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The effects of social transfers on human capital accumulation: A cost-effectiveness analysis using a dynamic cohort microsimulation model.

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Outline:

1. Economic effects of social transfers.
2. Evaluating direct and indirect effects.
3. A cohort microsimulation model.
4. Policy reforms: Cost- Effectiveness analysis
5. Final remarks.

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Economic effects of social transfers:

- Social protection and growth:
 - Alleviate credit and liquidity constraints.
 - Foster consumption and asset security.
 - Help to cover transaction and transportation costs.
 - Spillovers on non-beneficiaries and local economy.
 - Stabilizing aggregate demand.
 - Peace building and social cohesion.

(Barrientos & Scott 2008; Barrientos 2012; Alderman & Yemtsov 2012; Mideros et al 2012; Tirivayi et al 2013).

Economic effects of social transfers:

- Two considerations:

... “the dimension of growth relevant to social transfers is growth among the households in poverty”.

(Barrientos 2012).

... “those in poverty generally face a qualitative different set of opportunities to those better off”.

(Barrientos & Scott 2008).

Economic effects of social transfers:

- Human capital:
 - Human capital is a final out-come of development, but also a mean for economic performance and to enhance capabilities and individual agency.
 - Poverty is more severe in households with low human capital (Ducanes & Tan, 2014).
 - International evidence is highly conclusive about a positive effect of social transfers on school attendance by reducing cost barriers and covering opportunity costs (Arnold et al, 2011; UNICEF, 2012; Schady & Araujo, 2008; etc).
 - The effect on human capital accumulation over the life cycle has not been studied, neither potential indirect effects have been analysed.

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Evaluating direct and indirect effects:

- Data and programme information (Ecuador):
 - ENEMDUR (December, 2009-2013)
 - Subsample: persons (son/daughter, 5-23 years old)
 - *Bono de Desarrollo Humano* (BDH).
 - Soft-conditionality on school attendance and health control.
 - Monthly flat-cash transfer (proxy-means test, 2008/2009).

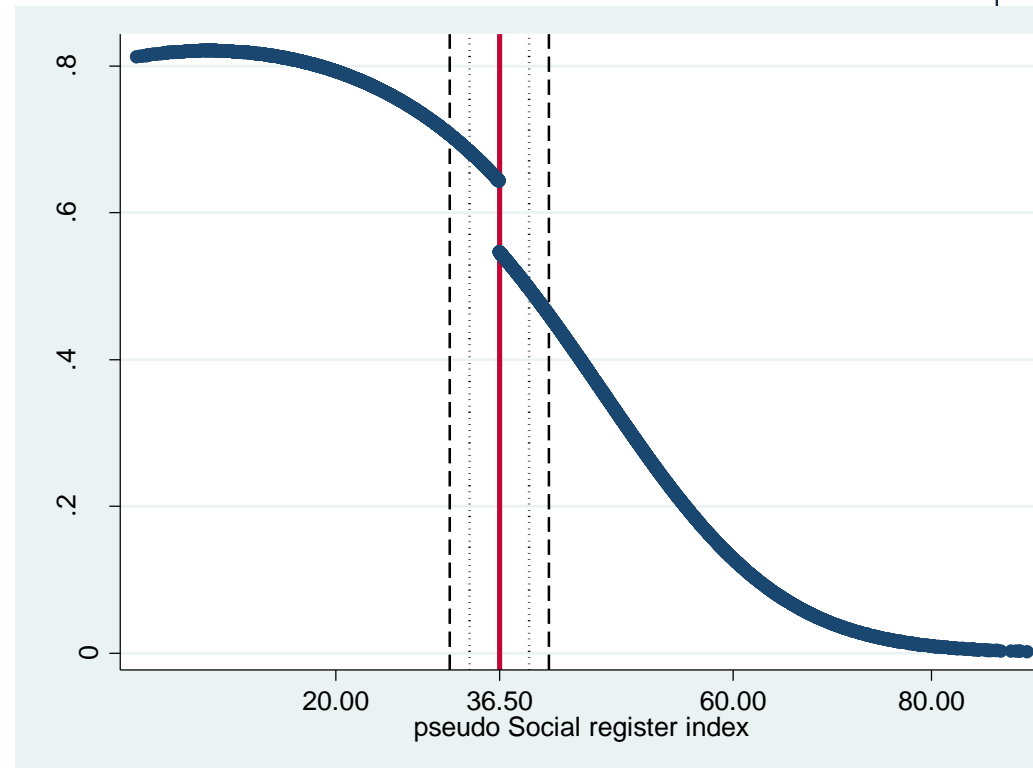
Year	BDH per month			Current USD per households	BDH as percentage of household's income per month
	Real (Base = 2009)		USD per capita		
	USD per households	USD			
2006	\$ 17.49	\$ 3.07	\$ 15.00	5.4%	
2009	\$ 35.00	\$ 6.31	\$ 35.00	10.9%	
2010	\$ 33.85	\$ 6.25	\$ 35.00	9.9%	
2011	\$ 32.08	\$ 6.04	\$ 35.00	9.0%	
2012	\$ 30.62	\$ 5.78	\$ 35.00	8.6%	
2013	\$ 42.75	\$ 8.29	\$ 50.00	11.5%	

Evaluating direct and indirect effects:

- Evaluation strategy:

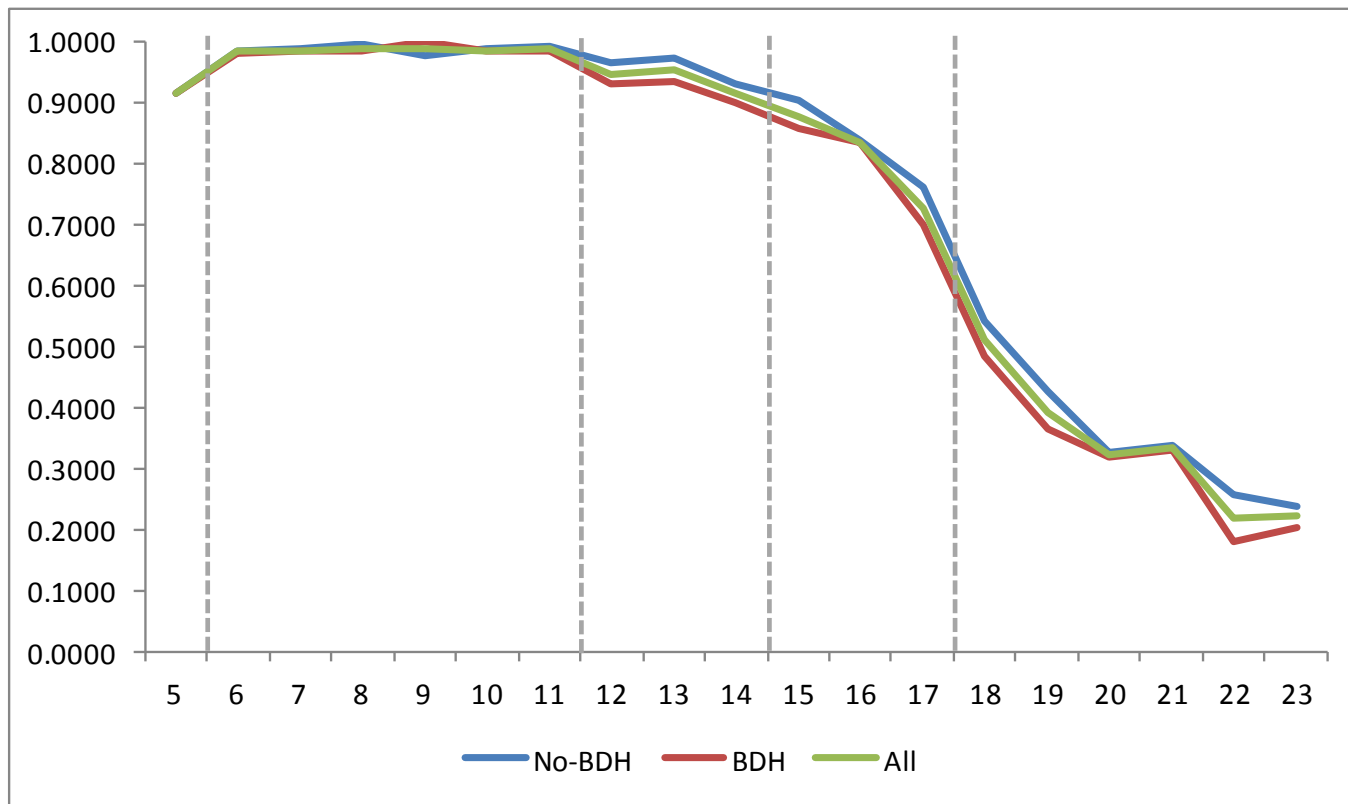
(Ponce & Bedi 2010; Gonzalez-Rosada & Llerena 2011).

- Replicate the social register index.
- Rely on regression discontinuity and IV
- Use targeting criteria as instrumental variable.



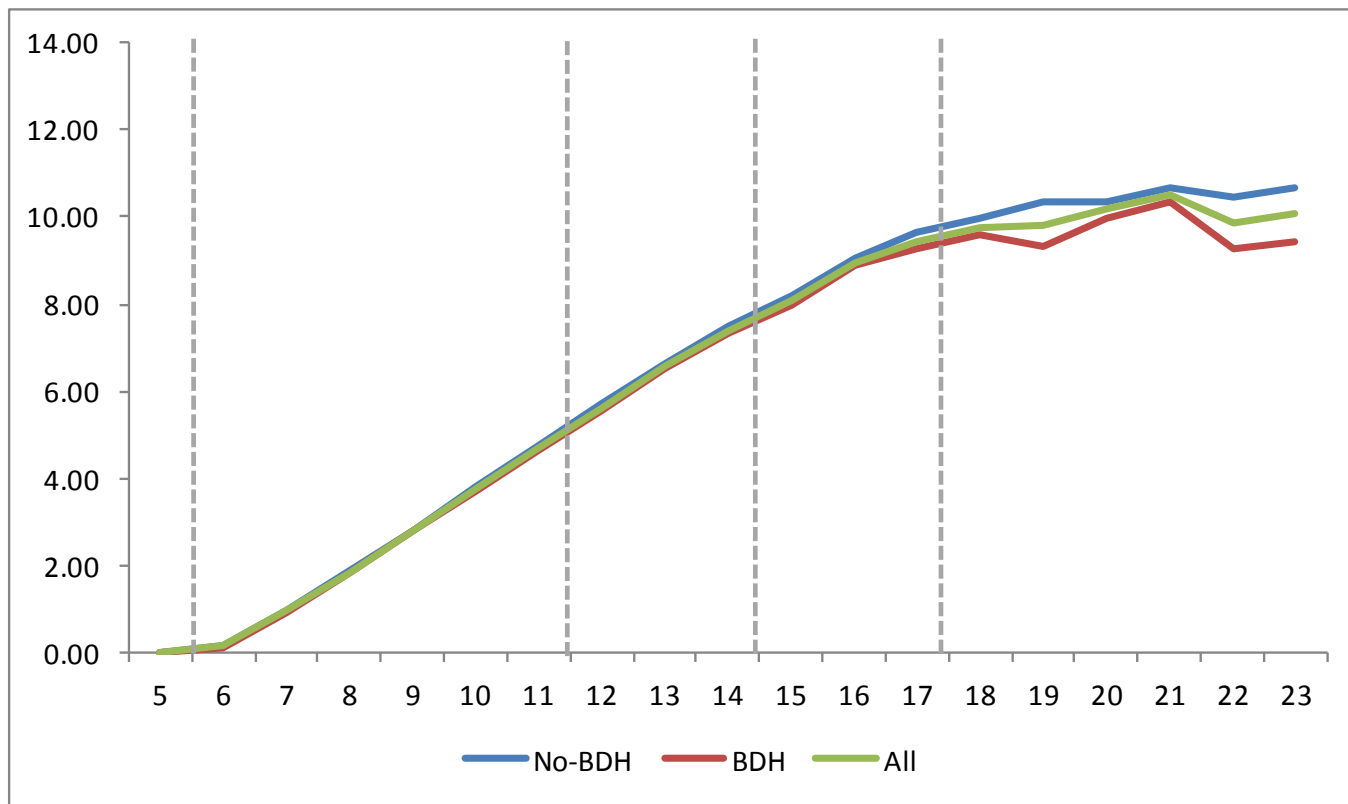
Evaluating direct and indirect effects:

- Descriptive statistics: School attendance (+/- 5p.)



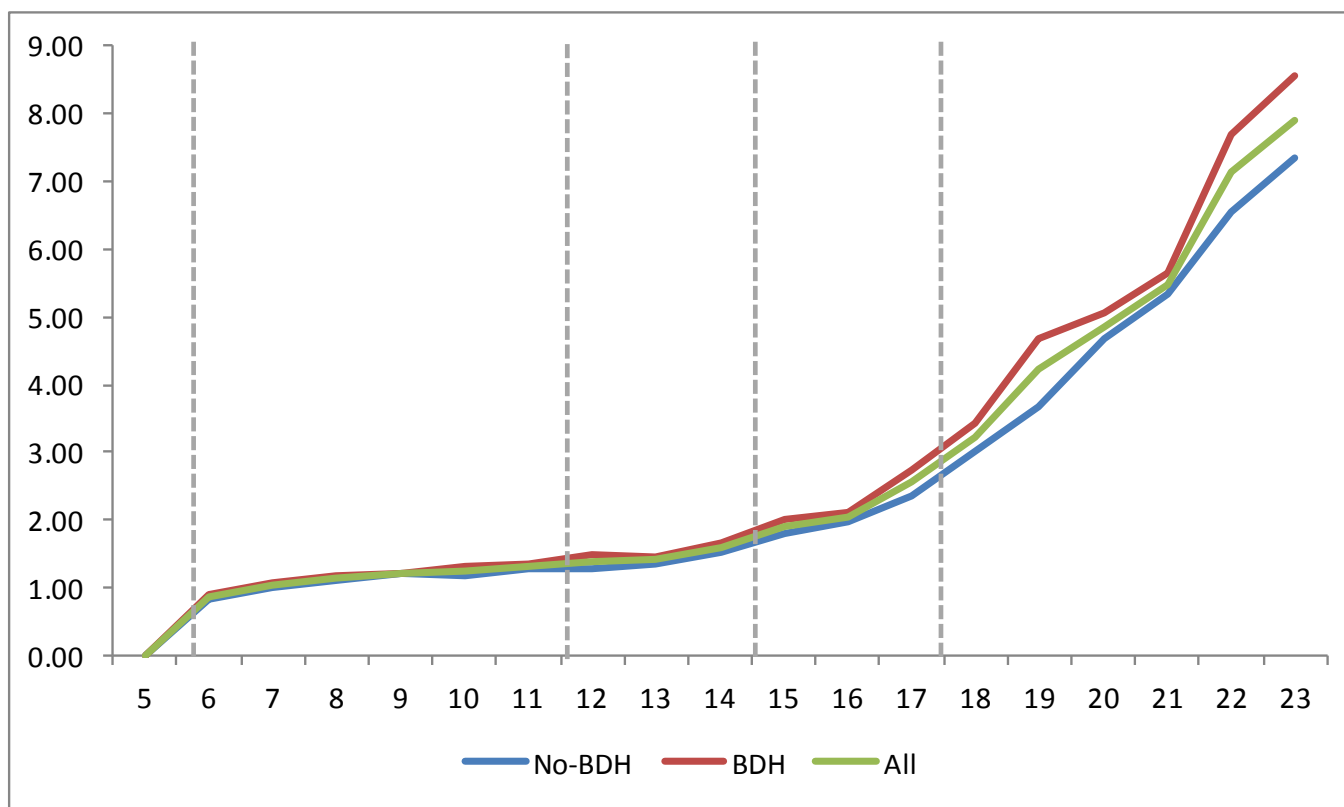
Evaluating direct and indirect effects:

- Descriptive statistics: Schooling (+/- 5p.)



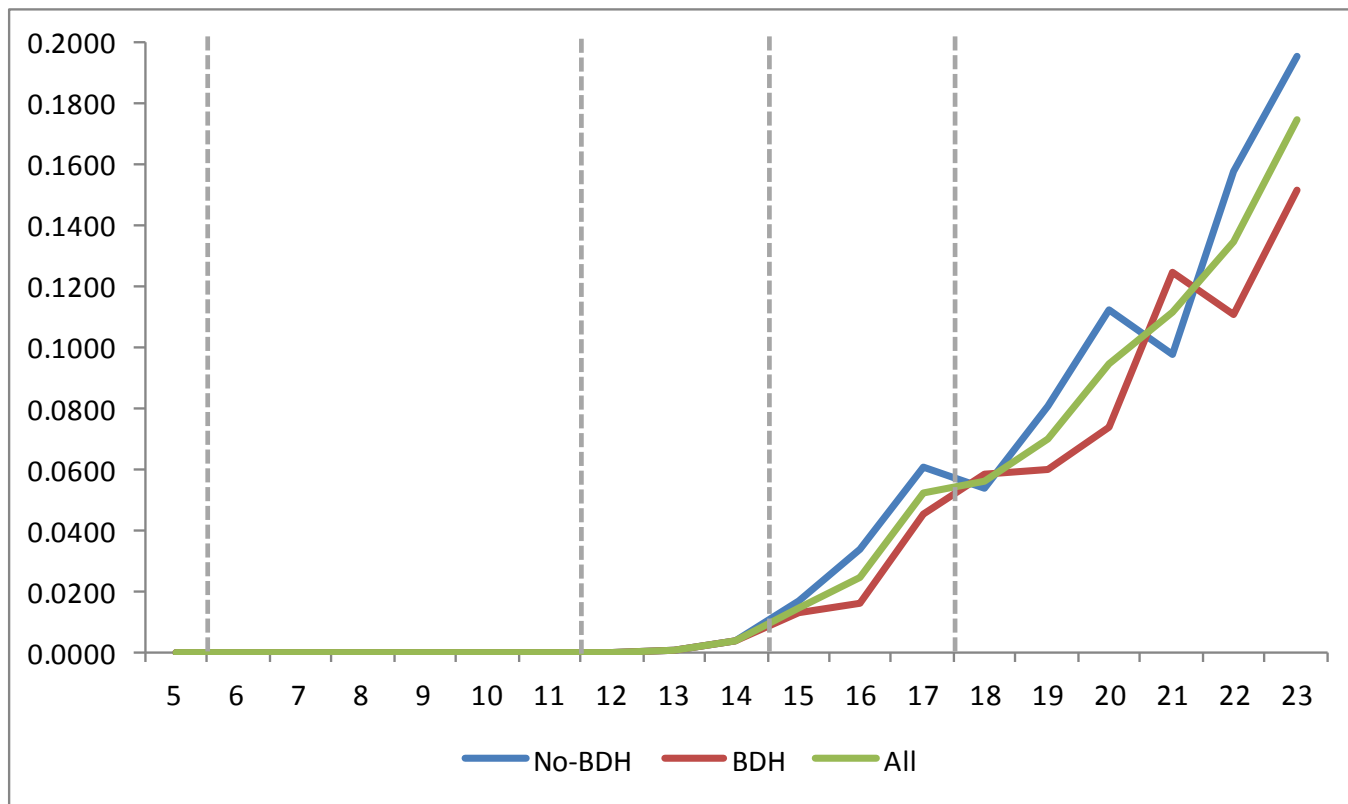
Evaluating direct and indirect effects:

- Descriptive statistics: School delay (+/- 5p.)



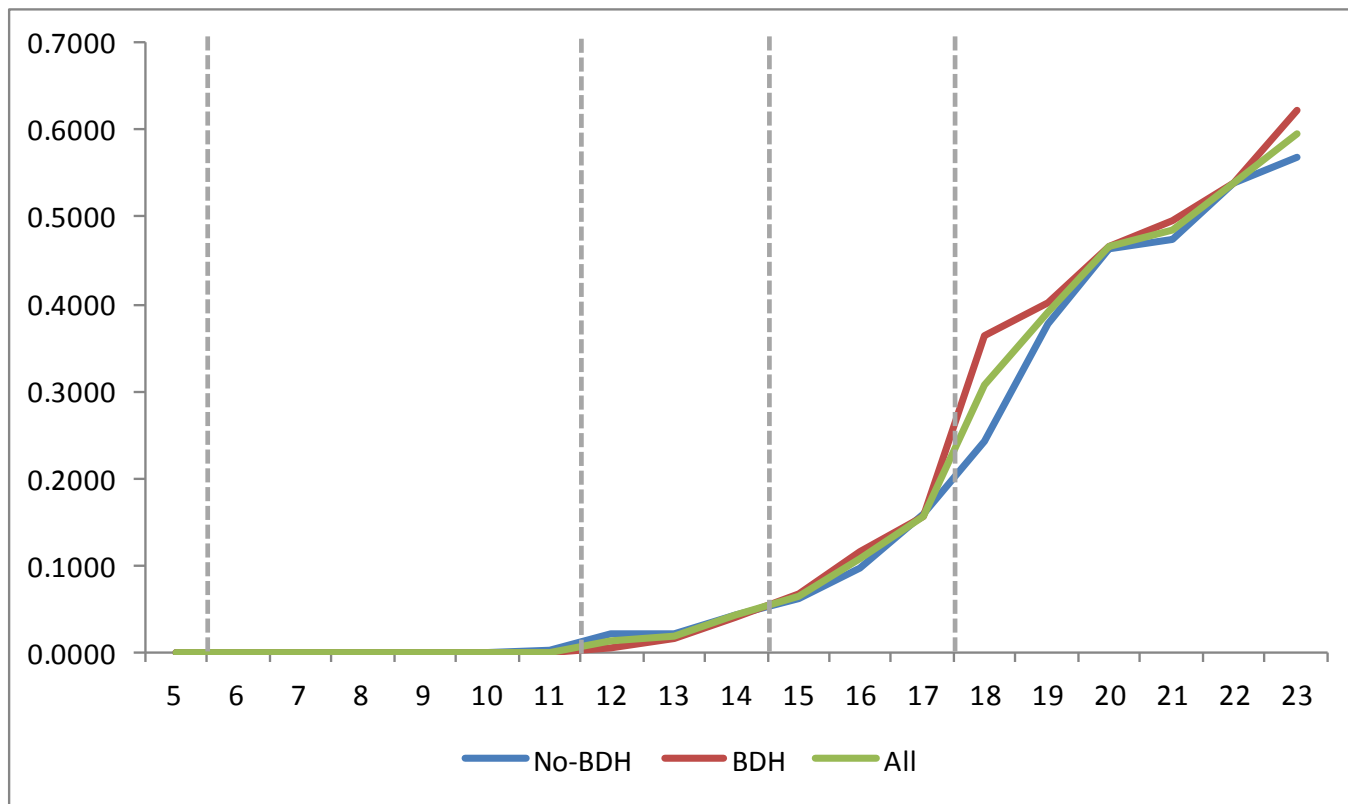
Evaluating direct and indirect effects:

- Descriptive statistics: Married (+/- 5p.)









Evaluating direct and indirect effects:

- Descriptive statistics: Paid-labour (+/- 5p.)








Evaluating direct and indirect effects:

- Effect on school attendance (Summary: AME, logit model)
Between 5 and 17 years old

	+/- 3 p. (IV)	+/- 5 p. (IV)	
Receiving the BDH (Yes=1 / No=0)	-0.5358 *** (0.0103)	-0.5620 *** (0.0080)	 Size matter: Positive in 14% of cases (>= USD 9.69)
BDH amount per month per capita	0.0542 *** (0.0011)	0.0580 *** (0.0009)	
Expected paidlabour income per month per capita	-0.0099 *** (0.0002)	-0.0101 *** (0.0002)	 Opportunity cost
Household income per month per capita	0.0000 *** (0.0000)	0.0000 (0.0000)	
Age	0.0660 *** (0.0005)	0.0681 *** (0.0004)	
Age squared	-0.0025 *** (0.0000)	-0.0027 *** (0.0000)	
Past (= age - 5 - schooling)	-0.0339 *** (0.0002)	-0.0312 *** (0.0002)	 School delay
Female (Yes=1 / No=0)	-0.0050 *** (0.0007)	-0.0068 *** (0.0006)	 Gender
Married (Yes=1 / No=0)	-0.0682 *** (0.0018)	-0.0969 *** (0.0015)	 Marriage
Schooling of the household's head	0.0029 *** (0.0001)	0.0009 *** (0.0001)	 Father/mother education

Evaluating direct and indirect effects:

- Effect on marriage (Summary: AME, logit model)
Between 15 and 23 years old

	+/- 3 p. (IV)	+/- 5 p. (IV)	
Receiving the BDH (Yes=1 / No=0)	-0.1137 *** (0.0083)	-0.0242 *** (0.0038)	 The BDH reduces the probability of marriage
Expected paidlabour income per month per capita	0.0000 (0.0000)	0.0002 *** (0.0000)	
Household income per month per capita	-0.0001 *** (0.0000)	0.0000 (0.0000)	
Age	0.0713 *** (0.0026)	0.0483 *** (0.0016)	
Age squared	-0.0014 *** (0.0001)	-0.0009 *** (0.0000)	
Female (Yes=1 / No=0)	-0.0042 *** (0.0007)	0.0013 *** (0.0005)	
Schooling (years of education)	-0.0045 *** (0.0002)	-0.0026 *** (0.0001)	 Education
Household's dependency ratio	-0.0026 *** (0.0005)	-0.0074 *** (0.0004)	 Dependency
Household's number of persons	0.0160 *** (0.0003)	0.0134 *** (0.0002)	 Household size
Parish's poverty by basic needs	0.0207 *** (0.0030)	-0.0126 *** (0.0017)	 Context matter

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A cohort microsimulation model

- The model:

- Human capital accumulation: $schooling_t^{f,r,i} = schooling_{t-1}^{f,r,i} + (attendance_{t-1}^{f,r,i} * promotion_{t-1}^{f,r})$

- School attendance: $attendance_t^{f,r,i} = Pr_att_t^{f,r} + (\alpha_t^{f,r} * bdh_t^{f,r,i}) + (\beta_t^{f,r} * \widehat{past}_t^{f,r}) + (\delta_t^{f,r} * married_t^{f,r,i})$

- Marriage: $married_t^{f,r,i} = Pr_marriage_t^{f,r} + (\gamma_t^{f,r} * BDH_t^{f,r,i}) + (\varphi_t^{f,r} * \widehat{schooling}_t^{f,r})$

- Ageing: $weight_t^{f,r,i} = weight_{t-1}^{f,r,i} * survival_{t-1}$

- Exogenous variables:

- Policy design (BDH, bdh)
- Average marginal effects (econometric models)
- Survival (age specific survival rates – Official demographic projections)
- Promotion (empirical estimation – ENEMDUR 2009-2013)

- Everything else is constant: the aim is to compare between scenarios.

A cohort microsimulation model

- Setting the model: empirical data 2009-2013 (I)

Age	School attendance				Past (= age - 5 - schooling)				Married			
	Urban		Rural		Urban		Rural		Urban		Rural	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
5	0.9445	0.9640	0.8626	0.8614	0.00	0.00	0.00	0.00				
6	0.9890	0.9931	0.9618	0.9699	0.87	0.88	0.84	0.86				
7	0.9898	0.9929	0.9795	0.9871	1.08	1.02	1.10	1.08				
8	0.9942	0.9980	0.9852	0.9866	1.12	1.06	1.26	1.23				
9	0.9876	0.9955	0.9844	0.9913	1.21	1.10	1.37	1.27				
10	0.9832	0.9966	0.9852	0.9925	1.22	1.13	1.45	1.32				
11	0.9892	0.9941	0.9774	0.9796	1.24	1.11	1.52	1.42				
12	0.9844	0.9794	0.9524	0.9436	1.28	1.20	1.61	1.44				
13	0.9668	0.9822	0.9047	0.8998	1.39	1.21	1.80	1.67				
14	0.9451	0.9613	0.8597	0.8431	1.52	1.29	2.05	1.79				
15	0.9172	0.9462	0.8156	0.8162	1.66	1.39	2.25	2.17	0.0098	0.0146	0.0109	0.0099
16	0.8997	0.9228	0.7624	0.7795	1.71	1.51	2.61	2.32	0.0152	0.0209	0.0117	0.0236
17	0.8394	0.8750	0.6620	0.7386	2.01	1.73	3.15	2.59	0.0204	0.0396	0.0282	0.0394
18	0.6311	0.6833	0.4790	0.5041	2.43	1.96	3.87	3.33	0.0327	0.0452	0.0398	0.0570
19	0.5276	0.6650	0.3992	0.5103	2.89	2.48	4.58	3.98	0.0454	0.0722	0.0611	0.0908
20	0.5003	0.6391	0.3216	0.3802	3.53	2.78	5.54	4.97	0.0518	0.0733	0.1047	0.0851
21	0.4957	0.6274	0.3078	0.4008	4.07	3.17	6.08	5.41	0.0680	0.0762	0.0766	0.0809
22	0.4368	0.5222	0.2031	0.3420	4.84	4.04	7.73	6.86	0.0947	0.1035	0.1190	0.1281
23	0.4183	0.4389	0.1613	0.2805	5.54	4.72	8.55	7.36	0.0979	0.1169	0.1704	0.1329

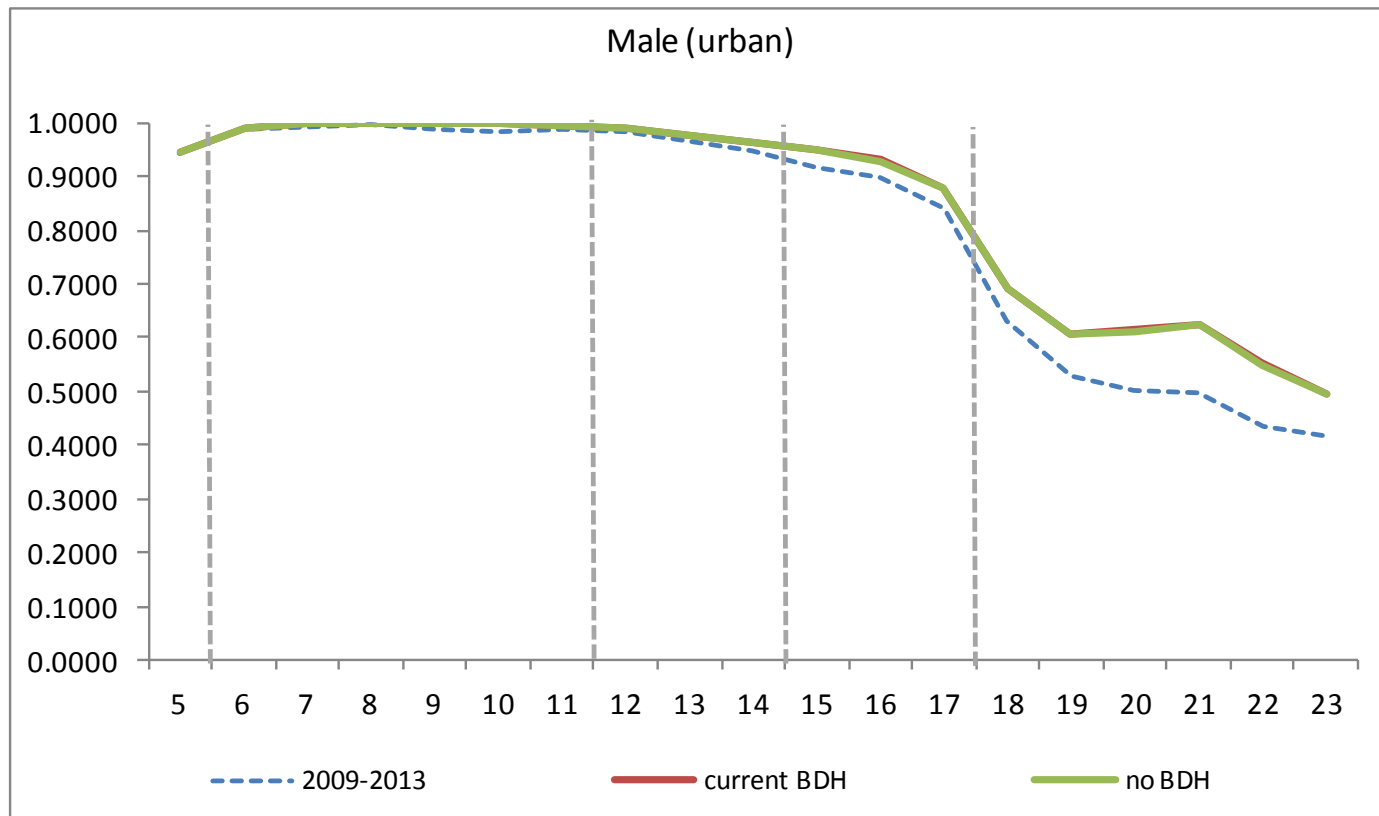
A cohort microsimulation model

- Cohort: 5 years old, ENEMDUR December 2013.

Number of observations	1,056
Weighted number of observations	197,892
Female (%)	52.3%
Rural (%)	35.1%
Household size	5.1
BDH recipient (%)	40.9%

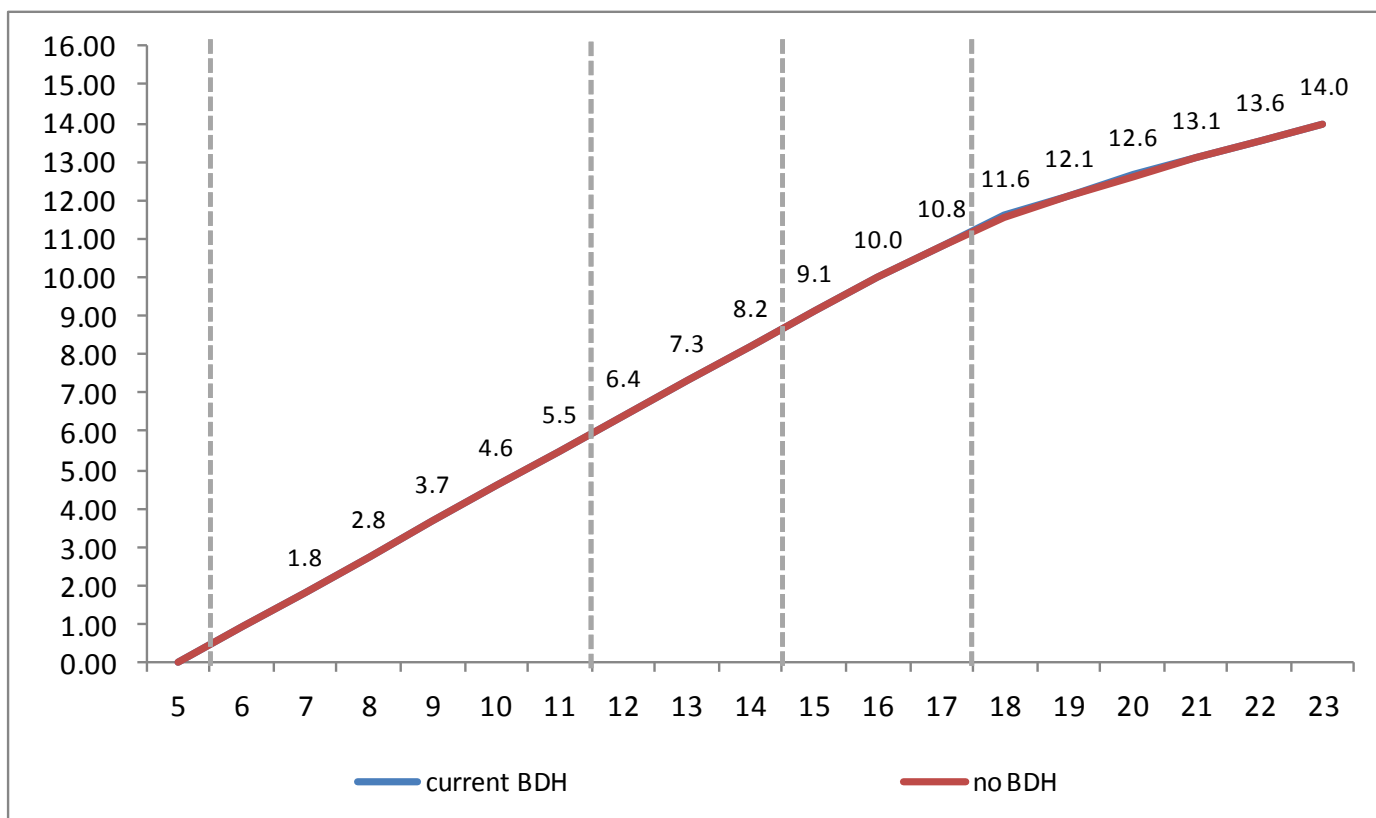
A cohort microsimulation model

- Base line simulation: school attendance



A cohort microsimulation model

- Base line simulation: mean schooling

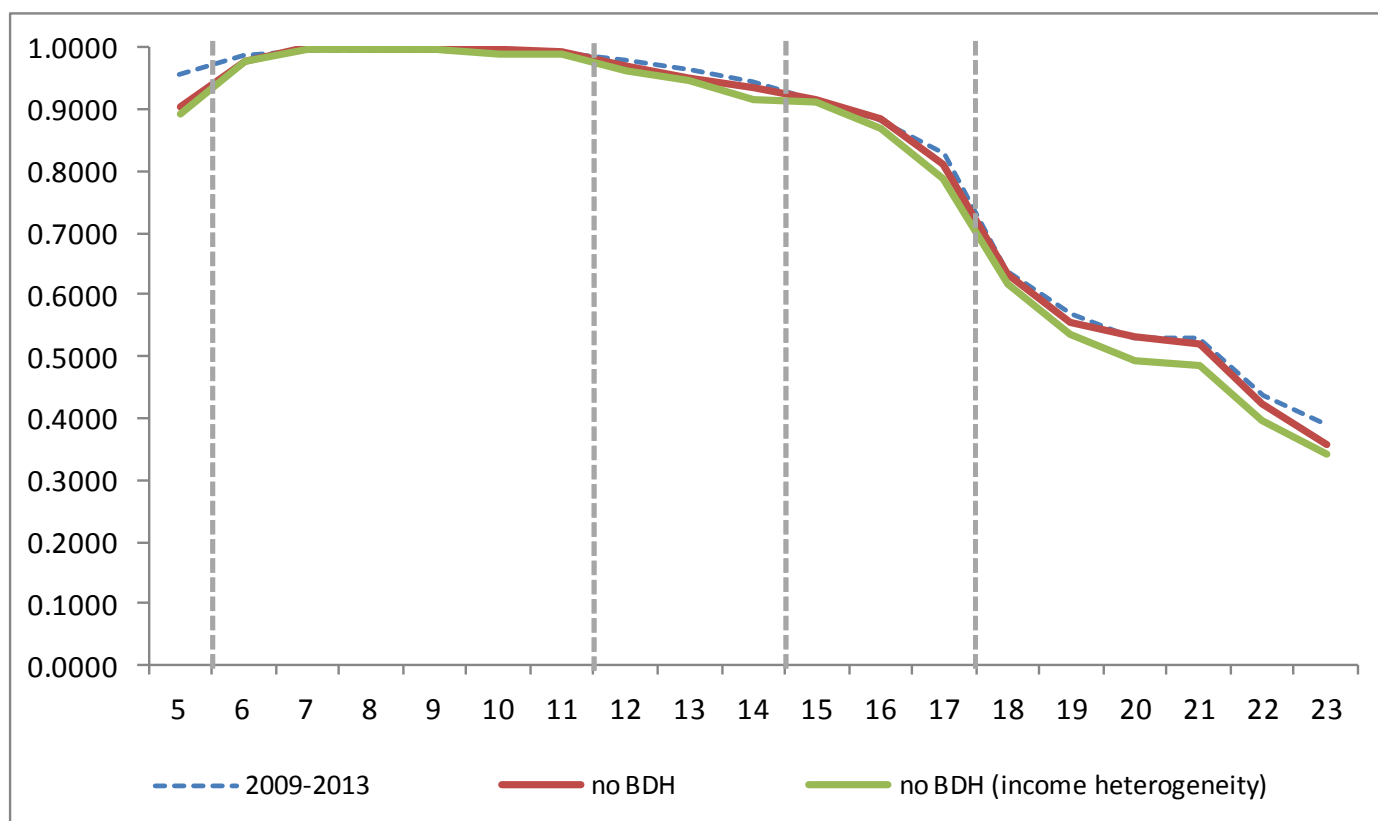


A cohort microsimulation model

- Possible extensions:
 1. Income heterogeneity
 2. The effect of “promotion”
 3. Conditionality (non-income effect)
 4. The effect of marriage

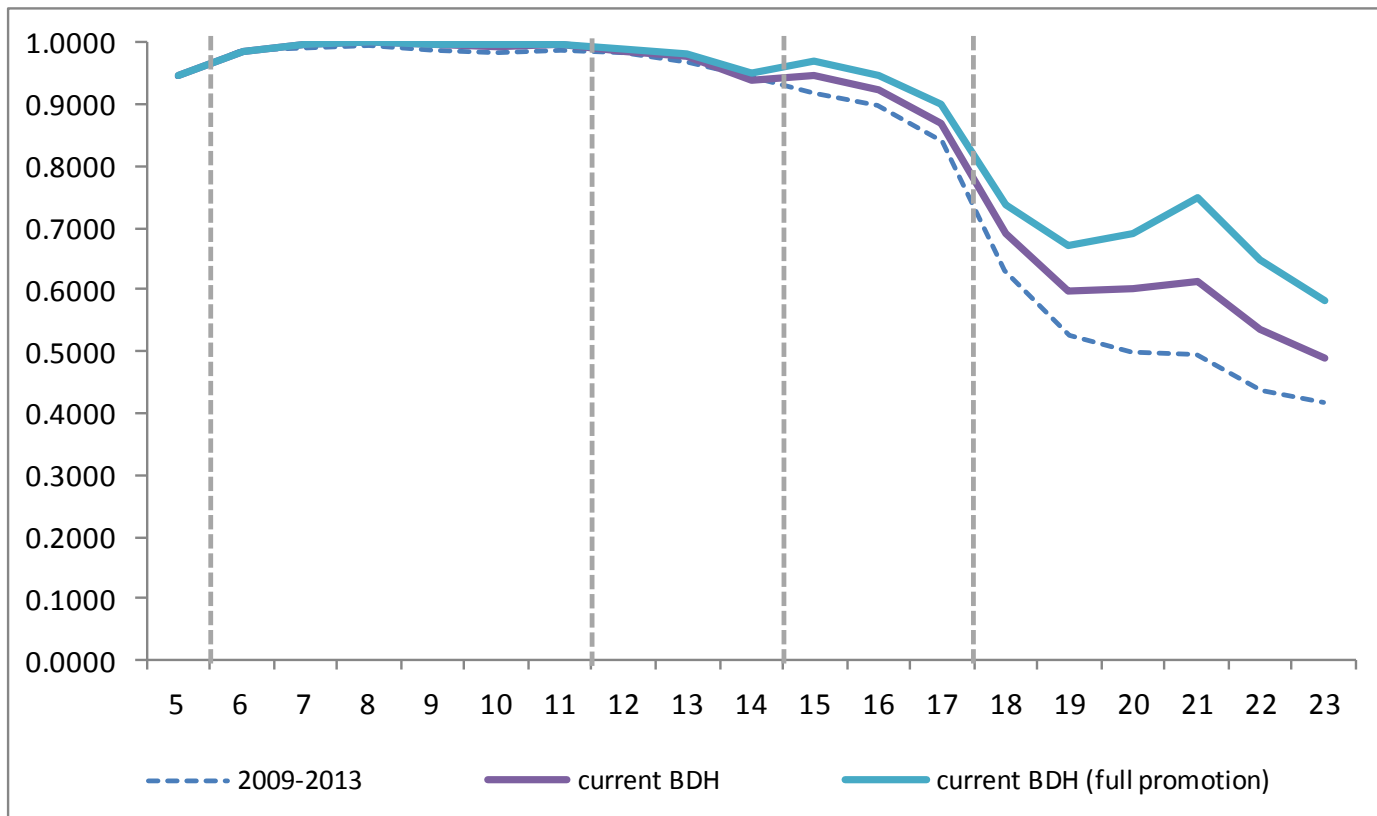
A cohort microsimulation model

- School attendance (poverty):



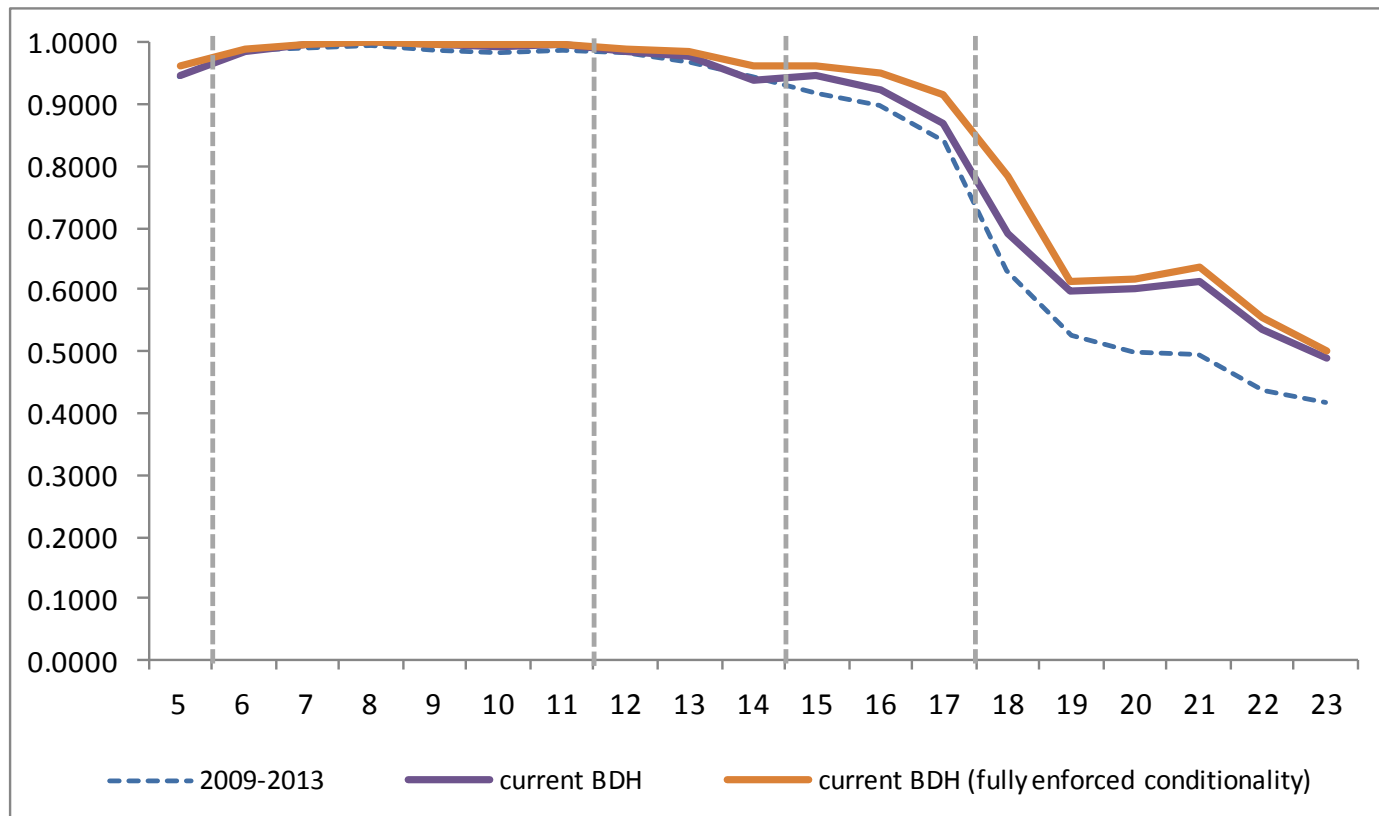
A cohort microsimulation model

- School attendance (“promotion”):



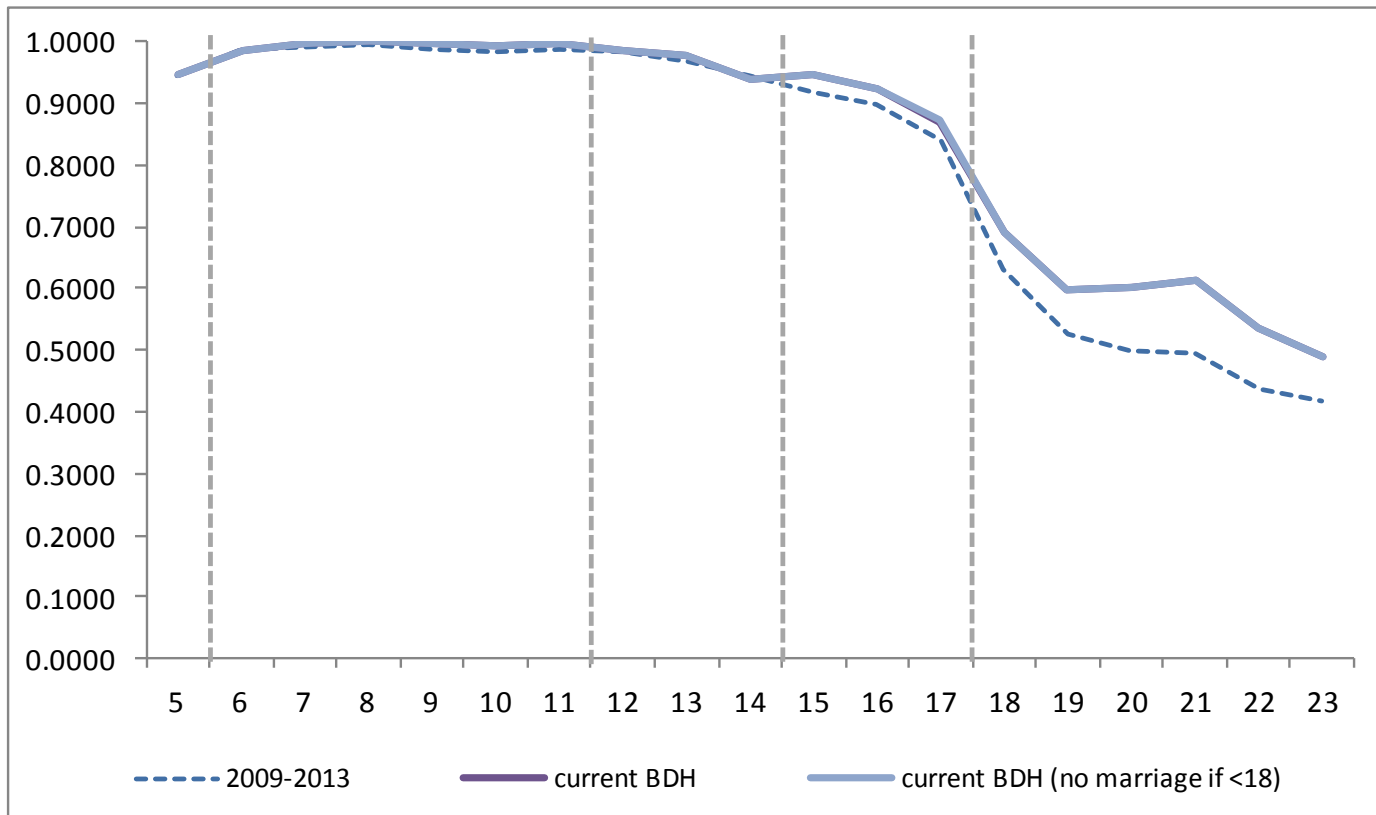
A cohort microsimulation model

- School attendance (conditionality):



A cohort microsimulation model

- School attendance (marriage):



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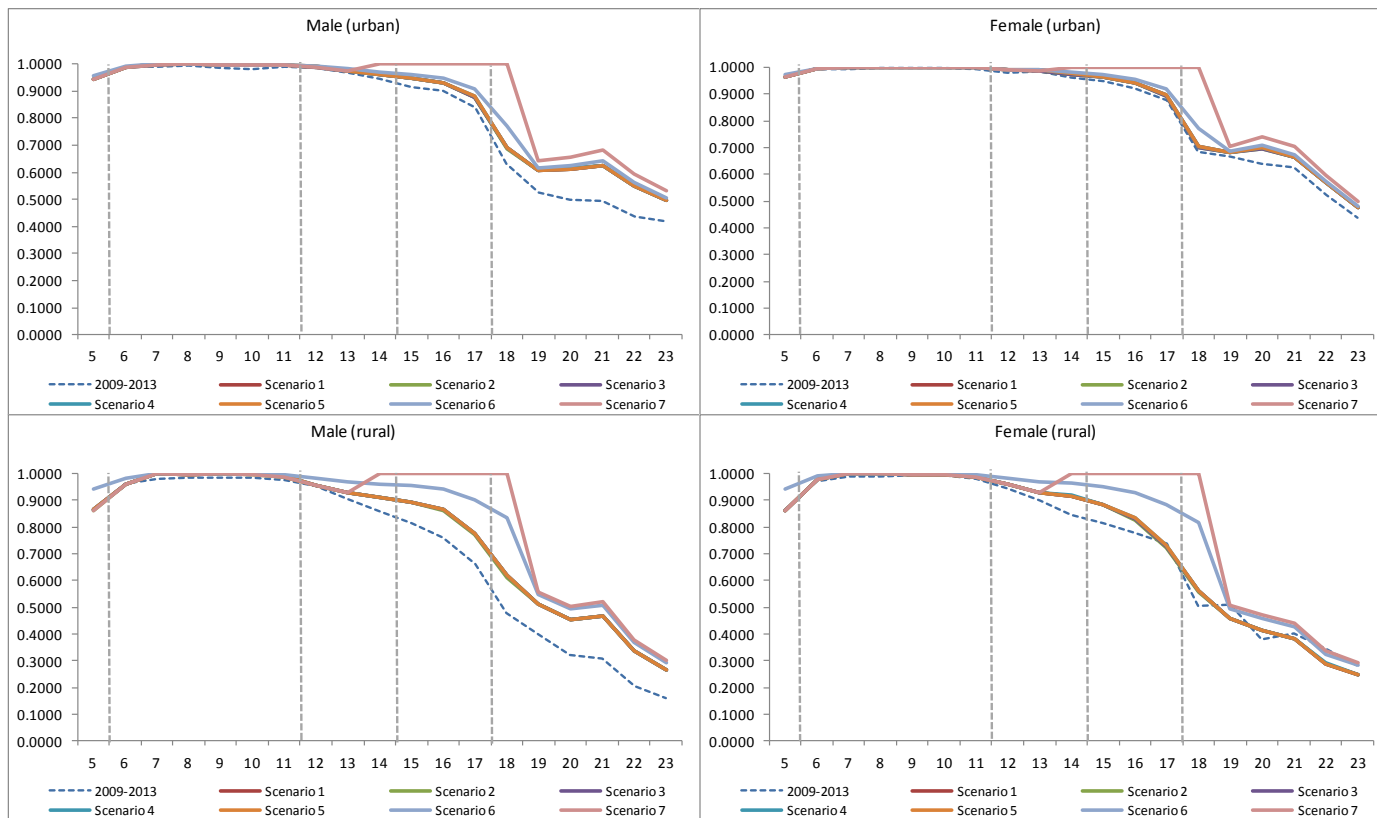
Cost-effectiveness analysis

- Policy scenarios:

Scenario 1	Current BDH (USD 50 per household up to the age of 18)
Scenario 2	No BDH
Scenario 3	Social transfer for extreme poverty eradication (extreme poverty line per person)
Scenario 4	Social transfer for poverty eradication (household specific poverty gap)
Scenario 5	Social transfer targeted at poor households (USD 7 + USD 20 per infant + USD 25 per child below 18 years old)
Scenario 6	Scenario 5 + fully enforced conditionality
Scenario 7	Universal scholarship for children (14-18 years old, USD 66.78) + fully enforced conditionality

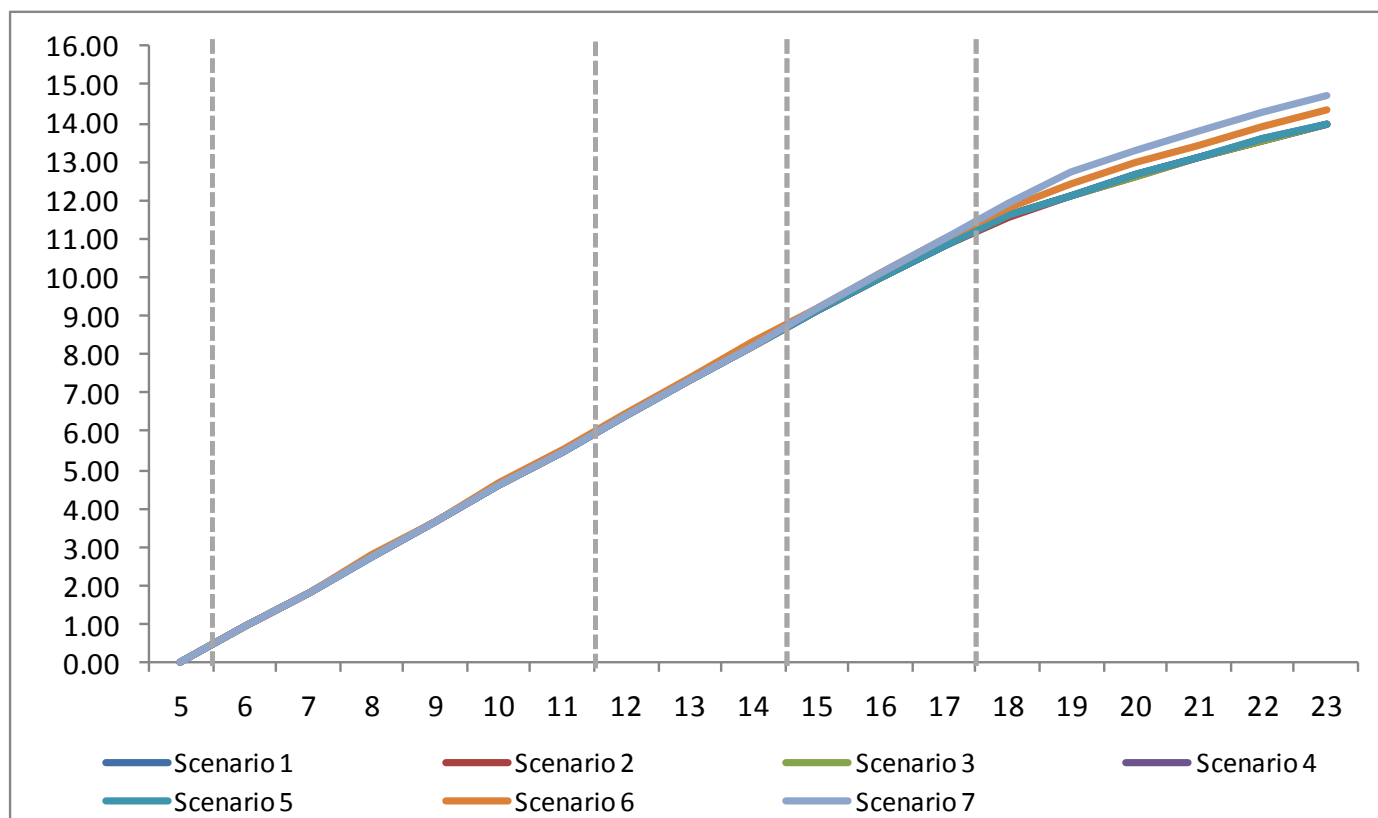
Cost-effectiveness analysis

- Results: school attendance



Cost-effectiveness analysis

- Results: mean schooling



Cost-effectiveness analysis

- Benefit: mean schooling (variation, %)

Age	All						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
15	0.00	0.00	0.00	0.01	0.00	0.09	0.05
16	0.00	0.00	0.00	0.01	0.01	0.12	0.11
17	0.01	0.00	0.00	0.01	0.01	0.16	0.20
18	0.01	0.00	0.01	0.01	0.01	0.22	0.34
19	0.01	0.00	0.01	0.02	0.01	0.32	0.61
20	0.01	0.00	0.01	0.02	0.01	0.34	0.64
21	0.01	0.00	0.01	0.02	0.01	0.36	0.68
22	0.01	0.00	0.01	0.02	0.01	0.38	0.72
23	0.01	0.00	0.01	0.02	0.02	0.39	0.76
Age	Poor						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
15	0.00	0.00	0.01	0.02	0.01	0.26	0.06
16	0.00	0.00	0.01	0.02	0.01	0.33	0.14
17	0.01	0.00	0.01	0.03	0.02	0.44	0.24
18	0.01	0.00	0.02	0.03	0.03	0.60	0.40
19	0.02	0.00	0.02	0.04	0.03	0.89	0.69
20	0.02	0.00	0.02	0.05	0.04	0.93	0.72
21	0.02	0.00	0.02	0.05	0.04	0.98	0.76
22	0.02	0.00	0.02	0.05	0.04	1.03	0.80
23	0.02	0.00	0.02	0.05	0.04	1.07	0.83

Cost-effectiveness analysis

- Benefit: equity d10/d1, mean schooling (%)

Age	All						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	-0.1%	0.0%	-0.6%	-0.7%	-0.3%	-11.8%	0.0%
7	0.0%	0.0%	-0.3%	-0.4%	-0.1%	-7.6%	0.0%
8	0.0%	0.0%	-0.2%	-0.3%	-0.1%	-5.0%	0.0%
9	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-3.8%	0.0%
10	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-3.1%	0.0%
11	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-2.7%	0.0%
12	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-2.4%	0.0%
13	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-2.6%	0.0%
14	0.0%	0.0%	-0.2%	-0.2%	-0.1%	-3.0%	0.0%
15	0.0%	0.0%	-0.3%	-0.3%	-0.1%	-3.4%	-0.4%
16	0.0%	0.0%	-0.3%	-0.4%	-0.1%	-4.0%	-0.8%
17	-0.1%	0.0%	-0.4%	-0.4%	-0.2%	-4.8%	-1.2%
18	-0.1%	0.0%	-0.4%	-0.5%	-0.2%	-6.0%	-1.7%
19	-0.1%	0.0%	-0.5%	-0.6%	-0.3%	-8.0%	-2.1%
20	-0.1%	0.0%	-0.5%	-0.6%	-0.3%	-8.0%	-2.1%
21	-0.1%	0.0%	-0.5%	-0.6%	-0.3%	-8.2%	-2.1%
22	-0.1%	0.0%	-0.5%	-0.6%	-0.3%	-8.3%	-2.1%
23	-0.1%	0.0%	-0.5%	-0.6%	-0.3%	-8.4%	-2.1%

Cost-effectiveness analysis

- Benefit: additional human capital (schooling)

Age	All						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
5	0	0	0	0	0	0	0
6	139	0	116	253	199	6,946	0
7	147	0	129	273	211	8,250	0
8	163	0	132	287	227	8,263	0
9	164	0	134	289	228	8,315	0
10	201	0	182	367	282	8,445	0
11	246	0	216	436	347	8,590	0
12	275	0	247	492	385	9,106	0
13	356	0	317	638	499	10,966	0
14	411	0	382	756	578	14,202	0
15	607	0	563	1,119	857	18,349	9,417
16	702	0	690	1,343	998	23,895	22,065
17	1,041	0	929	1,835	1,385	31,223	39,044
18	1,511	0	1,193	2,431	1,900	42,869	66,995
19	2,018	0	1,451	3,052	2,434	62,882	119,575
20	2,112	0	1,519	3,196	2,549	65,788	125,225
21	2,228	0	1,591	3,360	2,687	68,920	132,003
22	2,358	0	1,674	3,551	2,845	72,496	139,781
23	2,459	0	1,741	3,697	2,966	75,308	145,591

Cost-effectiveness analysis

- Benefit: additional human capital (schooling)

Age	Rural Female						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
15	121	0	190	290	173	7,217	2,666
16	157	0	257	390	228	9,446	6,528
17	311	0	388	614	395	12,519	11,848
18	434	0	495	796	530	17,027	19,642
19	535	0	550	903	625	23,239	30,376
20	557	0	573	941	652	24,227	31,668
21	587	0	603	991	686	25,500	33,331
22	614	0	632	1,037	718	26,684	34,879
23	633	0	652	1,070	741	27,531	35,986
Age	Poor						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
15	307	0	563	1,119	858	18,349	4,170
16	354	0	689	1,343	998	23,894	9,741
17	547	0	929	1,836	1,385	31,224	17,102
18	810	0	1,193	2,430	1,899	42,868	28,778
19	1,083	0	1,450	3,051	2,434	62,881	48,825
20	1,134	0	1,520	3,197	2,551	65,789	51,086
21	1,194	0	1,591	3,360	2,687	68,919	53,570
22	1,260	0	1,674	3,551	2,846	72,496	56,399
23	1,311	0	1,740	3,697	2,966	75,309	58,603

Cost-effectiveness analysis

- Cost: USD millions per year

Age	All						
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
5	\$ 48.57	\$ -	\$ 69.26	\$ 135.59	\$ 85.44	\$ 85.44	\$ -
6	\$ 48.55	\$ -	\$ 69.24	\$ 135.55	\$ 85.41	\$ 85.41	\$ -
7	\$ 48.54	\$ -	\$ 69.22	\$ 135.51	\$ 85.39	\$ 85.39	\$ -
8	\$ 48.53	\$ -	\$ 69.19	\$ 135.47	\$ 85.36	\$ 85.36	\$ -
9	\$ 48.51	\$ -	\$ 69.17	\$ 135.42	\$ 85.33	\$ 85.33	\$ -
10	\$ 48.48	\$ -	\$ 69.13	\$ 135.35	\$ 85.28	\$ 85.28	\$ -
11	\$ 48.45	\$ -	\$ 69.09	\$ 135.26	\$ 85.23	\$ 85.23	\$ -
12	\$ 48.41	\$ -	\$ 69.03	\$ 135.15	\$ 85.16	\$ 85.16	\$ -
13	\$ 48.36	\$ -	\$ 68.96	\$ 135.01	\$ 85.07	\$ 85.07	\$ -
14	\$ 48.30	\$ -	\$ 68.87	\$ 134.83	\$ 84.96	\$ 84.96	\$ 157.69
15	\$ 48.22	\$ -	\$ 68.76	\$ 134.62	\$ 84.82	\$ 84.82	\$ 157.44
16	\$ 48.13	\$ -	\$ 68.63	\$ 134.37	\$ 84.66	\$ 84.66	\$ 157.15
17	\$ 48.03	\$ -	\$ 68.48	\$ 134.08	\$ 84.48	\$ 84.48	\$ 156.81
18	\$ 47.92	\$ -	\$ 68.33	\$ 133.77	\$ 84.29	\$ 84.29	\$ 156.45
19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
20	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
21	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
22	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -


Cost-effectiveness analysis

- **Cost-effectiveness:** cost(millions) / p.p. of mean schooling

Age	All					
	Scenario 1	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
12	16,111	25,575	25,156	20,289	857	
13	15,718	25,167	24,500	19,731	899	
14	16,793	25,734	25,480	20,977	854	
15	13,626	20,970	20,657	16,983	794	453
16	13,873	20,119	20,241	17,164	717	312
17	10,781	17,217	17,069	14,250	632	250
18	8,421	15,211	14,615	11,783	522	192
19	6,576	13,040	12,138	9,588	371	112
20	6,540	12,962	12,064	9,531	369	111
21	6,401	12,785	11,851	9,335	364	109
22	6,254	12,564	11,596	9,119	358	106
23	6,159	12,399	11,435	8,981	354	105

Cost-effectiveness analysis

- **Cost-effectiveness:** cost(millions) / p.p. of mean schooling

	Scenario 1	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Male (urban)	1,433	2,771	3,003	2,110	145	37
Female (urban)	2,073	4,015	5,020	3,104	214	51
Male (rural)	1,331	2,380	1,962	1,842	48	14
Female (rural) 	1,073	2,047	1,756	1,598	43	12
Poor	2,377	4,408	4,063	3,191	126	34

Cost-effectiveness analysis

- Cost-effectiveness: $\text{cost(millions)} / \text{p.p. of d10/d1 ratio}$

Age	All					
	Scenario 1	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
12	14,436	3,027	4,964	7,447	255	
13	15,044	3,036	4,963	7,669	267	
14	15,292	3,077	4,984	7,873	253	
15	13,115	2,560	4,144	6,737	237	635
16	13,761	2,461	3,955	6,704	217	451
17	9,277	2,107	3,415	5,404	195	380
18	6,571	1,854	3,046	4,407	165	326
19	5,037	1,577	2,605	3,576	124	276
20	4,978	1,559	2,576	3,535	123	271
21	4,889	1,529	2,526	3,465	121	271
22	4,780	1,492	2,465	3,381	119	270
23	4,699	1,465	2,422	3,321	117	267

Cost-effectiveness analysis

- **Cost-effectiveness:** $\text{cost(millions)} / \text{additional years of education}$

Age	All					
	Scenario 1	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
12	1,274	2,022	1,989	1,604	68	
13	1,091	1,747	1,701	1,370	62	
14	1,037	1,589	1,574	1,295	53	
15	760	1,170	1,152	947	44	25
16	707	1,026	1,032	875	37	16
17	509	813	807	673	30	12
18	373	673	647	521	23	8
19	279	553	515	407	16	5
20	267	528	492	389	15	5
21	253	505	468	368	14	4
22	239	480	443	348	14	4
23	229	461	425	334	13	4

Outline:

1. Economic effects of social transfers.
2. Evaluating direct and indirect effects.
3. A cohort microsimulation model.
4. Policy reforms: Cost- Effectiveness analysis
- 5. Final remarks.**

Final remarks (summary):

- Social transfers can foster inclusive economic growth.
- A main effect of social transfers is on human capital accumulation by solving liquidity, opportunity and transportation costs.
- The direct effect of social transfers on human capital can be analyzed by the income effect, but also by non-income effects related with conditionalities or information transfers.

Final remarks (contributions):

- Direct and indirect effects of social transfers:
 - Social transfers do promote human capital accumulation, but size and context (e.g. supply side) matters. Furthermore, targeting and conditionality are important.
 - “Promotion”, school delay and child marriage are key drivers of school attendance.
- Cohort microsimulation model for cost-effectiveness analysis:
 - Microsimulation models can be used to evaluate mid- and long-term effects of social transfers on different outcomes.
- Results are policy relevant:
 - In the case of Ecuador (i.e. mid-income country with almost universal basic education) social transfers must include strong conditionalities.
 - Social transfers must consider household composition and be targeted at specific ages/grades.
 - Complementary policies like coverage and quality of education, as well as health (e.g. nutrition) must also be considered.
 - Human capital accumulation is not the only objective of social transfers.