Health Policies and Intergenerational Mobility

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In this paper I study how health and health policies affect intergenerational mobility.

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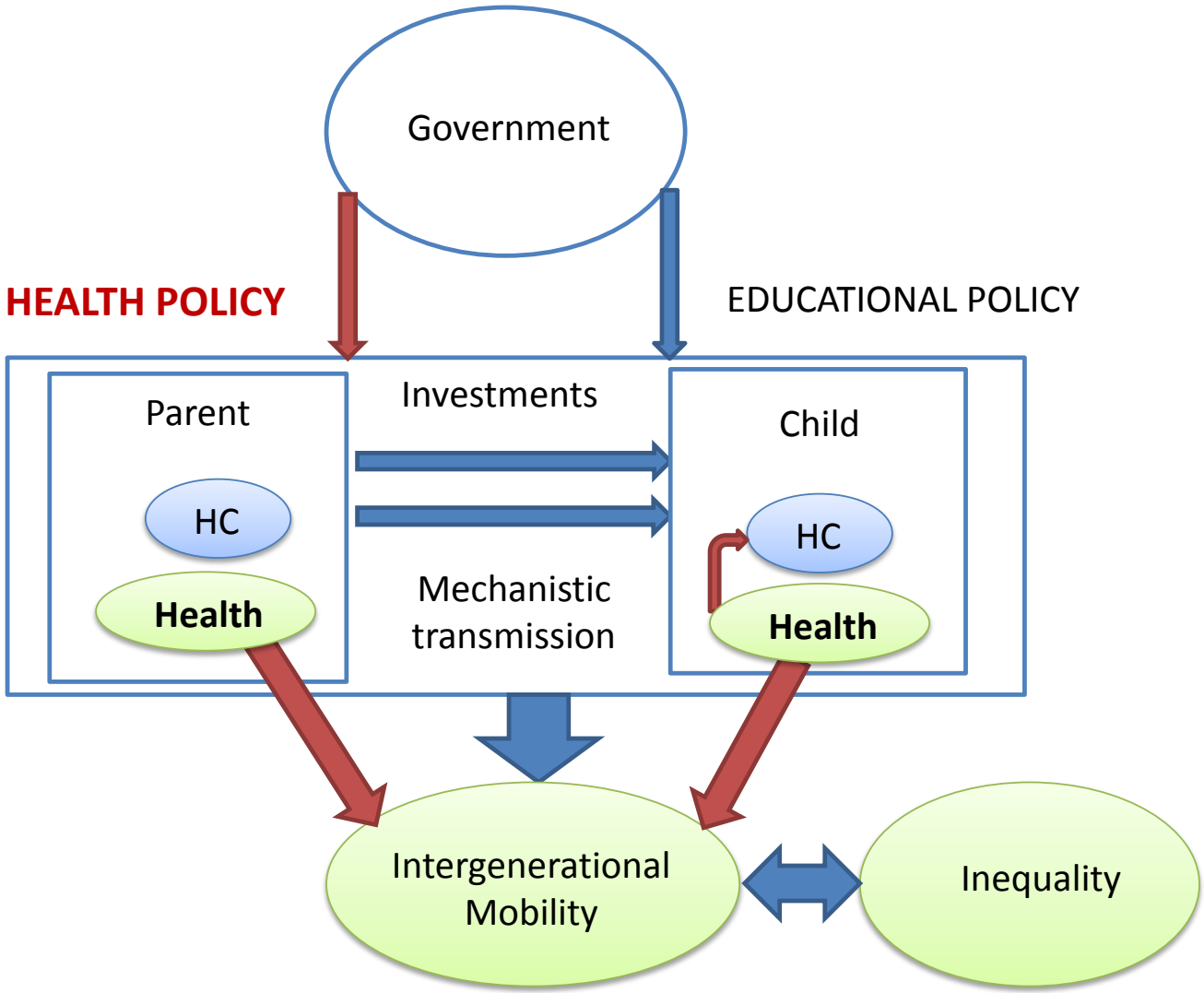
Government
HEALTH POLICY
EDUCATIONAL POLICY
Parent
Investments
Child
HC
HC
Health
Mechanistic
transmission
Health
Intergenerational
Mobility
Inequality

Outline

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- Dynamic complementarity and self-productivity of human capital (Cunha, Heckman, Schennach 2010) $\Rightarrow$ multiplicative effect

Model. Parents and Children

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- Children are born with innate ability a^* and innate health h^*, correlated with the parental innate ability A^* and innate health H^*, correspondingly.
- So, $a_1 = a^*$, $h_1 = h^*$, after that a and h evolve endogenously as a result of parental decisions, governmental policy and luck.

- **"Early" Education ($j = 1, 2$)**
  - Given parental income and child's ability a, parents decide on spending into early education (e) of their children.
  - Government spends g on every child on early education. Parents take g into account while deciding on e.
  - Given a, h, e, g, and a shock v, ability production:

$$a' = f(a, h, e, g, v).$$

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- **College ($j = 3$)**
  - Parents decide whether to send children to college or not, given the tuition fee E.
  - Government provides income-dependent college subsidies (similar to Restuccia and Urrutia, 2004)
  - Given $a, h, college, \upsilon$ the initial (adult) labor market productivity is defined:

$$A' = f(a, h, col, \upsilon).$$

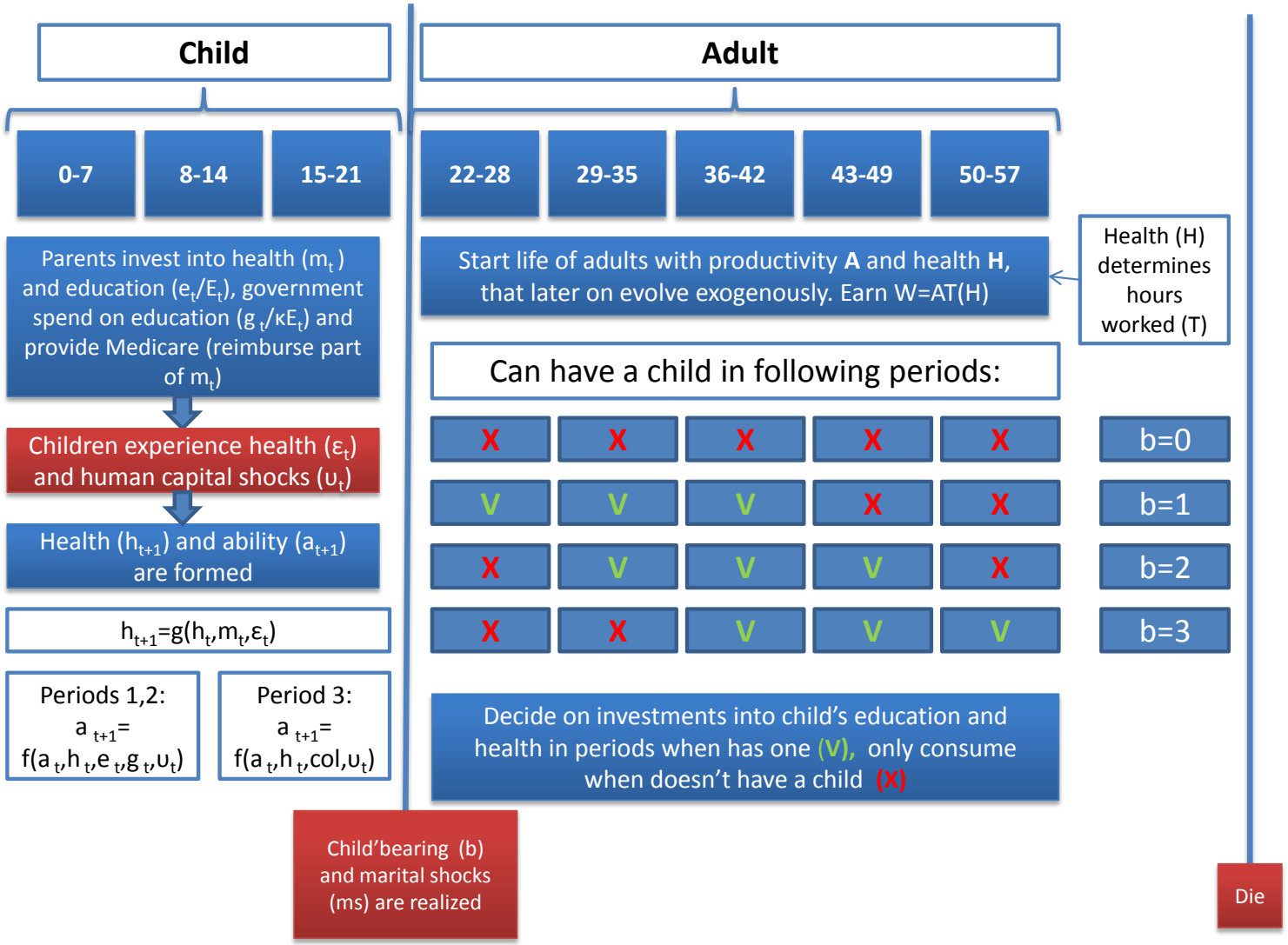
Model. Health

- Given h, parents decide how much to spend on health of their children (m).
- Medical expenditure, together with past levels of health, enter into health production function. But these processes are subject to shocks.
- Health production function:

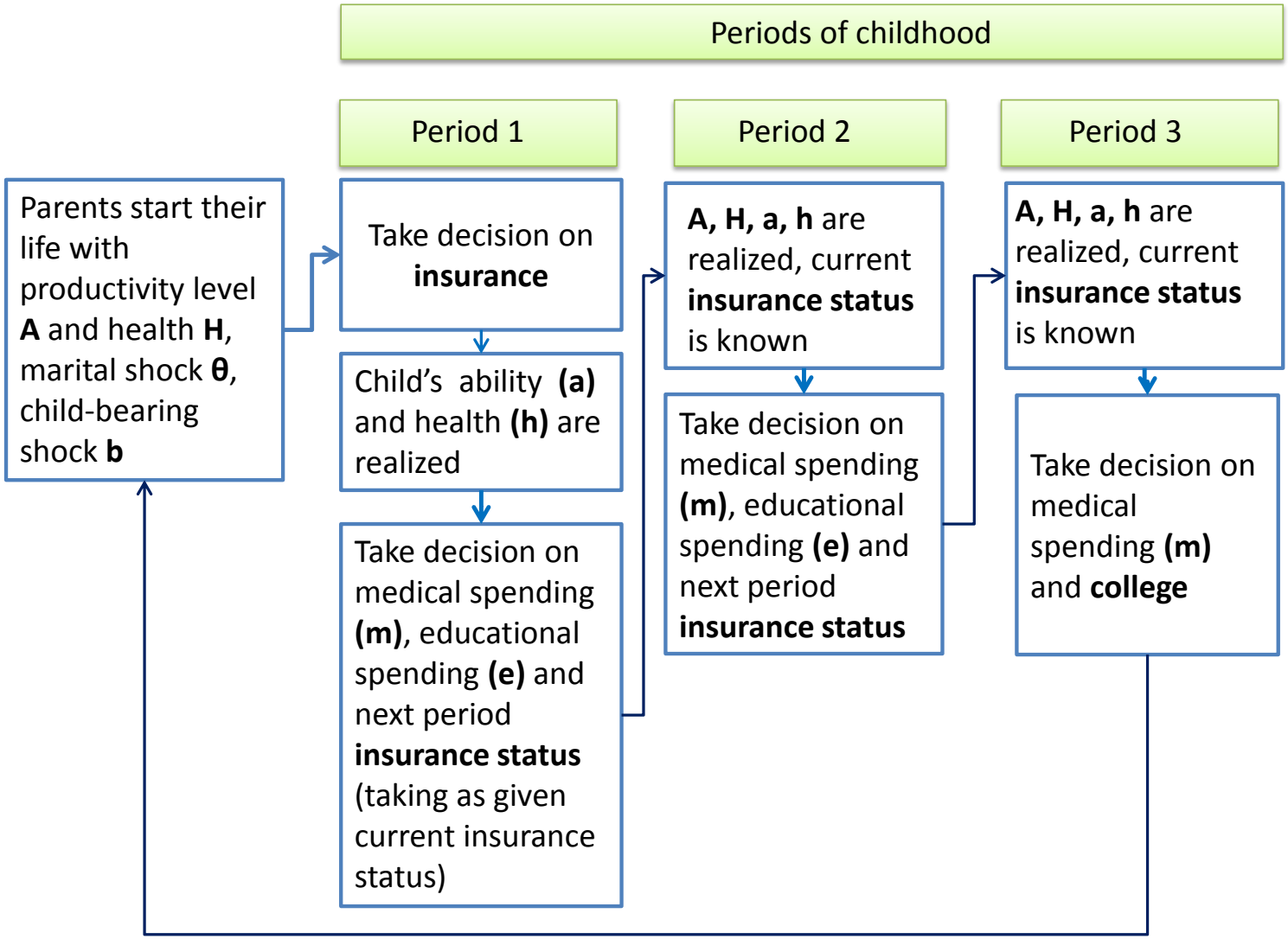
$$h' = g(h, m, \varepsilon).$$

- Government provides public insurance policy (Medicaid) for poor, means-tested transfers, to partially reimburse m.
- Parents can purchase private isurance: an upfront payment p_{ins} that allows to partially reimburse m.

Model.Timing



Model. Timing of Households Decisions



Household Problem

- Households maximize their lifetime utility.
- Per-period utility:

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- Childless parents state space $\mathbf{x} = \{A, H, \theta, b, A^*, H^*\}$.

$$V_{t,0}(\mathbf{x}) = \max\left\{u(c) + \beta E_{A',H'} V_{t+1,j}(\mathbf{x}')\right\},$$

subject to

$$c = (1-\tau)T_t(H)A,$$

and

$$j = \begin{cases} 0,\ b = 0,\ \text{or } b = 1 \text{ and } t > 3,\ \text{or } b = 2 \text{ and } t = 1 \text{ or } t > 4, \\ \qquad\qquad \text{or b=3 and t<3} \\ 1,\ \text{otherwise} \end{cases},$$

A–productivity, H – health status, θ – marital status, and b – child-bearing status, τ – tax rate, $T_t(H)$ – time devoted to labor market, A^*–parental innate ability, H^*–parental innate health.

Parental Problem in the First Period of Childhood

- Initial state space: $\widetilde{\mathbf{x}} = \{\theta, b, A, H, A^*, H^*\}$.
- Decision on insurance is taken

$$V_{t,1}(\widetilde{\mathbf{x}}) = \max\{E_{h,a}V^i_{t,1}((\mathbf{x}), E_{h,a}V^u_{t,1}(\mathbf{x})\},$$

- The state space after the realization of a and h: $\mathbf{x} = \{\theta, b, A, H, a, h\}$.

A problem of household **with insurance**

$$V^i_{t,1}(\mathbf{x}) = \max_{c,e,m} \{u(c) + \beta \max\{E_{A',H',a',h'} V^i_{t+1,2}(\mathbf{x}'), E_{A',H',a',h'} V^u_{t+1,2}(\mathbf{x}')\}\},$$

subject to

$$c = (1-\tau)[AT_t(H) - p_{ins}] - m + \chi^{PRV}(m) - (e-g),$$

$$a' = f(a, h, e, g, \upsilon), \text{ and } e \geq g$$

$$h' = g(h, m, \varepsilon),$$

and

$$Q^t_{H'|H}, \text{ and } \quad Q^t_{A'|A}.$$

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subject to

$$c = (1-\tau)[AT_t(H)] - m + \chi^{MCD}(m)\mathcal{I}_1^{MCD}(AT_t(H)) - (e-g),$$

$$a' = f(a, h, e, g, \upsilon), \text{ and } e \geq g,$$

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Third period of childhood

- State space $\mathbf{x} = \{a^*, h^*, \theta, b, a, h, A, H\}$.
- Given child's insurance status parents choose whether to send him to college

$$V^i_{t,3}(\mathbf{x}) = \max\{V^{c,i}_{t,3}(\mathbf{x}), V^{nc,i}_{t,3}(\mathbf{x})\},$$

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Third period of childhood

- The value of sending the child to **college** and purchasing **health insurance**:

$$V_{t,3}^{c,i}(\mathbf{x}) = \max_{c,m} \left\{ u(c) + \beta E V_{t+1,0}(\mathbf{x}') + \psi E \hat{V}_{1,j}(\mathbf{x}'_{child,j}) \right\},$$

subject to

$$c = (1-\tau)[T_t(H)A) - p_{ins}] - m + \chi^{PRV}(m) - (E - \kappa(T_t(H)A)),$$

and

$$\kappa(T_t(H)A) = \max\{0, E - \phi_1(AT_t(H))^{\phi_2}\},$$

and

$$A'_{child} = f(a, h, col, \upsilon),$$

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$$A'_{child} = f(a, h, col = 1, \upsilon),$$

$$H'_{child} = g(h, m, \varepsilon),$$

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$$Q^t_{H'|H}, \text{and } \; Q^t_{A'|A}.$$

Third period of childhood

- The value of **not** sending the child to **college** and **not** purchasing **health insurance**:

$$V_{t,3}^{nc,u}(\mathbf{x}) = \max_{c,m} \left\{ u(c) + \beta E V_{t+1,0}(\mathbf{x}') + \psi E \hat{V}_{1,j}(\mathbf{x}'_{child,j}) \right\},$$

subject to

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- **First Stage**: discount factor (β), risk-aversion (σ), governmental educational spending (g), marital (θ) and child-bearing (b) shocks, parental ($T_t(H)$) and children's ($t_3(h)$) hours worked and life cycle transitions for health ($Q_{H'|H}$) and productivity ($Q_{A'|A}$), insurance functions (η^i_j, μ^i_j).

Estimation

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- **Second Stage**: insurance functions thresholds $(\bar{I}_j)$, college subsidy function $(\kappa(AT_t(H))$, health and ability productions $(f(\cdot), g(\cdot))$.

Second-Step Estimation. Functional Forms

- Health:

$$Pr(h' = h_k|h, m) = \Lambda(\alpha_0^h + \alpha_1^h h + \alpha_2^h m + \alpha_3^h \cdot h \cdot m),$$

- Ability in $j = 1, 2$:

$$Pr(a' = a_k|a, h, e, A) = \Lambda(\alpha_0^a + \alpha_1^a a + \alpha_2^a h + \alpha_3^a e + \alpha_4^a \cdot a \cdot e + \alpha_5^a \cdot a \cdot h + \alpha_6^a \cdot A \cdot e)$$

- Productivity in $j = 3$

$$\Pi = \alpha_{30}^a + \alpha_{31}^a a + \alpha_{32}^a h + \alpha_{33}^a col + \alpha_{34}^a \cdot a \cdot h + \alpha_{35}^a \cdot h \cdot col + \alpha_{36}^a \cdot a \cdot col + \varepsilon_3.$$

where h–child's health, m–medical spending, a–child's ability, col–college, e–parental educational spending, A–parental productivity

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where h–child's health, m–medical spending, a–child's ability, col–college, e–parental educational spending, A–parental productivity

- The Estimator:

$$\widehat{\Omega} = argmin(\widehat{\pi} - \pi(\Omega))' \widehat{W} (\widehat{\pi} - \pi(\Omega)),$$

where Ω – vector of parameters to estimate, $\widehat{\pi}$– data moments, $\pi(\Omega)$–their model-based counterpart,$\widehat{W}$ is some positive semi-definite matrix

- 39 parameters and 52 data moments.
  - $\{\overline{I}_1, \overline{I}_2, \overline{I}_3, p_{ins}\}$–insurance market
  - $\{\kappa, \phi, E\}$ – college education
  - $\{\alpha_0^h, \alpha_1^h, \alpha_2^h, \alpha_3^h, \alpha_{30}^h, \alpha_{31}^h, \alpha_{32}^h, \alpha_{33}^h\}$–health production
  - $\{\alpha_0^a, \alpha_1^a, \alpha_2^a, \alpha_3^a, \alpha_4^a, \alpha_5^a, \alpha_7^a\}$–ability production in $j = 1, 2$
  - $\{\alpha_{30}^a, \alpha_{31}^a, \alpha_{32}^a, \alpha_{33}^a, \alpha_{34}^a, \alpha_{35}^a, \alpha_{36}^a, \sigma_{inc}, x_1, x_2, x_3, x_4\}$–ability production in $j = 3$

Model Fit

Moment	Data	Model
Intergenerational income elasticity	0.4	0.273
Probability of Moving from Q1 to Q5	0.09	0.105
Probability of Moving from Q5 to Q5	0.32	0.279
Gini coefficient	0.4	0.424
Children with public insurance, j=1	0.304	0.358
Children with public insurance, j=2	0.237	0.245
Children with public insurance, j=3	0.156	0.132
$Pr(h = bad \vert H == bad)$	0.218	0.439
$Pr(h = good \vert H == good)$	0.912	0.547
$Pr(h_2 = good \vert h_1 = bad)$	0.645	0.708
$Pr(h_2 = good \vert h_1 = good)$	0.893	0.858
$Pr(h_3 = good \vert h_2 = bad)$	0.653	0.673
$Pr(h_3 = good \vert h_2 = good)$	0.836	0.974
$Pr(H_1 = good \vert h_3 = bad)$	0.503	0.76
$Pr(H_1 = good \vert h_3 = good)$	0.796	0.819
% of people in good health in Q1	0.864	0.789
% of people in good health in Q2	0.939	0.882
% of people in good health in Q3	0.949	0.666
% of people in good health in Q4	0.967	1
% of people in good health in Q5	0.978	0.771
% of children in good health in $j = 1$	0.847	0.765

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Model Fit II

Moment	Data	Model
Share of students with federal grant	0.64	0.322
Share of college graduates	0.44	0.615
Average college subsidy	4.777	3.84
% of college educated people in Q1	0.18	0.26
% of college educated people in Q2	0.27	0.165
% of college educated people in Q3	0.349	0.819
% of college educated people in Q4	0.42	0.953
% of college educated people in Q5	0.65	0.956
$Pr(a = high \vert Q1)$	0.368	0.512
$Pr(a = high \vert Q2)$	0.543	0.522
$Pr(a = high \vert Q3)$	0.618	0.529
$Pr(a = high \vert Q4)$	0.677	0.529
$Pr(a = high \vert Q5)$	0.737	0.529
$Pr(a' = high \vert a = low, h = bad, e = 1)$	0.076	0.206
$Pr(a' = high \vert a = low, h = good, e = 1)$	0.207	0.344
$Pr(a' = high \vert a = high, h = bad, e = 1)$	0.615	0.334
$Pr(a' = high \vert a = high, h = good, e = 1)$	0.686	0.502
$Pr(a' = high \vert a = low, h = bad, e = 2)$	0.218	0.314
$Pr(a' = high \vert a = low, h = good, e = 2)$	0.329	0.48
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Outline

Marginal Effects. Health

- Health production function:

$$Pr(h' = h_k|h, m) = \Lambda(\alpha_0^h + \alpha_1^h h + \alpha_2^h m + \alpha_3^h \cdot h \cdot m),$$

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	Periods 1,2 $\overline{m}$ =5.49			Period 3 $\overline{m}$ =9.22		
$\overline{m}$	$h_j = bad$	$h_j = good$	Δh	$h_j = bad$	$h_j = good$	Δh
$Pr(h_{j+1} = good\|h_j)$	0.668	0.889	**0.221**	0.354	0.876	**0.522**

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- Marginal effects:

	Periods 1,2			Period 3		
	$h = bad$	$h = good$	Δh	$h = bad$	$h = good$	Δh
$\overline{m} + \$1,000$	0.0221	0.00387	**0.2028**	0.0252	0.00799	**0.505**

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- Marginal spendings on health are relatively more effective for poor children.

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$\overline{e} = 4.12$, $\overline{A} = 109$	Health=bad			Health=Good		
	$a_i = low$	$a_i = high$	Δa	$a_i = low$	$a_i = high$	Δa
$Pr(a_{j+1} = high\|a_j = a_i, h)$	0.0836	0.392	**0.308**	0.203	0.655	**0.452**

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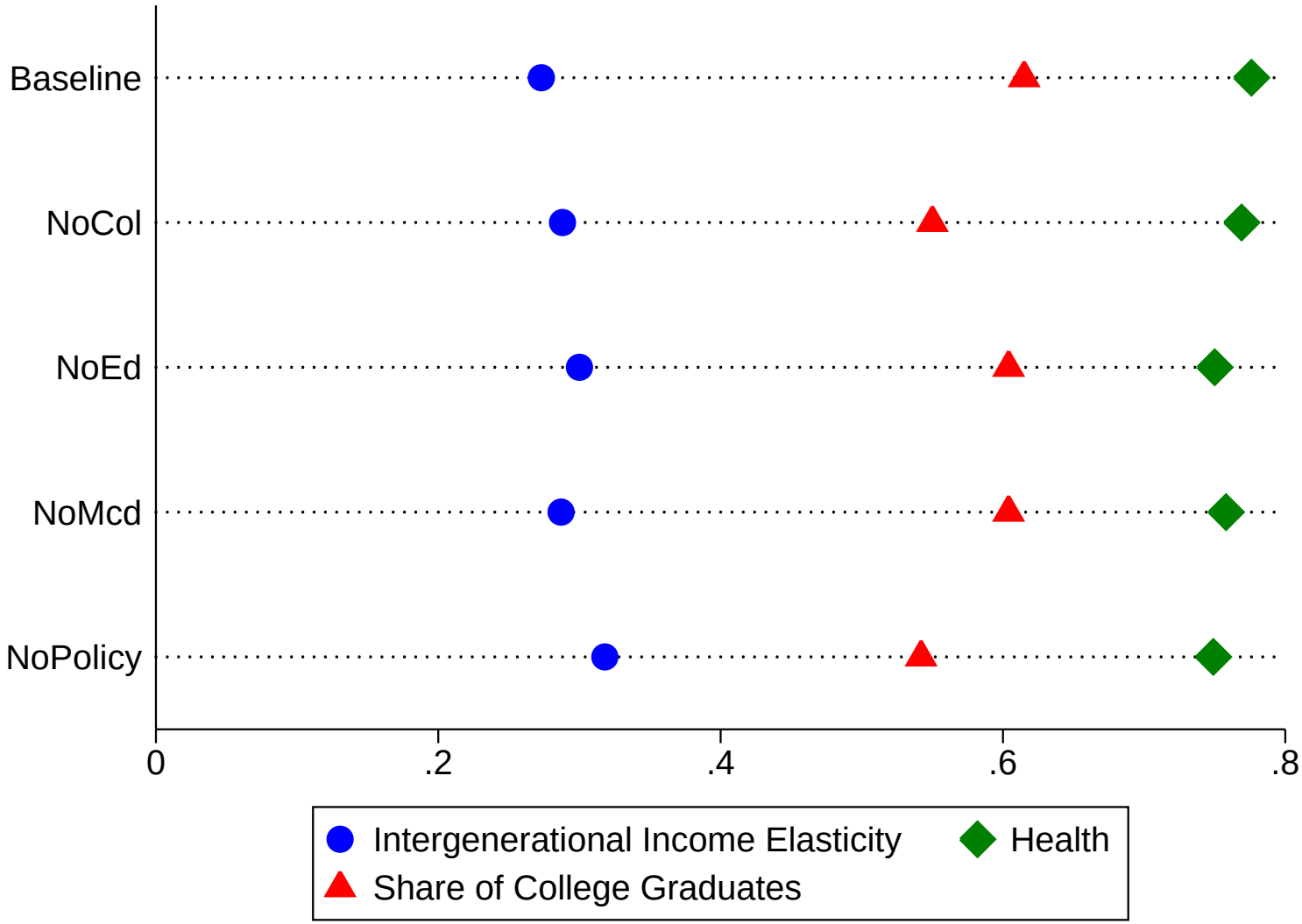
- Investing just in education is not enough. Health matters a lot.

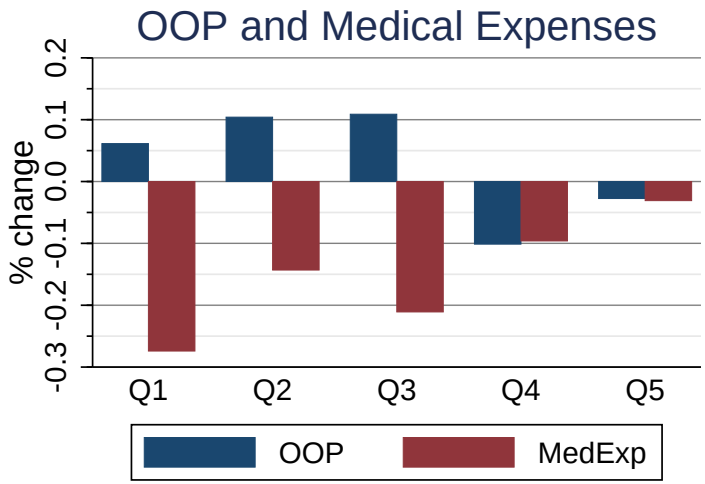
Counterfactual Policy Experiments

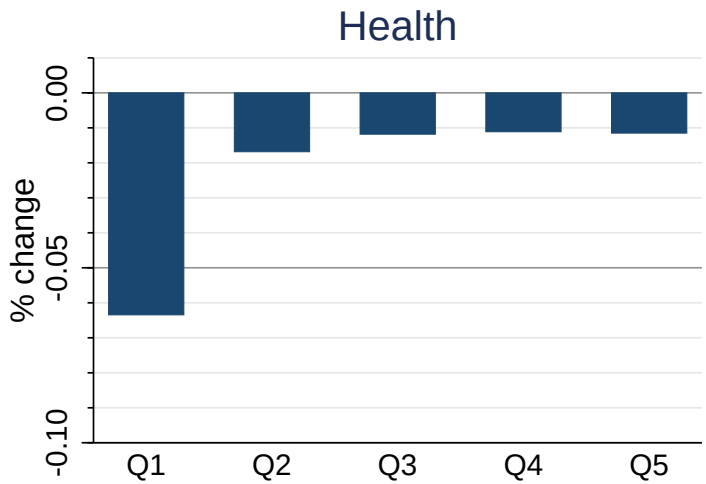
- Shutting down policies (today):
  - Role of health policies: shut down Medicaid
  - Role of educational policies: shut down educational policies
  - Role of policy interactions: shut down educational and medical policies together
- Experiment with health policies: Obamacare, income-dependent, conditional transfer (in progress)
- Cost-neutral reallocation of governmental resources between existing policies (in progress)
- Other welfare programs (Head Start, free lunch)

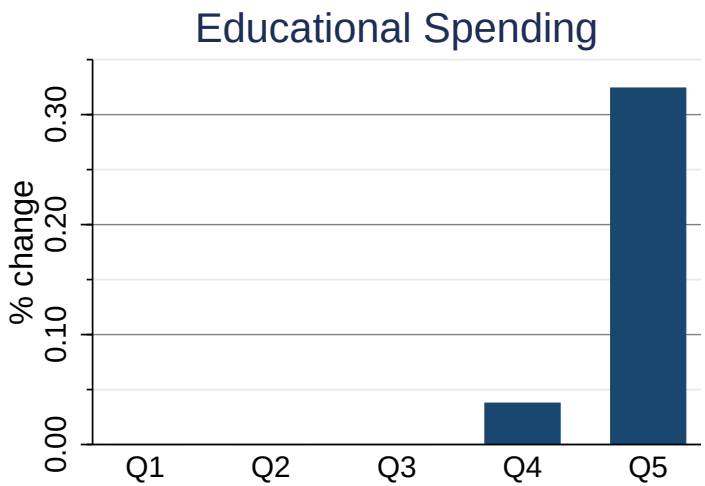
Aggregate Results

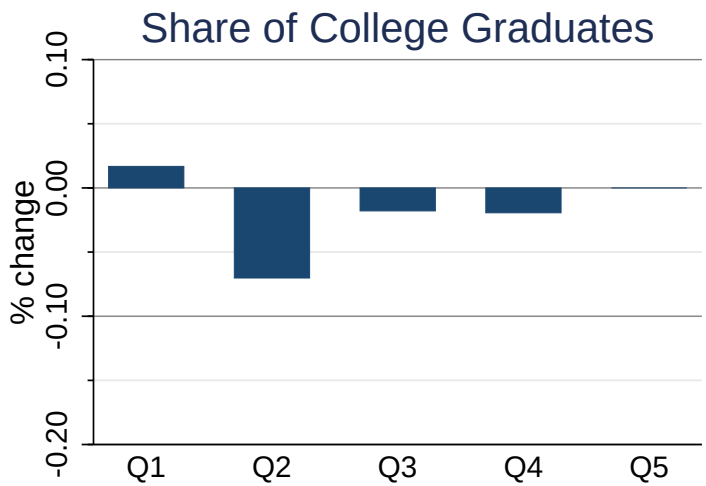


No Medicaid


OOP and Medical Expenses
% change
-0.3 -0.2 -0.1 0.0 0.1 0.2
Q1 Q2 Q3 Q4 Q5
OOP
MedExp


Health
% change
-0.10 -0.05 0.00
Q1 Q2 Q3 Q4 Q5

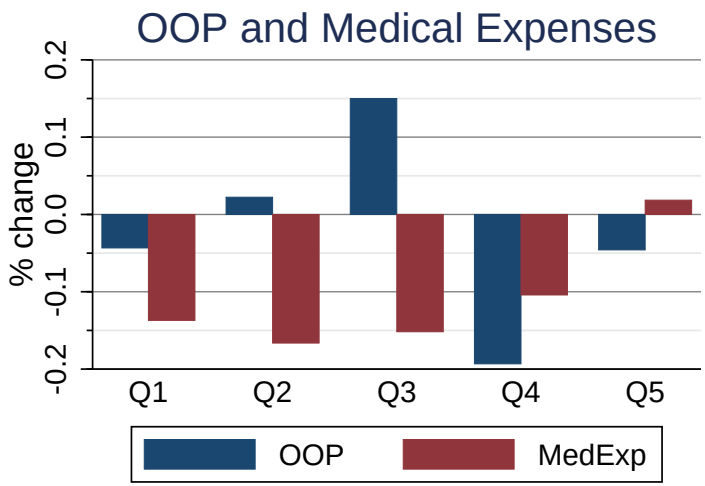

Educational Spending
% change
0.00 0.10 0.20 0.30
Q1 Q2 Q3 Q4 Q5

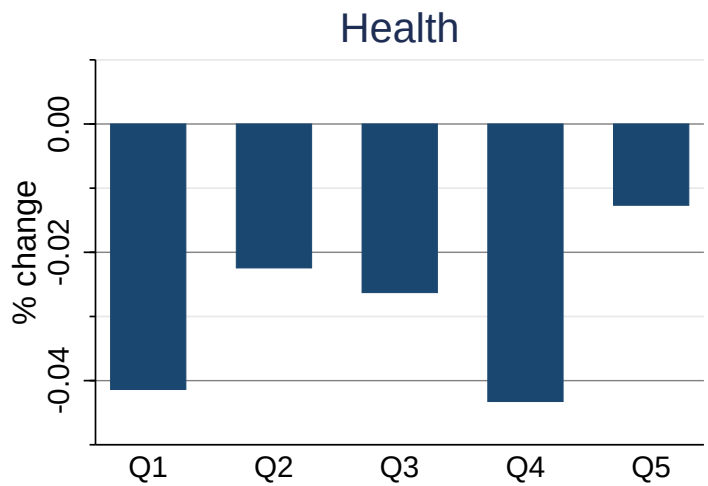

Share of College Graduates
% change
-0.20 -0.10 0.00 0.10
Q1 Q2 Q3 Q4 Q5

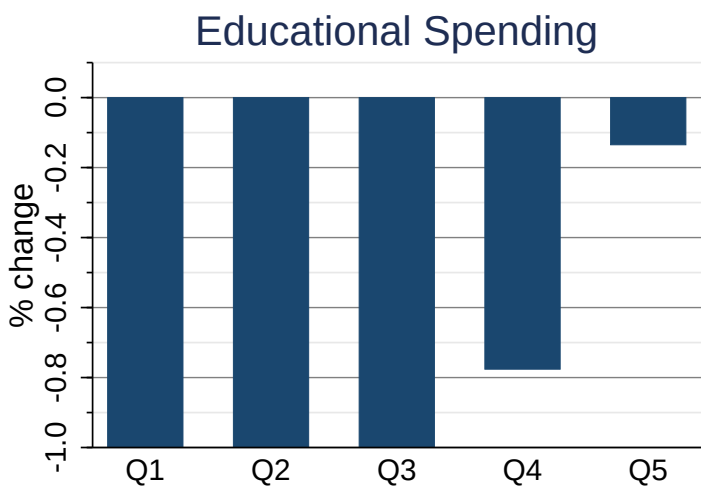
No Medicaid

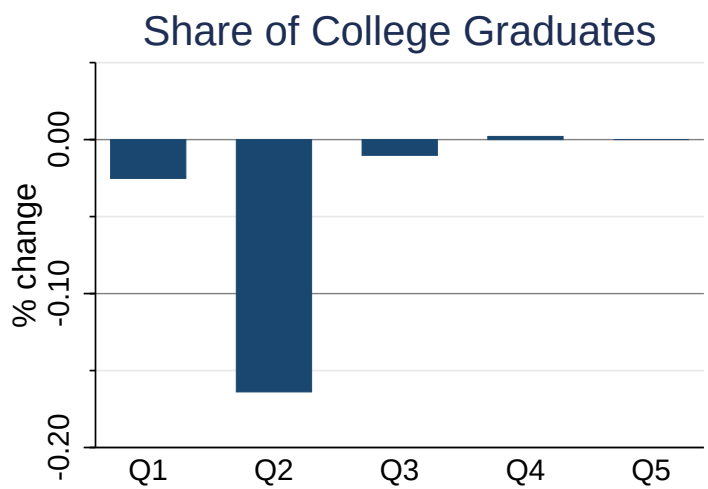
- **Medical spending** decrease, more for poor than for rich (while parental out-of-pocket expenses increase for poor)
- **Gap** between the educational spending of rich and poor parents widens: poor people do not invest in education, while rich people decrease their investments in health in order to increase their investments in education
- Average **health** declines, it declines more for poor children (from 72.5% to 67.9%), than for reach children (86.8% to 85.8%)

No Early Education Policy





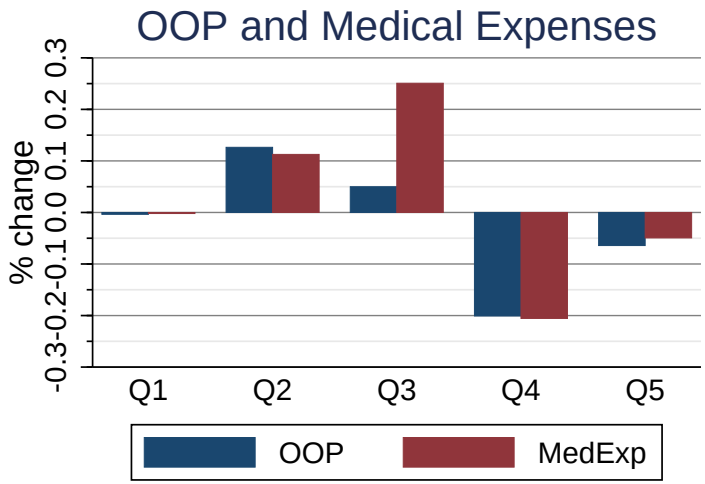


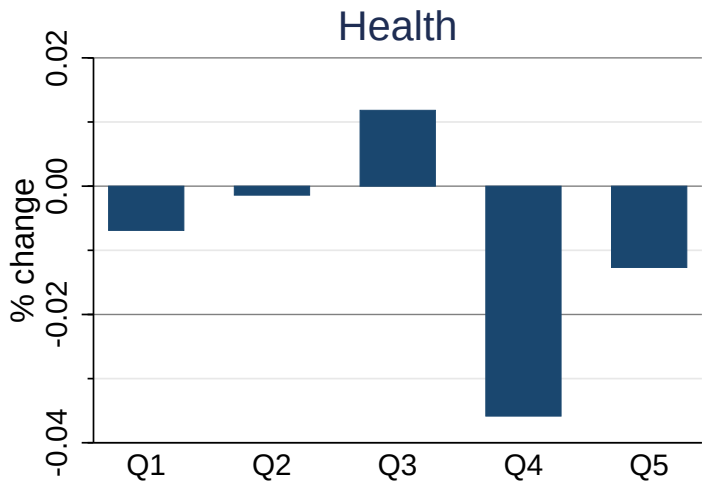


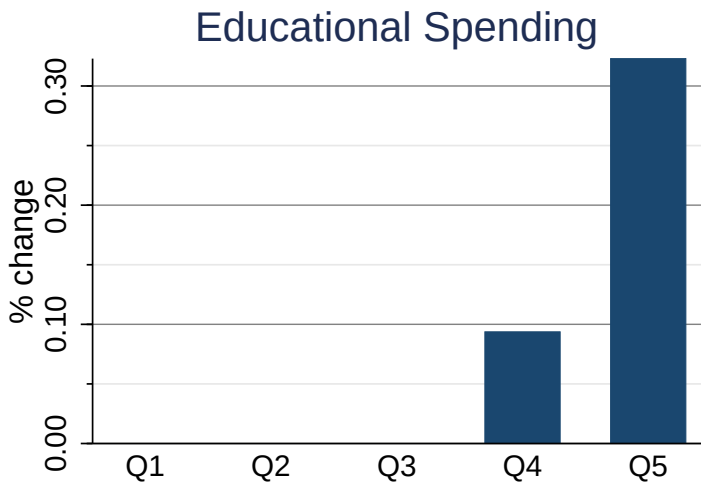
No Early Education Policy

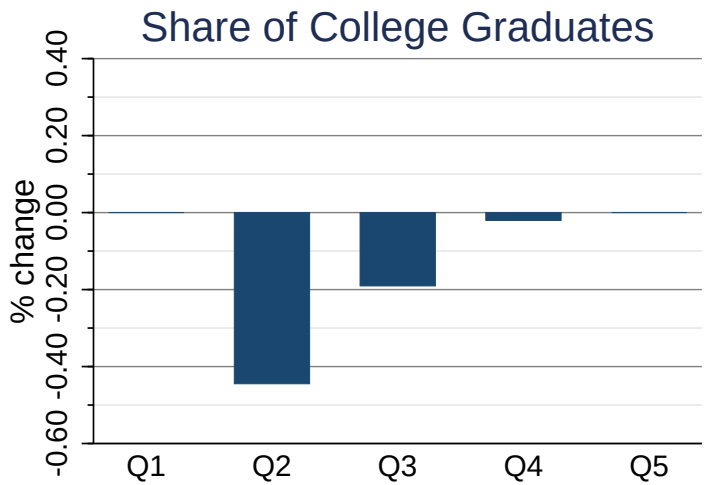
- **Health** slightly decrease and **college attainment** decreases for poor, parents spend slightly less on health.
- **Gap** in parental educational spending widens: poor parents do not compensate for lost governmental subsidies while rich parents do.

No College Subsidies





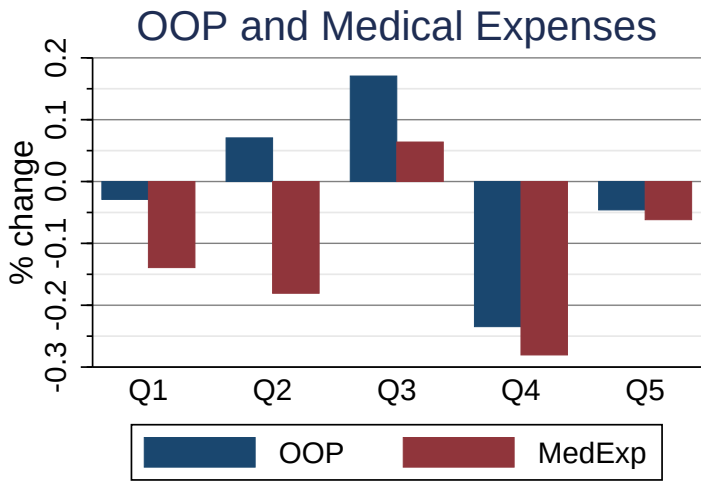


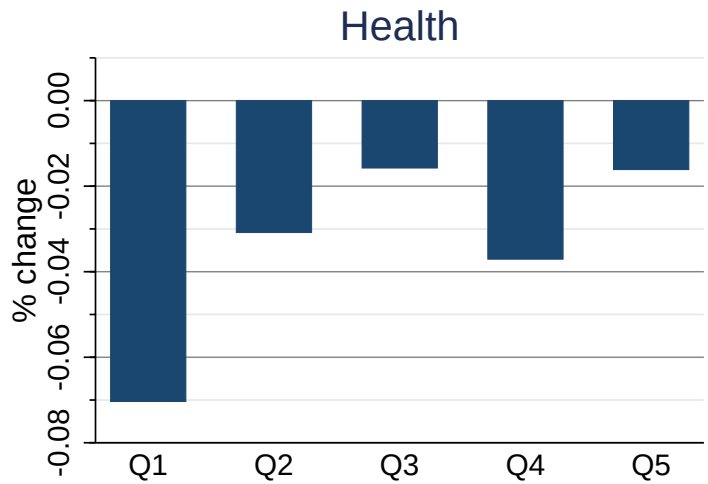


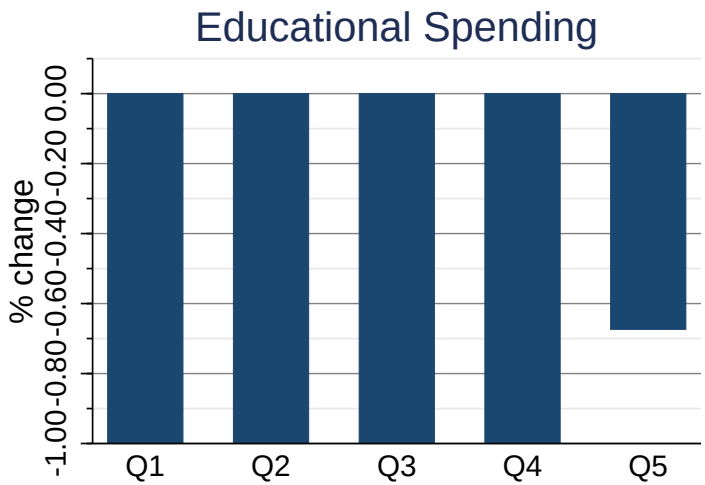
No College Subsidies Policy

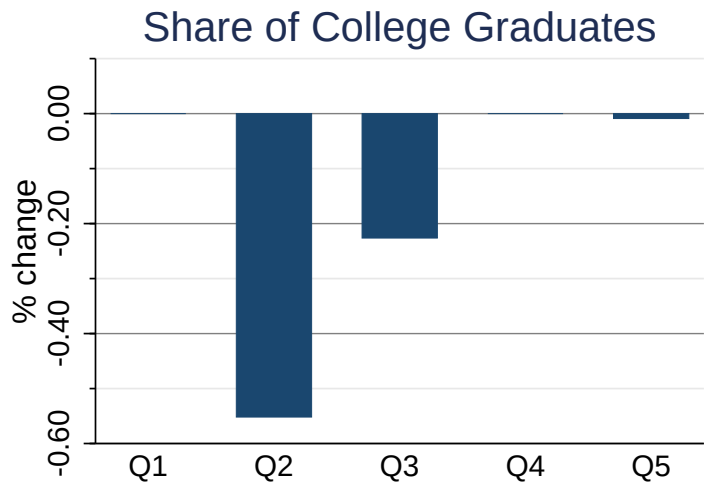
- Lower **college attainment** of all but the top quintile.
- Increase in early **educational spendings** for rich families $\rightarrow$ **gap** between educational spending of poor and rich widens.
- Rich families slightly substitute **health spending** towards early **education spending**.
- Middle class people invest more in **health** and receive less **college education**.

Policy Interaction

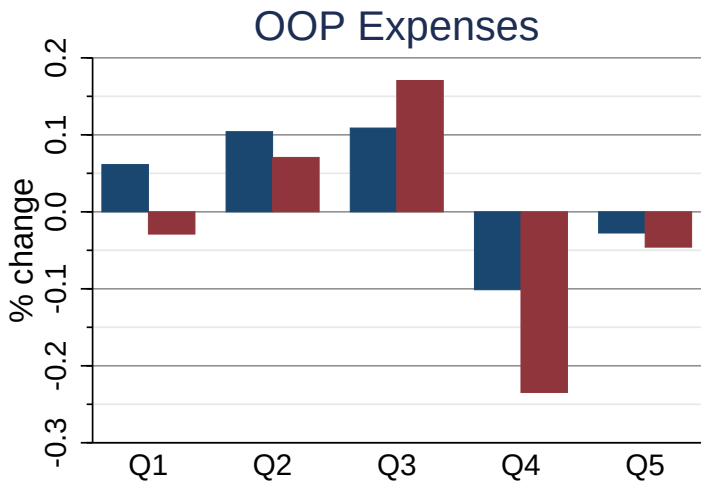


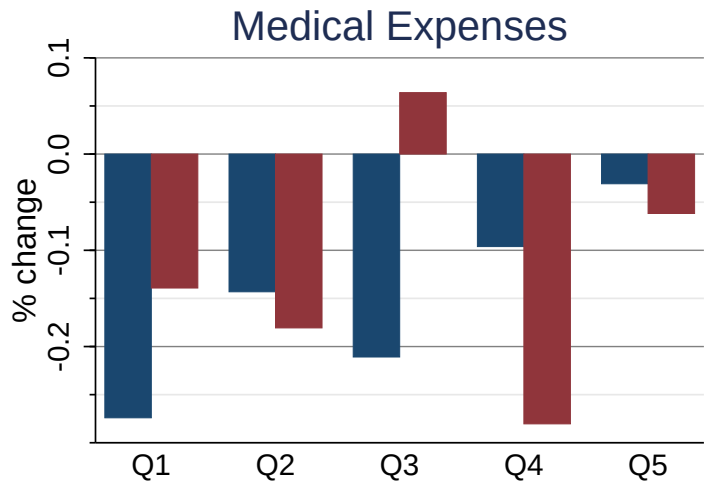


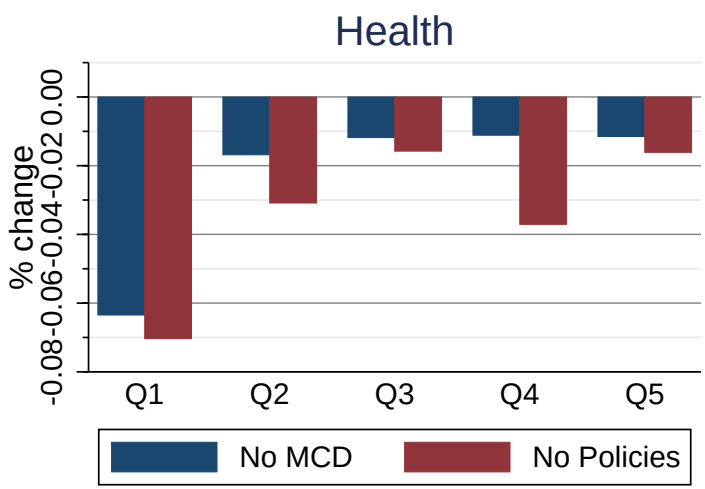




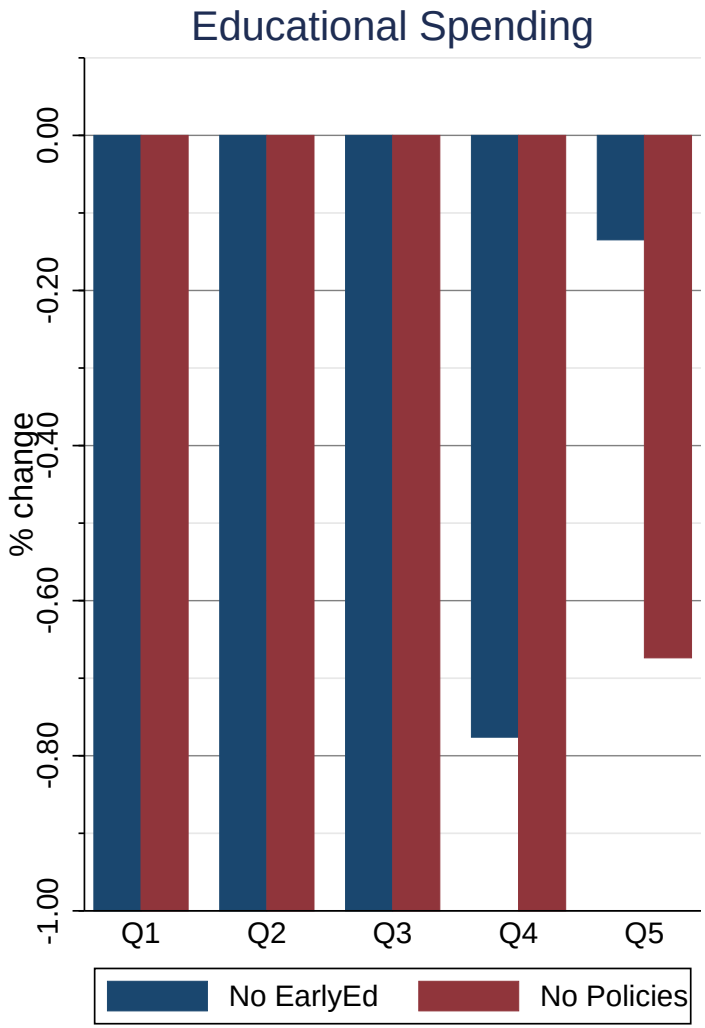
Policy Interaction: Health

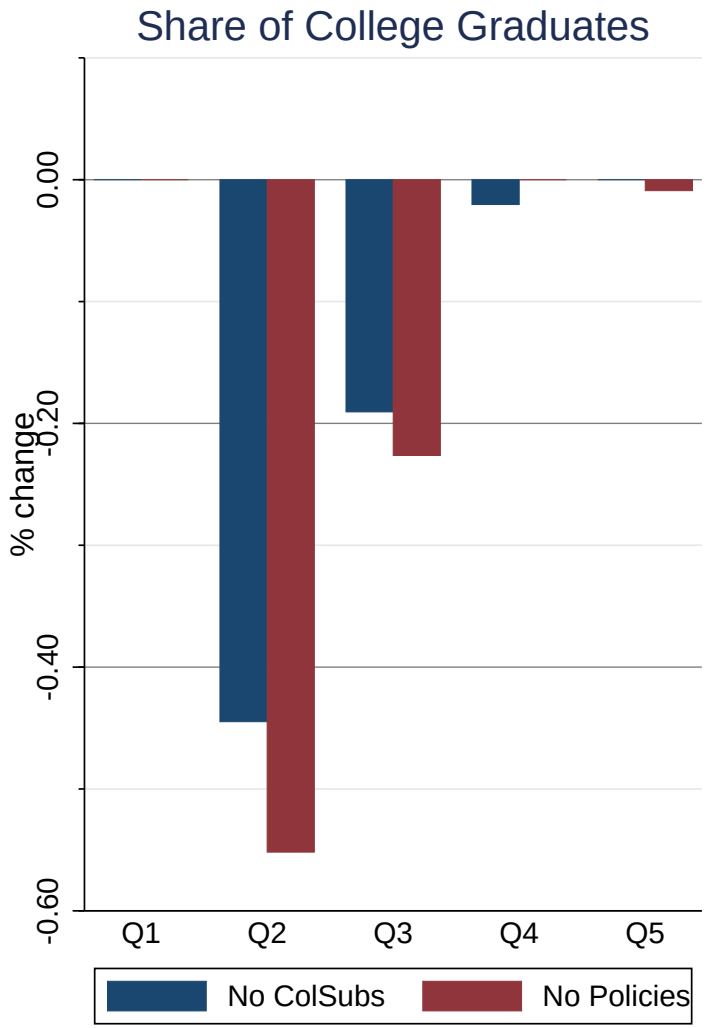






Policy Interaction: Education





Policy Interaction

- **Health** decreases much more than in only Medicaid shut-down case (from 72.5 to 67.4% for 1st quintile and from 86.8 to 85.4% for the top quintile)
- **College attainment** decreases more than in only college subsidies shut-down case (no children from the lower quintile receive college education, decreases more than two-fold for the 2nd quintile, decreases for the rest of quintiles as well)
- **Medical spending** decrease for everyone
- Rich parent try to compensate for **early education** subsidies, but much less than in only early subsidies shut-down.

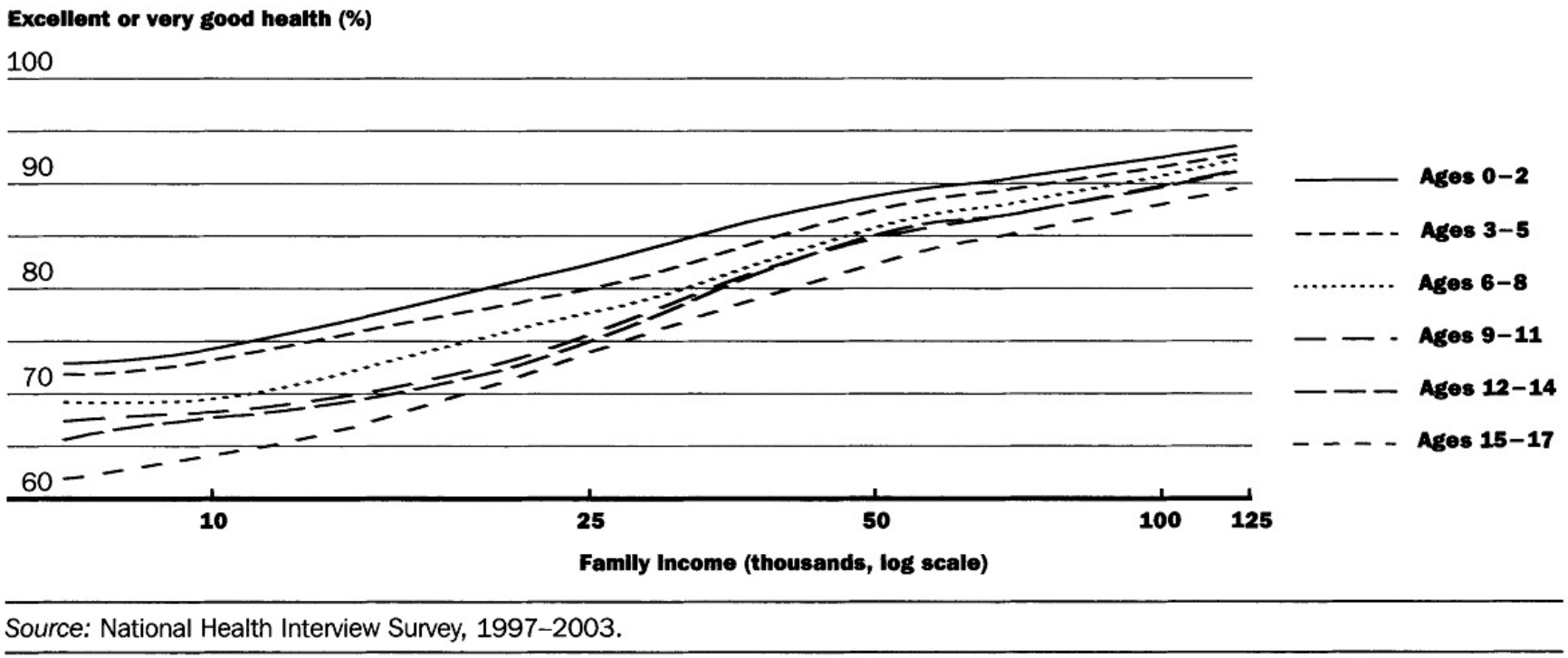
Summary of Results

- The **aggregate effect** of shutting down policies on intergenerational income elasticity:
  - 5% increase for Medicaid,
  - 10% increase for early education,
  - 5.5% increase for late education subsidies,
  - 16.5% increase for all policies.
- Distributional **heterogeneity** in responses to policy changes
- **Trade-off** between investments in health and education is stronger for poor people, they have to adjust for policies more, than reach people
- **Gaps** in decisions of poor and reach households widen
- **Interaction effect** of medical and educational policies

THANK YOU!

APPENDIX

Health Differences



Source: National Health Interview Survey, 1997–2003.

Source: Case and Paxton, 2006

Back

Intergenerational Correlation of Health

- Correlation of child's health at birth with parental health in the period the child is born (PSID):

Parent/Child	Good	Bad
Good	0.912	0.088
Bad	0.782	0.218

"Excellent", "very good", and "good" = good health, "fair" or "poor" = bad health.

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- Children in good health by age

Age	0-7	8-14	15-21
Fraction of children in good health	0.86	0.86	0.81

Back

Changes in Child's Ability

- Transitions across ability levels for children of age 0-7 to 8-14 and 8-14 to 15-21.

Changes in Child's Ability

- Transitions across ability levels for children of age 0-7 to 8-14 and 8-14 to 15-21.
- **Low Educational Spending**

Bad Health		
Ability	Low	High
Low	0.924	0.076
High	0.385	0.615

Good Health		
Ability	Low	High
Low	0.793	0.207
High	0.314	0.686

- **High Educational Spending**

Bad health		
Ability	Low	High
Low	0.782	0.218
High	0.364	0.636

Good Health		
Ability	Low	High
Low	0.671	0.329
High	0.204	0.796

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Ability	Low	High
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Back

Parental weekly hours worked conditional on health status (PSID):

Age/Health	Bad	Good
22-28	42	54
29-35	47	58
36-42	50	59
43-49	50	60
50-57	46	57

Back

No Medicaid

Moment	Baseline	No Medicaid
Intergenerational lifetime income elasticity	0.273	0.287
Probability of Moving from Q1 to Q5	0.105	0.1
Probability of Moving from Q5 to Q5	0.279	0.28
Gini coefficient	0.424	0.425
Children in good health	0.776	0.758
Share of College Graduates	0.615	0.604
Medical Expenses in $1000		
Average Medical Expenditure	8.042	7.118
Educational Spendings in $1000		
Private Educational Expenditure	0.40	1.5
Tax rate	0.124	0.101

No Medicaid

Moment	Baseline	No Medicaid
Average Medical Expenses in $1000		
Q1	4.67	3.39
Q2	5.59	4.79
Q3	6.26	4.94
Q4	7.49	6.77
Q5	16.2	15.7
Average Medical OOP Expenses in $1000		
Q1	2.77	2.94
Q2	2.69	2.97
Q3	3.4	3.77
Q4	6.52	5.86
Q5	10.9	10.6
Share of Children in Good Health		
Q1	0.725	0.679
Q2	0.713	0.701
Q3	0.761	0.752
Q4	0.809	0.8
Q5	0.868	0.858

No Medicaid

Moment	Baseline	No Medicaid
Average Early Educational Spending in $1000		
Q1	0	0
Q2	0	0
Q3	0	0
Q4	0	0.487
Q5	1.99	6.82

No Early Education Policy

Moment	Baseline	No g
Intergenerational lifetime income elasticity	0.273	0.3
Probability of Moving from Q1 to Q5	0.105	0.098
Probability of Moving from Q5 to Q5	0.279	0.273
Gini coefficient	0.424	0.425
Children in good health	0.776	0.75
Share of College Graduates	0.615	0.604
Medical Expenses in $1000		
Average Medical Expenditure	8.042	7.4
Educational Spendings in $1000		
Private Educational Expenditure	0.408	2.8
Tax rate	0.124	0.0263

No Early Education Policy

Moment	Baseline	No g
Average Early Educational Spending in $1000		
Q1	0	0
Q2	0	0
Q3	0	0
Q4	0	2.89
Q5	1.99	12.89
Share of College Educated Children		
Q1	0.0119	0.0116
Q2	0.299	0.25
Q3	0.782	0.774
Q4	0.98	0.982
Q5	1	1

No Early Education Policy

Moment	Baseline	No g
Effective Average Medical Expenses in $1000		
Q1	4.67	4.03
Q2	5.59	4.66
Q3	6.26	5.31
Q4	7.49	6.71
Q5	16.2	16.5
Average Medical Out-of-Pocket Expenses in $1000		
Q1	2.77	2.65
Q2	2.69	2.75
Q3	3.4	3.91
Q4	6.52	5.26
Q5	10.9	10.4
Share of Children in Good Health		
Q1	0.725	0.695
Q2	0.713	0.697
Q3	0.761	0.741
Q4	0.809	0.774
Q5	0.868	0.857

No College Subsidies Policy

Moment	Baseline	No colsubs
Intergenerational lifetime income elasticity	0.273	0.288
Probability of Moving from Q1 to Q5	0.105	0.0973
Probability of Moving from Q5 to Q5	0.279	0.299
Gini coefficient	0.424	0.432
Children in good health	0.776	0.769
Share of College Graduates	0.615	0.55
Medical Expenses in $1000		
Average Medical Expenditure	8.042	8.0
Educational Spendings in $1000		
Private Educational Expenditure	0.408	1.6
Tax rate	0.124	0.124

No College Subsidies Policy

Moment	Baseline	No colsubs
Average Early Educational Spending in $1000		
Q1	0	0
Q2	0	0
Q3	0	0
Q4	0	1.21
Q5	1.99	6.82
Share of College Educated Children		
Q1	0.0119	0
Q2	0.299	0.166
Q3	0.782	0.633
Q4	0.98	0.96
Q5	1	1

No College Subsidies Policy

Moment	Baseline	No colsubs
Effective Average Medical Expenses in $1000		
Q1	4.67	4.66
Q2	5.59	6.22
Q3	6.26	7.83
Q4	7.49	5.95
Q5	16.2	15.4
Average Medical Out-of-Pocket Expenses in $1000		
Q1	2.77	2.76
Q2	2.69	3.03
Q3	3.4	3.57
Q4	6.52	5.21
Q5	10.9	10.2
Share of Children in Good Health		
Q1	0.725	0.72
Q2	0.713	0.712
Q3	0.761	0.77
Q4	0.809	0.78
Q5	0.868	0.857

Policy Interaction

Moment	Baseline	No Policies
Intergenerational lifetime income elasticity	0.273	0.318
Probability of Moving from Q1 to Q5	0.105	0.0906
Probability of Moving from Q5 to Q5	0.279	0.298
Gini coefficient	0.424	0.435
Children in good health	0.776	0.749
Share of College Graduates	0.615	0.542
Medical Expenses in $1000		
Average Medical Expenditure	8.042	6.88
Educational Spendings in $1000		
Private Educational Expenditure	0.408	0.972
Tax rate	0.124	0

Policy Interaction

Moment	Baseline	No Policies
Average Medical Expenses in $1000		
Q1	4.67	4.02
Q2	5.59	4.58
Q3	6.26	6.66
Q4	7.49	5.39
Q5	16.2	15.2
Average Medical OOP Expenses in $1000		
Q1	2.77	2.69
Q2	2.69	2.88
Q3	3.4	3.98
Q4	6.52	4.99
Q5	10.9	10.4
Share of Children in Good Health		
Q1	0.725	0.674
Q2	0.713	0.691
Q3	0.761	0.749
Q4	0.809	0.779
Q5	0.868	0.854

Policy Interaction

Moment	Baseline	No Policies
Average Early Educational Spending in $1000		
Q1	0	0
Q2	0	0
Q3	0	0
Q4	0	0
Q5	1.99	4.86
Share of College Educated Children		
Q1	0.0119	0
Q2	0.299	0.134
Q3	0.782	0.605
Q4	0.98	0.98
Q5	1	0.991