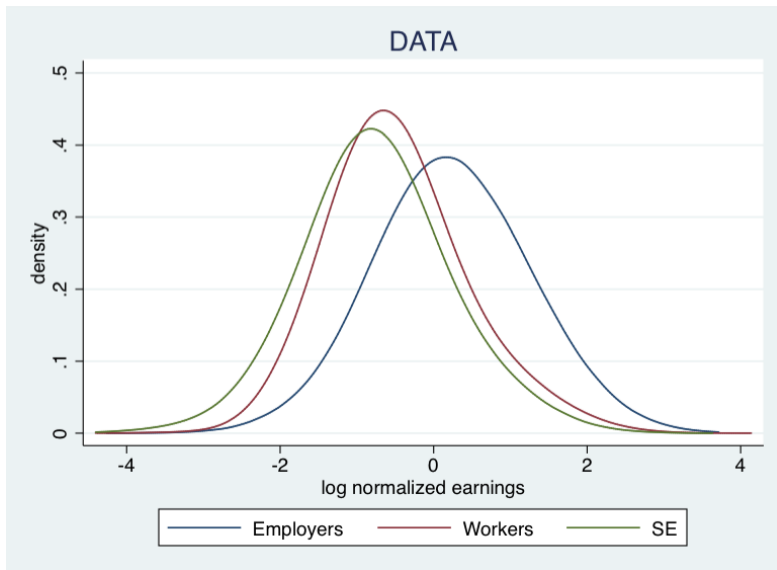
Income Distribution I

- **Median** entrepreneurial and wage **income** is not different ...



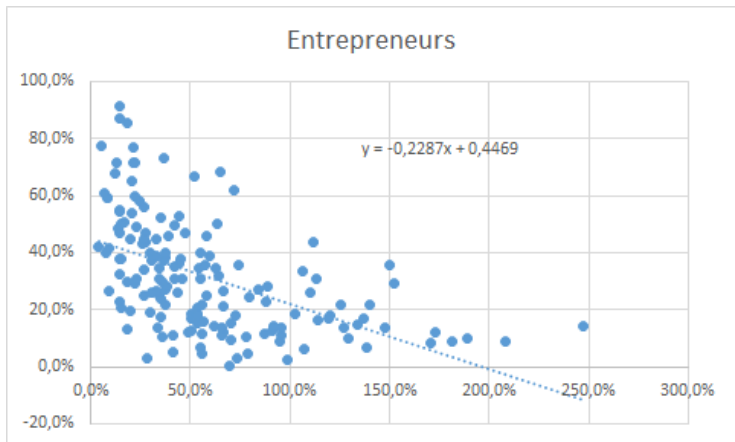
Income Distribution II

- ...but within entrepreneurs there two very different groups



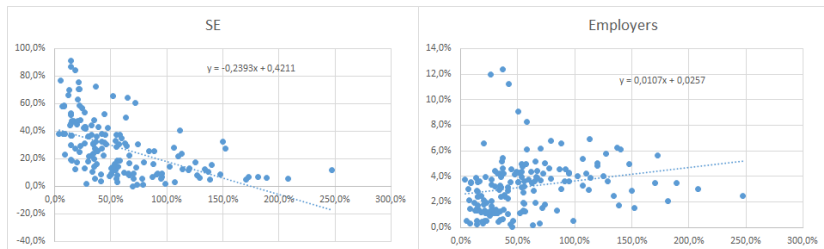
Occupational Structure

- In developing economies, most entrepreneurs do not hire employees.



Occupational Structure

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What we do:

- Parsimonious extension of the Lucas (1978) model with:
 - ▶ Financial frictions
 - ▶ Heterogeneity in two skills → working and entrepreneurial
 - ▶ Time allocation decision
- Use household data from Brazil to discipline the theory
- Show consequences of financial frictions on:
 - ▶ Occupation structure
 - ▶ Aggregate output and TFP
 - ▶ Distribution of income
 - ▶ Winners and losers of a financial reform

Mechanism

- Without financial frictions, occupational choices **only** depend on comparative advantages
- Financial frictions **distort** these decisions → **Assets** also matter now
 - ▶ Good but poor managers have to start small → self-employed
 - ▶ Rich and mediocre managers become employers
 - ★ Get high return on their capital
 - ★ Benefit from low wages
- Overall, the economy has **more** self-employed and **less** workers
- Two skill heterogeneity allow us to have poor and rich entrepreneurs with and without financial frictions

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Preview of findings

1. Two skill heterogeneity is important:
 - ▶ incorporate self-employment into Lucas (1978)
 - ▶ evidence on earnings across occupations
 - ▶ cross-country differences in entrepreneurship are mostly due to self-employment
2. Self-employment: crucial to understand impact of financial frictions
3. Financial frictions affect inequality through many channels:
 - ▶ labor income accounts for 31% of the income variance in the baseline economy (but more than 80% with no financial frictions)
 - ▶ **persistence** of income and **correlation** between capital and labor income increases
4. Large welfare gains of eliminating financial frictions...
 - ▶ ...but the majority of employers lose

The model

Economic Environment

- Life cycle growth model of an small economy
- Households are heterogeneous in two skills (z_w, z_m) (can be correlated)
- Households are endowed with one unit of time
 - ▶ They allocate their time to manage or work $t_m + t_w = 1$
- Production function uses three inputs: Managerial input, Labor and Capital
- Financial intermediation industry is competitive
- Entrepreneurs can renege on contracts after production has taken place
- Financial contracts are restricted such that there is no default in equilibrium

Financial intermediaries

Enforcement problems are modeled as in Buera, Kaboski, and Shin (2010)

- Financial intermediation industry is competitive
- Pay international interest rate r to depositors
- Intermediaries rent capital at a rate $r + \delta$
- Entrepreneurs can renege on contracts after production has taken place and run away with a fraction $1 - \phi$ of resources after production
 - ▷ $\phi \in [0, 1]$ indexes strength of legal institutions
- Financial contracts are restricted so that there is no default in equilibrium
$$k \leq \bar{k}(a, z_m, z_w; \phi)$$

more

Household's Problem: Worker

$$\max_{c_j, a_{j+1}} E \left\{ \sum_{j=1}^J \beta^j U(c_j) \right\}$$

subject to

$$c_j + a_{j+1} = wz_w + (1+r)a$$

$$c_j, a_{j+1} \geq 0,$$

Household's Problem: Entrepreneur

$$\max_{c_j, a_{j+1}} E \left\{ \sum_{j=1}^J \beta^j U(c_j) \right\}$$

subject to

$$\begin{aligned} c_j + a_{j+1} &= y^e \\ c_j, a_{j+1} &\geq 0, \end{aligned}$$

where

$$y^e \equiv \max_{n, t_m, k} \{ m^\gamma k^\nu n^\theta - wn^d - r(k - a) + a - \delta k - c_f \mathbb{I}_{n^d > 0} \}$$

subject to

$$m = t_m z_m,$$

$$n = (1 - t_m) * z_w + n^d,$$

$$\text{where } t_m \in [0, 1], n^d \geq 0, k \leq \bar{k}$$

Calibration

Calibration Strategy

- 1 Assume $\rho = \text{corr}(\alpha_{wi}, \alpha_{mi}) = \text{corr}(\epsilon_{wt}, \epsilon_{mt})$.
- 2 Set exogenously
 - Curvature of utility function (CES, with $\sigma = 1.5$).
 - Parameters of production function to standard values in the literature (Guner et. al. and Buera et. al.).
 - Interest rate is set at 3%.
- 3 Select β and ϕ to match $\frac{K}{Y}$ and credit to GDP in Brazil.
- 4 Select parameters of skill distribution to match
 - age profile of variance of log wages.
 - proportion of entrepreneurs and workers, variance of entrepreneurial log earnings, persistence of employer-occupation between two consecutive years.
 - ratio of median income between entrepreneurs and workers
 - fixed cost to match fraction of employers among entrepreneurs.

Calibration Results

- The model is able to match the selected targets.
 - ▶ Variance of $\ln(\text{earnings})$ [Graph](#)
 - ▶ Occupational structure [Table](#)
 - ▶ Occupations transitions [Table](#)
 - ▶ Distribution of income across occupations [Graph](#)

[Parameter Values](#)

Experiment: Removing Financial Frictions

Occupational Structure and Financial Frictions

Occupation	Baseline Ec.	No Frictions
Workers	67%	82%
Self-Employed	24%	11%
Employers	9%	7%

Removing Financial Frictions

Changes in %	Output	TFP
Aggregate	48	8.8
Self-Employed	-53	-4.5
Employers	64	9.0

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Removing Financial Frictions: Efficiency Gains

$$Y_E = \frac{\left[\sum_{i \in E} z_i r_i^{-\frac{\eta}{\gamma}} \right]^{1-\theta}}{\underbrace{\left[\sum_{i \in E} r_i^{\frac{\theta-1}{\gamma}} z_i \right]^{\eta}}_{TFP_E}} K_E^{\eta} L_E^{\theta},$$

TFP is affected by :

- reallocation of capital: $TFP_R = \left[\sum_{i \in E} z_i \right]^{1-\eta-\theta}$
- improved selection of entrepreneurs.
- mass of entrepreneurs (love for variety).

Removing Financial Frictions: Output and TFP gains

Changes in %	TFP	K mis-allocation	No. of Ent	Quality Ent
Self-Employed	-4.5%	6.3%	-15.2%	4.3%
Employers	9.0%	8.9%	-6.0%	6.1%

Graph MPK

Are Financial Frictions Important for Income Inequality?

Superficial Answer: No!

Gini index of Income decrease from 0.53 to 0.52.

However, **financial frictions** affect the sources and the persistence of inequality:

- **reduce** inequality of labor income. [more](#)
- **increase** inequality of capital income.
- **increase** the correlation between capital and labor income.
- **increase** the persistence of income.
- **reduce** the variance of income explained by skills.
- **increase** between occupation inequality and reduce within occupation inequality.

[Table](#)

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[Table](#)

Financial Reform

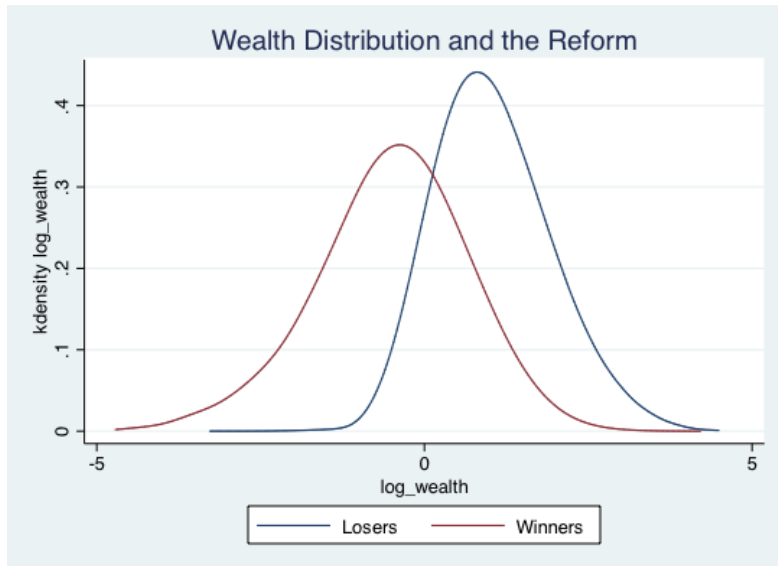
Assume that suddenly there is a once and for all financial reform that increases ϕ to 1. Who gains/loses?

Financial Reform: Winners and Losers

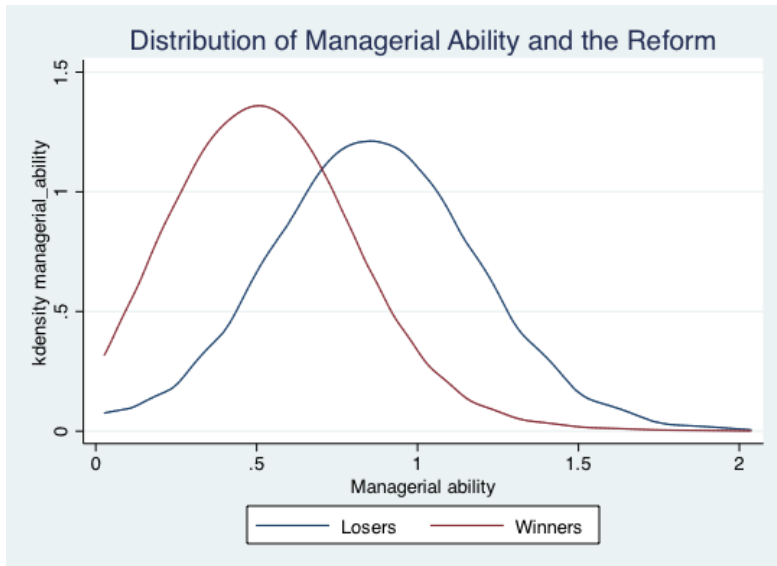
For **fixed** initial occupations:

- ① workers **gain** since wages \uparrow
- ② self-employed **gain** since they can borrow more
- ③ unconstrained employers **lose** since wages \uparrow with no changes in managerial rents
- ④ constrained employers may gain or lose
 - ▶ managerial rents $\uparrow \Rightarrow$ profits \uparrow
 - ▶ wages $\uparrow \Rightarrow$ profits \downarrow

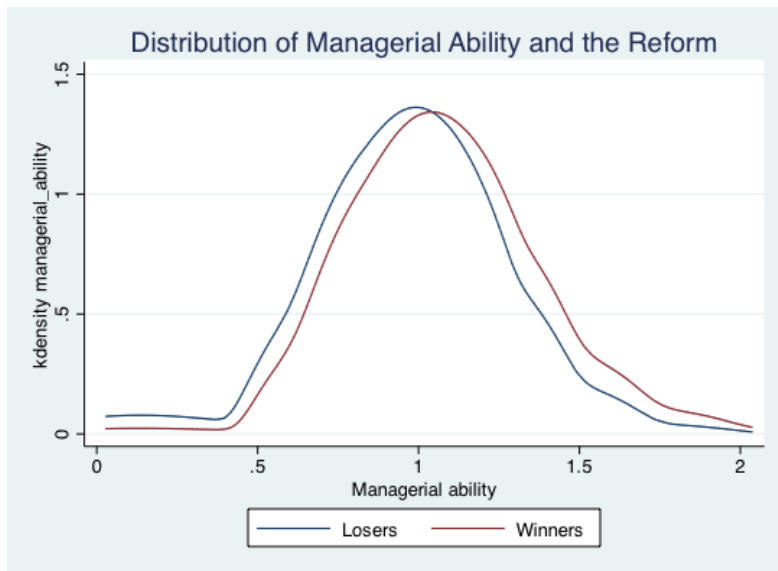
Wealth Distribution and the Reform



Distribution of Managerial Ability and the Reform



Distribution of Managerial Ability of Employers and the Reform



Summary

We extend Lucas (1978) to include household heterogeneity in managerial and working skills:

- 1 theory accounts for own account workers (or SE).
- 2 theory consistent with Brazilian household data on earnings between and within occupation, occupational transitions, and the cross-country variation in occupational structure.
- 3 modeling the occupational structure is important for understanding:
 - ▶ aggregate and distributive effects of financial frictions.
 - ▶ political economy of financial frictions.
- 4 In progress: Impact of financial frictions on TFP could be reduced due to changes in working ability.

Entrepreneur's production plan given k

$$\begin{aligned}\pi(z_m, z_w, a; k) &\equiv \max_{m, n, n^d, t_m} \{m^\gamma k^\nu n^\theta - wn^d - r(k - a) + a - \delta k - c_f I_{n^d > 0}\} \\ &\text{subject to} \\ m &= t_m z_m, \\ n &= (1 - t_m) * z_w + n^d, \\ &\text{where } t_m \in [0, 1], n^d \geq 0, k \text{ given.}\end{aligned}$$

Capital rental k is enforceable if and only if

$$\begin{aligned}\pi(z_m, z_w, a; k) &\geq (1 - \phi) \max_{m, n, n^d, t_m} \{m^\gamma k^\nu n^\theta - wn^d + (1 - \delta)k - c_f I_{n^d > 0}\} \\ &\text{subject to} \\ m &= t_m z_m, \\ n &= (1 - t_m) * z_w + n^d, \\ &\text{where } t_m \in [0, 1], n^d \geq 0.\end{aligned}$$

\Rightarrow borrowing limit $\bar{k}(a, z_m, z_w; \phi)$ back to enforcement

Entrepreneurial income:

$$y^e(z_m, z_w, a) \equiv \max_k \{ \pi(z_m, z_w, a; k) \}$$

subject to

$$k \leq \bar{k}(a, z_m, z_w; \phi)$$

Worker's income:

$$y^w(z_m, z_w, a) = wz_w + ra.$$

Household's problem:

$$\max_{c_j, a_{j+1}} E \left\{ \sum_{j=1}^J \beta^j U(c_j) \right\}$$

subject to

$$c_j + a_{j+1} = \max \{ y^e(z_{mj}, z_{wj}, a_j), y^w(z_{mj}, z_{wj}, a_j) \},$$
$$c_j, a_{j+1} \geq 0,$$

back to [enforcement](#)

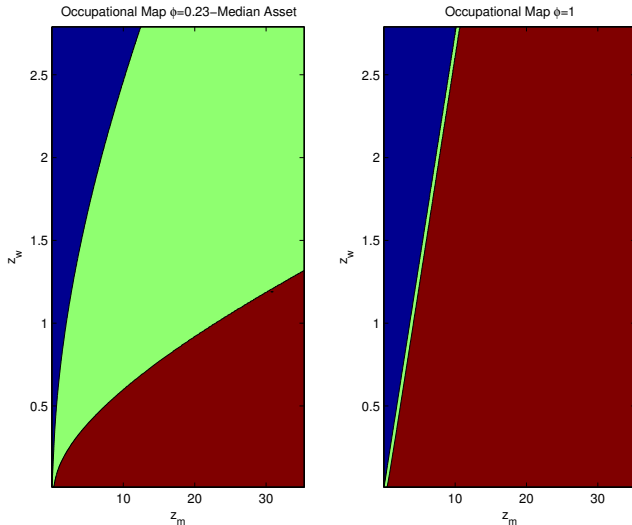
$r_{mw}(\mu)$ and $r_m(\mu)$

$$r_{mw}(\mu) = \gamma \eta^{\frac{\eta}{1-\eta}} \left(\frac{\gamma \theta}{(\gamma + \theta)^2} \right)^{\frac{\theta}{1-\eta}} \left(\frac{1}{r + \delta + \mu} \right)^{\frac{\eta}{1-\eta}}$$

$$r_m(\mu) = \gamma \left[\left(\frac{\eta}{(r + \delta + \mu)} \right)^{\eta} \left(\frac{\theta}{w} \right)^{\theta} \right]^{\frac{1}{1-(\eta+\theta)}}$$

back to [back](#)

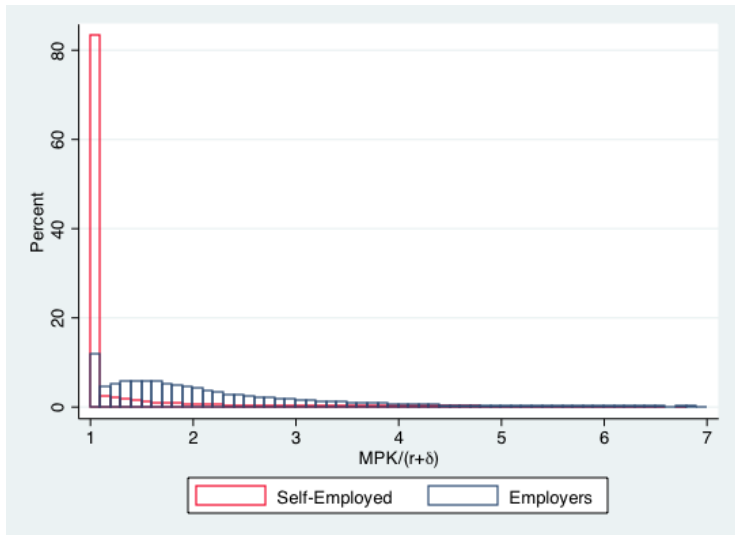
Occupational Map with Perfect Capital Markets



blue-worker, green-self-employed and red-employers

back to [Properties of the model](#)

Ratio of MPK to Market Return on Capital



back to [tfp](#)

Skill correlation and absolute advantage

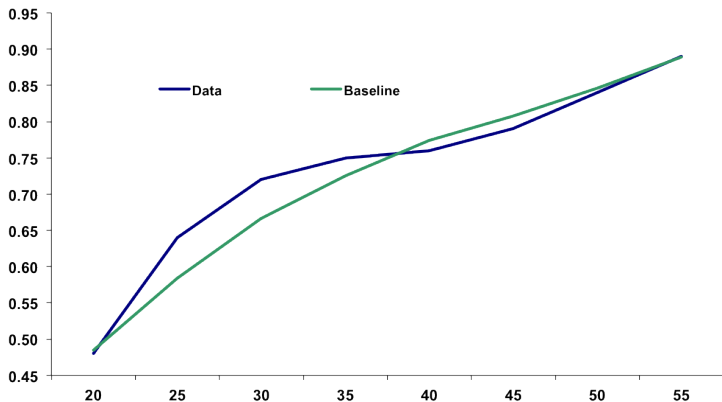
$$Y_t \equiv \begin{pmatrix} \ln(z_{mt}/z_{wt}) \\ \ln(z_{wt}) \end{pmatrix}$$

$$Y_t \sim N \left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_{mt}^2 + \sigma_{wt}^2 - 2\rho_{wmt}\sigma_{wt}\sigma_{mt} & \rho_{wmt}\sigma_{wt}\sigma_{mt} - \sigma_{wt}^2 \\ \rho_{wmt}\sigma_{wt}\sigma_{mt} - \sigma_{wt}^2 & \sigma_{wt}^2 \end{bmatrix} \right)$$

The absolute advantage case arises when the correlation between $\ln(z_{mt}/z_{wt})$ and $\ln(z_{wt})$ is positive, which holds if and only if

$$\rho_{wmt} > \frac{\sigma_{wt}}{\sigma_{mt}}$$

Variance of Ln earnings - Model vs. Data



back to

Calibration Results

Occupational Structure

Fraction	Data	Model Ec.
Workers	68%	67%
Self-Employed	24%	24%
Employers	8%	9%
Emp to Emp	70%	68%

back to

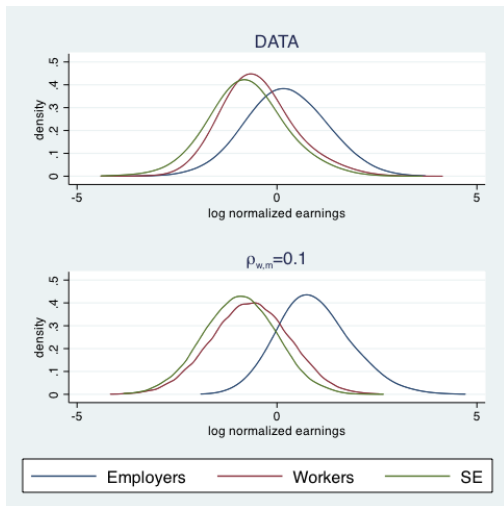
Calibration Results

Occupational Transitions

Transitions	Data	$\rho = 0.1$
E to W	9%	7%
E to SE	22%	24%
E to E	68%	70%
SE to W	15%	26%
SE to SE	77%	65%
SE to E	8%	9%
W to W	94%	89%
W to SE	5%	10%
W to E	1%	1%

back to [Calibration Results](#)

Distribution of Income Across Occupations



back to [Calibration Results](#)

Calibration: Parameter Values

Table: Calibrated Parameters

$\rho_{w,m}$	ρ_w	ρ_m	$\sigma_{\alpha,w}^2$	$\sigma_{\alpha,m}^2$	$\sigma_{\epsilon_w}^2$	$\sigma_{\epsilon_m}^2$	c_f	ϕ	β
0.1	0.98	0.78	0.38	1.59	0.03	0.99	0.10	0.23	0.995

back to [Calibration Results](#)

Financial Frictions and Income Inequality

	$\phi = 0.23$	$\phi = 1$
Gini Labor Income	0.52	0.56
Gini Capital Income	0.67	0.59
Corr (cap inc., lab inc.)	0.80	0.50
Persistence of inc.	0.81	0.74

Properties of the Model.

- Worker's income: $y_w = wz_w + ra$

- Self-employed's income:

$$y_{se} = r_{wm} (z_m^\gamma z_w^\theta)^{\frac{1}{\gamma+\theta}} + \mu k + ra.$$

- Employer's income:

$$y_e = r_m z_m + \mu k + ra - c_f$$

- r_{wm} and r_m depend on parameters and μ (Lagrange multiplier of borrowing constraint). [more](#) [back](#)