

Early Childbearing, School Attainment and Cognitive Skills: Evidence from Madagascar

Catalina Herrera Almanza
Northeastern University

David Sahn
Cornell University

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Motivation

- In developing countries, adolescent pregnancy is *not only* associated with health risks, *but also* with low schooling and productivity:
  - Intergenerational transmission of poverty

- *Pregnancy-related school dropout* is increasingly important in Sub-Saharan Africa, in part due to recent expansion of female secondary school enrollment:
  - Higher chances for girls to go to school after puberty and risk of early pregnancy while in school (Lloyd et al. 2008).

Madagascar: Relevant Context

- Female progression to secondary school increased from 45% to 69% in 1998-2010
- 32%, girls 15-19 years, have a child or are pregnant
  - Total fertility is very high: 4.8
- Top 10 developing countries with more than 20% of adolescent pregnancy
- 29% of contraception prevalence (among women 15 to 49 years old)
- Abortion is illegal
- High STIs and low HIV prevalence

Literature Review

- In the US: Extensive literature on the causal effects of teenage pregnancy on socioeconomic outcomes:
  - Siblings fixed effect (Geronimus and Korenman, 1992)
  - IV instruments (Keplinger et al. 1999) or Miscarriages (Hotz et al, 2005; Fletcher and Wolfe, 2009)
  - Propensity Score Matching (Levine and Painter, 2003; Lee; 2010)
  - No consensus over results

- In developing countries: Most literature from middle income countries
  - In Mexico, Arceo et al. (2012) use propensity score matching while Azevedo et al. (2012) miscarriages as IV; no consensus on results
  - In South Africa, Ranchod et al. (2011) use propensity score matching and find no significant effects; in contrast with Ardington et al. (2015)

- No empirical evidence on teen fertility effects on cognitive skills

Research Question

Among young women in Madagascar, what is the *causal impact* of early childbearing on:

- School dropout
- Completion of secondary school
- Cognitive skills, measured by Math and French test scores

Household Panel Data Survey

Madagascar Life Course Transition of Young Adults Survey 2004-12

- 1749 young adults (859 women), 21-23 years old in 2012, were re-interviewed from 2004 when they were 13-16 years old.
  - Sample attrition 10%
- 2012 Math and French tests scores for all cohort members even if they were not in school.

73 Communities included in the 2004/12 panel:

- Questions on access to family planning services, condoms and pills and since when they were available in the community.

Additionally:

- 2001 and 2007 community census in Madagascar of social and economic infrastructure and public services.

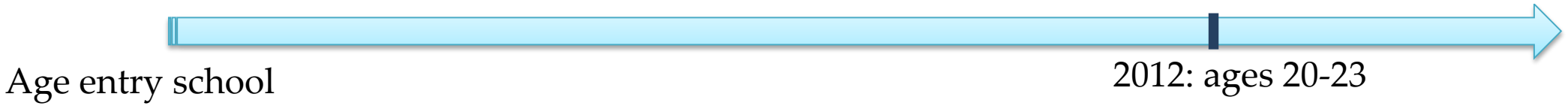
Education and Fertility Descriptives

- *Ever Mothers*: have had at least one child; 54%
- Median of Age of First Birth: 18 years (std. dev. 2.12)

	Non Mothers	***Ever Mothers***	***All***
% School Enrollment	34.00	3.27	17.39
Years of Education	9.25	6.20	7.60
	(3.74)	(3.18)	(3.77)
% Completed Upper Secondary	23.41	4.94	13.39
2012 Math Test Score	16.43	11.78	13.97
	(8.12)	(7.10)	(7.94)
2012 French Test Score	12.28	7.92	9.98
	(6.22)	(5.75)	(6.35)
% Family Planning use	18.07	42.27	31.2
% Condoms access	84.48	69.1	76.1
No of Observations	393	466	859

Notes: Standard deviations in parentheses. Differences among groups statistically significant at 1% level

Timing of School Drop Out and First Pregnancy



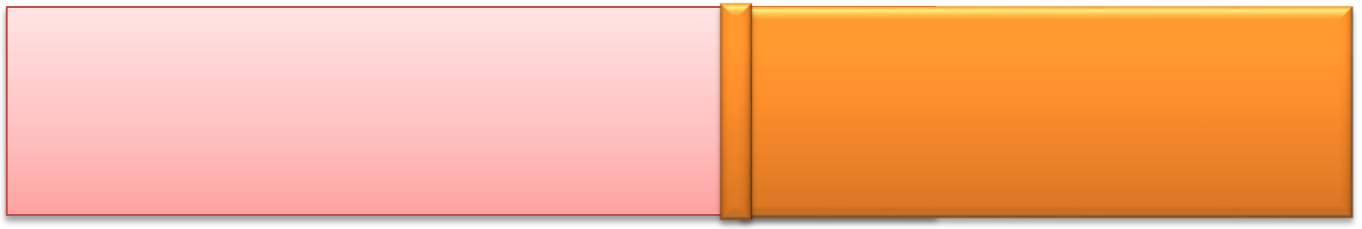
In school

Out of school

Average Dropout Age

Average Age of First birth

Timing of School Drop Out and First Pregnancy



30%, Dropouts non moms

Age entry school

2012: ages 20-23

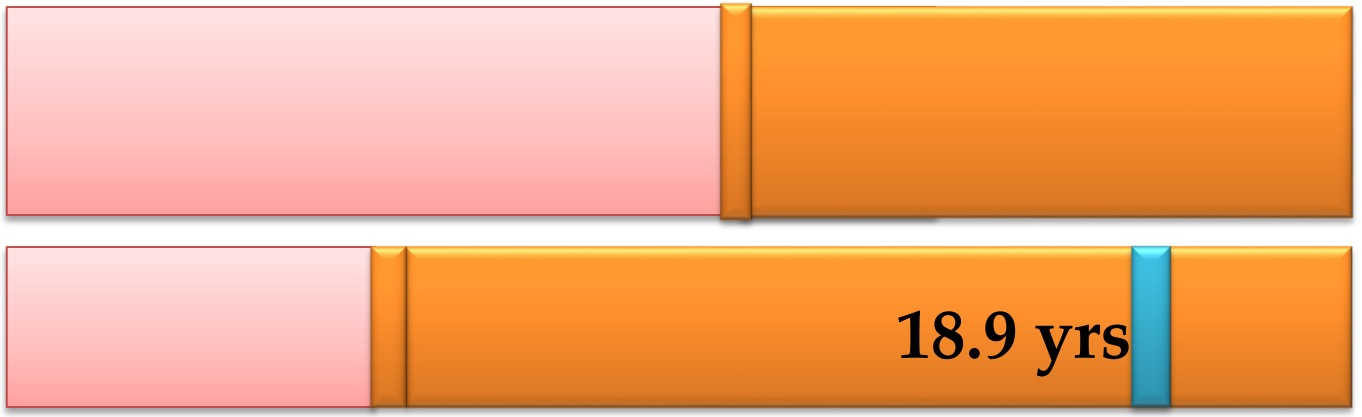
In school

Out of school

Average Dropout Age

Average Age of First birth

Timing of School Drop Out and First Pregnancy



30%, Dropouts non moms

27%, Dropout later moms

Age entry school

2012: ages 20-23

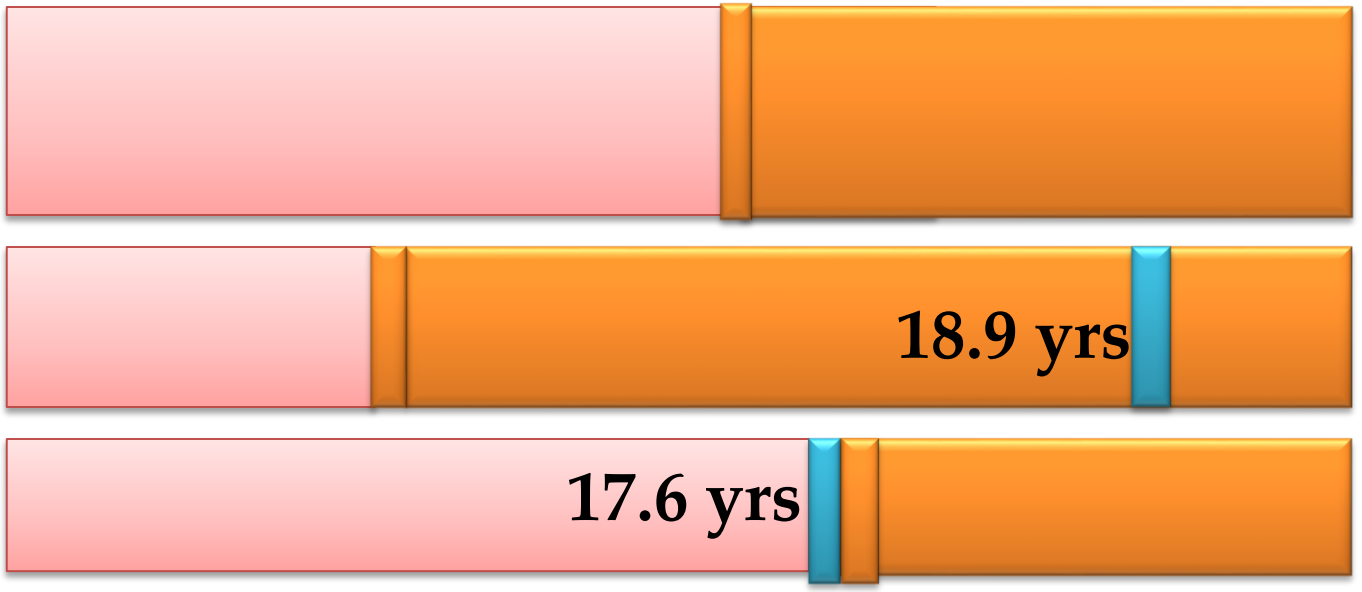
In school

Out of school

Average Dropout Age

Average Age of First birth

Timing of School Drop Out and First Pregnancy



30%,Dropouts non moms

27%, Dropout later moms

24%, Pregnant in School

Age entry school

2012: ages 20-23

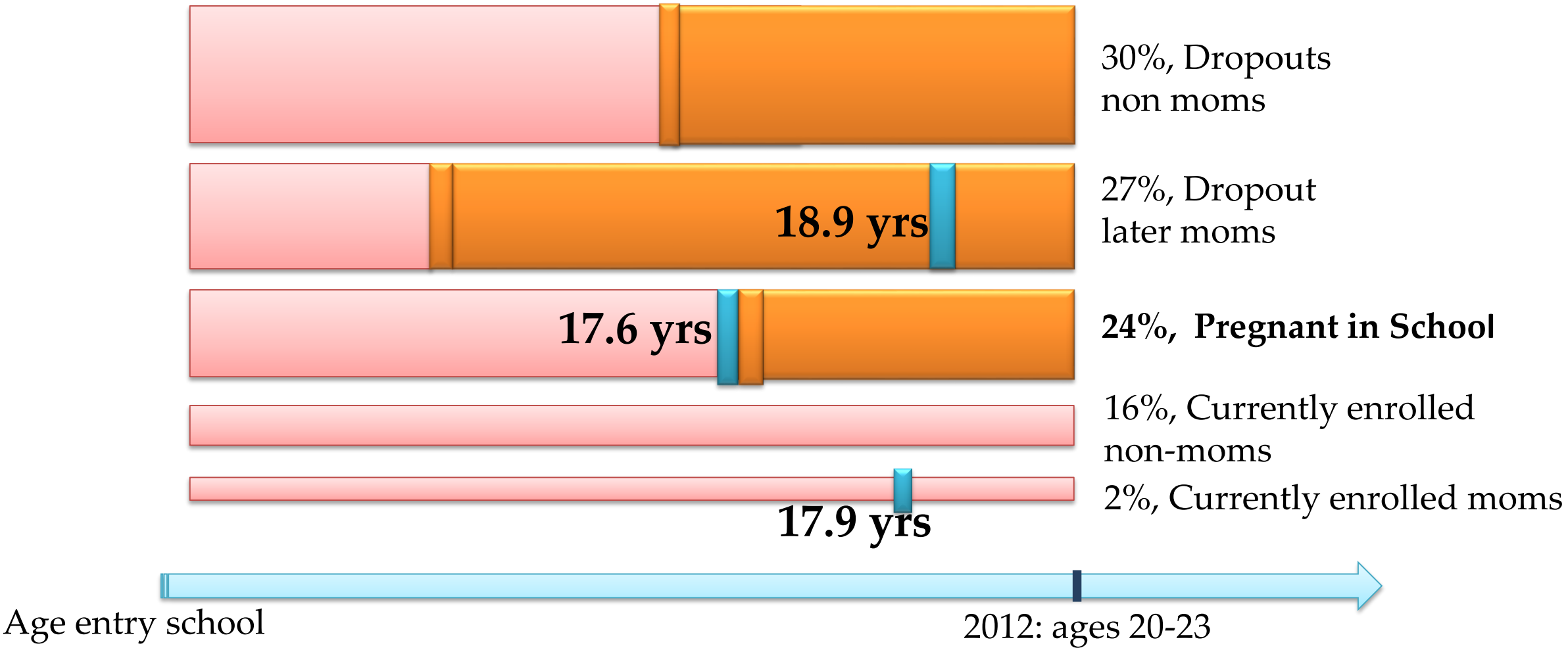
In school

Out of school

Average Dropout Age

Average Age of First birth

Timing of School Drop Out and First Pregnancy



Instrumental Variable Models

$$First\ Stage: \quad EverMother_i = \mu + \delta' Z_i + \gamma' X_i + \theta' C_i + v_i$$

$$Second\ Stage: \quad Y_i = a + \beta EverMother_i + \rho' X_i + \theta' C_i + u_i$$

Y_i = 2012 school outcomes; i) Current Enrollment, ii) Years of education, iii) Completed 9 years of schooling, and iv) Z-scores French and Math

Z_j = Access to Condoms at the community level
Z_i = Exposure to Condoms: No. of years of access since girl is age 15

X_i = Women's birth cohort dummies, dummy variable if parents are alive 2012, 2004 asset index and parents' education.

C_i = Access to upper secondary school, community health center, hospital, electricity, piped water, weekly market, paved roads, urban indicator, regional dummies.

- Also community health center, electricity and secondary school when girl was 10 years old as well as 2001 remoteness index.

Why access/exposure to condoms is a good IV?

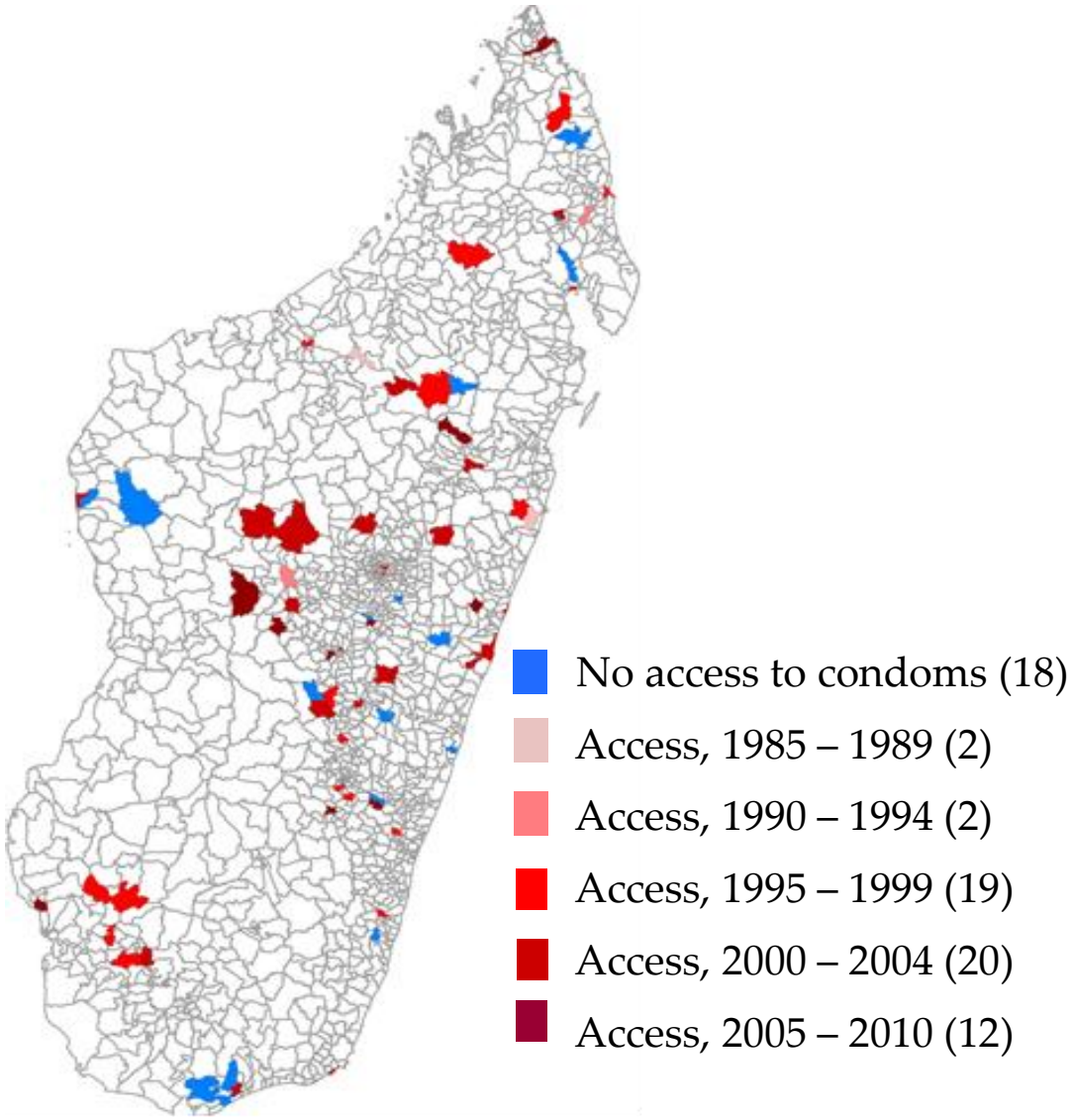
- Plausible exogenous variation that can explain early childbearing and does not affect directly young women's schooling if it is not through the reduction of teen fertility.
  - FP access during adolescence can reduce women's fertility (Miller; 2010; Angeles et al. 2005)

- Can lower the fertility control costs among young women; more if teen pregnancy is a risky behavior (Dupas, 2011; Friedman, 2015)
  - Median age of sexual initiation is 17.4 (DHS,2009)

- Pills and injectables are more used to space children rather than to postpone the first birth:
  - 38% of women who used for the first time family planning are already mothers (DHS, 2009).
  - Condoms are commonly used by unmarried women (PSI, 2008; Glick et al, 2009)

- Young women's stigma of going to Family Planning Centers to get the injections or pills:
  - Condoms easier access: 40% in stores and 20% pharmacies; not in schools (DHS, 2009).
  - Free or heavily subsidized; only 0.2% of women state price as a reason for not using modern FP.

Community-Level Access to Condoms: ENSOMD data



- Lack of information on how communities gain access to condoms nor the channels of distribution within the community
- Models control for extensive set of current and lagged community characteristics
- Test for the endogeneity of program placement
  - Robustness checks
  - Placebo tests
- No evidence to support non-random placement

Endogeneity of Program Placement

Models of 2012 Access to Condoms on Community Socioeconomic Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
2006 No. of Births	-0.0000277					
	[0.0000310]					
2006 Maternal Mortality		0.00144				
		[0.00921]				
2001 Log Population			0.0157			
			[0.0726]			
2001 Poor People (%)			-0.00190			
			[0.00236]			
Merina Ethnic Group (%)				0.00155		
				[0.00619]		
Betsileo Ethnic Group (%)				0.00298		
				[0.00245]		
Betsimisaraka Ethnic (%)				0.00220		
				[0.00309]		
Participation Catholic (%)					0.182	
					[0.352]	
N	68	66	71	71	73	73
adj. R-sq	0.158	0.154	0.125	0.133	0.130	0.123

Notes: ***, **, *: significant at 1%, 5%, and 10% levels respectively. Robust Standard errors reported in parentheses. Regional dummies are not shown.

First Stage using Access to Condoms

$$EverMother_i = \mu + \delta' Z_i + \gamma' X_i + \theta' C_i + v_i$$

	(1)	(2)	(3)	(4)	(5)
Condom Access (Y=1)	-0.262*** [0.0395]	-0.193*** [0.0441]	-0.199*** [0.0497]	-0.182*** [0.0514]	-0.179*** [0.0530]
Household variables		X	X	X	X
Community variables 2012			X	X	X
Community Variables at 10 years old				X	X
Regional Dummies					X
N	778	750	750	750	750
First Stage- F-stat	38.75	19.26	16.04	12.47	11.37
adj. R-sq	0.066	0.085	0.098	0.106	0.104

Notes: * p<0.10, ** p<0.05, *** p<0.01.Robust Standard errors in brackets. All the models (1-5) include cohort age dummies.

First Stage using Exposure to Condoms

$$EverMother_i = \mu + \delta' Z_i + \gamma' X_i + \theta' C_i + v_i$$

	(1)	(2)	(3)	(4)	(5)
Condom Exposure-15 years	-0.0368***	-0.0277***	-0.0257***	-0.0230***	-0.0234***
	[0.00553]	[0.00606]	[0.00640]	[0.00659]	[0.00680]
Household variables		X	X	X	X
Community variables			X	X	X
Community variables at age 10				X	X
Regional Dummies					X
N	778	750	750	750	750
First Stage	44.2365	20.8813	16.143	12.2032	11.8428
adj. R-sq	0.067	0.087	0.097	0.106	0.104

Notes: Robust Standard errors in brackets * p<0.10,** p<0.05, *** p<0.01 *** p<0.01All the models (1-5) include cohort age dummies.

- Exposure to condoms: Median 6 years; Average 4.9 years

Hazard Models-Age of First Birth

- *Modified First Stage*: Age at First Birth (AFB) is modeled using Weibull Hazard Model:

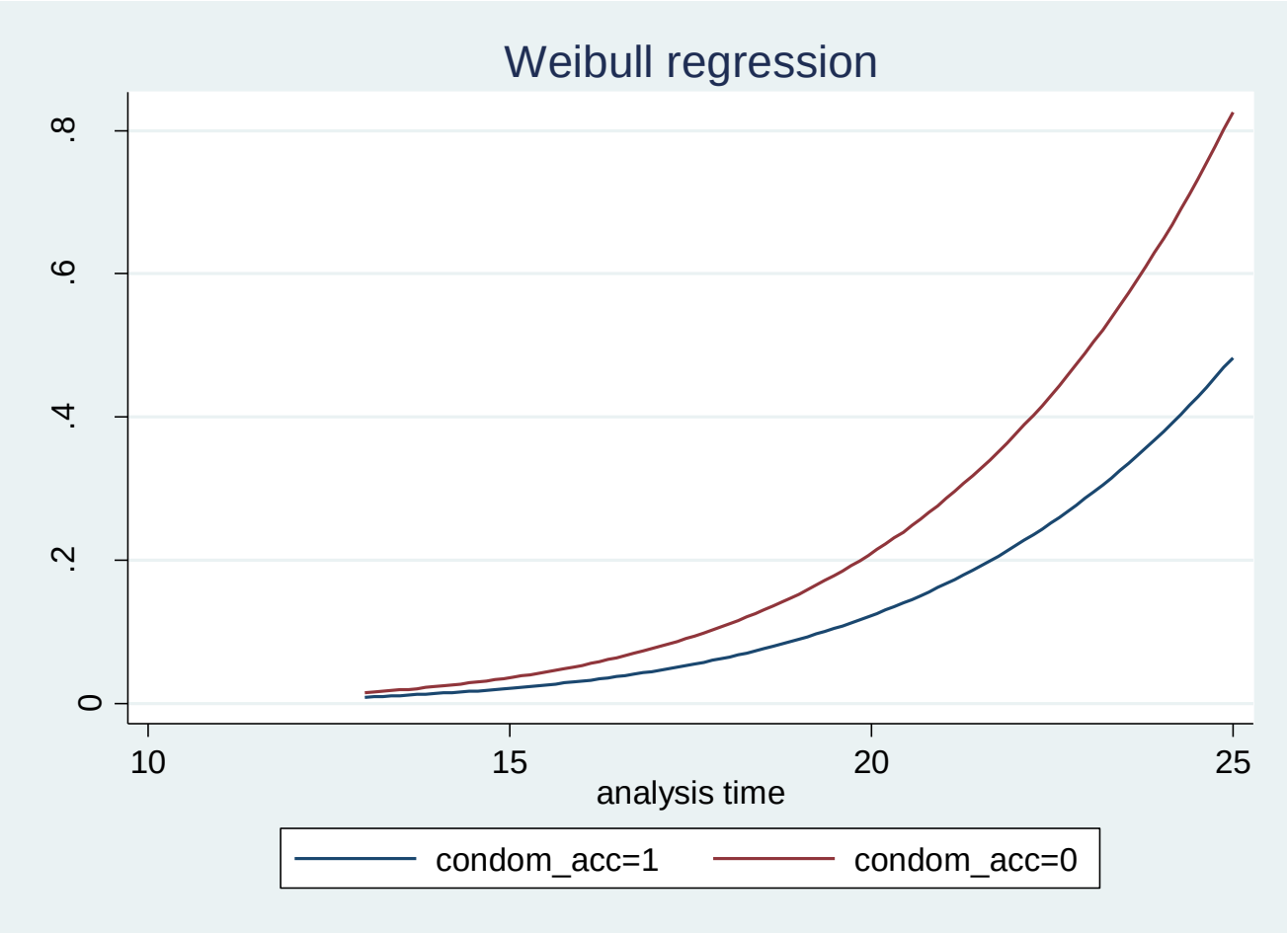
$$h_j(t) = h_o(t)\exp\{\delta' BCoh_j + \beta' Z_j + \alpha' X_j + \rho' C_j\}$$
$$ho(t) = pt^{p-1}$$

- $h_j(t)$ is the probability of having the first birth at time (or age) t conditional on not having a child until t.

- This hazard model allows to predict AFB to explain schooling in the second stage:

$$Y_i = a + \beta PredAFB_i + \pi' Age_i + \rho' X_i + \theta' C_i + u_i$$

Hazard Models-Age of First Birth



Note: This is the predicted hazard function by access to condoms after estimating the Weibull model which controls by the individual, household and community covariates

IV Results on School Attainment

		(1)	(2)	(3)
Dependent Variable		**OLS**	**IV- 2sls Access to condoms**	**IV Exposure to condoms [a]**
Panel A : Currently enrolled	*Ever-mother*	-0.275***	-0.428**	-0.427***
		[0.0270]	[0.189]	(0.126)
	F-stat First Stage		11.36	11.84
	N	750	750	750

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	F-stat First Stage		11.36	11.84
	N	750	750	750
Panel B: Years of Education	*Ever-mother*	-2.029***	-2.172	-2.400
		[0.201]	[1.460]	[1.487]
	F-stat First Stage		11.36	11.84
	N	750	750	750

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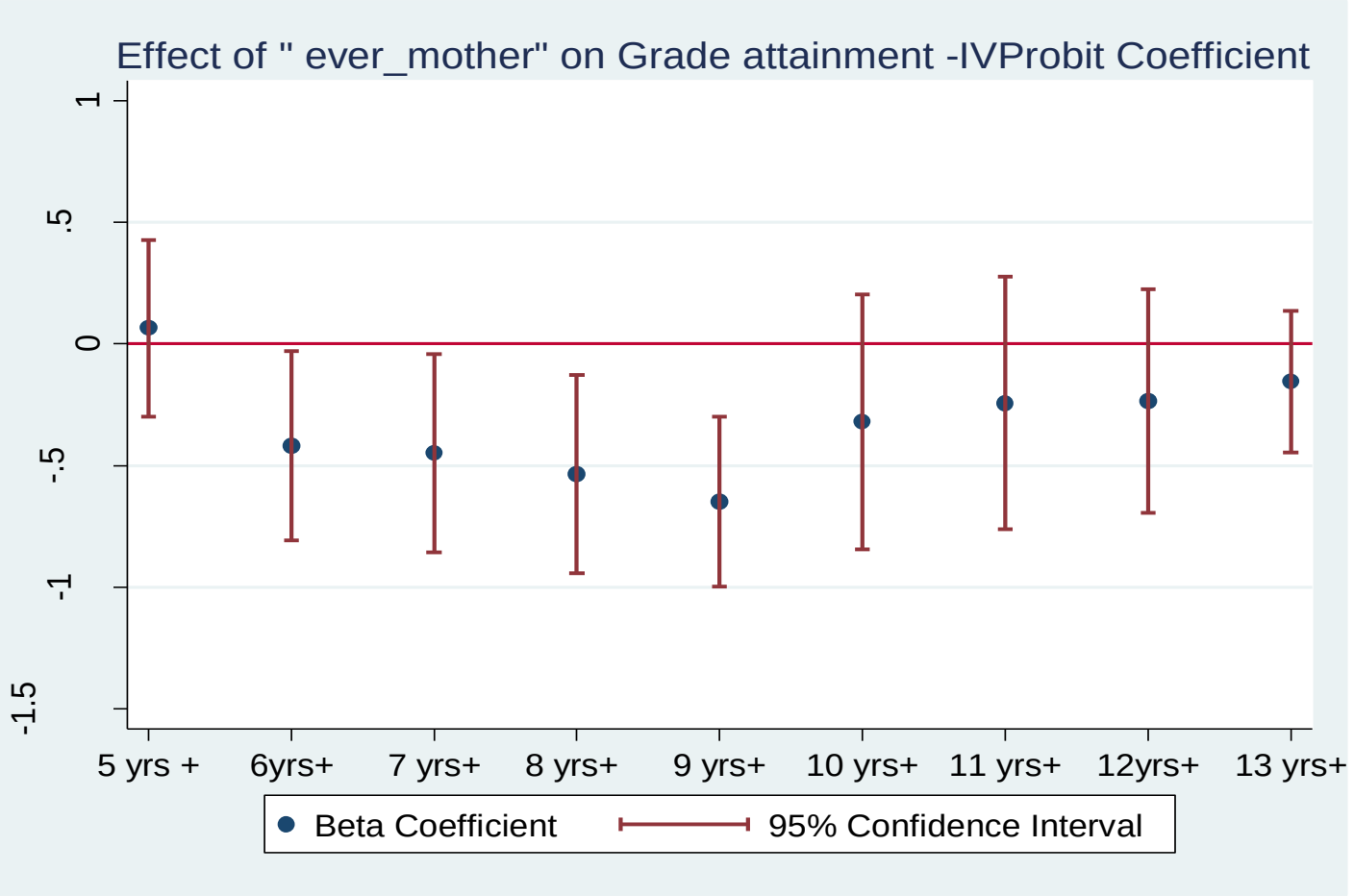
		[0.201]	[1.460]	[1.487]
	F-stat First Stage		11.36	11.84
	N	750	750	750
Panel C: 9 or more years of school	*Ever-mother*	-0.259***	-0.486**	-0.445***
		[0.0326]	[0.243]	(0.055)
	F-stat First Stage		11.36	11.84
	N	750	750	750

Notes: ***, **, *: significant at 1%, 5%, and 10% levels, respectively. Robust standard errors reported in parentheses.

[(a)] Models with IV-Exposure to condoms in Panel A and Panel C are estimated with IV-probits. For these models, the Ever-Mother coefficient is the average marginal effect and standard errors are calculated with the delta method. All the models include age cohort dummies, parents' education, dummies for whether parents were alive at the time of survey (2012), 2004 asset index, the extensive social infrastructure variables at the community level described in section III as well as regional dummies.

IV Results on School Attainment



IV Estimates on Cognitive Skills

		(1)	(2)	(3)
		OLS	**IV- 2SLS Access to condoms**	**IV-2SLS Exposure to Condoms**
Panel A : Dependent Variable				
Standardized math score	*Ever-mother*	-0.371***	-1.136**	-1.495***
		[0.0637]	[0.532]	[0.570]
	F-stat First Stage		12.37	12.269
	R-Square	0.414	0.2789	0.121
	N	688	688	688
Panel A : Dependent Variable				
Standardized French score	*Ever-mother*	-0.429***	-1.142**	-1.569***
		[0.0611]	[0.515]	[0.567]
	F-stat First Stage		12.83	12.11
	R-Square	0.479	0.361	0.178
	N	679	679	679

Notes: ***, **, *: significant at 1%, 5%, and 10% levels, respectively. Robust standard errors reported in parentheses. Standardized test scores are calculated by subtracting the mean and dividing by the standard deviation. All the models include age cohort dummies, parents' education, dummies for whether parents were alive at the time of survey (2012), 2004 asset index, and extensive social infrastructure variables at the community level described in section III as well as regional dummies.

Impact of Predicted Age of First Birth on School Outcomes

	Current Enrollment	9 or more Years of Schooling	Z-Score French	Z-Score Math
	(1)	(2)	(3)	(4)
Predicted Age First Birth (Mean)	0.056** [0.026]	0.084** [0.030]	0.190*** [0.0614]	0.211*** [0.0642]
N	750	750	688	679

Notes: ***, **, *: significant at 1%, 5%, and 10% levels, respectively. Robust standard errors reported in parentheses. Age of First Birth was predicted after estimation of Weibull models in the first stage. Models (1) and (2) are estimated with probit models, in these models coefficients are average marginal effects. All the models include age cohort dummies, parents' education, dummies for whether parents were alive at the time of survey (2012), 2004 asset index, and extensive social infrastructure variables at the community level described in section III as well as regional dummies.

Placebo test on Male Outcomes

Reduced form of Access to Condoms on Male and Female School Outcomes

Dependent Variables		Current Enrolment	Years of Schooling	Completed Lower Secondary	Z-Score French	Z-Score Math
Outcomes for Young Men	Access to Condoms	-0.00512	0.0567	0.0352	0.121	0.0863
		[0.0341]	[0.475]	[0.0676]	[0.151]	[0.141]
	Mean Outcome/[a]	0.203	8.287	0.527	0.055	0.054
	Adj -R^2	0.129	0.371	0.379	0.311	0.250
	N	723	723	723	664	675
Outcomes for Young Women	Access to Condoms	0.0765**	0.388	0.0869*	0.233**	0.224**
		[0.0332]	[0.281]	[0.0448]	[0.0959]	[0.0920]
	Mean outcome/[a]	0.189	8.076	0.504	0.076	0.074
	Adj -R^2	0.162	0.436	0.420	0.363	0.286
	N	750	750	750	688	679

Notes: ***, **, *: significant at 1%, 5%, and 10% levels respectively. Robust standard errors reported in parentheses.
[a]/: Mean outcome for the sample of men (women) who drop out of school at age 13 and older. All the models include the individual, household and community controls,

Additional Robustness Checks

First Stage of Ever Mother on Access to Pills and Family Planning Services

	Access to Condoms	Access to Pills	Access to Family Planning Services
Ever-Mother	-0.179***	-0.0530	-0.120*
	[0.0530]	[0.0478]	[0.0625]
First-stage F-stat	11.36	1.22	3.66
N	750	750	750
adj. R-sq	0.104	0.091	0.094

Notes: ***, **, *: significant at 1%, 5%, and 10% levels respectively. Robust standard errors reported in parentheses. All the models include the individual, household and community control variables.

- No statistically significant effects for alternative IVs: Community Health Center, 2001 Remoteness Index
- Placebo test: Access to condoms does not have statistically effect on young women's height

Conclusions

- Early Childbearing has a detrimental, causal effect on young women's human capital in Madagascar:
  - It increases the likelihood of dropping out of school and decreases the probability of completing secondary school, reducing the cognitive skills.
  - Effects on test scores similar in magnitude to effects of secondary school attendance

- Postponing a young woman's first birth by a year can also generate gains in educational attainment and cognitive skills.

- These results of early fertility impacts on schooling depend on the identifying instrument employed.

- Future research should analyze if this teen fertility reduction will be translated into reduced fertility over a woman's lifetime as well as into improvements in her family's long-term economic outcomes.

Policy Implications

- Policies that would have positive benefits in women's human capital are those that aim:
  - at allowing teen mothers to catch up with their education
  - at preventing early childbearing

- Family Planning and Reproductive Health Policies: Beyond preventing poor pregnancy outcomes can have a role in young women's human capital investment.
  - Regardless of the Family Planning effect on total fertility, the effect on the timing of births can have potential economic benefits.

- These policies will have also an effect in children's outcomes: Young women's education increases their children's education and health outcomes.

- These policies are crucial in sub-Saharan Africa: Given the demographic transition there is a unique opportunity to reap the benefits of enhancing young women's human capital.

Thank You !

Catalina Herrera Almanza
Assistant Professor, Economics and International Affairs
c.herreraalmanza@neu.edu

Northeastern University