# Credit and Savings Constraints in General Equilibrium: Evidence from Survey Data*

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2018 AEA Meetings
Philadelphia, January 4-7

*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, their Boards of Directors, or the countries they represent.

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- Little is known about general equilibrium effects of savings constraints, or how they interact with credit frictions

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- Presents framework to quantify general equilibrium effects of savings constraints and study their interactions with credit frictions

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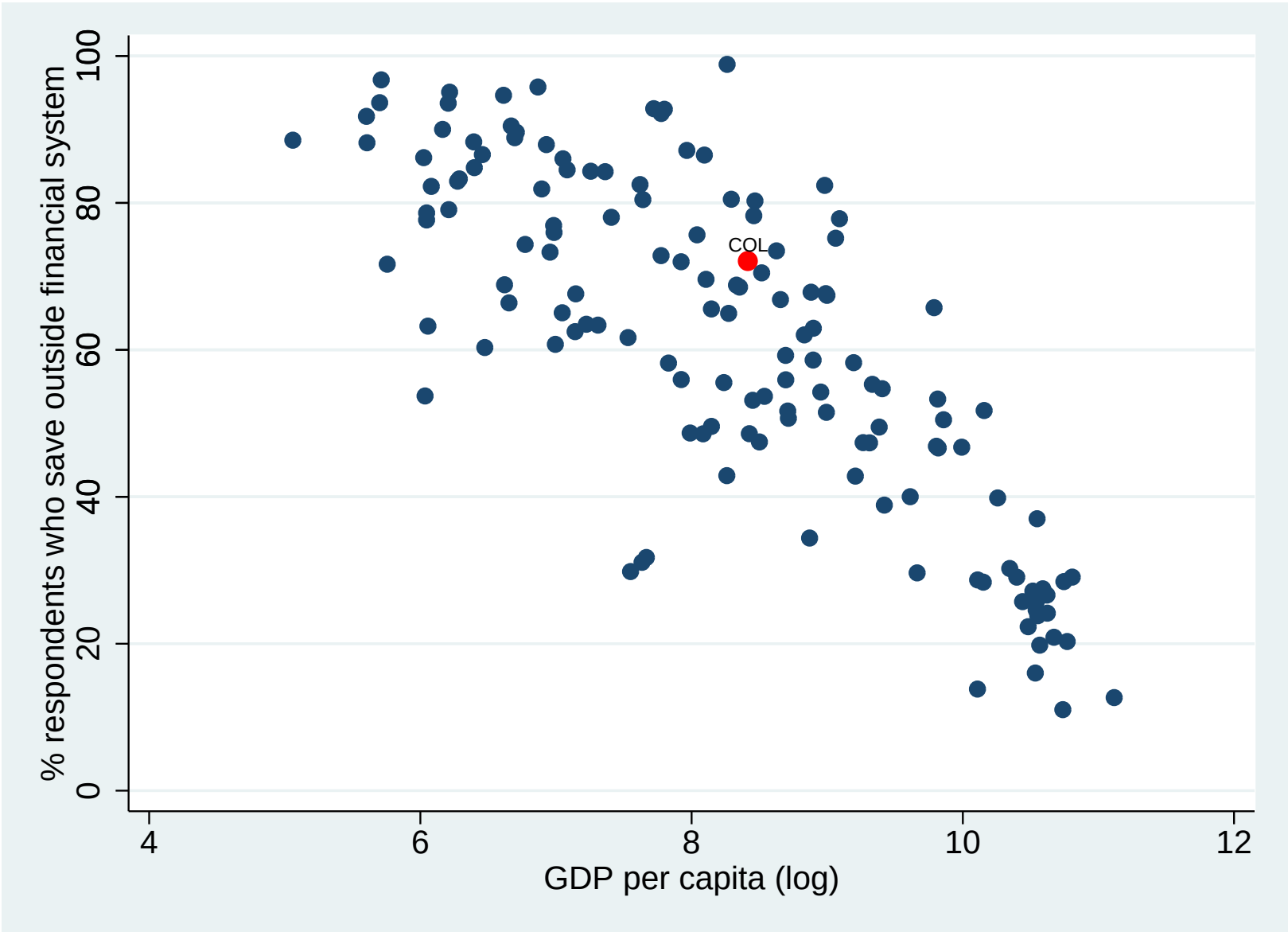
  - Income, saving & credit behavior (how much and where?)
  - Three waves (2010, 2013, 2016)

# Empirical regularities

Saving outside the financial system is a widespread phenomenon



# Empirical regularities

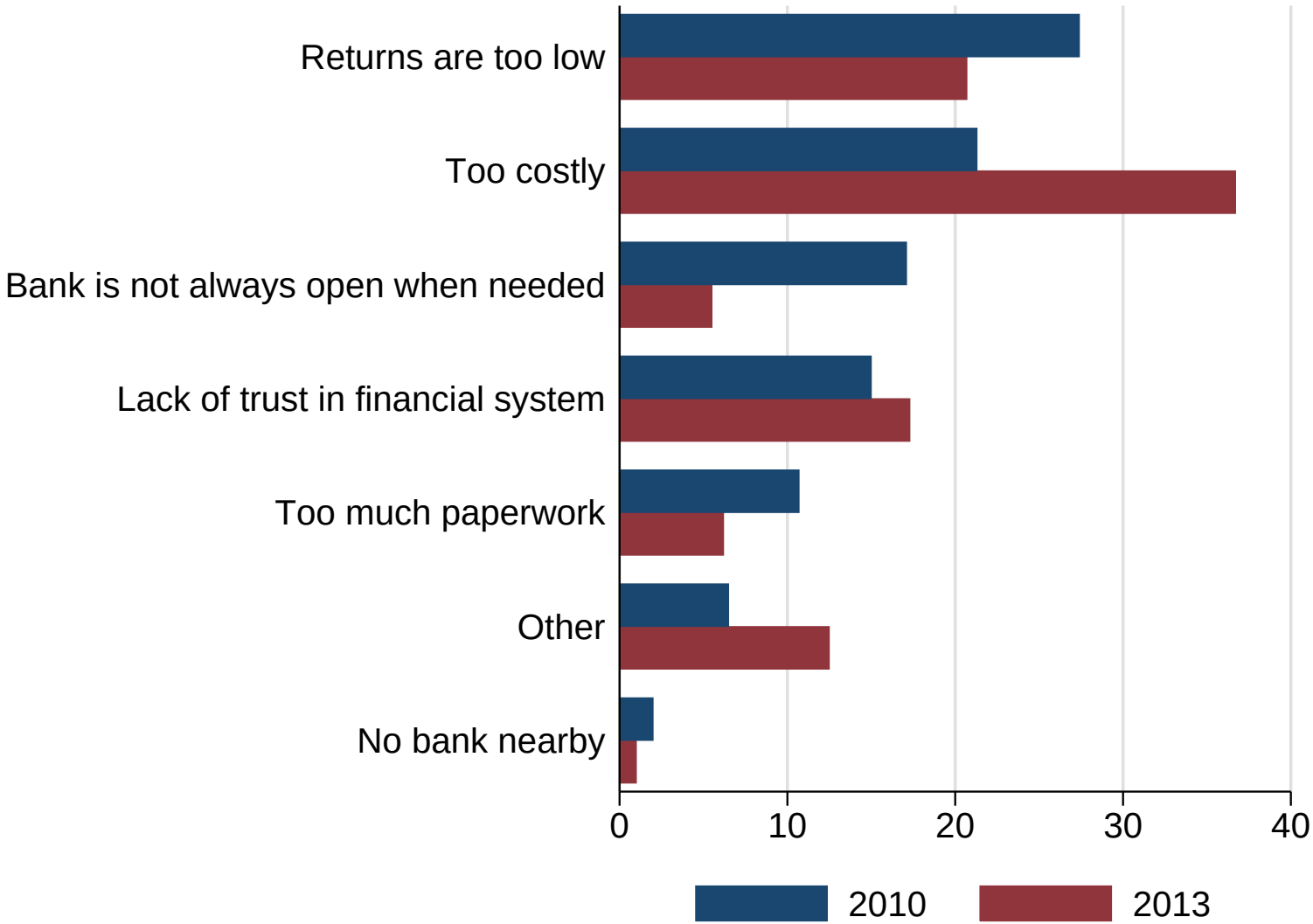
Colombia is no exception

Table: Incidence and composition of savings

| | 2010 | 2013 |
|---|---|---|
| Non-savers | 72.9% | 73.3% |
| Savers | 27.1% | 26.7% |
| Formal | 61.5% | 62.2% |
| Informal | 38.5% | 37.8% |

# Empirical regularities

High costs and low returns are the main reasons why



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  - High costs $\longrightarrow$ low savings $\longrightarrow$ low investment
  - Low productivity of investment $\longrightarrow$ low returns $\longrightarrow$ low savings

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- Interaction between formal and informal financial markets in developing countries

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- Credit constraints $\longrightarrow$ capital misallocation $\longrightarrow$ lower productivity and return to formal financial instruments

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- Each $t$, $1-\eta$ die and are replaced by new ones who draw from their $a$
- Can borrow $d$ at interest rate $r$ and save $b$ at cost $\tau$
- After de-trending ($\gamma = g^{\frac{1}{1-\alpha}}$) and re-scaling by $a$, an entrepreneur's problem is:

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

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

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

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

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

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

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

# Calibration: Assigned parameters

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

# Calibration: Parameters used to match moments

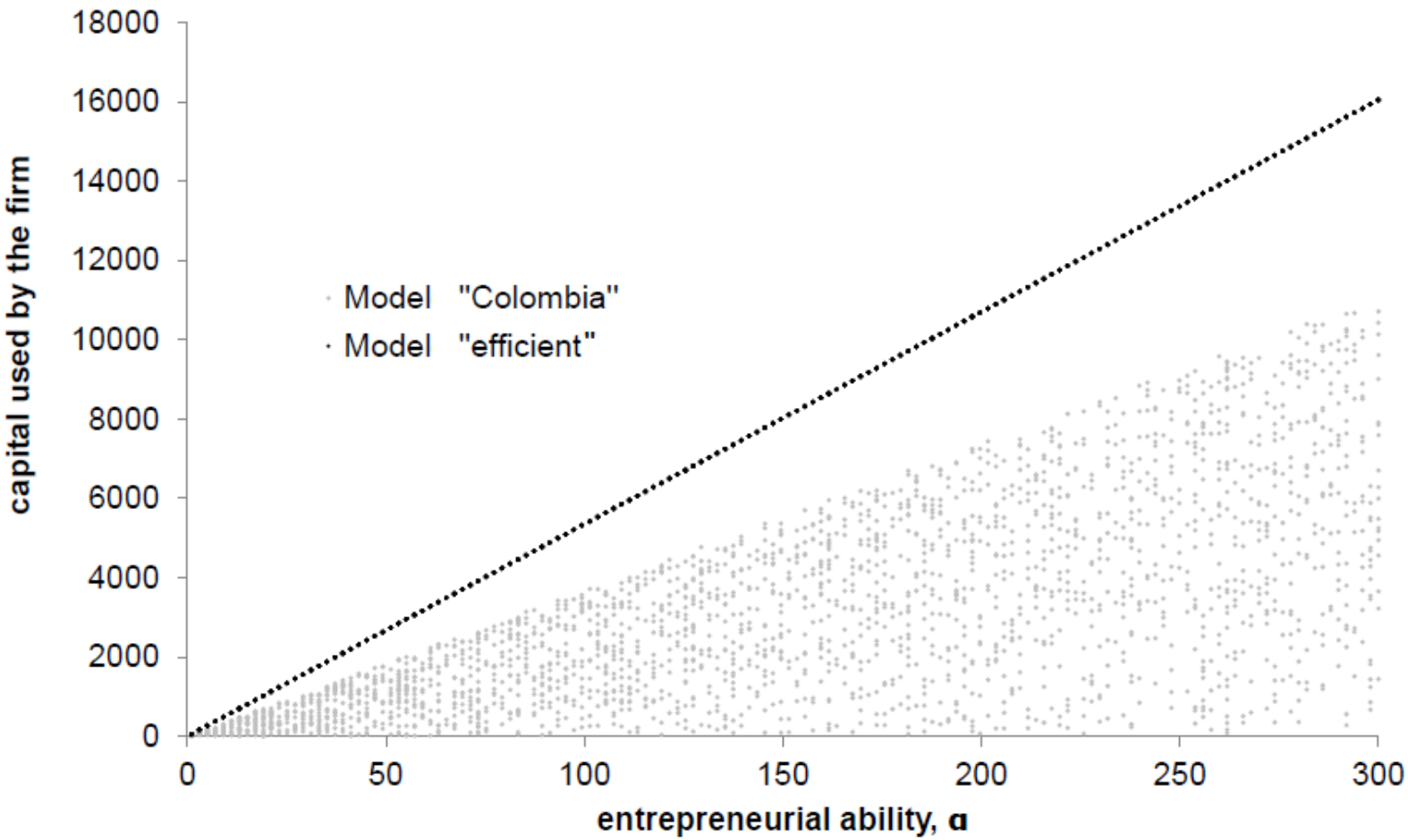
| | Description | Target | Data | Model |
|---|---|---|---|---|
| $\omega$ | Tail Pareto workers | % income in top 1% (workers) | 7.2% | 7.1% |
| $\zeta$ | Tail Pareto firms | % income in top 1% (all) | 11.3% | 11.1% |
| $\rho_\epsilon$ | AR(1) labor prod | % of workers who do not save | 73.3% | 62.9% |
| $\sigma_\epsilon$ | S.D. of labor prod | Workers saving rate | 12.1% | 12.0% |
| $\rho_z$ | AR(1) entrep prod | % of entrep who do not save | 76.1% | 20.8% |
| $\sigma_z$ | S.D. of entrep prod | Entrepreneurs saving rate | 23.9% | 19.4% |
| $\tau$ | Cost of formal saving | % of formal savers | 62.2% | 63.1% |
| $\varphi$ | % of pledg collateral | Credit-to-output ratio | 31.8% | 31.2% |

# Policy experiments: Main results

| Statistic | Colombia | $\tau = 0$, $\varphi$ =COL | | $\tau = 0$, $\varphi$ =CHL | | First best | |
|---|---|---|---|---|---|---|---|
| | | SOE | Closed | SOE | Closed | SOE | Closed |
| Savings rate workers | 12.0% | 11.6% | 11.5% | 12.3% | 12.1% | 13.0% | 19.2% |
| % of workers who do not save | 62.9% | 32.0% | 62.5% | 32.5% | 33.1% | 34.7% | 26.5% |
| Savings rate entrepreneurs | 19.3% | 19.3% | 19.3% | 19.6% | 19.6% | 21.8% | 21.2% |
| % of entrep who do not save | 20.8% | 20.8% | 20.7% | 25.3% | 24.8% | 51.6% | 50.3% |
| Credit-to-output ratio | 0.31 | 0.31 | 0.32 | 0.71 | 0.72 | 2.64 | 2.38 |
| % of formal savers (workers) | 63.1% | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | | | | |
| % of capital financed by firms | 83.6% | 83.6% | 83.5% | 65.4% | 65.4% | 6.5% | 8.1% |
| Output | 1.00 | 1.00 | 1.01 | 1.05 | 1.06 | 1.34 | 1.26 |
| Total factor productivity | 1.00 | 1.00 | 1.00 | 1.01 | 1.01 | 1.06 | 1.05 |
| Real interest rate | 6.31% | 6.31% | 4.66% | 6.31% | 6.05% | 6.31% | 7.59% |
| | | | | | | | |
| Welfare | | | | | | | |
| Workers | 1.00 | 1.09 | 1.02 | 1.18 | 1.17 | 1.51 | 1.61 |
| Entrepreneurs | 1.00 | 1.00 | 0.99 | 1.16 | 1.16 | 2.00 | 2.00 |
| | | | | | | | |
| Income distribution | | | | | | | |
| % income in top 5% | 31.6% | 30.9% | 31.9% | 29.3% | 29.6% | 22.1% | 20.3% |
| % income in quintiles 3-4 | 25.4% | 25.4% | 24.9% | 26.7% | 27.1% | 33.4% | 35.4% |
| % income in quintiles 1-2 | 15.2% | 16.1% | 15.1% | 16.6% | 15.8% | 21.4% | 21.8% |

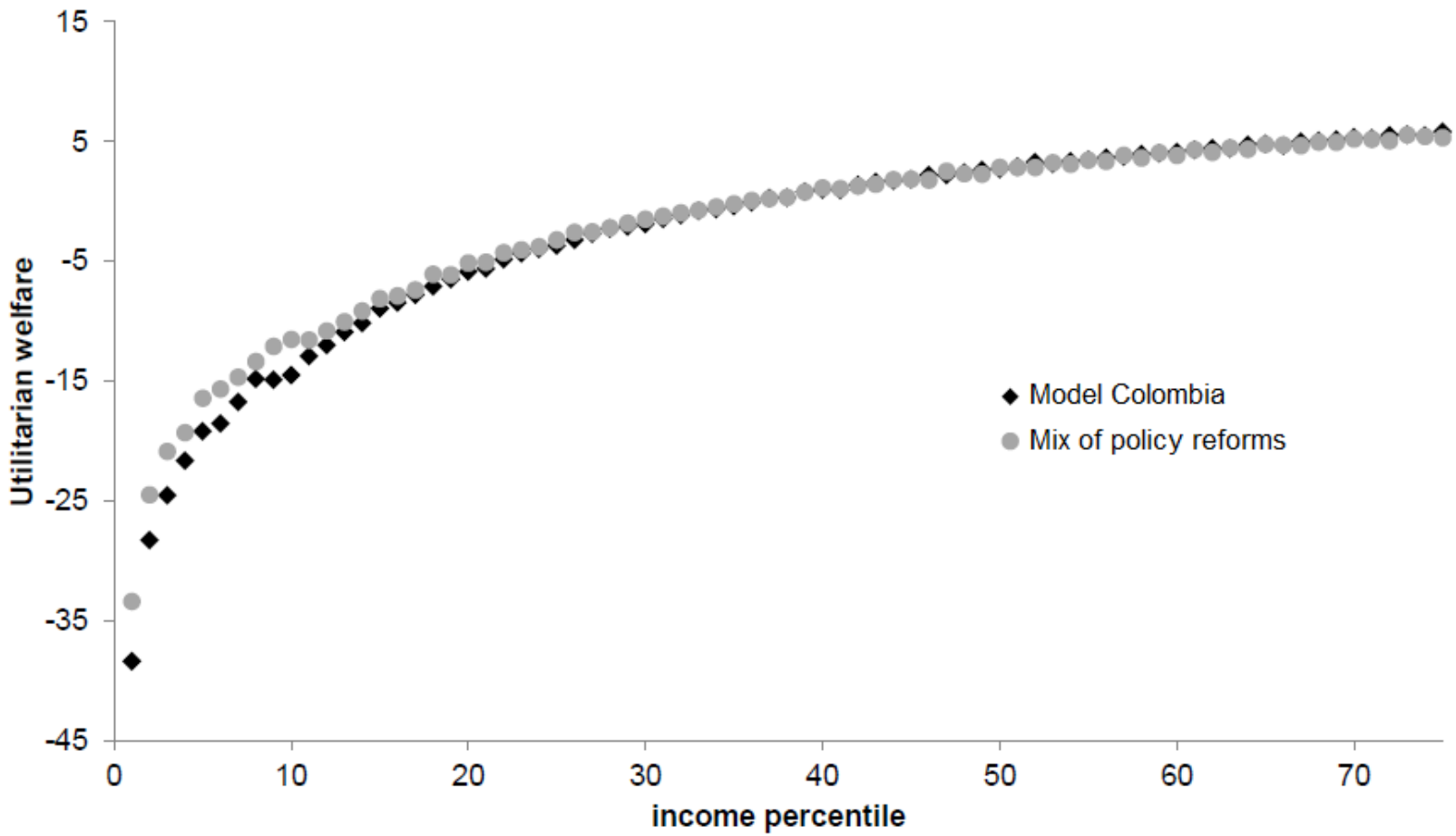
# Policy experiments: Capital allocation

In an 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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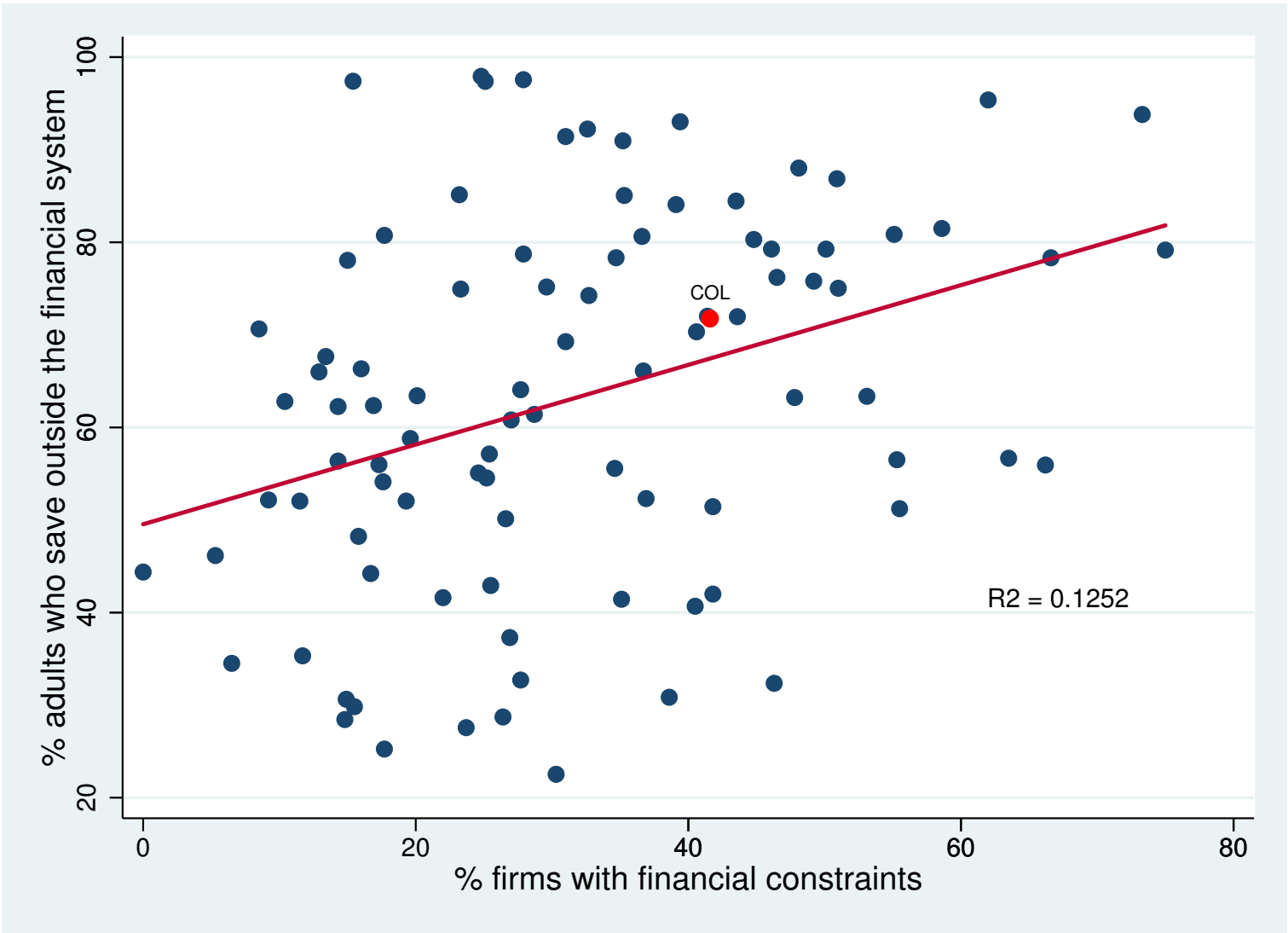
  $\longrightarrow$ Support comprehensive financial development strategies
- Studies like this greatly complement growing literature on small-scale field experiments

# THANKS!

# ADDITIONAL STUFF

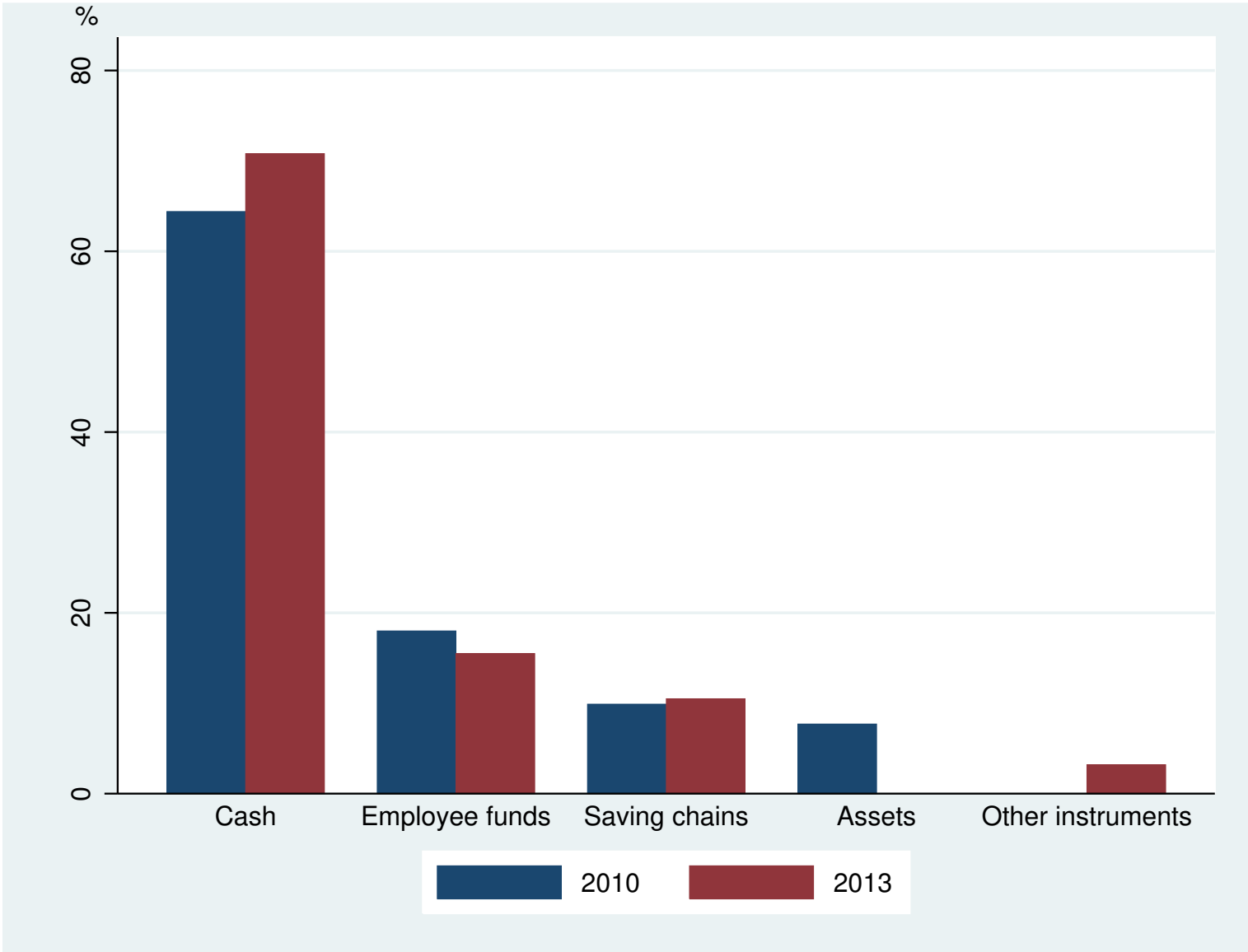
# Empirical regularities

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



# Empirical regularities (Colombia)

Those who save informally because costs are too high save mainly in cash



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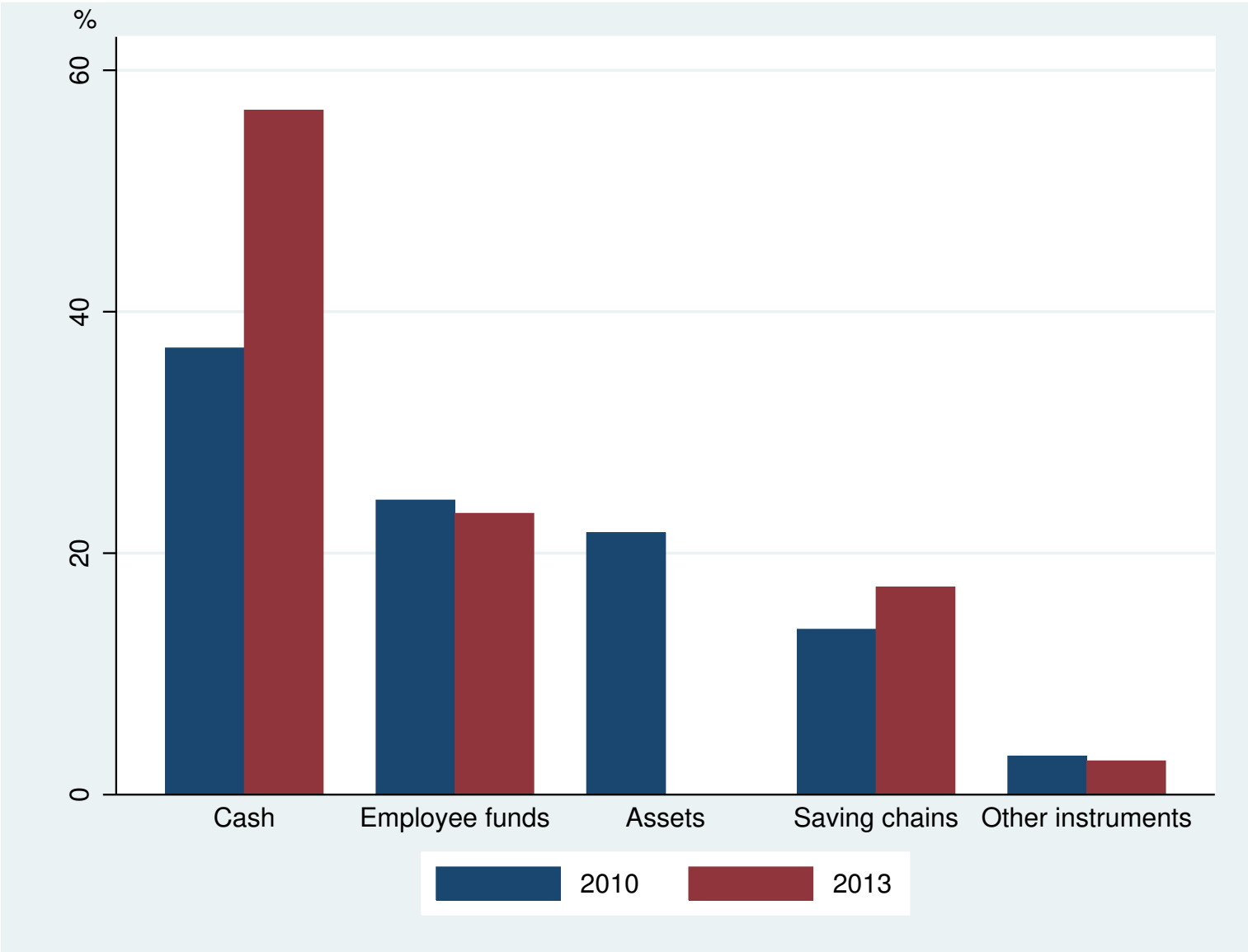
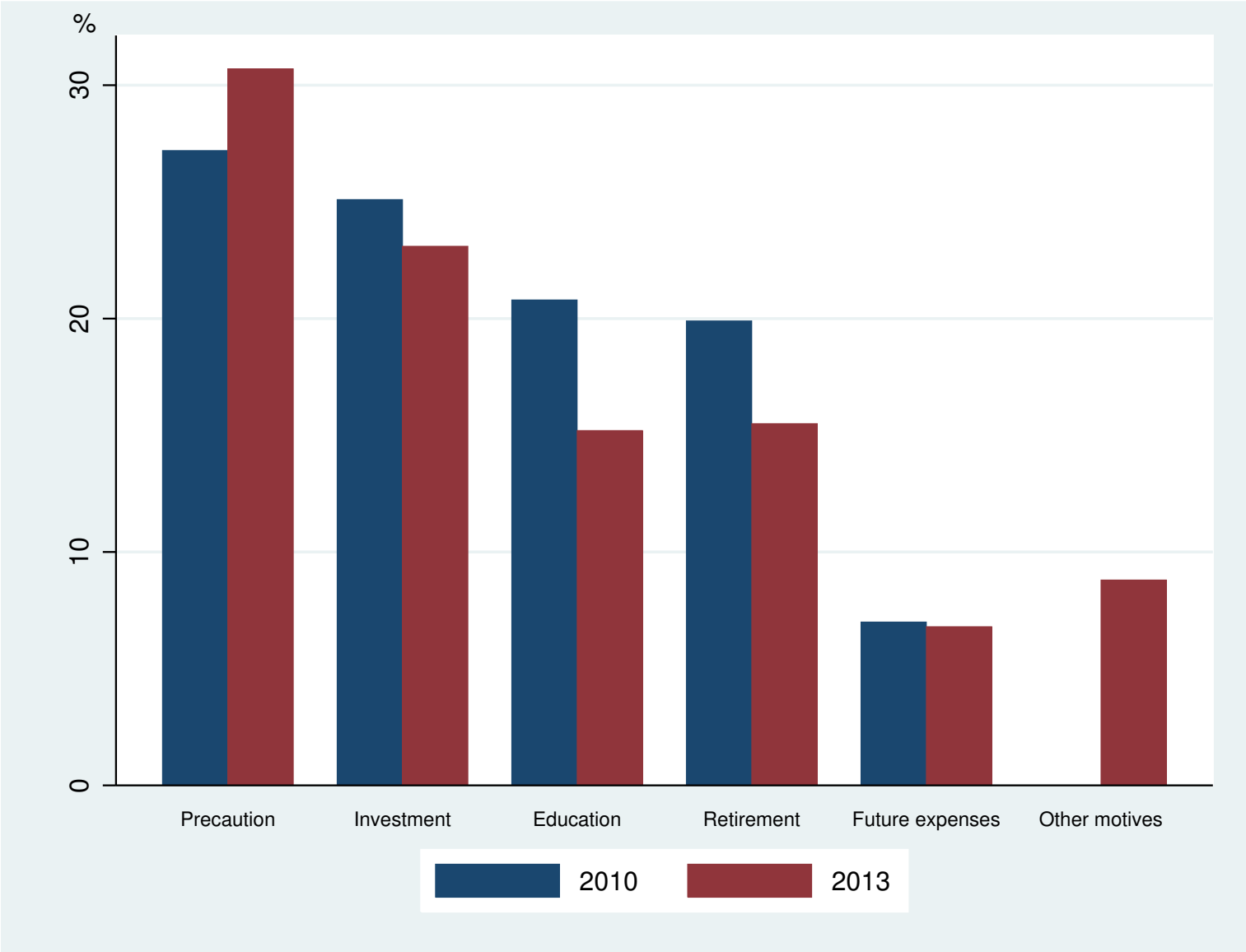
And so do those who think returns are too low



# Empirical regularities (Colombia)

Most people save for precautionary motives and for investment



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