Credit and Saving Constraints in General Equilibrium: Evidence from Survey Data

Catalina Granda
Universidad de Antioquia

Franz Hamann
BdR & St. Louis Fed

Cesar E. Tamayo
Inter-American Development Bank[1]

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[1] Opinions are those of the authors and do not necessarily reflect the views of the Banco de la República, the Federal Reserve System, the Inter-American Development Bank, its Board of Directors, or the countries they represent.

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- Recently, goal of improving access to credit joined by interest in role of savings in comprehensive financial inclusion strategy
- Little is known about general equilibrium effects of savings constraints, or how they interact with credit frictions

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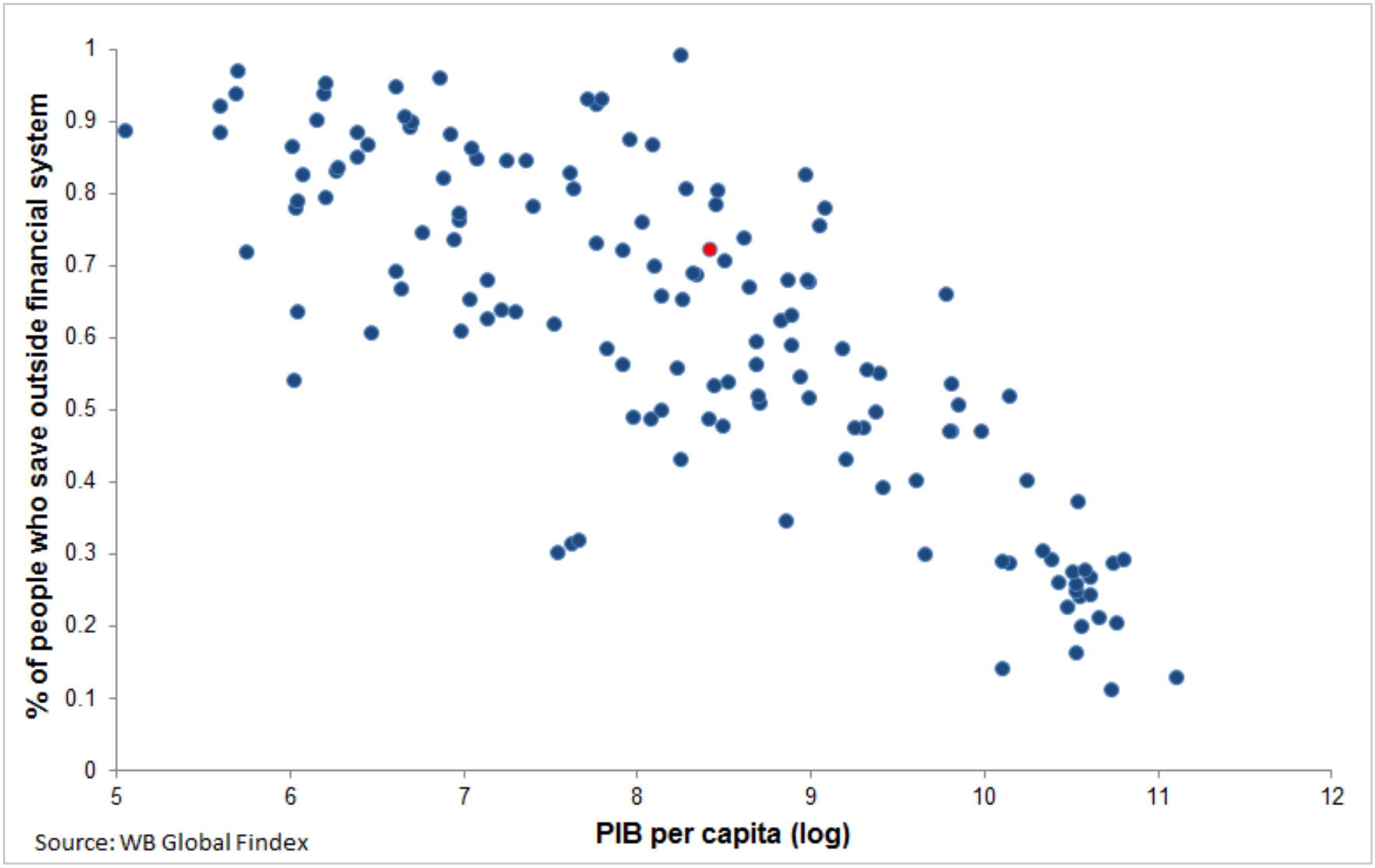
  - Income, saving & credit behavior (how much and where)
  - Three waves (2010,2013,2016)

Empirical regularities (World)

Saving outside the financial system is a widespread phenomenon



Empirical regularities (Colombia)

Colombia is no exception

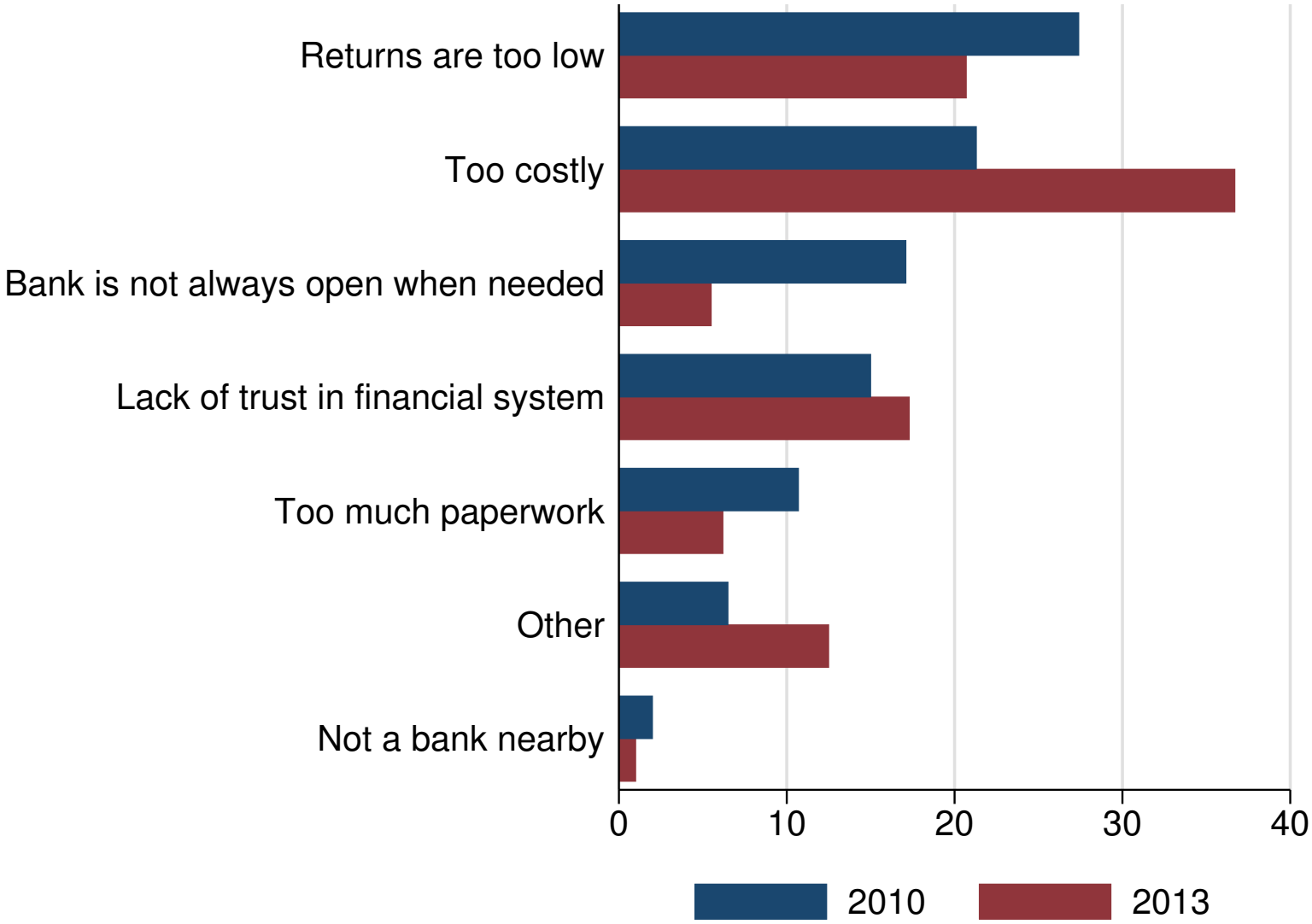
Table: Incidence and composition of savings

	2010	2013
	Workers	Workers
Does not save	72.9%	73.3%
Savers	27.1%	26.7%
Formal	61.5%	62.2%
Informal	38.5%	37.8%

Source: Authors' calculations based on ELCA.

Empirical regularities (Colombia)

High costs and low returns are the main reasons why



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  - Low productivity of investment $\longrightarrow$ low returns $\longrightarrow$ low saving

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A dynamic general equilibrium model with heterogeneous agents in which financial market frictions distort credit and saving decisions

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- Deposit contract is costly $\rightarrow$ Savings constraints $\rightarrow$ informal saving $\rightarrow$ lower aggregate savings
- Entrepreneurs can access credit markets, but face collateral requirements $\rightarrow$ credit constraints $\rightarrow$ capital misallocation $\rightarrow$ lowers productivity and return to formal financial instruments

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- Can borrow d at interest rate r and save b at cost τ
- After de-trending ($\gamma = g^{\frac{1}{1-\alpha}}$) and re-scaling by a:

$$V\left(b, z\right) = \max_{b', k, l} \frac{c^{1-\chi}}{1-\chi} + \beta \eta \gamma^{1-\chi} \sum_{z'} V\left(b', z'\right) \pi\left(z' | z\right)$$

$$\text{s.t.} \quad c + \gamma b' + \tau = \exp\left(z\right)^{1-\mu} \left(k^{\lambda} l^{1-\lambda}\right)^{\mu} - \left(r + \delta\right) k - w l + (1 + r) b$$

$$d \leq \varphi k, \qquad k = b + d$$

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- Can save in one-period deposit contracts, q, at a fixed cost τ, or in cash, s, at zero cost
- After de-trending and re-scaling by ν, the worker's problem is:

$$W(q, s, \epsilon) = \max_{q', s'} \frac{c^{1-\chi}}{1-\chi} + \beta\gamma^{1-\chi} \sum_{\epsilon'} W(q', s', \epsilon') \psi(\epsilon'|\epsilon)$$

$$\text{s.t.} \quad c + \gamma q' + \gamma s' = w \exp(\epsilon) + (1 + r) q + s - \tau \mathbb{I}_{\{q' > 0\}}$$

$$q \geq 0, \ s \geq 0$$

Model: Stationary Equilibrium

A S.E. is a set of prices (w, r), stationary distributions g and h, decision rules for workers $\{c(q, s, \epsilon), q'(q, s, \epsilon), s'(q, s, \epsilon)\}$ and entrepreneurs $\{b'(b, z), d(b, z), l(b, z), k(b, z)\}$, that satisfy:

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- Labor market clearing:

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- Asset market clearing condition:

$$\sum_{b,z} h(b,z) k'(b,z) = \sum_{q,s,\epsilon} g(q,s,\epsilon) q'(q,s,\epsilon) + \sum_{b,z} h(b,z) b'(b,z)$$

Calibration: assigned parameters

Param	Value	Description	Source
β	0.96	Discount factor	DGE literature
χ	2.3	Risk aversion coefficient	Prada & Rojas (2010)
μ	0.85	Share of variable inputs	Zuleta et al. (2010)
α	0.46	Capital share in production	Zuleta et al. (2010)
δ	0.075	Capital depreciation rate	Hamann & Mejía (2013)
$1-\eta$	0.07	Exit rate for entrepreneurs	Eslava et al. (2013)
γ	1.038	Trend output growth rate	Stats Office (DANE)

Calibration: parameters used to match moments

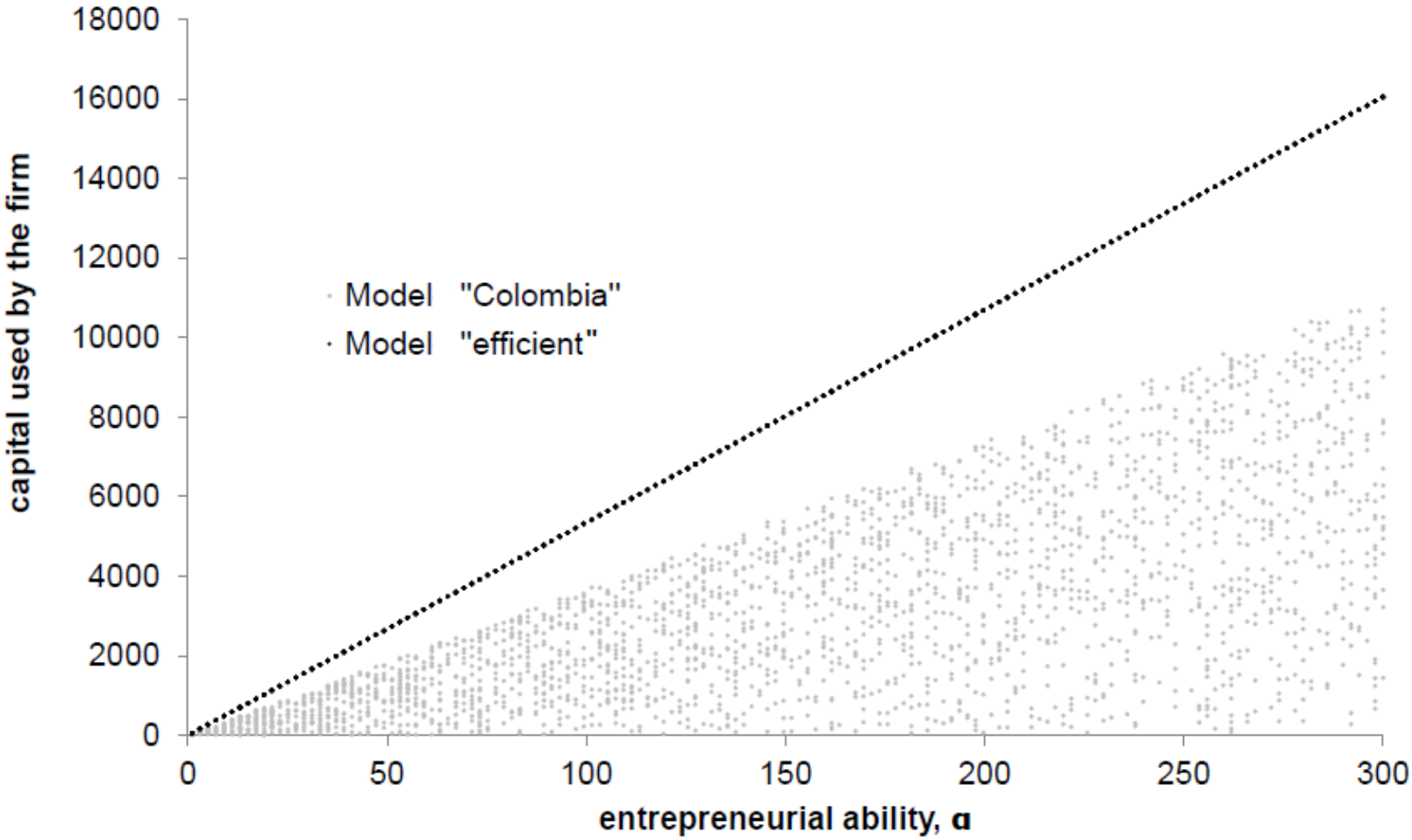
	Description	Target	Data	Model
ω	Tail Pareto workers	% income in top 1% (workers)	7.2%	7.1%
ζ	Tail Pareto firms	% income in top 1% (all)	11.3%	11.1%
ρ_ϵ	AR(1) labor prod.	% of workers who do not save	73.3%	62.9%
σ_ϵ	S.D. labor prod.	Workers saving rate	12.1%	12.0%
ρ_z	AR(1) entrep prod.	% of entrep who do not save	76.1%	20.8%
σ_z	S.D. of entrep prod.	Entrepreneurs saving rate	23.9%	19.4%
τ	Cost of formal saving	% of formal savers	62.2%	63.1%
φ	% of pledg. collateral	Credit-to-output ratio	31.8%	31.2%

Policy experiments: main results

Statistic	"Colombia"		$\xi = 0$, ϕ =COL		$\xi = 0$, ϕ =CHL		First best	
	SOE	Closed	SOE	Closed	SOE	Closed	SOE	Closed
Saving rate workers	0.12	0.12	0.12	0.11	0.12	0.12	0.13	0.19
% of workers who do not save	0.63	0.63	0.32	0.63	0.33	0.33	0.35	0.27
Saving rate entrepreneurs	0.19	0.19	0.19	0.19	0.20	0.20	0.22	0.21
% of entrepreneurs who save	0.21	0.21	0.21	0.21	0.25	0.25	0.52	0.50
Credit to GDP	0.31	0.31	0.31	0.32	0.71	0.72	2.64	2.35
% of formal savers (workers)	0.63	0.63	1.00	1.00	1.00	1.00	1.00	1.00
Entrep assets/total K	0.84	0.84	0.84	0.84	0.35	0.65	0.07	0.09
Output	1.00	1.00	1.00	1.01	1.05	1.06	1.33	1.25
TFP	1.00	1.00	1.00	1.00	1.01	1.01	1.06	1.05
interest rate (%)	6.31	6.31	6.31	4.66	6.31	6.05	6.31	7.59
Welfare								
Workers	1.00	1.00	1.09	1.02	1.18	1.17	1.51	1.60
Entrepr	1.00	1.00	1.00	0.99	2.84	1.16	2.00	2.00
Income dist								
tp 5%	0.32	0.32	0.31	0.32	0.29	0.30	0.22	0.20
bottom 40%	0.15	0.15	0.16	0.15	0.17	0.16	0.21	0.22
40%-80%	0.24	0.24	0.25	0.25	0.27	0.27	0.33	0.35

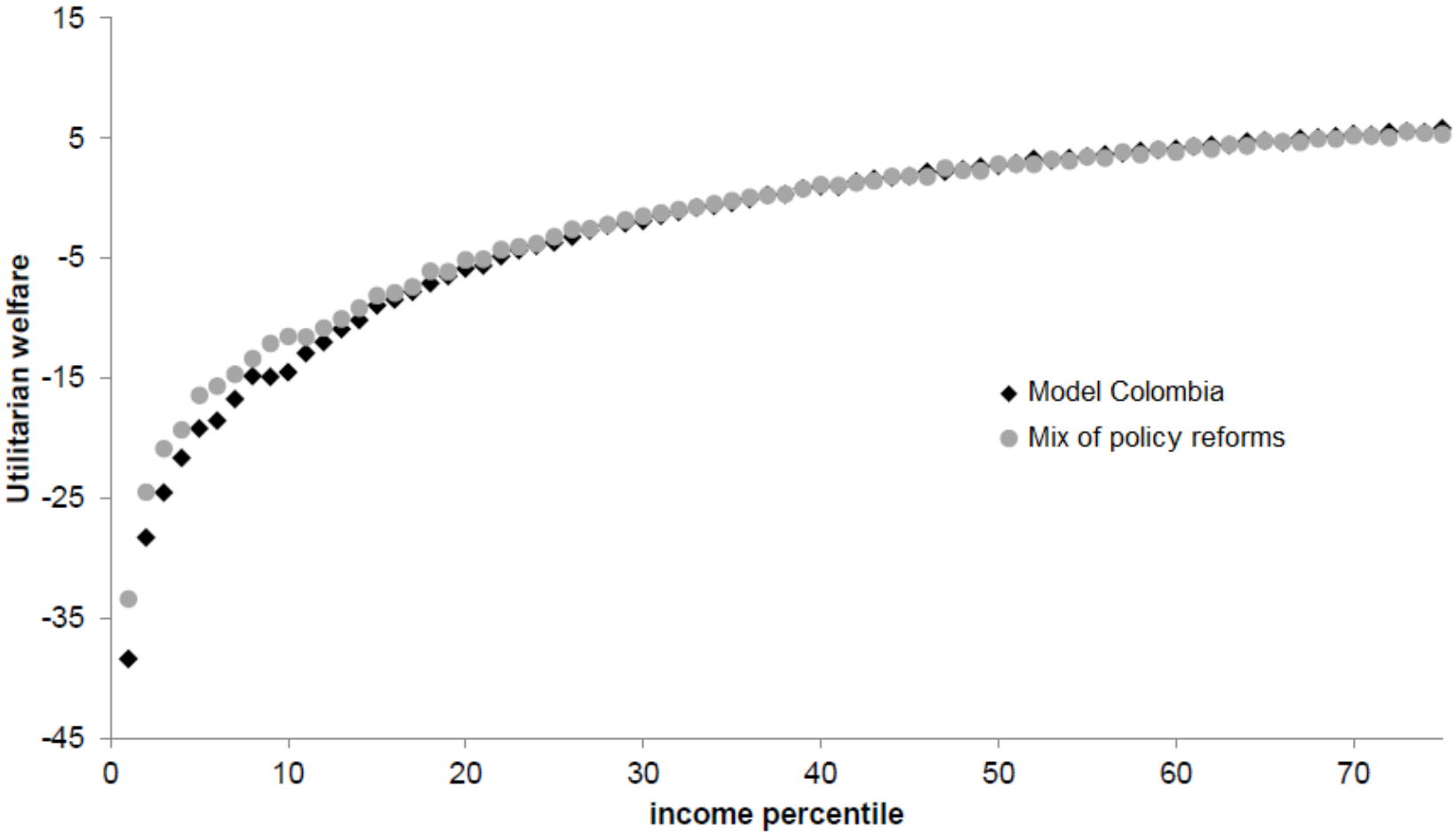
Policy experiments: capital allocation

In efficient economy, losses due to misallocation disappear as credit frictions do not constrain firm size



Policy experiments: welfare and income distribution

Increase in welfare from combination of reforms is larger for lowest percentiles of income distribution



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- Studies like this greatly complement growing literature on small-scale field experiments

Moving forward

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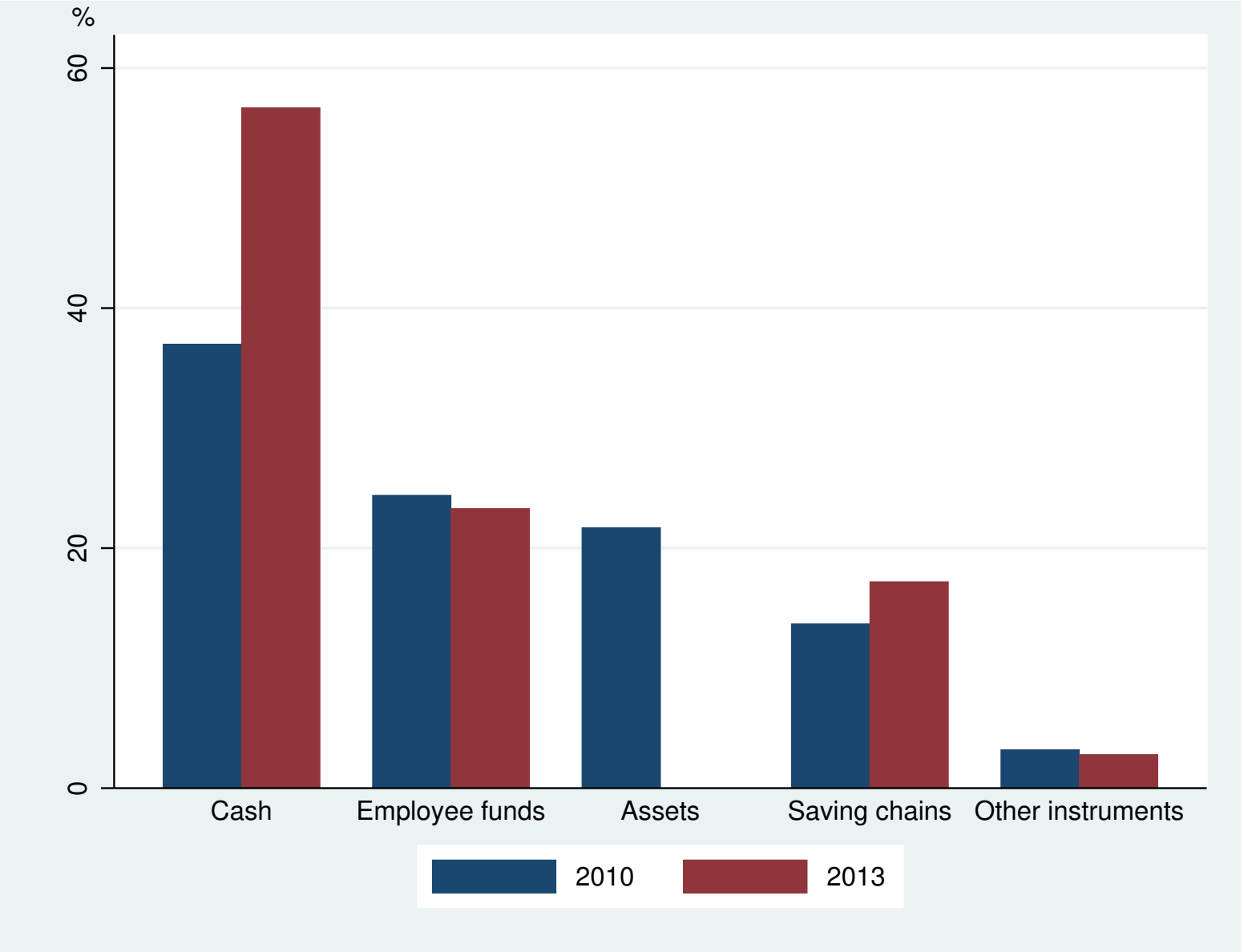
- Other mechanisms: save to borrow to run a firm (occupational choice)?

THANKS!

ADDITIONAL STUFF

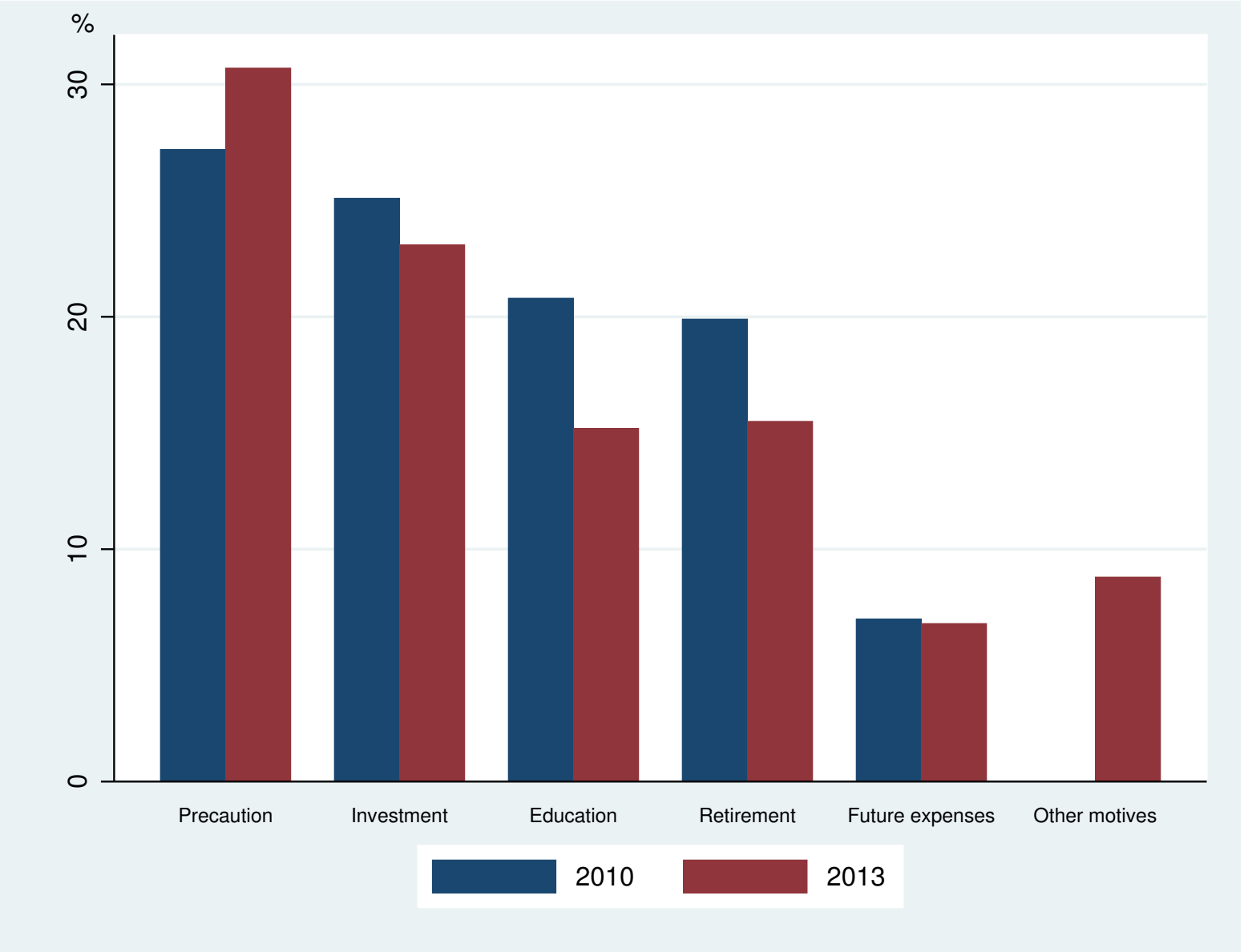
Empirical regularities

Response: returns are too low... save through...



Empirical regularities

Most people save for precautionary motives and for investment



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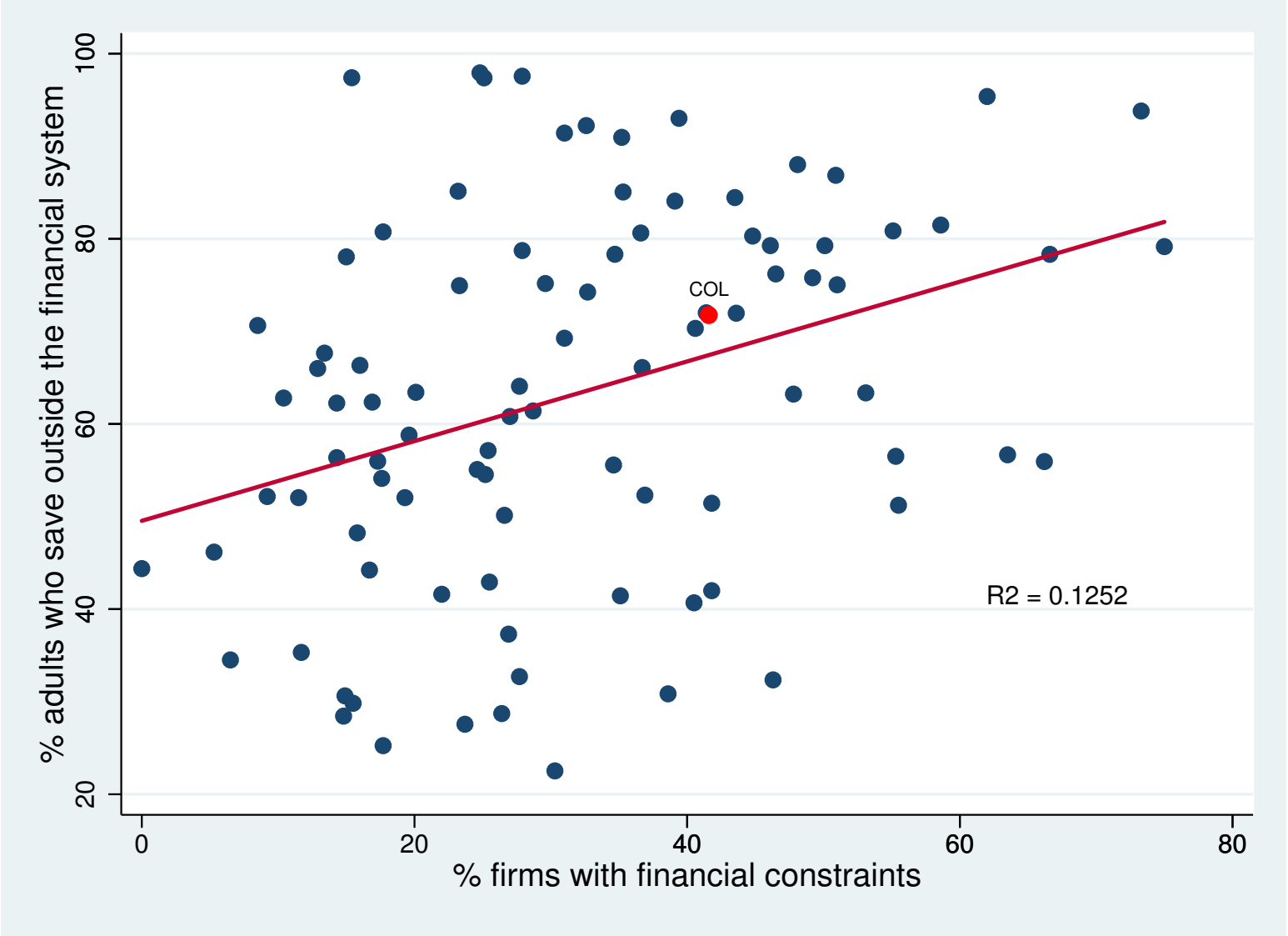
Capital misallocation stemming from borrowing constraints may be a contributing factor to such low returns



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σ_z	0.56	Std dev entrep productivity	Entrepreneurs saving rate
τ	0.02	Fixed cost of formal saving	% of formal savers
φ	0.165	% of pledgeable collateral	Credit-to-output ratio