The Macroeconomic Consequences of Subsistence Self-Employment

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Self-employment in developing countries

- High **self-employment rates** in developing countries (Poshke, 2019)
- High prevalence of *subsistence entrepreneurship* (Schoar, 2010)

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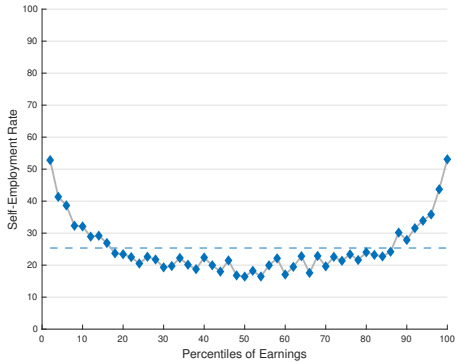
Self-employment concentrated among the rich **and the poor**

(Data from 9 developing countries)



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

What we do

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 (loosen financial frictions)
   - 3.2 Targeted transfers to the unemployed (insure labor risk)

What we find

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4. Generosity of the safety net to the unemployed is TFP enhancing
   (increases selection into self-employment)

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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Occupational Choice:

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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$$V^S(a,z) \geq V^U(a,z)$$

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

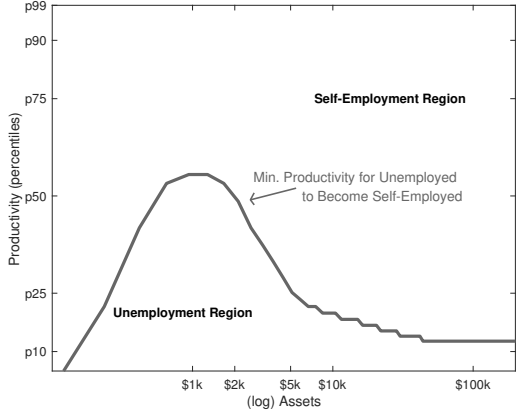
$$\text{Example:} \quad \Omega^U = \left\{(a,z) \in \mathcal{S} \mid V^U(a,z) > V^S(a,z)\right\}$$

(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:

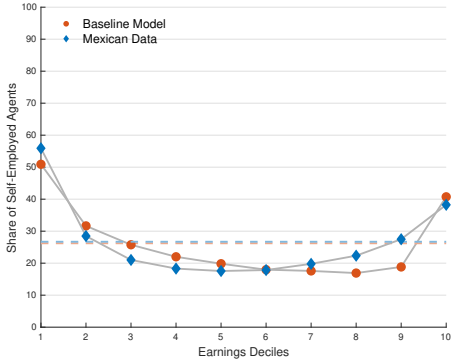
sample details | more moments

- 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. **Joint distribution of occupations and income**
   - Model matches profile of self-employment across earnings
     - **Key:** Subsistence concerns of the unemployed $\longrightarrow$ Occupational Choice
   - Model with only financial frictions fails in doing so

details



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2. **Reaction after labor demand shocks**
   - Dev. 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 response of wages $\left(\frac{\Delta \log w}{\Delta \log N} < 1\right)$: self-employment "hides" slack
   - Model simulation $\frac{\Delta \log w}{\Delta \log N} = 0.16$ (vs 1.6 with only financial frictions)
     - **Key:** Occupational transitions $SE \to U$ rather than $SE \to E$

Development Policies

What are the (macro) effects of policies aimed at self-employed?

- Literature finds overall small effects of micro-credit programs on individuals
  - Angelucci, Karlan, Zinman (2015): "small effects on 37 outcomes" from loans to women entrepreneurs in Mexico
    - Loans have high interest rates (110 APR) and group liability (10-50 women per group)
  - Maeger (2019): "the impact on household business and consumption variables is unlikely to be transformative and may be negligible"
    - Meta-study (Boznia, Ethiopia, India, Mexico, Mongolia, Morocco and The Phillipines)
    - Varied conditions (13% to 100% APR, individual or group liability, rural or urban, women and men, collateralized or not)

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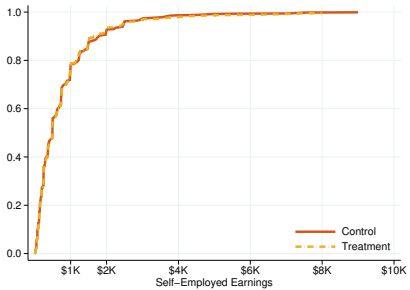

- Data from Angelucci, Karlan, Zinman (2015)
- Effects of a $540 dollar loan on business income
- No change in self-employed' earnings

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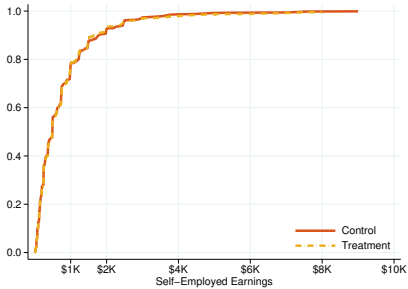

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Objective:

1. Can the model match the muted effects at the micro-level?
2. Test macro effects of policies using the model

Policy design

1. **Micro-Loans:** Credit lines of around USD $500 to rent physical capital
2. **Micro-Grants:** Zero interest lease of around USD $500 of physical capital
3. **Transfers to Unemployed:** Transfer of around USD $20 to unemployed individuals

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1. Do small micro effects imply negligible macro effects?
2. How does design of policy affect micro vs macro effects?

Micro Loans

- Relaxation of collateral constraint $k \leq \lambda a + \underline{\lambda}$
- Policy is self-financed. Recepients pay $(r + \delta)$ to rent capital
- $\underline{\lambda}$: Ave. loan size of micro-credit interventions in Mexico Angelucci, Karlan, Zinman (2015)

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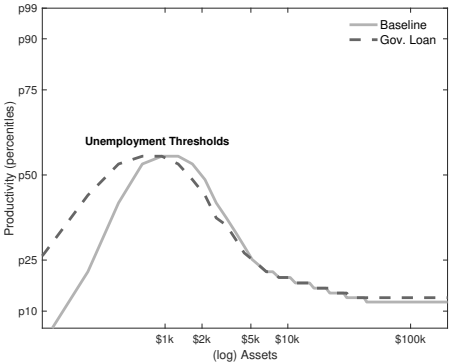
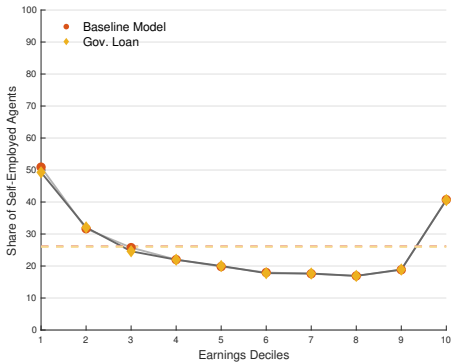
Policy effects:

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**

Micro Loans - Occupational Choices

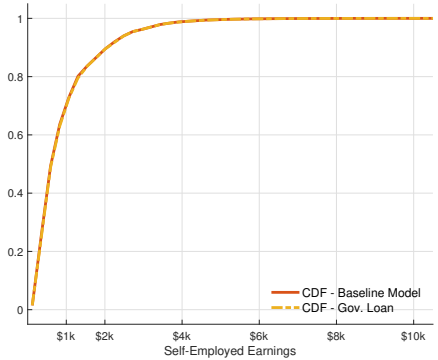


Some changes in thresholds



Small effects across distribution of income

Micro Loans - Self-Employment Income



Negligible effects in the distribution

Micro Loans - Aggregate effects are non-negligible

	Output	TFP	Assets	Consumption
% Δ	0.20	**0.15**	-0.40	0.02

- Small changes in selection into SE $\longrightarrow$ Effects in agg. TFP
- Decrease in assets from insurance effect of loans (loosen collateral constraint)
- Heterogeneity in consumption effects, e.g., $\%\Delta(C^U) = 1.25$
- Small welfare gains for poor agents 0.1pp

Micro Grants

- Relaxation of collateral constraint $k \leq \lambda a + \underline{\lambda} +$ Recipients pay 0 to rent capital
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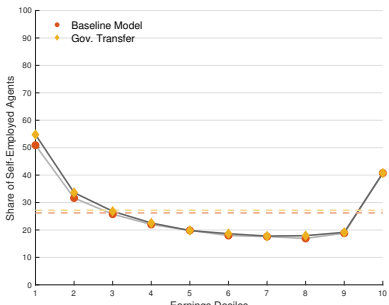
Policy effects:

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**



Decrease in threshold

Micro Grants - Aggregate effects are non-negligible

	Output	TFP	Assets	Consumption
% Δ	0.23	**-0.45**	-1.11	0.15

- Small changes in selection into SE $\longrightarrow$ Effects in agg. TFP
- Decrease in assets from insurance effect of loans (loosen collateral constraint)
- Heterogeneity in consumption effects, e.g., $\%\Delta(C^U) = -2.38$
- Small but broad welfare gains 0.7pp

Transfers to the unemployed

The policy grants \$20 USD (10% of min wage) to the unemployed (Similar to Δ in profits from other policies)

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

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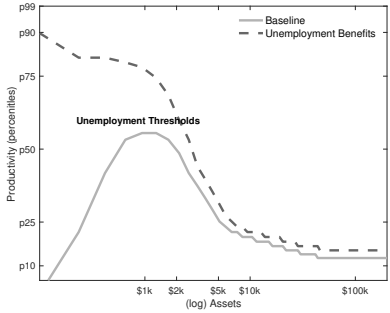
Policy effects:

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**



Increase in productivity selection

Transfers to the unemployed - Aggregate effects are non-negligible

	Output	TFP	Assets	Consumption
% Δ	0.25	**0.42**	-0.52	-0.26

- Changes in selection into SE $\longrightarrow$ Increase aggregate TFP
- Decrease in assets from insurance effect of payments
- Heterogeneity in consumption effects, e.g., $\%\Delta(C^U) = 3.95$
- Small welfare losses (0.9pp) due to lower (after-tax) wages

generosity

Transfers to the non-employed

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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	Output	TFP	Assets	Consumption
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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

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or

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Appendix

Data Appendix

Mexican sample details

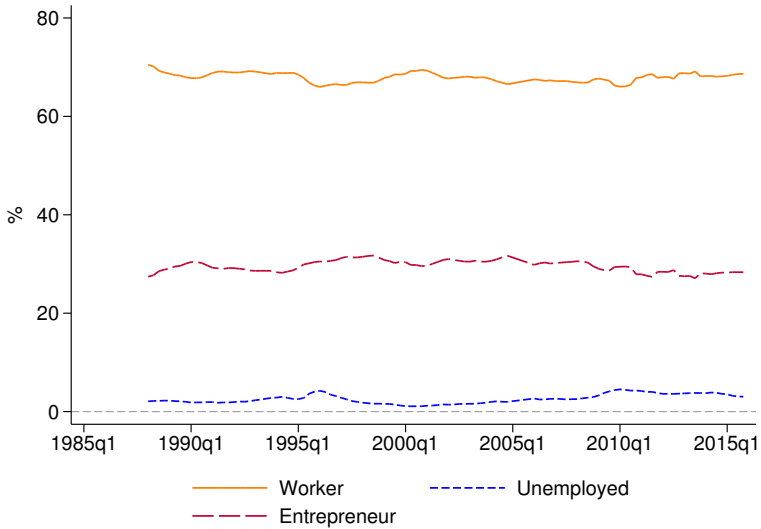
back

- 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

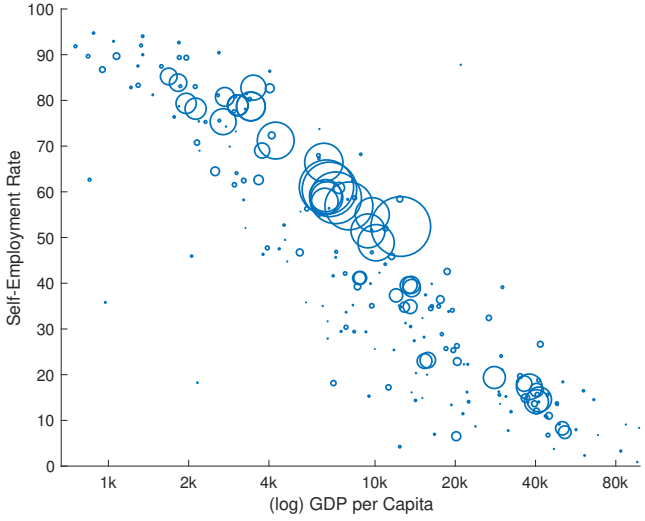
Workforce composition in Mexico: Time series

back



Self-employment across countries

back



Self-employment and earnings distribution: Details

back

- Run a regression of the form:

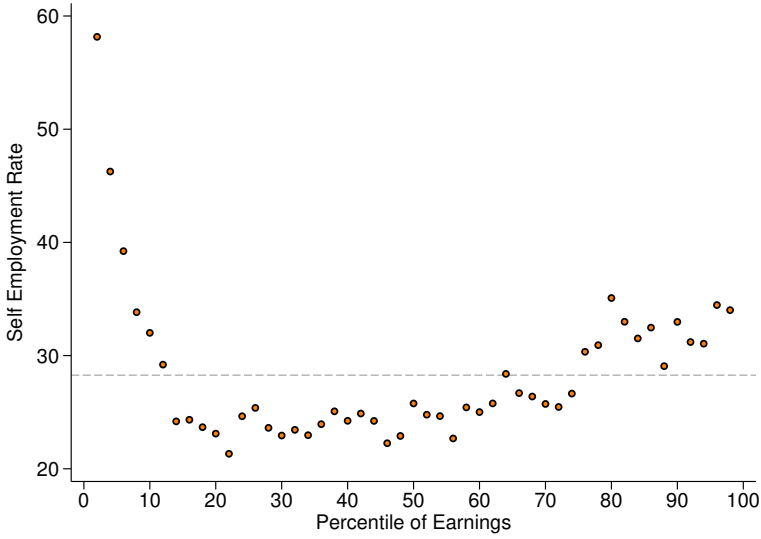
$$\log(w_{i,t}) = \alpha + \gamma_t + \beta X_{i,t} + \eta_{i,t}$$

- 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

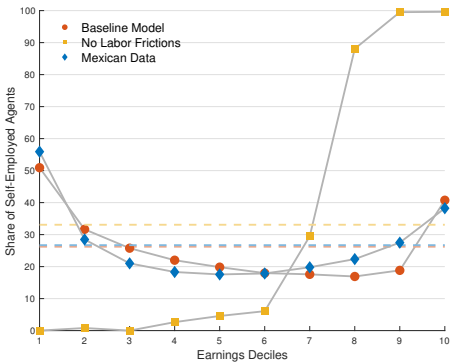
	Data	Model		Data	Model		Data	Model
$U \to U$	27.4	29.3	$S \to U$	1.9	4.6	$E \to U$	3.1	2.5
$U \to S$	14.6	23.6	$S \to S$	76.8	62.2	$E \to S$	8.1	12.8
$U \to E$	58.0	47.1	$S \to E$	21.3	33.1	$E \to E$	88.8	84.7

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

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

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: $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$

Unemployment

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

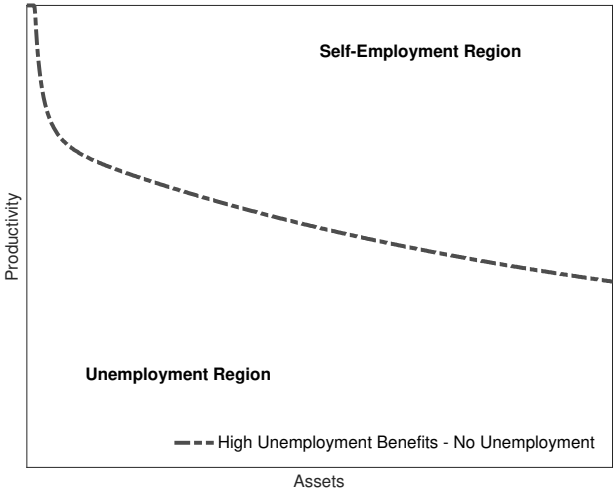
Self-Employment

- 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

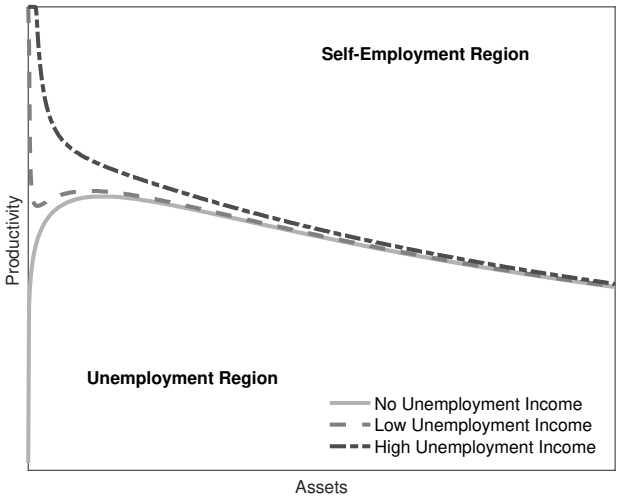


High unemployment benefits (b) or no unemployment ($p = 1$)

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

Self-employment as an outside option to unemployment

back



Selection breaks for resource constrained agents:

- Poor + Unemployed

→ Unproductive SE

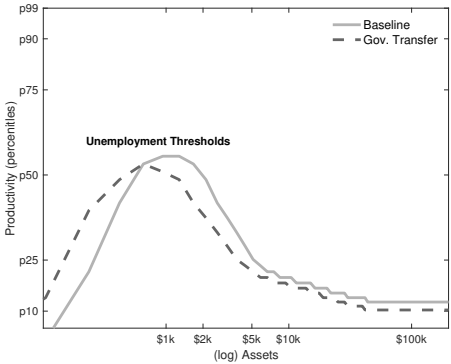
→ Low-earning SE

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

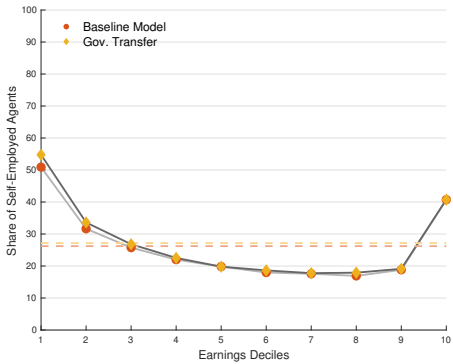
Policy Appendix

Micro Transfers - Occupational Choices

back



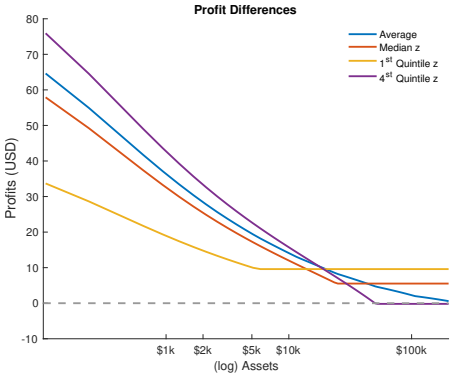
Some changes in thresholds



Small effects across distribution of income

Micro Transfers - Self-Employment Income

back

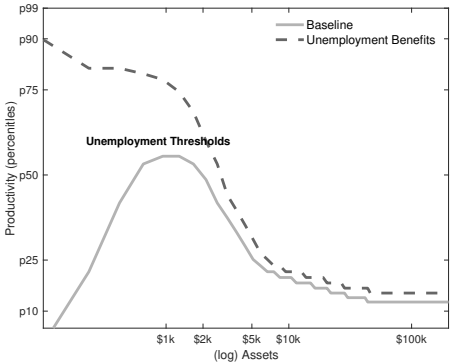


Small profit gains to poor & productive

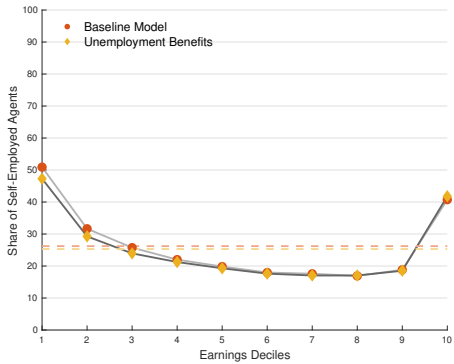
Negligible effects in the distribution

Unemployment benefits - Occupational Choices

back



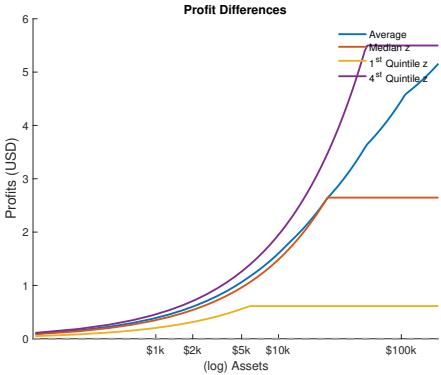
Increase in productivity selection



Lower mass of low-earning SE

Unemployment benefits - Self-Employment Income

back

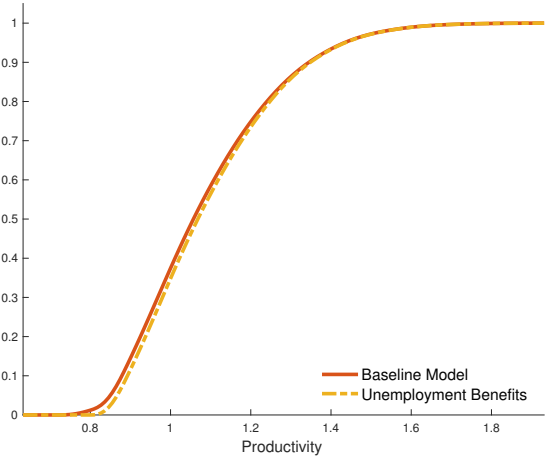


Productive SE take advantage of $w \downarrow$

Noticeable effects on earnings

Unemployment benefits - Productivity Distribution

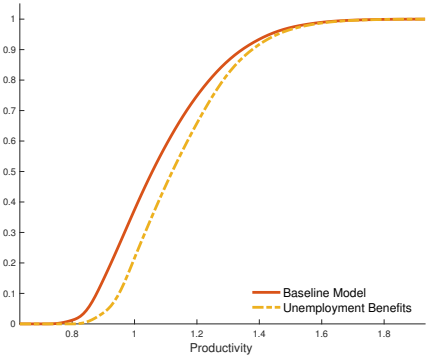
back

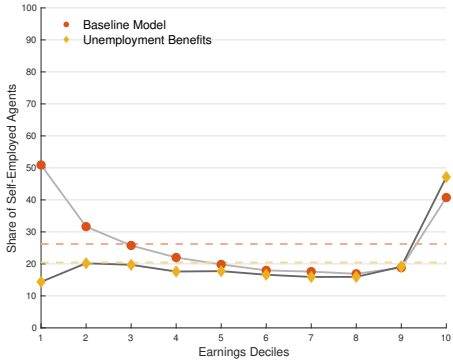


Change in selection improves productivity

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

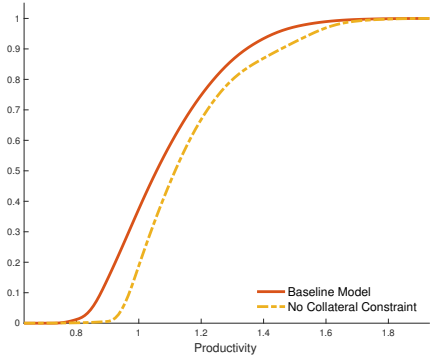
$$k \leq (\lambda + \lambda_{CD}) \cdot a$$

Two exercises:

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

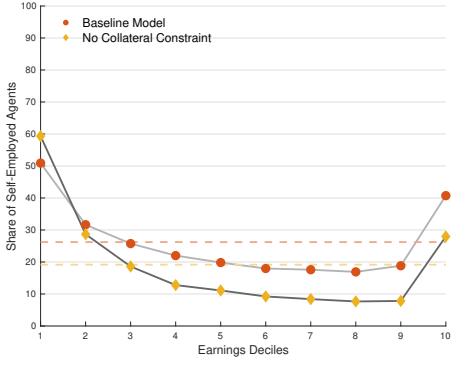
more

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



Productivity distribution improves

TFP $\uparrow$ 11%

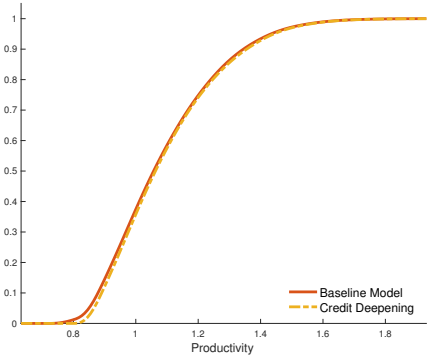


SE $\downarrow$ bc strong GE effects: wages $\uparrow$

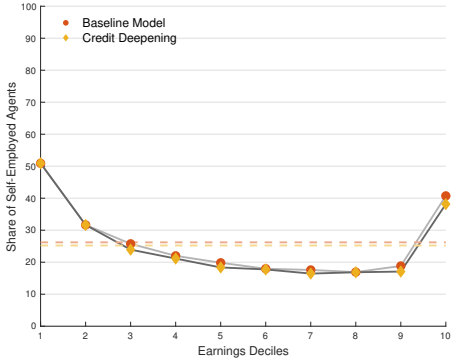
Subsistence concerns remain more

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

back



Productivity distribution improves

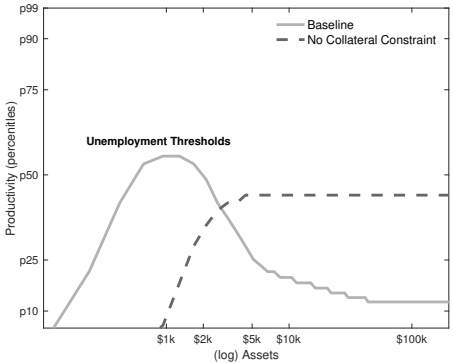


SE ↓ because wages ↑

(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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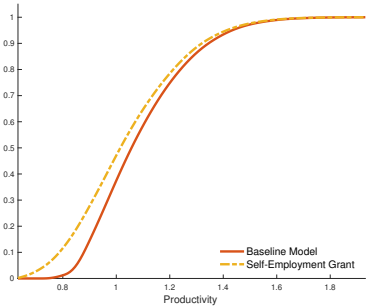
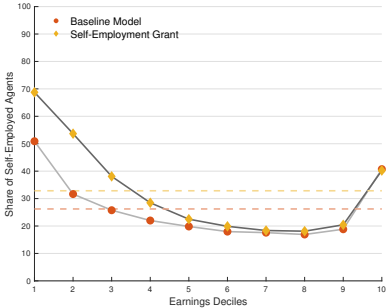


Productivity distribution worsens (FOSD)



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**

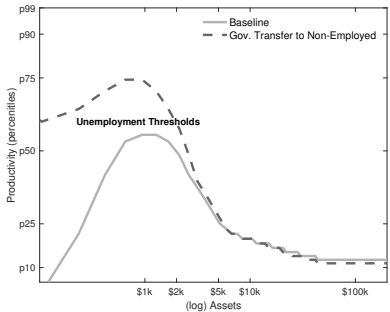
- Transfers heavily influence occupational choice
- Unemployed agents prefer self-employment regardless of productivity
- Aggregate producitivity decreases as a result

Transfers to the non-employed: Occupational choice

back

Policy effects:

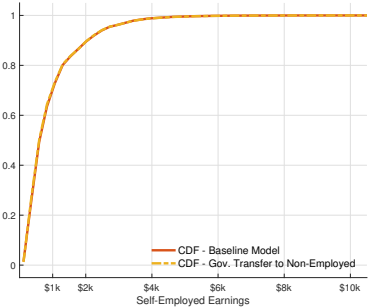
Moment	
Δ Employment	-0.22
Δ Unemployment	-0.14
Δ Self-employment	**0.36**
% Δ Wage	-0.04
% Δ Income(E)	-0.22
% Δ Income (S)	**-1.40**



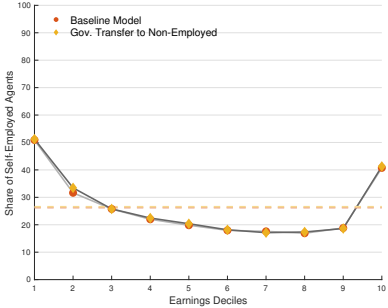
Increase in productivity selection

Transfers to the non-employed: Self-employed income

back



Increase in productivity selection



Increase in productivity selection