The Macroeconomic Consequences of Subsistence Self-Employment

Juan Herreño[†] Sergio Ocampo[‡]

[†]UC San Diego

[‡]University of Western Ontario

Self-employment in developing countries

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- High prevalence of *subsistence entrepreneurship* (Schoar, 2010)

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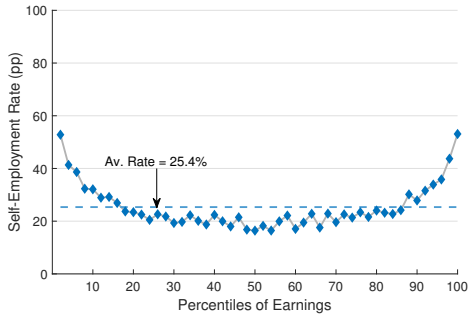
(Data from 9 developing countries)



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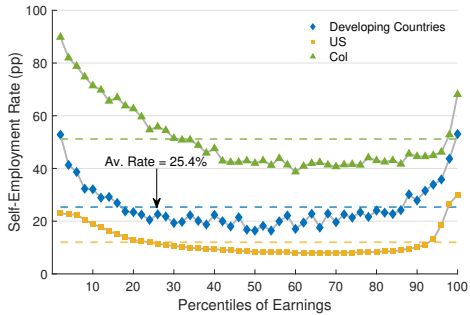

Policies aimed at the self-employed

- Grants, loans, transfers (varied designs and generosity)
- Policies meant to spur firm creation/growth but target the **self-employed** in practice
- Evidence of small effects on individual outcomes (income, firm creation, consumption)

  (Angelucci, Karlan, & Zinman, 2015; Banerjee, Duflo, Glennerster, & Kinnan, 2015; Maeger, 2019)

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Effects of these policies (micro & macro) depend on many factors:

- Financial frictions affect occupational sorting (Buera, Kaboski, & Shin, 2015; Midrigan & Xu, 2014)
  - Self-employed choose worse technologies/smaller scale
- Subsistence concerns (Poshke, 2013; Breza, Kaur & Shamdashani, 2021)
  - Reflect labor rationing

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1. Study the effects of development policies when subsistence entrepreneurship is prevalent
   - Heterogeneous agents macro-development model
   - Financial and subsistence concerns (labor market frictions) driving occupational choices

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   - Joint distribution of occupations and income
   - Labor market response to labor demand shocks

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2. Use a set of cross-sectional moments to evaluate importance of subsistence concerns
   - Joint distribution of occupations and income
   - Labor market response to labor demand shocks
3. Evaluate macro-effects of policies
   - 3.1 Micro loans and grants to the self-employed $\longrightarrow$ loosen financial frictions
   - 3.2 Targeted transfers to the unemployed $\longrightarrow$ insure labor risk

What we find

1. Model consistent with joint distribution of occupations and income + labor market slack
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   - The key is the muted response of wages to the reform (slack!)
   - TFP increases (loans improves selection into self-employment, only productive benefit)
   - Without subsistence concerns model overestimates responses

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4. Other Policies: Generosity of the safety net to the unemployed is TFP enhancing (improves selection into self-employment **if well targeted**)

Model

A general equilibrium occupational choice model

- Heterogeneous agents:
  - Agents can be **Employed**, **Unemployed** or **Self-Employed**
  - Agents differ in Assets (a), Idiosyncratic Productivity (z)

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Agents' problems

- Income of agents depends on occupation (wages, benefits, profits)
- Shocks also depend on occupations: Job offers to **U** and **SE** and job separations to **E**
  - All agents receive productivity shocks (z)

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Occupation	Flow Income (y)	Occupational Choice	Shocks	
Employed	$r \cdot a + w \cdot \epsilon(z)$	U or S	γ^z , γ^{E}	$\longleftarrow$ Job separation
Unemployed	$r \cdot a + b$	S	γ^z , γ^{U}	$\longleftarrow$ Job offer
Self-employed	$r \cdot a + \pi(a, z)$	U	γ^z , γ^{S}	$\longleftarrow$ Job offer
	$\uparrow$ $y^o(a, z)$		$\uparrow$ Prod.	

Profits and value functions

Self-employed profits:

$$\pi(a, z) = \max_{k \leq \lambda \cdot a,\, n} f(z, k, n) - (r + \delta) \cdot k - w \cdot n$$

- Collateral constraints depend on assets: $k \leq \lambda \cdot a$

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Value function for occupation $o \in \{E, U, S\}$: details

$$\rho V^o(a,z) = \max_{\text{s.t. } a \geq \underline{a}} u(c) + V_a^o \cdot \underbrace{(y^o(a,z) - c)}_{\dot{a}} + \frac{E[dV^o]}{dt}$$

- Standard Hamilton-Jacobi-Bellman formulation
- Change in value depends on savings: $\dot{a} = y^o(a,z) - c$
- Last term captures productivity and occupational shocks

Optimal choices

Savings Choice, $o \in \{E, U, S\}$:

$$c^o(a, z) = u'^{-1}\left(V_a^o(a, z)\right)$$

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Agents can move freely to unemployment or self-employment so

$$V^E(a,z) \geq \max\left\{V^U(a,z), V^S(a,z)\right\}$$

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- Occ. choice defines regions $\Omega^o \in \mathcal{S} \equiv [\underline{a}, \infty) \times \mathbb{R}_+$ where occupation 'o' prevails

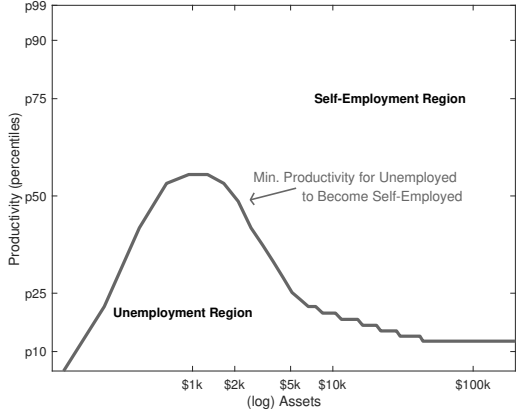
$$\text{Example:} \quad \Omega^U = \left\{(a,z) \in \mathcal{S} \mid V^U(a,z) > V^S(a,z)\right\}$$

(Stationary) Equilibrium

- Solve agents' problems given prices
  - Value functions solved as HJB variational inequalities.
- Small open economy: $r = r^\star$
- Wage (w) clears labor market:
  - Labor demand firms of the self-employed: $N^d = \int n^\star(a,z) dG^S$
  - Labor supply from the employed: $N^s = \int \epsilon(z) dG^E$
- Stationary distribution of agents: G^E, G^U, G^S details
  - Solve system of Kolmogorov-Forward-Equations
  - Reflects both exogenous shocks and endogenous occ. choice

Main mechanism: Occupational choice

Toy model (intuition)



- (Min) Productivity threshold for self-employment
- Subsistence concerns: Low threshold for poor agents $\longrightarrow$ Unproductive self-employed

Calibration and Model Performance

Parametrization

- Interest rate: $r^\star = 3\%$
- Collateral constraint: $\lambda = 1.42$ to match debt-to-asset ratio of large Mexican firms
- Utility and production function: $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$ and $f(z,k,n) = z(k^\alpha n^{1-\alpha})^\nu$

$$\sigma = 2 \qquad \alpha = 0.3 \qquad \nu = 0.85$$

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Internally calibrated parameters:

- Labor income is a function of productivity: $\epsilon(z) = z^\eta$
- Shocks follow Poisson processes with arrival rates: γ^z , γ^E , γ^U , γ^S
- z discretized with transition matrix $Pr^z(z'|z)$
  - Discretization from AR(1) process - Rowenhurst (1995) method

Model performance: Targeted moments

Occupational Rates	Data	Model
Unemployment	4.4	4.1
Self-employment	26.7	26.2
Employment	69.1	69.7

Income Moments	Data	Model
$\text{std}(y_t^S)$	0.86	0.86
$\text{std}(y_t^E)$	0.54	0.58
$\text{corr}(y_t^S, y_{t+1}^S)$	0.59	0.59
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Data from ENOE:

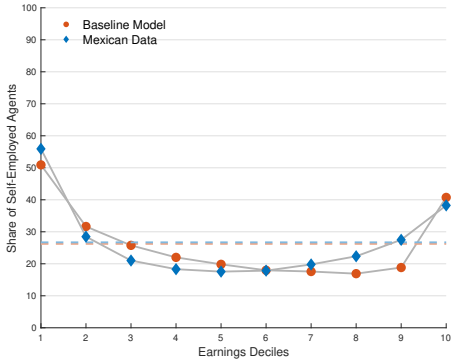
sample details | more moments

- Household Survey - Quarterly rotating panel (up to 5 quarters)
- Information on labor status, search activities, transitions, and earnings
- **Key:** Observe transitions and earnings dynamics

Model performance: Untargeted moments

1. **Model matches joint distribution of occupations and income**
   - **Key:** Subsistence concerns of the unemployed $\longrightarrow$ Occupational Choice
   - Model with only financial frictions fails in doing so (more on this later)

details



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2. **Model matches reaction after labor demand shocks**
   - Development Literature on response of local labor market to labor demand shocks

     Imbert and Papp (2015), Breza, Kaur & Shamdasani (2021) and Muralidharan, Niehaus & Sukhtankar (2017)
   - Low *elasticity of wages to labor demand* $\left(\frac{\Delta \log w}{\Delta \log N} < 1\right)$: self-employment "hides" slack
   - Model elasticity $\frac{\Delta \log w}{\Delta \log N} = 0.16$ (vs 1.6 with only financial frictions)
     - **Key:** Occupational transitions $SE \rightarrow U$ rather than $SE \rightarrow E$
     - Model also matches partial crowd-out of private labor demand from job-guarantee programs

Credit Expansions Under Subsistence Self-Employment

The effects of credit expansions

We increase access to credit by modifying borrowing constraint

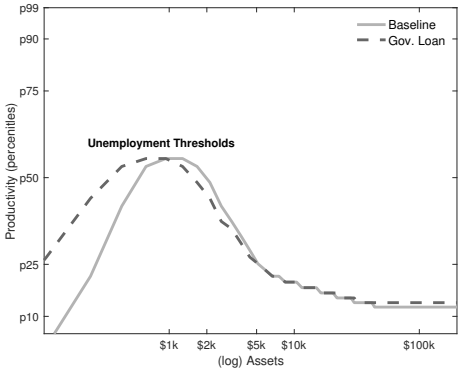
$$k \leq \lambda \cdot a + \phi$$

$\phi \approx \$540 \frac{\text{USD}}{\text{Q}}$ as in RCT loans from Compartamos Banco (Angelucci, Karlan, Zinman, 2015)

1. Contrast *micro* effects of loans on earnings with RCT evidence + Role of GE
2. Obtain *macro* effect on output and productivity by aggregating
3. Contrast effects with/without subsistence self-employment

1.1 Earnings effects of credit expansions

- Credit ↑ 20% and SE-earnings ↑ 0.95% in equilibrium ⟶ (micro) elasticity of 0.048
  - Earnings up 41 $\frac{\text{USD}}{\text{Q}}$, comparable with RCT result of 55 $\frac{\text{USD}}{\text{Q}}$ increase in business earnings
  - Level change *"small"* throughout the distribution but impacts occupational choice



1.2 General equilibrium effects of credit expansions

- **Key:** Muted response of wages, up only 0.06% (consistent with wage elasticity)
- Labor earnings increase 0.04 (composition effect from SE)
- Re-composition of labor force out of self-employment

Moment		Moment	
% Δ Wage	0.06	Δ Employment	0.08
% Δ Income(E)	0.04	Δ Unemployment	0.16
% Δ Income (S)	**0.95**	Δ Self-employment	**-0.24**

2. Aggregate effects of credit expansions

	Output	TFP	Assets	Consumption
% Δ	0.20	0.15	-0.40	0.02

- (Macro) elasticity of output is proportional (micro) elasticity of income

$$\varepsilon_Y^{\text{macro}} = 0.011 = S \times \varepsilon_y^{\text{micro}}$$

- TFP increases due to selection **out of** self-employment
- *Insurance* from loans changes consumption/savings choices
  - Crowd-out private assets
  - Increase consumption... of the unemployed! $\%\Delta(C^U) = 1.25$

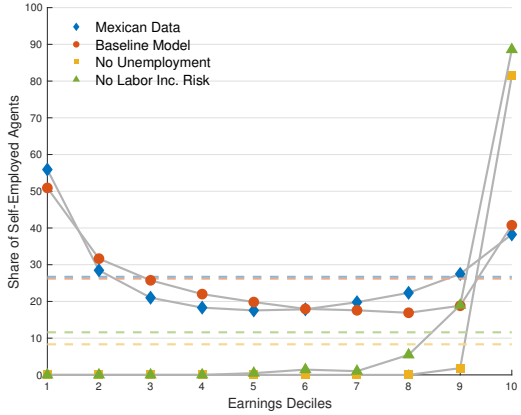
3. The role of subsistence self-employment

Two economies without subsistence self-employment:

1. **No unemployment risk:** $\gamma^E = 0$ and $\gamma^U, \gamma^S \to \infty$
   - Without unemployment risk occupational choice reflects productivity
2. **No labor-income risk:** $\gamma^z = 0$
   - Without labor-income risk savings reflect presence of collateral constraint

- Recalibrate to match the same targets (when possible)
- Comparable to standard macro-development framework (e.g., Buera, Kaboski, Shin, 2020)

Without unemployment risk self-employment concentrated at the top



- No subsistence-concerns $\longrightarrow$ self-employment selection based on a/z

Toy model (intuition)

Aggregate effects of credit without subsistence self-employment

	Baseline	No Unemp. Risk	No Labor Inc. Risk
Elasticities			
Output to credit supply	0.011	0.091	0.065
Wage to labor demand	0.16	0.36	2.32
Change in Variables (pp)			
Output	0.20	0.37	0.47
TFP	0.15	0.42	0.10
Wage	0.06	0.54	0.53
Self-employment	−0.24	0.07	0.05
Income (SE)	0.95	−0.38	−0.10
Assets	−0.40	−2.45	−2.14
Lending	20.00	4.03	7.27

Policy Design and Subsistence Self-Employment

The self-employed are sensitive to policy design

Three examples

1. **Micro grants:** Subsidized version of loans above (common in practice; Meager, 2019)
2. **Transfers to the unemployed:** Common in many countries, can improve search (Acemoglu & Shimer, 1999, 2000; Chetty, 2008)
3. **Transfers to the non-employed:** Reflects limited implementation capacity (intuition extends to universal transfers)

Micro grants - Negative selection

- Relaxation of collateral constraint $k \leq \lambda a + \phi$ + Recipients pay 0 to rent capital
- ϕ: Ave. loan size of micro-credit interventions in Mexico Angelucci, Karlan, Zinman (2015)

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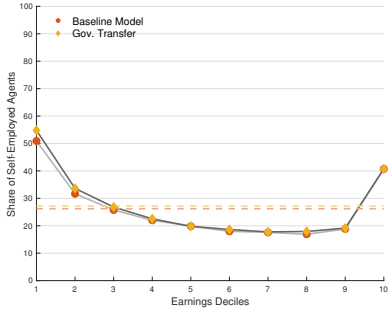
Policy effects:

occ. choice SE inc.

Moment	
Δ Employment	-0.24
Δ Unemployment	-0.72
Δ Self-employment	**0.96**
% Δ Wage	0.32
% Δ Income(E)	0.50
% Δ Income (S)	**-2.40**
% Δ TFP	**-0.45**



Decrease in z threshold for

Transfers to the unemployed - Subsistence concerns

The policy grants $20 USD (10% of min wage) to the unemployed

$$y^U = r \cdot a + b + b_{UB}$$

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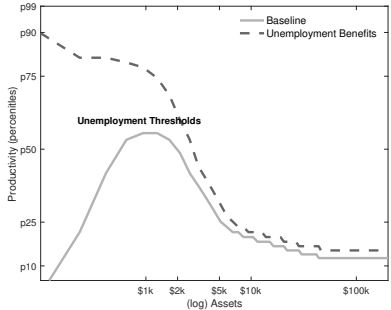
Policy effects:

occ. choice | SE inc. | SE prod.

Moment	
Δ Employment	0.06
Δ Unemployment	0.85
Δ Self-employment	**-0.90**
% Δ Wage	-0.16
% Δ Income(E)	-0.40
% Δ Income (S)	**3.70**
% Δ TFP	**0.42**



Increase in productivity selection

Transfers to the non-employed - Back to negative selection

Hard to effectively target transfers to the unemployed

- Likely that transfers go to low-earning self-employed too

The policy grants \$20 USD to the unemployed + self-employed (income below minimum wage)

$$y^U = r \cdot a + b + b_{UB} \qquad y^S = r \cdot a + \pi + b_{UB}$$

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	Output	TFP	Assets	Consumption
% Δ	-0.04	**-0.32**	-1.90	-0.61

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- Transfers affect asset accumulation
- Occ. Choice: More self-employment occ. choice
- Small micro effects on income distribution SE inc.

Conclusions

- High SE among the poor in developing economies
- Subsistence self-employment shapes economies response to shocks and policy
- Policies that alleviate subsistence concerns improve productivity
- Policies that target the self-employed can backfire

Thank You

Please send your questions to

juanherreno@ucsd.edu

or

socampod@uwo.ca

Appendix

Data Appendix

Mexican sample details

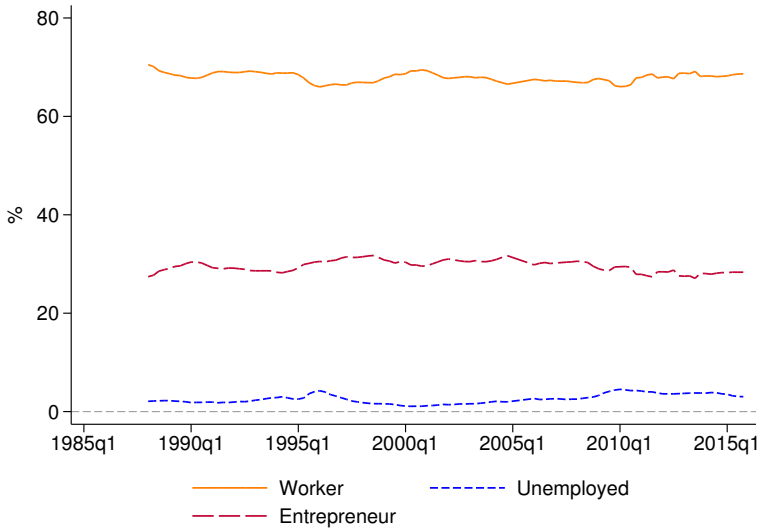
back

- Our Sample: 1995Q1 - 2015Q4.
  - Males, Head of households, Prime age workers (23 to 65)
  - Ten largest municipalities
  - Unbalanced panel for 250 thousand individuals (1m obs.)

- Labor Status (Self-Reported)
  - Employed: Has a job, has a supervisor
  - Unemployed: Does not have a job, is looking for one
  - Self-Employed: Has a job, reports to be his own employer

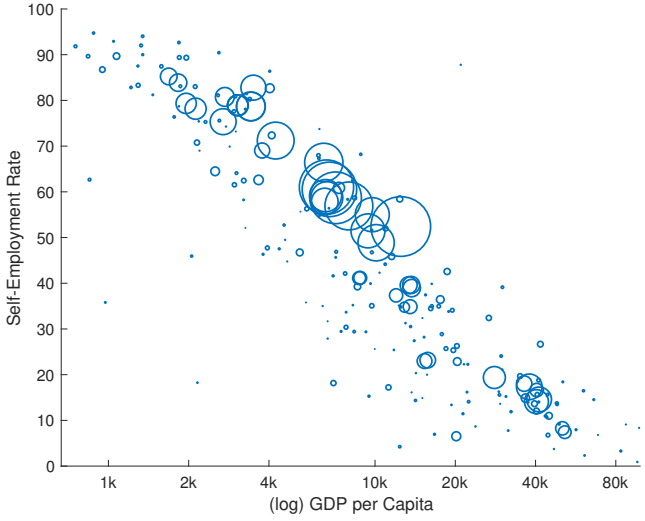
Workforce composition in Mexico: Time series

back



Self-employment across countries

back



Self-employment and earnings distribution: Details

back

- Run a regression of the form:

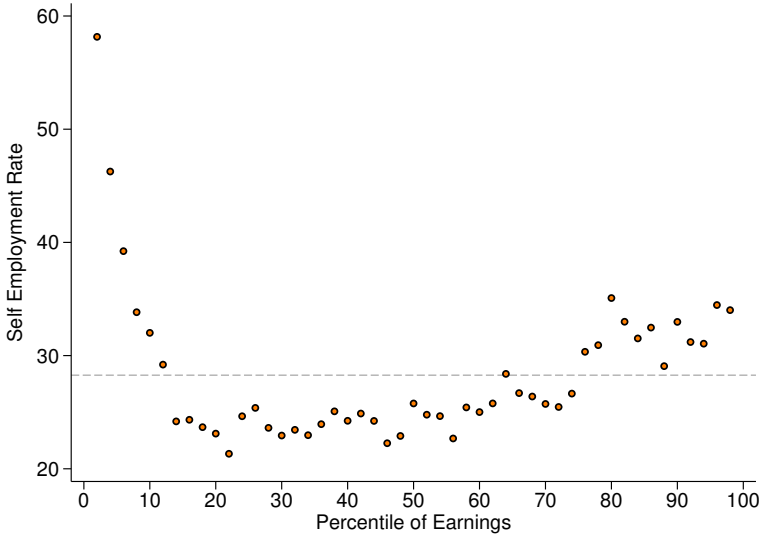
$$\log(w_{i,t}) = \alpha + \gamma_t + \beta X_{i,t} + \eta_{i,t}$$

- Rank $\hat{\eta_{i,t}}$ and classify them in bins of 3% of the sample
- Compute the statistics for each bin
- Results are robust to direct earnings comparison

details

Self-employment and earnings distribution: Raw data

back



Model Appendix

Agent's problem: Value functions

back

Employed agents:

$$\begin{aligned}\rho V^E(a,z) &= \max_c u(c) + V_a^E(a,z)\,\dot{a} + \gamma^E\left(V^U(a,z) - V^E(a,z)\right) \\ &\quad + \gamma^z \int \left(V^E(a,z') - V^E(a,z)\right) d\Pr{}^z(z'|z) \\ \text{s.t.} \quad & \dot{a} = w\epsilon(z) + ra - c, \qquad a \geq \underline{a}.\end{aligned}$$

Unemployed and Self-employed agents, $o \in \{U, S\}$:

$$\begin{aligned}\rho V^o(a,z) &= \max_c u(c) + V_a^o(a,z)\,\dot{a} + \gamma^o \max\left\{V^E(a,z,\epsilon) - V^o(a,z), 0\right\} \\ &\quad + \gamma^z \int \left(V^o(a,z') - V^o(a,z)\right) d\Pr{}^z(z'|z) \\ \text{s.t.} \quad & \dot{a} = b\mathbb{1}_{o=U} + \pi(a,z)\mathbb{1}_{o=S} + ra - c, \qquad a \geq \underline{a}.\end{aligned}$$

Agent's distribution: Kolmogorov Forward Equations

back

- Characterize stationary distributions $\{G^o\}_{o\in\{E,U,S\}}$ by their densities $\{g^o\}_{o\in\{E,U,S\}}$

$$0 = -\frac{\partial}{\partial a}\left[\dot{a}g^E(a,z)\right] - \left(\gamma^E + \gamma^z\right) g^E(a,z) \qquad \longleftarrow \text{Holds for } (a,z)\in\Omega^E$$
$$+ \gamma^z \int \Pr^z\left(z|z'\right) g^E(a,z')\,dz' + \gamma^U g^U(a,z) + \gamma^S g^S(a,z)\,\mathbb{1}_{\{(a,z)\in\Omega^E\}}$$

$$0 = -\frac{\partial}{\partial a}\left[\dot{a}g^U(a,z)\right] - \left(\gamma^U + \gamma^z\right) g^U(a,z) \qquad \longleftarrow \text{Holds for } (a,z)\in\Omega^U$$
$$+ \gamma^z \int \Pr^z\left(z|z'\right) g^U(a,z')\,dz' + \gamma^E g^E(a,z),$$

$$0 = -\frac{\partial}{\partial a}\left[\dot{a}g^S(a,z)\right] - \left(\gamma^S \mathbb{1}_{\{(a,z)\in\Omega^E\}} + \gamma^z\right) g^S(a,z) \qquad \longleftarrow \text{Holds for } (a,z)\notin\Omega^U$$
$$+ \gamma^z \int \Pr^z\left(z|z'\right) g^S(a,z')\,dz' + \gamma^E g^E(a,z)\,\mathbb{1}_{\{(a,z)\notin\Omega^U\}},$$

Model performance: Untargeted moments

back

Occupational Transition Rates

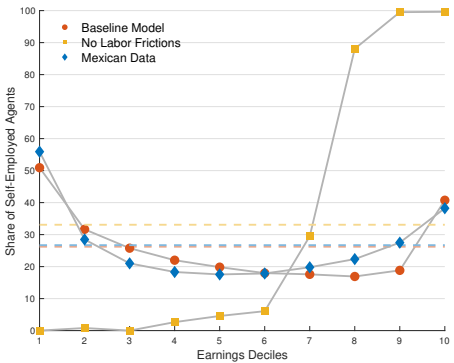
	Data	Model		Data	Model		Data	Model
$U \to U$	27.4	29.3	$S \to U$	1.9	4.6	$E \to U$	3.1	2.5
$U \to S$	14.6	23.6	$S \to S$	76.8	62.2	$E \to S$	8.1	12.8
$U \to E$	58.0	47.1	$S \to E$	21.3	33.1	$E \to E$	88.8	84.7

Income Moments

	Data	Model		Data	Model
$\text{corr}(y_t^E, y_{t+1}^S)$	0.43	0.39	$\text{corr}(y_t^S, y_{t+1}^E)$	0.43	0.34

Model Performance: The role of labor vs financial frictions

back



- Model without labor frictions misses Self-employment *out-of-necessity*
- There is also no unemployment risk for employed agents
- Self-employment is only taken by agents who can generate higher profits than wages

Toy Model Appendix

Selection into self-employment

back 1 back 2

Static Model Continuum of unemployed (U) agents

- Choose to stay unemployed (U) or become self-employed (SE)
- Heterogeneity: Assets (a) and productivity (z)
- CRRA utility: $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$

Selection into self-employment

back 1 back 2

Static Model Continuum of unemployed (U) agents

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Unemployment

- U get a job with probability p
- If employed, consume: $a + w$
- If not, consume: $a + b$

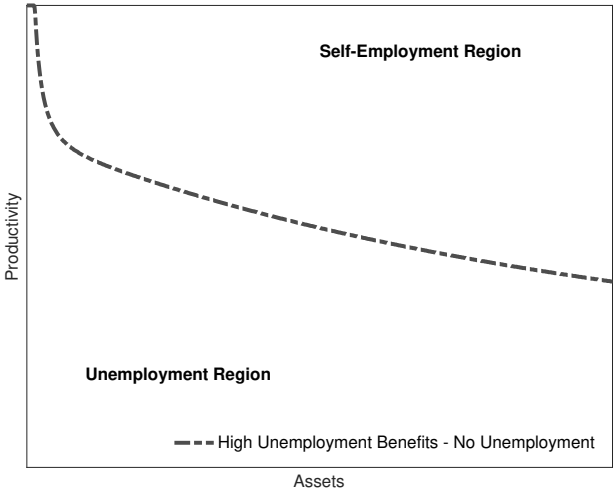
Self-Employment

- SE produce using own assets
- Consume: $a + za^{\alpha}$

Mechanisms behind policies depend on **selection into self-employment**

Self-employment as an outside option to employment

back 1 back 2

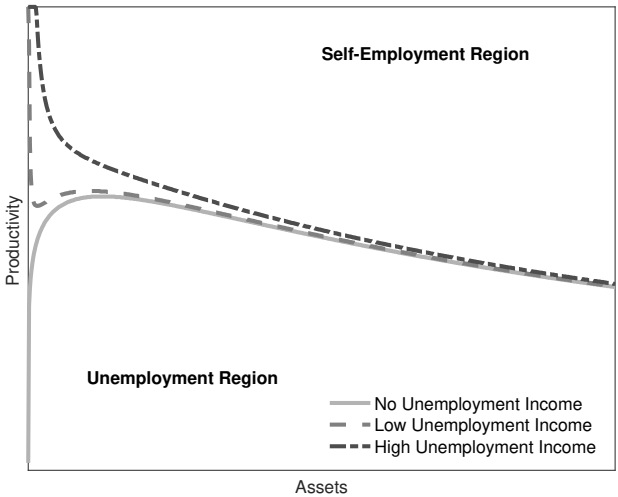


High unemployment benefits (b) or no unemployment ($p = 1$)

- "Positive" selection to SE
- Productive/Wealthy agents
- No low-earning SE

Self-employment as an outside option to unemployment

back 1 back 2



Selection breaks for resource constrained agents:

- Poor + Unemployed

→ Unproductive SE

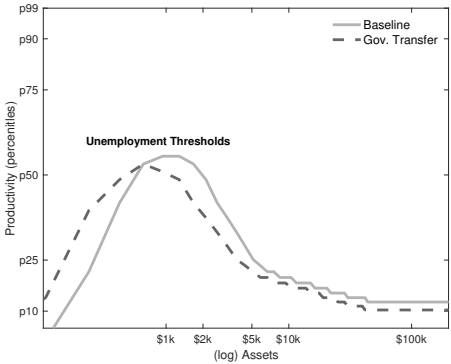
→ Low-earning SE

- Large share of SE if lots of poor/constrained agents

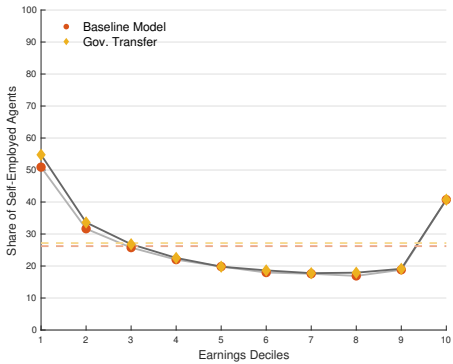
Policy Appendix

Micro Transfers - Occupational Choices

back



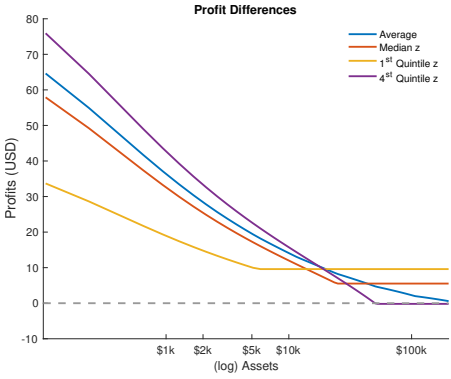
Some changes in thresholds



Small effects across distribution of income

Micro Transfers - Self-Employment Income

back

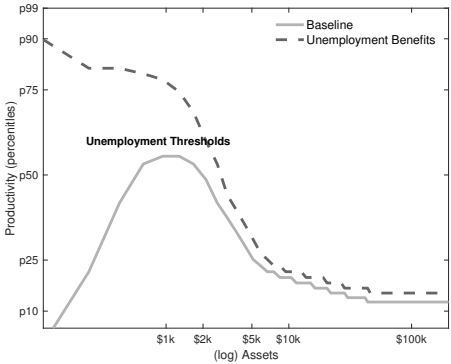


Small profit gains to poor & productive

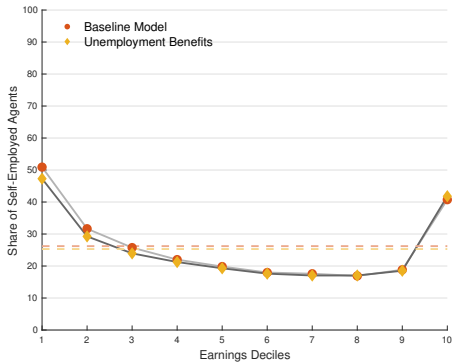
Negligible effects in the distribution

Unemployment benefits - Occupational Choices

back



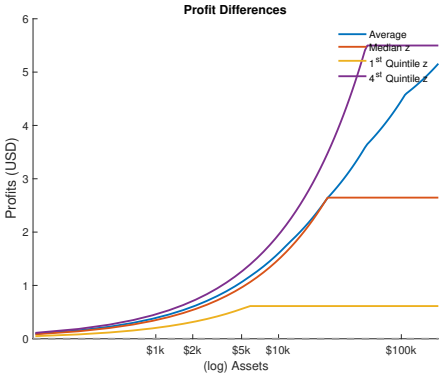
Increase in productivity selection



Lower mass of low-earning SE

Unemployment benefits - Self-Employment Income

back

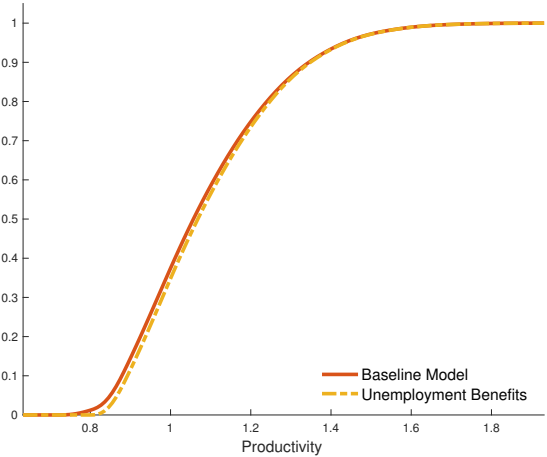


Productive SE take advantage of $w \downarrow$

Noticeable effects on earnings

Unemployment benefits - Productivity Distribution

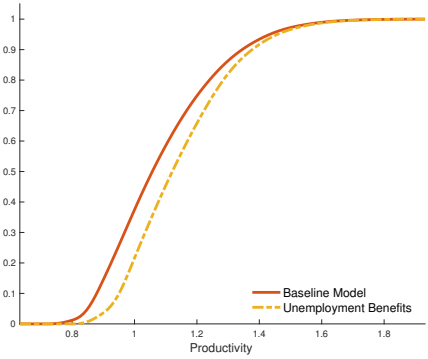
back

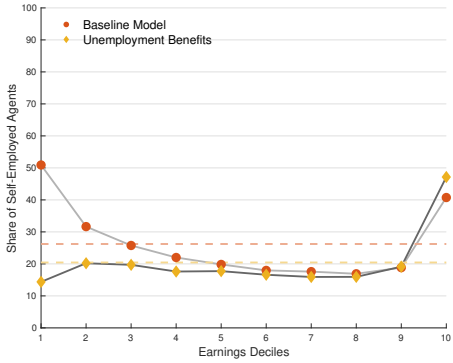


Change in selection improves productivity

Unemployment Benefits: Self-employment ↓ among the poor

back





Productivity distribution improves (FOSD)

In GE self-employment ↓ among poor (↓ wages benefit high-productivity)

Unemployment benefits: productivity ↑, unemployment ↑

back

Moment	GE	Moment	GE
% Δ Wage	-2.0	Δ Employment	0.46
% Δ Output	-2.3	Δ Self-employment	-5.8
% Δ TFP	**2.9**	Δ Unemployment	**5.1**

Credit Deepening: Relaxing Collateral Constraints

- Financial frictions prevent self-employed to produce at optimal scale
- Capture financial reform as credit deepening

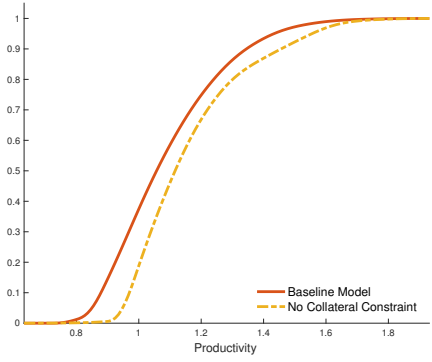
$$k \leq (\lambda + \lambda_{CD}) \cdot a$$

Two exercises:

1. Relaxed collateral constraint: $\lambda_{CD} > 0$ (In paper)
2. No collateral constraint: $\lambda_{CD} \to \infty$

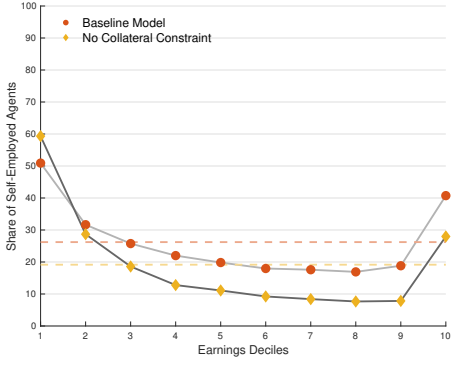
more

Elimination of Collateral Constraints: $\lambda_{CD} \to \infty$



Productivity distribution improves

TFP $\uparrow$ 11%

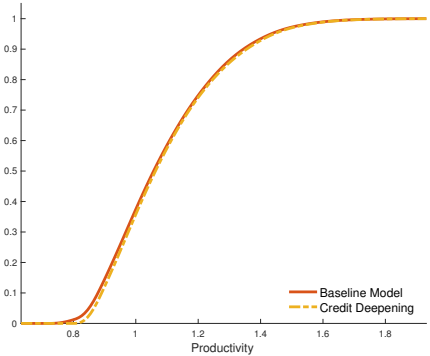


SE $\downarrow$ bc strong GE effects: wages $\uparrow$

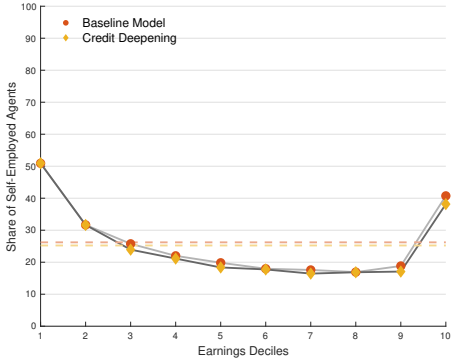
Subsistence concerns remain more

Credit Deepening: $\lambda_{CD} > 0$

back



Productivity distribution improves

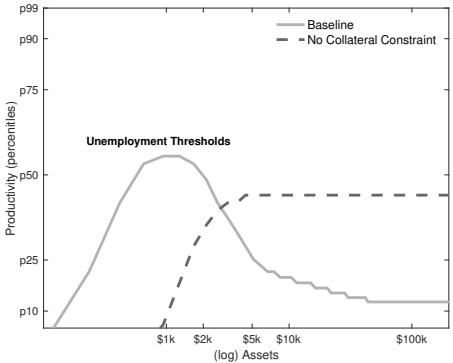


SE ↓ because wages ↑

(subsistence SE persists)

Elimination of Collateral Constraints

back



Does not solve occupational choices at the bottom

Transfers to the self-employed

Transfers of 17% of labor incomes to the lowest 10% Banerjee, Niehaus, and Suri (2019)

$$y^S = r \cdot a + \pi(a, z) + b_{MG} \mathbb{1}_{MG}$$

Transfers to the self-employed

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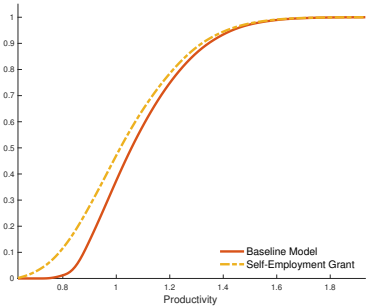
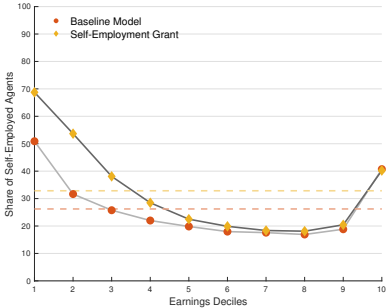


Productivity distribution worsens (FOSD)



Self-employment ↑ among the poor

(productive SE do not benefit)

Transfers to the self-employed

Moment	GE	Moment	GE
% Δ Wage	1.0	Δ Employment	-2.5
% Δ Output	-2.4	Δ Self-employment	**6.6**
% Δ TFP	**-2.5**	Δ Unemployment	**-4.1**

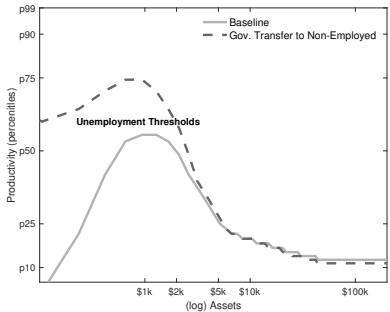
- Transfers heavily influence occupational choice
- Unemployed agents prefer self-employment regardless of productivity
- Aggregate producitivity decreases as a result

Transfers to the non-employed: Occupational choice

back

Policy effects:

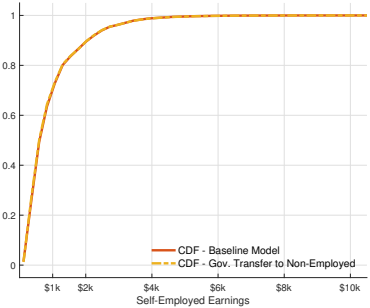
Moment	
Δ Employment	-0.22
Δ Unemployment	-0.14
Δ Self-employment	**0.36**
% Δ Wage	-0.04
% Δ Income(E)	-0.22
% Δ Income (S)	**-1.40**



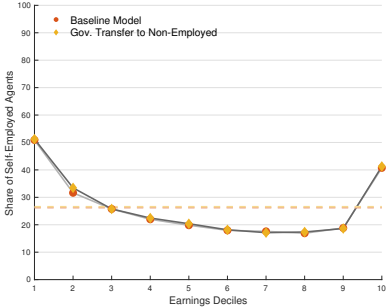
Increase in productivity selection

Transfers to the non-employed: Self-employed income

back



Increase in productivity selection



Increase in productivity selection