Human Capital and Occupational Choice: Implications for Growth and Inequality

Martí Mestieri (Northwestern)
joint with Johanna Schauer (TSE) and Robert M. Townsend (MIT)

December 16, 2015

Human Capital

Human Capital

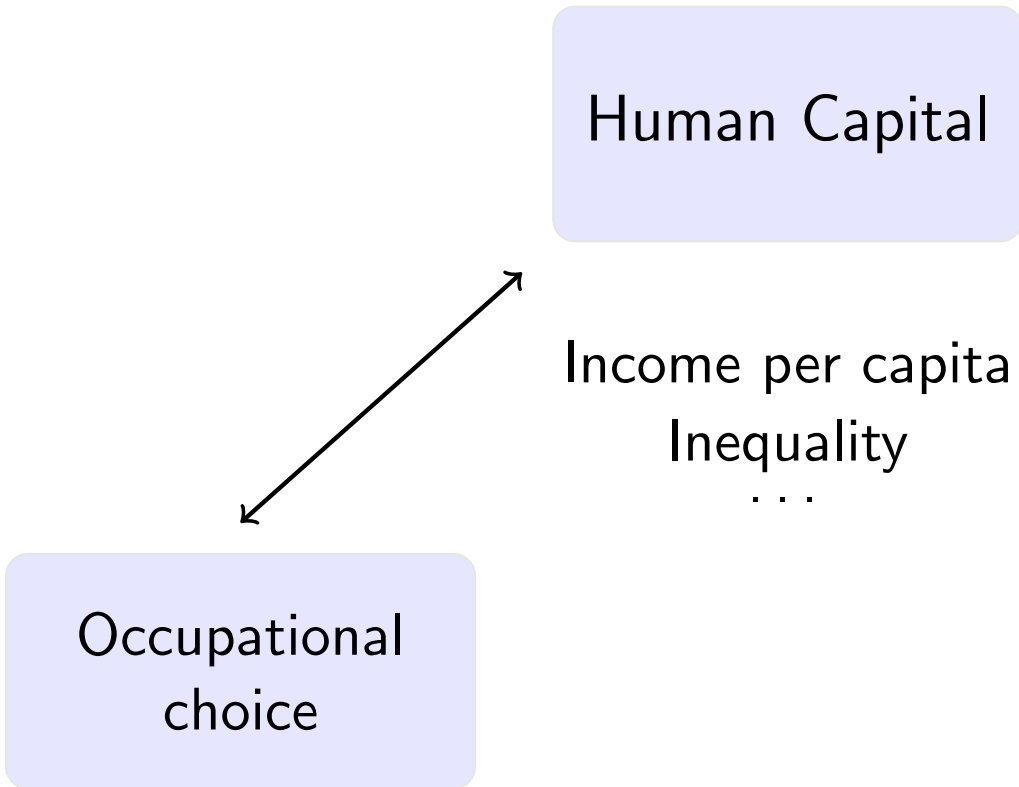
Income per capita

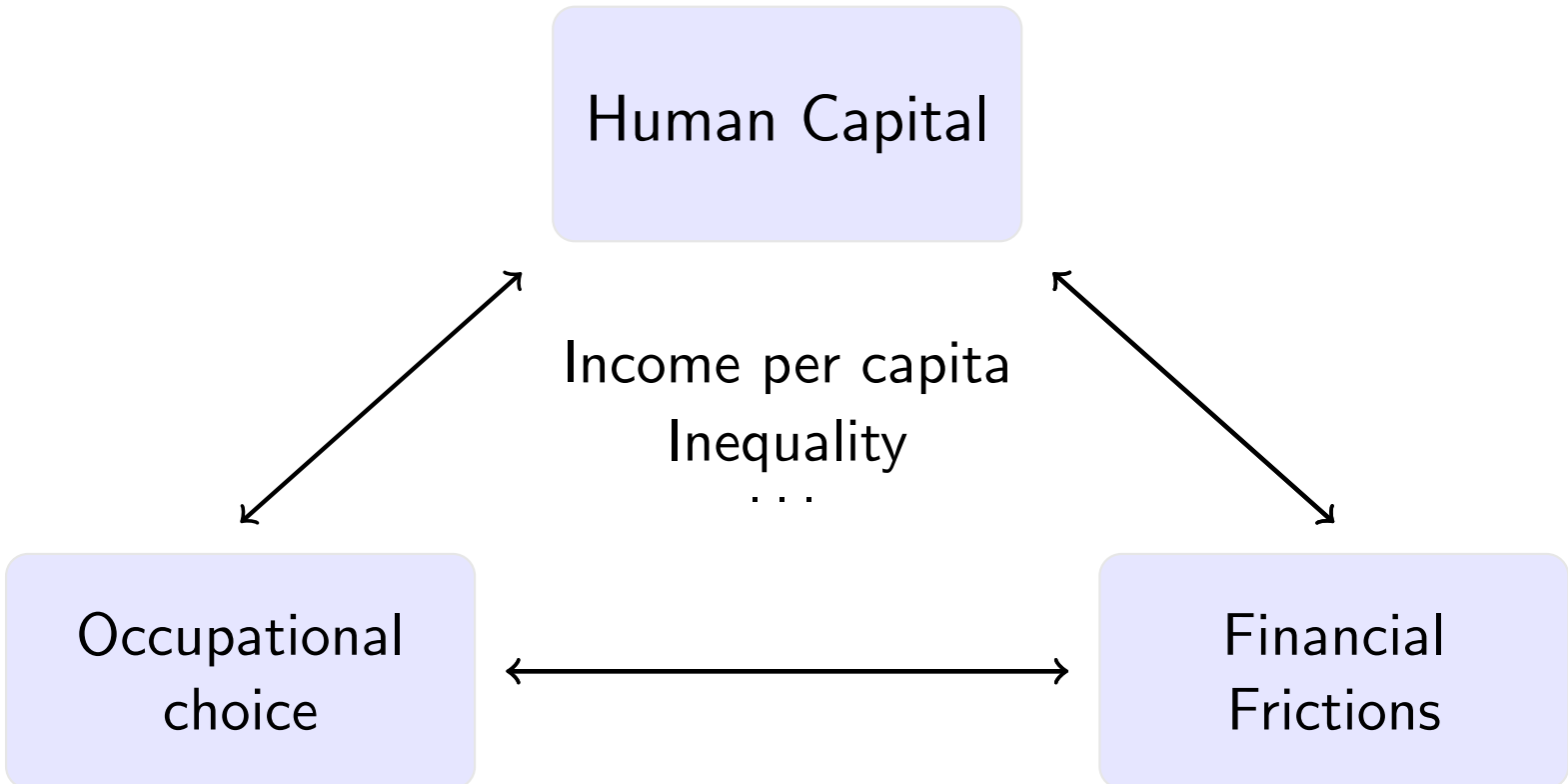
Human Capital

Income per capita

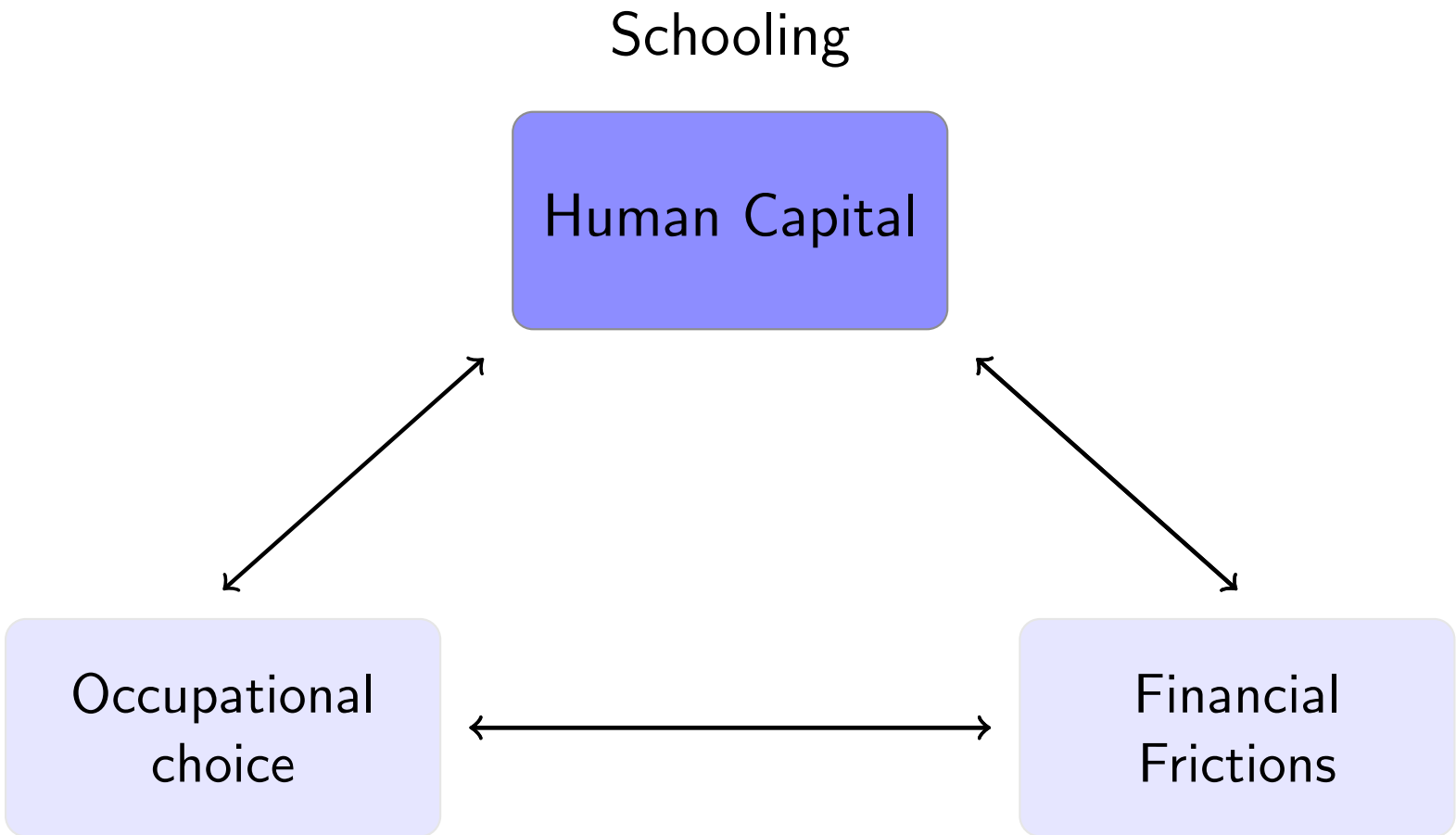
Inequality

...

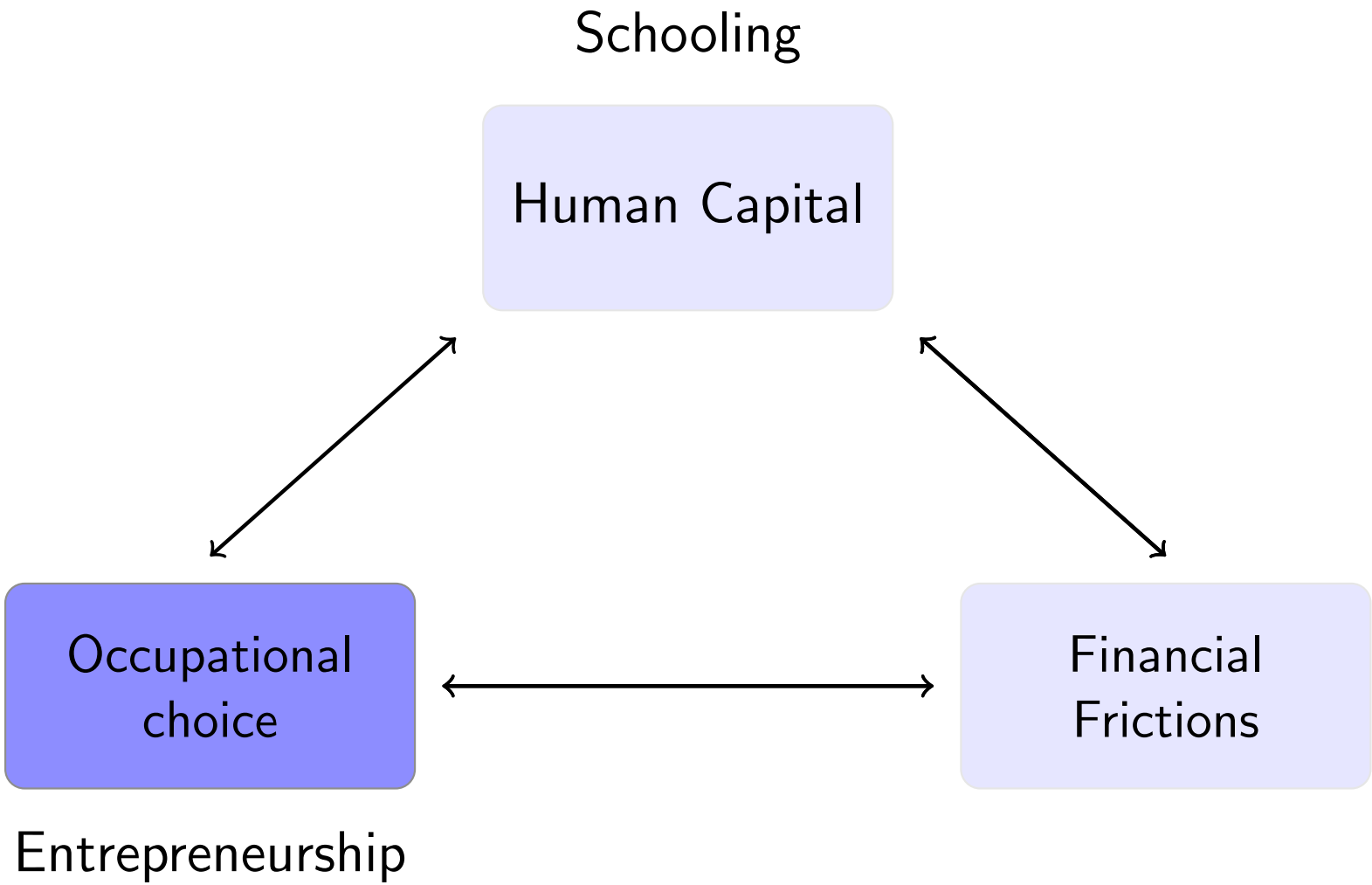

Human Capital
Income per capita
Inequality
. . .
Occupational choice


Human Capital
Income per capita
Inequality
...
Occupational choice
Financial Frictions

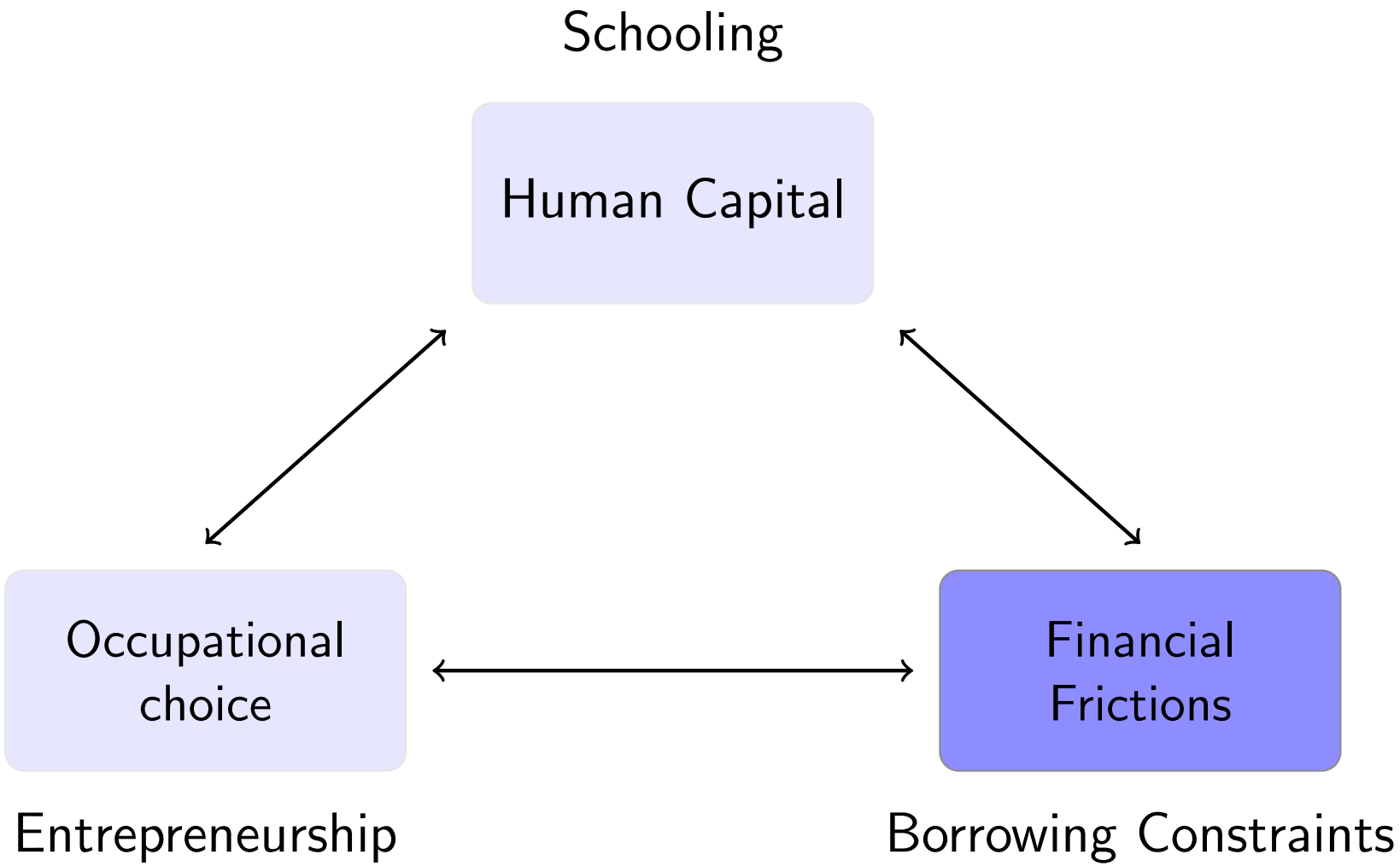
Key Elements



Key Elements



Key Elements



Introduction

- Heterogeneous Households: wealth, ability and schooling.
- Solve jointly wealth and human capital accumulation.
- Borrowing Constraints $\rightarrow$ "misallocation" in both margins.
  - HH income can be used for education and/or by entrepreneurs.

Introduction

- Heterogeneous Households: wealth, ability and schooling.
- Solve jointly wealth and human capital accumulation.
- Borrowing Constraints $\rightarrow$ "misallocation" in both margins.
  - HH income can be used for education and/or by entrepreneurs.

- **Goal**: develop quantitative GE model w/ micro heterogeneity.

Preview of the Results: Effects of Borrowing constraints

- Preliminary results: HK does not change much elasticity of income to borrowing constraints.
- Different composition relative to model without HK:
  - 1/3 comes from TFP, (vs 1/2).
- Relative to models without HK:
  - Much higher compression right tail firm distribution (x4).
  - Higher elasticity (+20%) of top income inequality.

Preview of the Results: Effects of Borrowing constraints

- Preliminary results: HK does not change much elasticity of income to borrowing constraints.
- Different composition relative to model without HK:
  - 1/3 comes from TFP, (vs 1/2).
- Relative to models without HK:
  - Much higher compression right tail firm distribution (x4).
  - Higher elasticity (+20%) of top income inequality.
- Account for correlations in the data between HK and entrep.
  - Non-monotonic policy function for constrained entrepreneurs.

Related Literature

- Entrepreneurship and borrowing constraints: Buera and Shin (2013), Buera et al. (2011), Cagetti and De Nardi (2006),...
- Human Capital in representative agent economies: Manuelli and Seshadri (2014), Erosa et al. (2010), Córdoba and Ripoll (2013), Cubas et al. (2015),...
- BC in education in the US: Caucutt et al. (2015), Lochner and Monge-Naranjo (2012), ...
- Extensive development-micro on returns to education, capital, entrepreneurship and borrowing constraints: McKenzie and Woodruff (2008,...), Udry and Anagol (2006), Banerjee and Duflo (2004),....
- WP in entreprenurship and schooling with heter. agents: Castro and Sevcik (2015), Samaniego and Sun (2015).

Outline of the Presentation

1. Introduction
2. Model
3. Empirical Application: US and Mexico

Basic Elements of the Model

- Single good economy.
- Households (HH) composed of one parent and one kid.
- HH heterogeneous in
  1. Wealth,
  2. Talent of parent and kid,
  3. Schooling of parent.

Basic Elements of the Model

- Single good economy.
- Households (HH) composed of one parent and one kid.
- HH heterogeneous in
  1. Wealth,
  2. Talent of parent and kid,
  3. Schooling of parent.
- HH choices
  1. Education level the kid,
  2. Savings for next period,
  3. Occupation of the parent.

Basic Elements of the Model

- Single good economy.
- Households (HH) composed of one parent and one kid.
- HH heterogeneous in
  1. Wealth,
  2. Talent of parent and kid,
  3. Schooling of parent.
- HH choices
  1. Education level the kid,
  2. Savings for next period,
  3. Occupation of the parent.
- Occupations
  1. Worker,
  2. Entrepreneur in modern sector,
  3. Entrepreneur in subsistence sector.

Family Structure

- Agents go through 2 stages of life: youth and adulthood.
- Each stage lasts $\mathcal{T}$ periods.

Family Structure

- Agents go through 2 stages of life: youth and adulthood.
- Each stage lasts $\mathcal{T}$ periods.
- When a kid becomes a parent, has one kid, her mother dies.

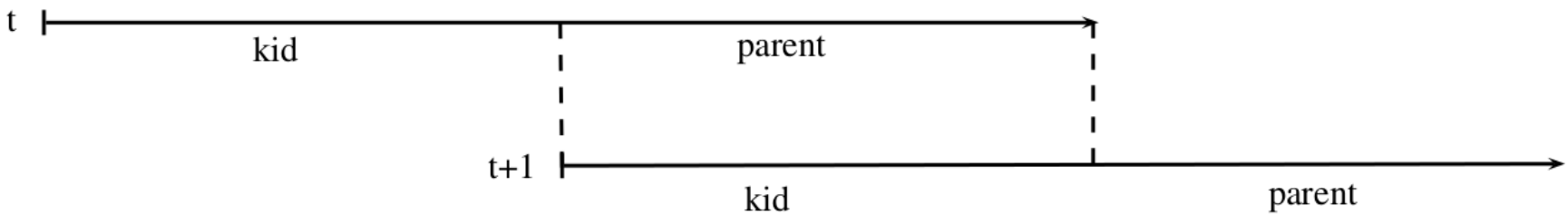


Figure: Timeline of the OLG

Talent and its evolution

- Each hh member is endowed with innate talent.
- Talent is fully persistent throughout the life of an agent.

Talent and its evolution

- Each hh member is endowed with innate talent.
- Talent is fully persistent throughout the life of an agent.
- Inter-generational law-of-motion for talent:
  - With probability ϕ, kid inherits talent of parent.
  - With probability $1 - \phi$, drawn from $F(\theta)$.

Preferences and Endowments

- Per-period utility of a household at time t is

$$U\left(c_t^{p,\tau}, c_t^{k,\tau+\mathcal{T}}\right) = \lambda u\left(c_t^{p,\tau}\right) + (1-\lambda)u\left(c_t^{k,\tau+\mathcal{T}}\right),$$

$\lambda \in (0,1)$ Pareto weights and $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$.

Preferences and Endowments

- Per-period utility of a household at time t is

$$U\left(c_t^{p,\tau}, c_t^{k,\tau+\mathcal{T}}\right) = \lambda u\left(c_t^{p,\tau}\right) + (1-\lambda)u\left(c_t^{k,\tau+\mathcal{T}}\right),$$

  $\lambda \in (0,1)$ Pareto weights and $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$.

- Defining total HH consumption $c_t = c_t^{p,\tau} + c_t^{k,\tau+\mathcal{T}}$,

$$U(c_t) = \frac{c_t^{1-\sigma}}{1-\sigma}\left(\lambda^{\frac{1}{\sigma}} + (1-\lambda)^{\frac{1}{\sigma}}\right)^{\sigma} = \max U\left(c_t^{p,\tau}, c_t^{k,\tau+\mathcal{T}}\right)$$

  subject to $c_t = c_t^{p,\tau} + c_t^{k,\tau+\mathcal{T}}$.

Preferences and Endowments II

- The utility of a household at time 0 is the discounted value of utilities

$$V_0^{HH} \equiv U_0^{HH} + \mathbf{E}_0 \left[\sum_{t=1}^{\infty} \beta^t U_t^{HH} \right],$$

  with $\beta \in (0, 1)$.
- Expectation because future generation types are stochastic.

Preferences and Endowments II

- The utility of a household at time 0 is the discounted value of utilities

$$V_0^{HH} \equiv U_0^{HH} + \mathbf{E}_0 \left[\sum_{t=1}^{\infty} \beta^t U_t^{HH} \right],$$

  with $\beta \in (0, 1)$.
- Expectation because future generation types are stochastic.
- Each household is endowed with initial wealth a_0 at time 0.
- Each agent is endowed with one unit of time per period.

Human Capital Production

- Kids accumulate HK by going to school.
- Can go to school for $s \in [0, \bar{s}]$ units of time.

Human Capital Production

- Kids accumulate HK by going to school.
- Can go to school for $s \in [0, \bar{s}]$ units of time.
- School level s generates HK as

$$(\psi_w s^\zeta, \psi_e s^\zeta), \qquad \text{with} \qquad \zeta \in (0,1),\ \psi_e, \psi_w > 0.$$

- To consume one unit of schooling
  - Spend one unit of time in school,
  - Pay price p_s.

Human Capital Production

- Kids accumulate HK by going to school.
- Can go to school for $s \in [0, \bar{s}]$ units of time.
- School level s generates HK as

$$(\psi_w s^\zeta, \psi_e s^\zeta), \qquad \text{with} \qquad \zeta \in (0,1),\ \psi_e, \psi_w > 0.$$

- To consume one unit of schooling
  - Spend one unit of time in school,
  - Pay price p_s.
- **Assumption**: After dropping out of school, cannot go back.

Human Capital Production II

- Effective HK

$$\theta_w = (1 + \psi_w s^{\zeta})\theta^{\kappa_w},$$
$$\theta_e = (1 + \psi_e s^{\zeta})\theta^{\kappa_e}.$$

and $\kappa_w, \kappa_e > 0$.

Human Capital Production II

- Effective HK

$$\theta_w = (1 + \psi_w s^{\zeta})\theta^{\kappa_w},$$
$$\theta_e = (1 + \psi_e s^{\zeta})\theta^{\kappa_e}.$$

  and $\kappa_w, \kappa_e > 0$.
- Experience
  - Introduced in the quantitative exercise.
  - If out of school t periods, $\vartheta_t \theta_i$ with $\vartheta_t > 1$ and θ_i, $i = \{w, e\}$.

Schooling Production

- Schooling S produced using final good, M, and labor, T,

$$S = A_s T^{\alpha_s} M^{1-\alpha_s}, \qquad 0 < \alpha_s < 1, \quad A_s > 0.$$

Final Good Production

- Three inputs needed to produce final good.
  1. Entrepreneur to run a firm.
  2. Capital, k.
  3. Hired Labor, l. Efficiency units assumption.

Final Good Production

- Three inputs needed to produce final good.
- Two technologies available for producing output.
  1. **Subsistence** technology,

$$y = \theta_e k^{\alpha} l^{\gamma}, \quad \alpha + \gamma < 1.$$

  2. **Modern** technology,

$$y = \theta_e A k^{\alpha} l^{\gamma}, \quad \alpha + \gamma < 1, \ A > 1.$$

  To operate the modern technology: sunk investment $\bar{k}$.

Feasible occupational choices

Occupation	Parent	Kid
Student	✗	✓
Entrepreneur	✓	✗
Worker	✓	✓

- **Assumption**: Cannot work simultaneously in two or more occupations (but you can sequentially).

Markets

- Within-period timing.
  1. HH starts period with a and effective HK,

$$z = (\theta_e^p, \theta_w^p, \theta^k, s).$$

  2. Occupational choice and schooling decisions are made.
  3. Production and Education takes place.
  4. Factors of production paid, agents consume.

Markets

- Within-period timing.
- Within-period Borrowing constraint: upper limit on borrowing

$$\xi a,$$

a is HH assets coming into the period and $\xi \in [0, \infty)$.

Markets

- Within-period timing.
- Within-period Borrowing constraint: upper limit on borrowing

$$\xi a,$$

  a is HH assets coming into the period and $\xi \in [0, \infty)$.
- No negative bequests, $a_t \geq 0$.
- The credit sector is operated by competitive bankers that break even.
- Factors are paid their marginal product.

Competitive Equilibrium

Definition

Given an initial distribution of state variables $\mathcal{F}_0(a, z)$ and a sequence of wages, interest rates and schooling prices $\{w_t, r_t, p_{s,t}\}_{t=0}^{\infty}$, a competitive equilibrium is given by a sequence of allocations $\{c_t(a_t, z_t), s_t(a_t, z_t), a_{t+1}(a_t, z_t), k_t(a_t, z_t), l_t(a_t, z_t)\}_{t=0}^{\infty}$ such that *(i)* households maximize utility subject to their budget constain , *(ii)* the schooling sector solves, $\max_{M_t, T_t} p_{s,t} T^{\alpha_s} M^{1-\alpha_s} - w_t T_t - m_t$, *(iii)* the intermediary sector makes zero profits, $R_t = r_t + \delta$ and *(iv)* there is market clearing in final good, schooling, capital and labor markets.

Recursive Formulation of Household

- Consider a household (a, z).
- Today chooses optimal occupation (and schooling for kid)

$$V(a,z) = \max\left\{V^{\text{Worker}}(a,z), V^{\text{Modern}}(a,z), V^{\text{Subsistence}}(a,z)\right\}.$$

- Consider separately the three sub-problems and picks the max.

The Worker Household Problem

- If parent decides to be a worker (and period length=1) solves:

The Worker Household Problem

- If parent decides to be a worker (and period length=1) solves:

$$V^{\text{Worker}}(a, z) = \max_{c,\eta\in[0,1],a'\geq 0} U(c) + \beta \mathbf{E}_{z'} V'(a', z')$$

subject to budget constraint

$$a' = (1 + r)(a - p_s\eta) + (\theta_w^p + (1 - \eta)\theta_w^k)w - c,$$

The Worker Household Problem

- If parent decides to be a worker (and period length=1) solves:

$$V^{\text{Worker}}(a, z) = \max_{c,\eta\in[0,1],a'\geq 0} U(c) + \beta \mathbf{E}_{z'} V'(a', z')$$

subject to budget constraint

$$a' = (1 + r)(a - p_s\eta) + (\theta_w^p + (1 - \eta)\theta_w^k)w - c,$$

borrowing constraint

$$p_s\eta \leq (1 + \xi)a,$$

The Worker Household Problem

- If parent decides to be a worker (and period length=1) solves:

$$V^{\text{Worker}}(a,z) = \max_{c,\eta\in[0,1],a'\geq 0} U(c) + \beta \mathbf{E}_{z'} V'(a',z')$$

subject to budget constraint

$$a' = (1+r)(a - p_s\eta) + (\theta_w^p + (1-\eta)\theta_w^k)w - c,$$

borrowing constraint

$$p_s\eta \leq (1+\xi)a,$$

and state variable updating and schooling upper limit

$$s' = s + \eta, \qquad s + \eta \leq \bar{s}, \qquad \text{and} \qquad \eta = 0, \quad \text{if} \quad s < \tau.$$

The (Modern) Entrepreneur Household Problem

- If entrepreneur operating modern technology, she solves:

$$V^{\text{Modern}}(a,z) = \max_{c,\eta\in[0,1],a',l,k\geq 0,} U(c) + \beta \mathbf{E}_{z'} V'(a',z')$$

subject to the budget constraint

$$a' = (1+r)(a-p_s\eta)+(1-\eta)\theta_w^k w+\theta_e^p A k^\alpha l^\gamma - wl - R(k+\bar{k}) - c,$$

borrowing constraint

$$p_s\eta + k + \bar{k} \leq (1+\xi)a,$$

and state variable updating and schooling upper limit

$$s' = s+\eta, \qquad s+\eta \leq \bar{s}, \qquad \text{and} \qquad \eta = 0, \quad \text{if} \quad s < \tau.$$

- If subsistence, analogous problem.

The role of borrowing constraints in partial equilibrium

- Consider entrepreneur problem.
- Denote $\mathcal{I}(z, k, \eta)$ total net income in the period.
- λ_1 multip. on budget, λ_2 multip. on borrowing constriant.

The role of borrowing constraints in partial equilibrium

- Consider entrepreneur problem.
- Denote $\mathcal{I}(z, k, \eta)$ total net income in the period.
- λ_1 multip. on budget, λ_2 multip. on borrowing constriant.

$$
\begin{aligned}
U'(c) &= \lambda_1, \\
\beta \mathbf{E}_{z'} \frac{\partial V'(a', z')}{\partial a'} &= \lambda_1 (1 + r), \\
\beta \mathbf{E}_{z'} \frac{\partial V'(a', z')}{\partial \eta} &= \lambda_1 \left((1 + r) p_s - \frac{\partial \mathcal{I}}{\partial \eta} \right) + \lambda_2 p_s, \\
\lambda_1 \frac{\partial \mathcal{I}}{\partial k} &= \lambda_2.
\end{aligned}
$$

Special Case $\xi = \infty$

- Conditional on prices
  - Efficient allocation of capital to entrepreneurs.
  - Human capital investment can be sub-optimal ($a' \geq 0$.)
- In this case, if $\psi_e = \psi_w$ more talented agents select into entrepreneurship iff

$$\frac{\kappa_e}{1-\gamma-\alpha} > \kappa_w.$$

Quantitative Application

Compare Mexico and the US

- Model accommodates stylized facts from Mexico

Compare Mexico and the US

- Model accommodates stylized facts from Mexico
- Dual productive structure:
  - Around 40% pop. employed in traditional/subsistence firms.
- Financial development:
  - Private lending/GDP $\sim$ 20% OECD countries.
  - Ample micro evidence on financial constr. (for firms).
- Education: average years 7.2 (vs 13 in US).
  - Most of difference comes from high-school enrollment (50% enrollment rates in 2007).
  - Low quality as measured by PISA scores.

Household Evidence from Mexico

- We use household data from the Mexico Life Family Survey and the Progresa/Oportunidades to inform our quantitative exercise.
- Mexican Family Life Survey (MXFLS/ENNVIH)
  - Longitudinal representative survey (2002, 2005-2006, 2009-2012).
- First wave of MxFLS (2002): kids affected by randomized CCT to schooling.
- MxFLS provides informative measures for our model
  - Houshold Assets and Income
  - Education level of parents.
  - Education of kids (incl. expenditure, separate school survey)
  - Talent measured by Raven scores.
  - Other co-variates.

Do more talented agents select into entrepreneurship?

	All HH	Subsistence	Modern
Parent's Quantile (Raven)	0.458	0.459	0.616
	(0.00659)	(0.0103)	(0.0206)
Parents' schooling (yrs)	5.591	5.626	7.636
	(0.0944)	(0.142)	(0.319)
Kid's Quantile (Raven)	0.505	0.489	0.603
	(0.00661)	(0.0133)	(0.0229)
Kids' schooling (yrs)	10.04	9.497	11.36
	(0.0825)	(0.181)	(0.272)

Classification:

- Subsistence : agricultural worker working on own plot, self-employed.
- Modern: boss, employer or business proprietor.

Mincer Returns to education (without instrumenting)

- Do returns to education differ across occupations?

Mincer Returns to education (without instrumenting)

	All HH, weighted	Workers, weighted	Entrep., weighted
	LHS is Ln(Annual income 2009)		
Yrs Schooling	0.0922***	0.0817***	0.167
	(0.0298)	(0.0288)	(0.114)
Experience	0.192***	0.194***	-0.0672
	(0.0398)	(0.0405)	(0.231)
Experience*Experience	-0.00764***	-0.00803***	0.0143
	(0.00188)	(0.00194)	(0.0197)
Points in Raven Test	0.528*	0.697***	-1.909
	(0.272)	(0.256)	(1.271)
Female	-0.261*	-0.145	-2.465***
	(0.136)	(0.124)	(0.582)
Married	0.0551	0.0776	0.187
	(0.193)	(0.197)	(0.409)
Indigenous	-0.286	-0.177	-0.872
	(0.252)	(0.217)	(0.547)
Constant	8.284***	8.262***	9.824***
	(0.324)	(0.333)	(0.914)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Mincer Returns to education (instrumenting w/ Progresa)

	All HH	Workers	Entrepreneurs
	LHS is Ln(Annual income 2009)		
Yrs Schooling	0.127***	0.110***	0.320
	(0.0444)	(0.0424)	(0.210)
Experience	0.259***	0.263***	0.0938
	(0.0586)	(0.0614)	(0.239)
Experience^2	-0.0122***	-0.0130***	0.00165
	(0.00443)	(0.00464)	(0.0234)
Raven	0.391	0.569*	-2.837*
	(0.317)	(0.295)	(1.687)
Female	-0.320**	-0.196	-2.347***
	(0.153)	(0.139)	(0.590)
Married	0.0195	0.0491	0.0427
	(0.204)	(0.209)	(0.453)
Indigenous	-0.364	-0.247	-0.648
	(0.253)	(0.205)	(0.761)
Constant	7.880***	7.919***	8.477***
	(0.434)	(0.442)	(1.617)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Household Schooling Choices

- Regress years of kids education on household assets, debt, education of parents, Raven, number of household members age,

$$\text{Years Educ}_i = \beta_0 + \beta' X + \varepsilon_i$$

Household Schooling Choices

- Regress years of kids education on household assets, debt, education of parents, Raven, number of household members age,

$$\text{Years Educ}_i = \beta_0 + \beta' X + \varepsilon_i$$

- Parents' schooling, kid's Raven always significant and positive.
- Poor Households (below median assets) ▸ Table
  - Positive effects of household assets.
  - Negative effect of becoming a modern entrepreneur:

$$-2.5 \text{ years of education}$$

  - Positive interaction of debt with modern entrepreneur.

Ex-ante Imposed Parameters and Restrictions

Prefs.		Tech.		Talent		Human Capital			
σ	1.5	α	.26	Pareto Distrib.		$\bar{s}$	18	κ_w	1
λ	.25	γ	.53	# Types	10	ϕ	.72	κ_e	1
		δ	.52			α_s	.66	ψ_e	ψ_w
								ϑ_1	1.5
								ϑ_2	1.85

- Time periods: 12 years.
- Each life stage: 2 periods.
- Returns to schooling similar across occupations: $\psi_e = \psi_w$.
- No differential effect of Raven test across occ.: $\kappa_w = \kappa_e \equiv 1$.

Calibration: Parameterns and Moments (US targets)

Target Moments		Model	Parameter Value
Yearly Interest rate	4%–4.5%	4.5%	$\beta = .55$(Discount Factor)
Top 10% emp. share	69%	61%	$\nu = 4.5$ (Pareto tail)
Exp. share GDP in edu.	7%	7.1%	$A_s = .67$ (Educ. Prod.)
Average Years Schooling	12.8	12.9	$\psi = 4.3$ (Returns Education)
Percentage of Entrepren.	7%	3%	$\zeta = .45$ (Curvature HK)
Top 5% emp. share	51.7%	51.3%	$\bar{k} = 4$ (Fixed Cost)
Top 5% earnings	30%	43%	$A = 4$ (Modern Prod.)
Credit market instr. to non-fin. assets	70%	54%	$\xi = 4.8$ (Borrowing constr.)

Calibration: Parameterns and Moments (US targets)

Target Moments		Model	Parameter Value
Yearly Interest rate	4%–4.5%	4.5%	$\beta = .55$(Discount Factor)
Top 10% emp. share	69%	61%	$\nu = 4.5$ (Pareto tail)
Exp. share GDP in edu.	7%	7.1%	$A_s = .67$ (Educ. Prod.)
Average Years Schooling	12.8	12.9	$\psi = 4.3$ (Returns Education)
Percentage of Entrepren.	7%	3%	$\zeta = .45$ (Curvature HK)
Top 5% emp. share	51.7%	51.3%	$\bar{k} = 4$ (Fixed Cost)
Top 5% earnings	30%	43%	$A = 4$ (Modern Prod.)
Credit market instr. to non-fin. assets	70%	54%	$\xi = 4.8$ (Borrowing constr.)

- 1% increase in the Pareto Tail implies a
  - $\sim$ 1% decrease in share entrepreneurs
  - $\sim$ 1% decrease in top 5 emp. and earnings.
  - $\sim$ 1.2% change in share educ. expenditure
- Matrix of elasticities in the making ...

Long-run Effects of Borrowing Constraints

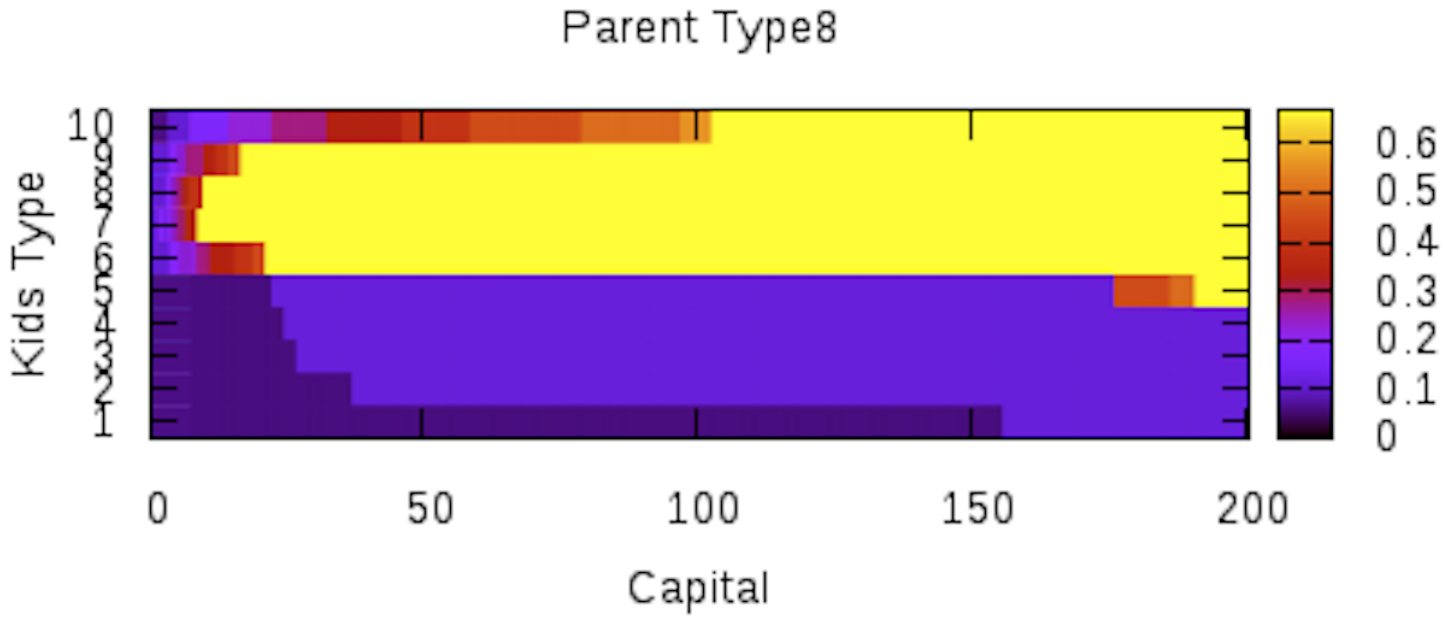
- Hold all parameters constant except borrowing constraints.
- Recalibrate ξ to match financial dependence in Mexico $\sim 30\%$.
- The new stationary distribution features:
  - GDP per capita: $\downarrow 15\%$,
  - TFP decreases: $\downarrow 4\%$,
  - Share of workers employed by Top 5% : $\downarrow 21\%$,
  - Share of income by Top 5%: $\uparrow 5\%$.

Optimal Schooling Choices Heat Map - High HK Mother

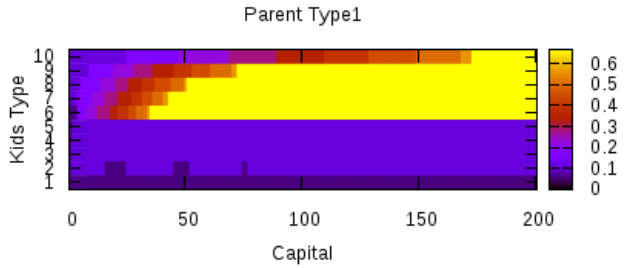
- Richer parents, educate more kids.
- Kids with more talent, more educated.
- More educated parents, educate more kids.
- Non-monotonic policy functions for high talent, poor households (as suggested in MxFLS).

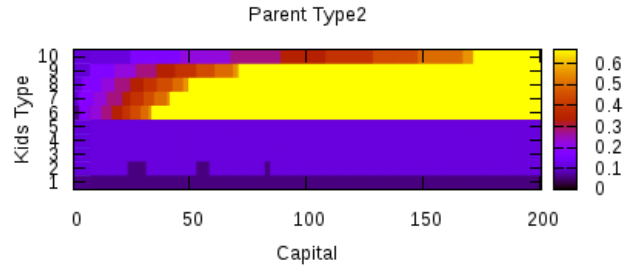
Optimal Schooling Choices Heat Map - High HK Mother

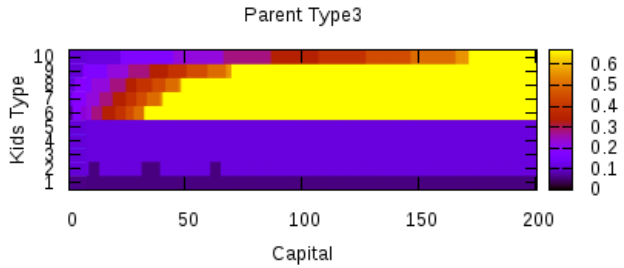
- Richer parents, educate more kids.
- Kids with more talent, more educated.
- More educated parents, educate more kids.
- Non-monotonic policy functions for high talent, poor households (as suggested in MxFLS).

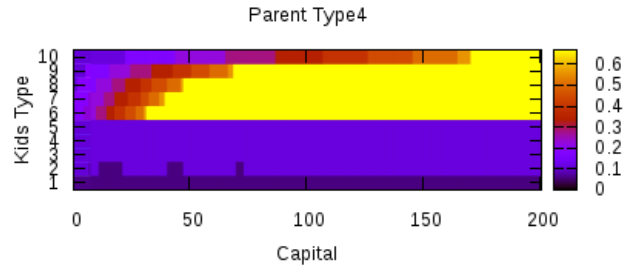


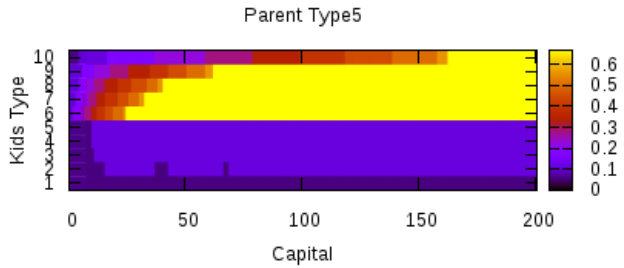
Optimal Human Capital Investment in Sub-Period 1, Maximum Human Capital Parent

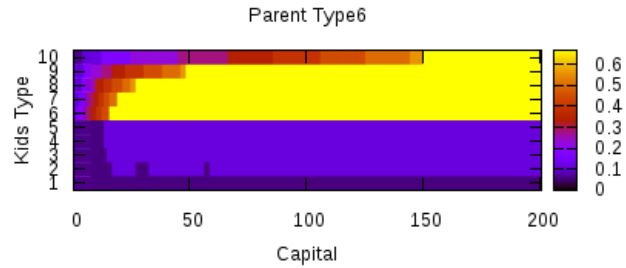


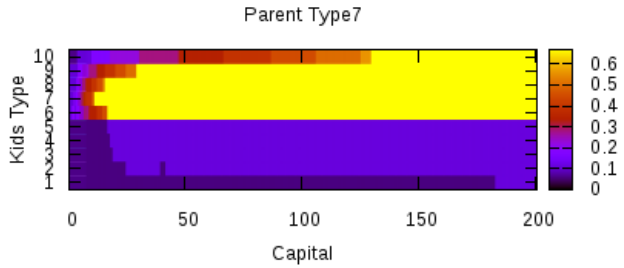


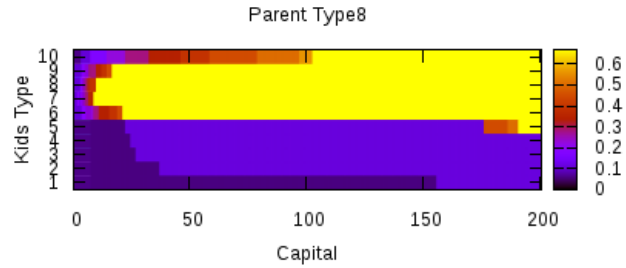


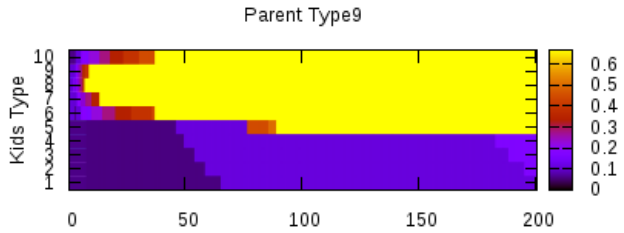


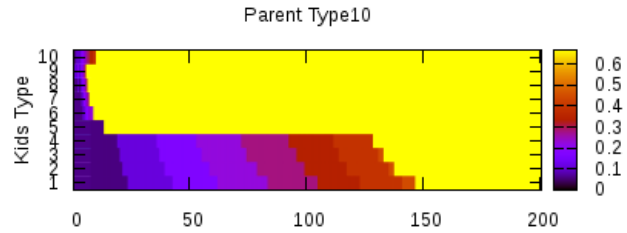






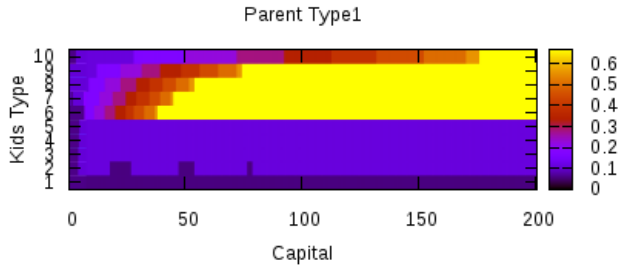


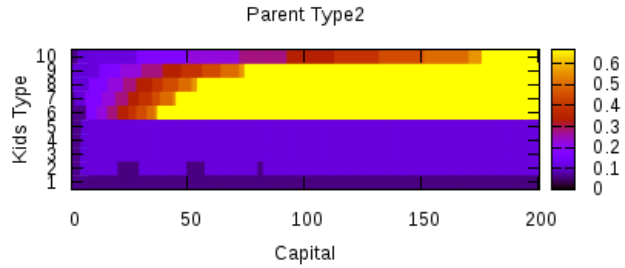


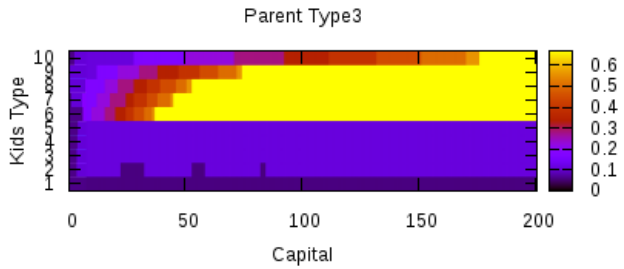


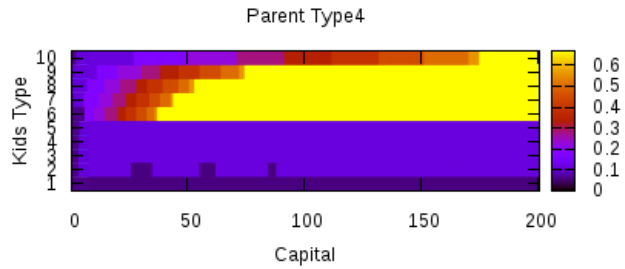
Optimal Schooling Choices Heat Map - Low HK Mother

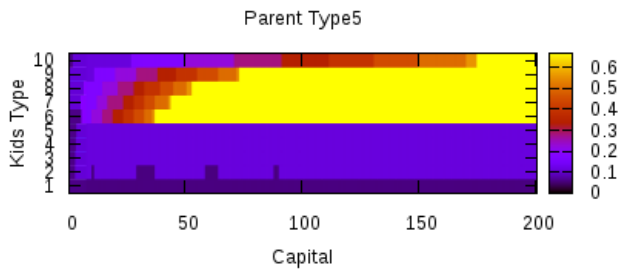
Optimal Human Capital Investment in Sub-Period 1, Minimum Human Capital Parent

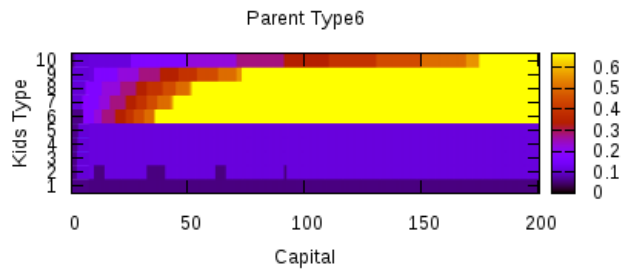


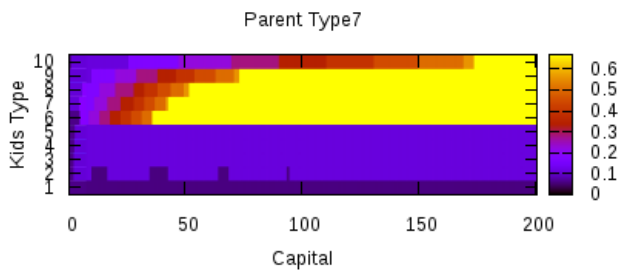


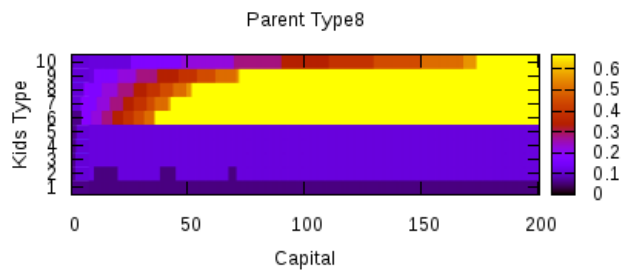


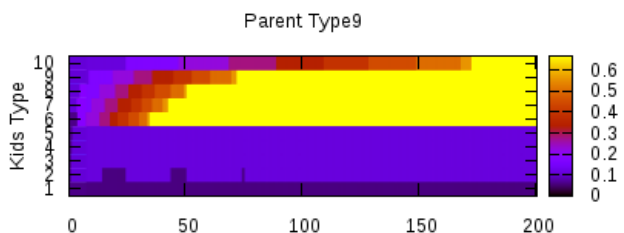


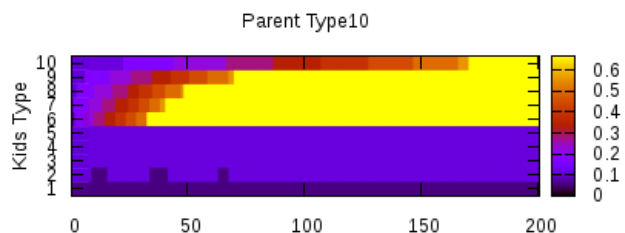






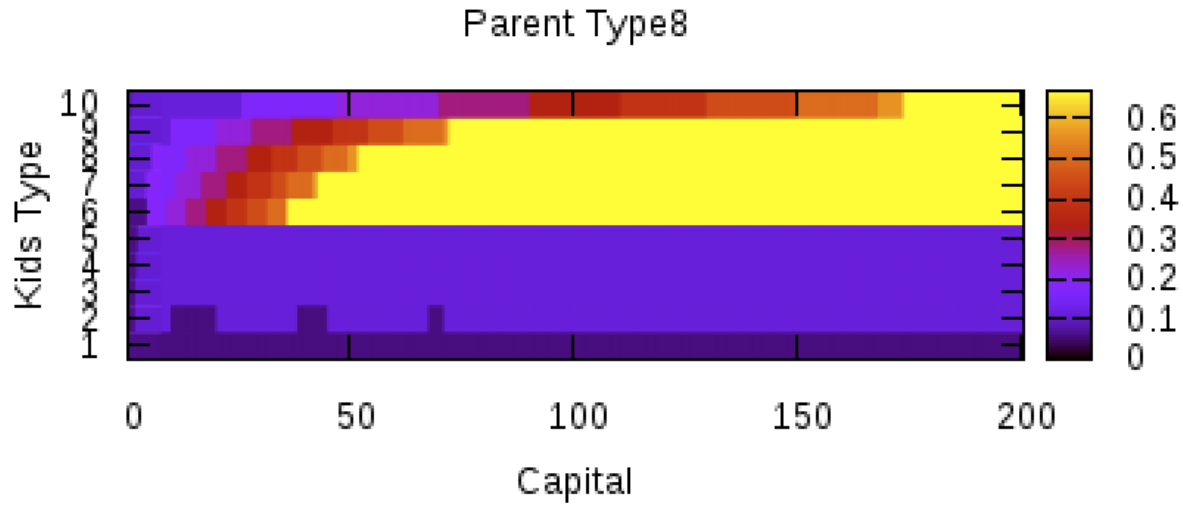




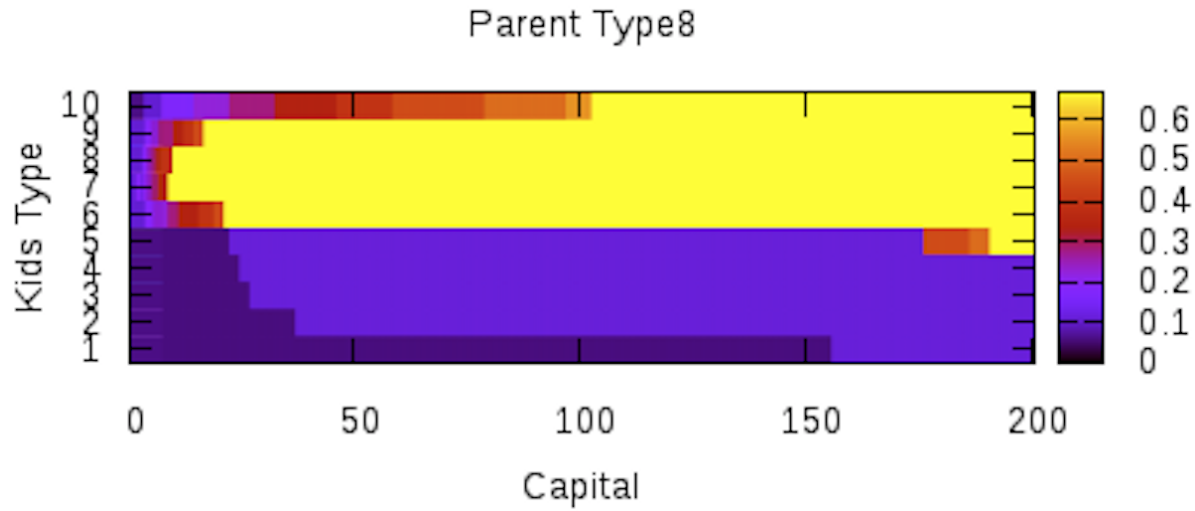


Non-monotonic policy functions

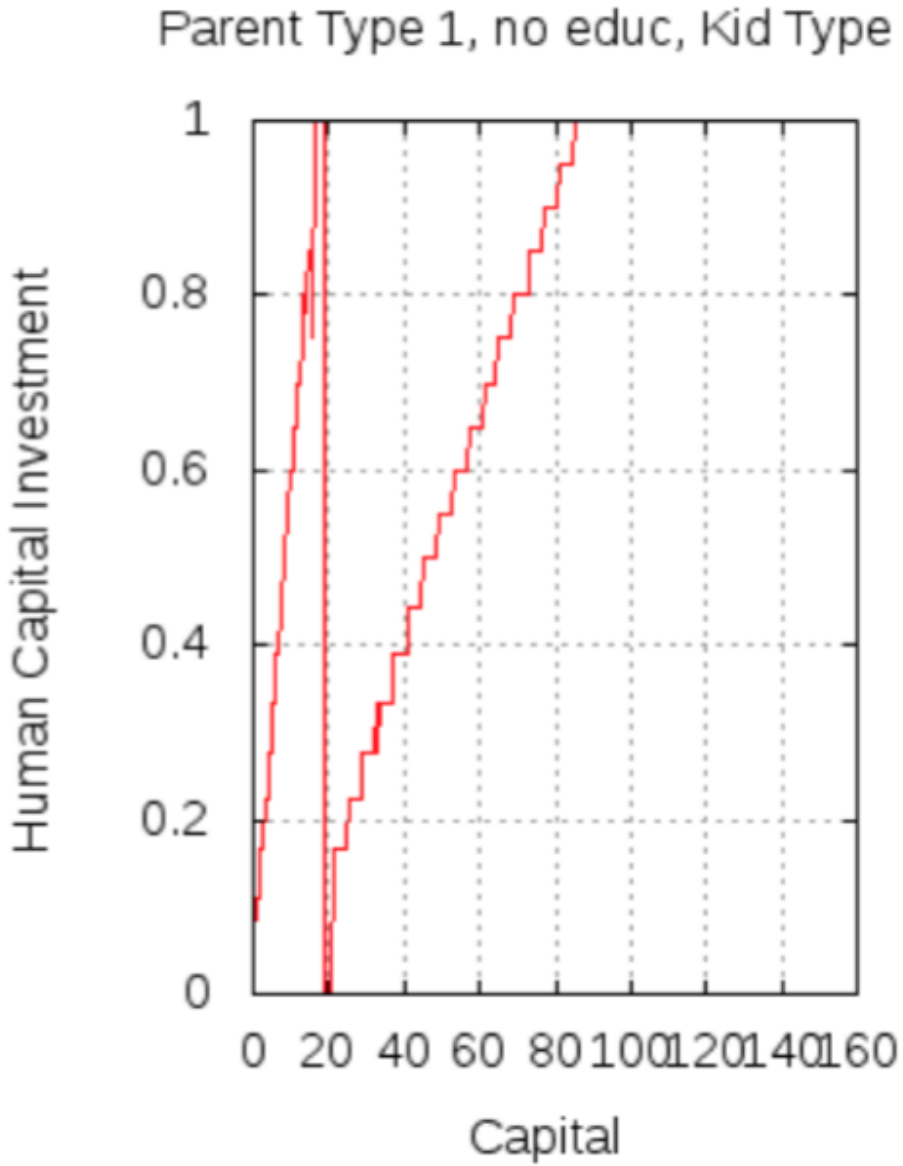
Low Human Capital parent



High Human Capital parent



Example of Non-monotonic Educational Policy Functions



The role of Human Capital

- Perform the same exercise shutting down human capital.
- Change in variables of the stationary distribution:
  - GDP per capita: $\downarrow$ 15%
  - TFP decreases: $\downarrow$ 7%
  - Top 5% employer: $\downarrow$ 2%
  - Top 5% earners: $\uparrow$ 4%

Dynamics of a Reform

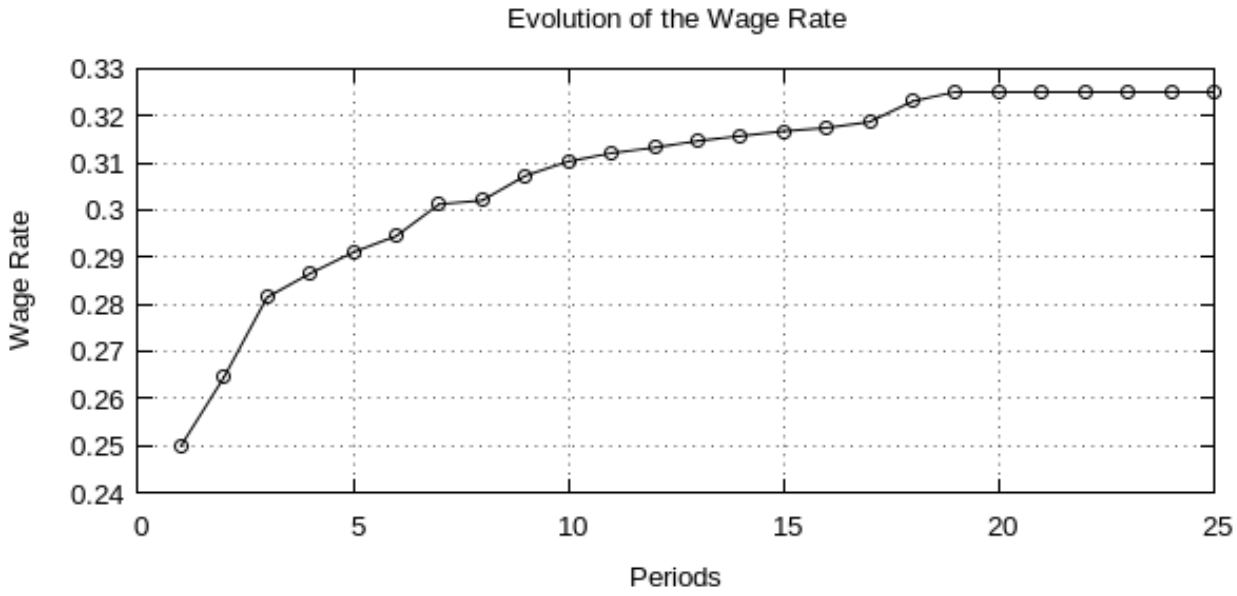
- Suppose that policy change relaxes borrowing constraints to US levels.
- Compute the transition between two stationary distributions.

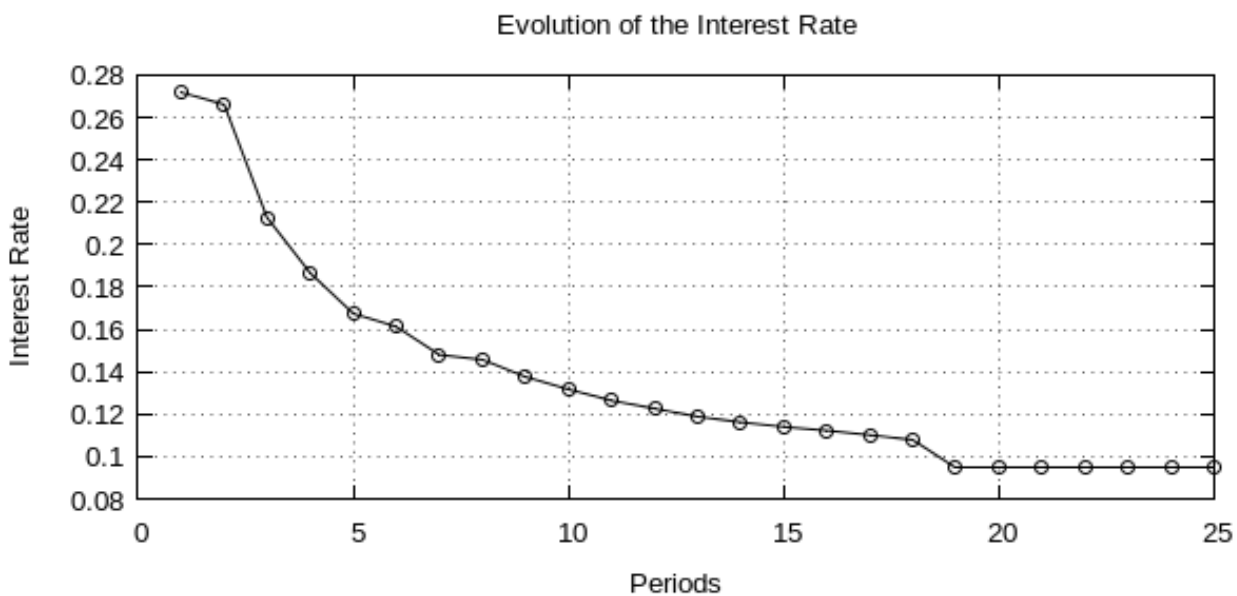
Dynamics of a Reform

- Suppose that policy change relaxes borrowing constraints to US levels.
- Compute the transition between two stationary distributions.
- Example of a different calibration with less types example.

Loosening of Borrowing Constraints $\xi = .5 \longrightarrow \xi = 4$

Intial invariant distribution $w = .11$, $r = 10\%$





Conclusions

- Framework to analyze the joint determination of human capital, capital accumulation and occupational choice.
- Plan to further exploit HH survey and experimental data to calibrate micro part of the model. In particular,
  - Returns to education for different occupations.
  - Skill complementarity for modern vs. subsistence.
  - Separate high skill vs. low skill in production functions?

Conclusions

- Framework to analyze the joint determination of human capital, capital accumulation and occupational choice.
- Plan to further exploit HH survey and experimental data to calibrate micro part of the model. In particular,
  - Returns to education for different occupations.
  - Skill complementarity for modern vs. subsistence.
  - Separate high skill vs. low skill in production functions?
- Framework can be used to analyze different policies, quantify short-run and long-run gains. E.g.,
  - School Expansion Programs, e.g., INPRES.
  - Arrival of Technologies complementary to skills, e.g., HYV.
  - Conditional cash transfers, e.g., PROGRESA/Oportunidades.
  - Financial expansion/liberalization, e.g., Million Baht Fund.
  - South Africa, abolishment of Apartheid.

Thank you.

Questions? Comments?

marti.mestieri@northwestern.edu

Kids' schooling choices, age above 11 and below 22 in 2002,

Back

	All HH	Below median Assets	Above Median Assets
	LHS is Kids Years Schooling		
HH assets	-8.052	17490.9**	-13.32*
	(7.856)	(8081.8)	(7.146)
HH debt	2825.0	4405.1	1820.8
	(2780.5)	(7874.5)	(2503.3)
Parent Raven	1.017	-1.617	2.187
	(1.063)	(1.477)	(1.474)
Parent schooling	0.310***	0.326***	0.261***
	(0.0361)	(0.0644)	(0.0418)
Kid Raven	3.634***	3.214**	3.680**
	(0.955)	(1.253)	(1.436)
Subsistence Ent.	-0.453	-1.386	-0.334
	(0.381)	(1.143)	(0.370)
Modern Ent.	0.267	-2.505***	0.448
	(0.476)	(0.732)	(0.513)
Parent Subsistence Ent.*Assets	76.50	31910.9	-58.85
	(127.1)	(23928.2)	(91.70)
Parent Subsistence Ent.*Debt	11802.8	-5413.2	10948.6
	(8308.0)	(17040.4)	(7363.2)
Parent Modern Ent.*Assets	-3.401	-8712.9	-3.702
	(9.773)	(18956.9)	(9.177)
Parent Modern Ent.*Debt	2342.0	728323.0***	2333.5
	(3141.9)	(117446.1)	(2942.9)
Number of HH members	-0.288***	-0.203**	-0.341***
	(0.0687)	(0.0929)	(0.0928)
Kid's age	0.0943*	0.00822	0.118**
	(0.0506)	(0.0921)	(0.0527)
Constant	6.765***	7.533***	7.052***
	(1.064)	(1.700)	(1.295)
Observations	5962	2876	3084

Standard errors in parentheses

Kids older than age 11 in 2002. Parents are averaged over household head and spouse. Kids are averaged over all kids in the household. Quantile ranges from 0 to 1.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$