



# Early Fertility and Labor Market Segmentation: Evidence from Madagascar

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Human Capital Growth Conference – WIDER Development Conference

June 6<sup>th</sup>, 2016

Helsinki, Finland

# Motivation

- Growing interest in improving female employment outcomes in addition to increasing female labor market participation in developing countries.
  - Compared to men: working women typically earn less and are more likely to work in unpaid or informal employment (Verick, 2014)
- Women represent 40% of the total global workforce but represent 58% of all unpaid work and 50% of informal sector employment (World Bank, 2012)
  - In Sub-Saharan Africa: 80% of the female labor force are self-employed or unpaid family workers
- Developing country labor markets highly segmented between formal and informal sectors.

# Fertility and Labor Market Segmentation

- Fertility may affect women's decision to participate in the labor market
  - Preferences over work may change after having children
  - Need to work may increase to support family
- Mixed evidence on the causal effect of fertility on female labor market participation:
  - Negative Effect (Cruces and Galiani, 2007; Bloom et al, 2007; Caceres, 2012)
  - No effect, OLS overestimation (Agüero and Marks, 2011)
  - Fertility decreases the extensive margin of women's labor supply while it increases the working hours for women who are already in the labor force (Heath, 2015)

# Fertility and Labor Market Segmentation

- Fertility may affect selection into employment type:
  - Evidence suggests fertility reduces women's probability of working in formal sector (Miller, 2010; Agüero and Marks, 2011; Urdinola and Ospino, 2015).
  - Some jobs are more conducive to demands of motherhood (**direct effect**)
    - In Madagascar, women in the informal sector self-select into industries where they can combine market-oriented and domestic activities (Nordman and Vaillant, 2014)
  - Timing of fertility may affect human capital formation (**indirect effect**)
    - Evidence points to education and experience increasing likelihood of formal sector employment (Nasir 2005; Vijverberg 1993; Glick and Sahn 1997; Sahn and Villa; 2015)

# Research Question

- To explore the effect of the *timing* of the first birth on female labor market participation and on the selection into different types of employment among young women in Madagascar:
  - formal employment
  - informal employment
  - Non-participation
  - student
- To investigate the extent to which the impact of early childbearing on labor market outcomes is mediated through its effect on school attainment.

# Contribution

- To analyze the timing of the first birth, rather than the extensive or intensive effect of fertility, during the transition from adolescence to adulthood:
  - Young women face trade-offs between schooling, becoming mothers, entering the labor force, and the type of work they want and they are offered.
- Explore to what extent the fertility timing effect on labor market outcomes, is mediated through its effect on school attainment.
  - Direct and indirect effects (through human capital formation) call for different policy responses
  - To model the effect of education on the relationship between fertility and employment rather than assuming it is exogenous.

# Household Panel Data Survey

## *The Madagascar Life Course Transition of Young Adults Survey 2004 and 2012*

- 1749 young adults (859 women), 21-24 years old in 2012, were re-interviewed from 2004 when they were 13-16 years old.
- Collected detailed retrospective and event histories: Fertility, schooling, labor market. Also, range of economic and life-course events on the cohort members and their families since 2004.
- 73 communities included in the 2004 and 2012 panel: Questions on social and economic infrastructure.
  - 2004 school information on facilities (i.e. bathrooms, blackboards, teacher quality, distance to the center of the town; etc.)
  - Questions on access to family planning services, condoms and pills and since when they were available in the community

# Data Descriptives

- Maternal Status: i) Teen mothers: Age of First Birth (AFB) is 18 or less; (29% of the sample); ii) Young mothers: AFB is 19 or older; (24%); iii) Not-yet mothers (47%)
  - Most non-yet-mothers will eventually have child: 2.7% of women aged 35-39 are childless (DHS, 2009)

## Maternal Status and Labor force Participation

	Not-Yet Mothers	Young Mothers (AFB > 19)	Teen Mother (AFB ≤ 18)	Total
Non-participation (%)	12.44	14.63	10	12.25
n	48	30	25	103
<b>Working (%)</b>	<b>61.14</b>	<b>83.41</b>	<b>88</b>	<b>74.55</b>
<b>n</b>	<b>236</b>	<b>171</b>	<b>220</b>	<b>627</b>
Student (%)	26.42	1.95	2	13.2
n	102	4	5	111
<b>Total (%)</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>n</b>	<b>386</b>	<b>205</b>	<b>250</b>	<b>841</b>



# Fertility and Labor Market Sectors

Definition of employment categories based on woman's **main** employment activity:

## A. Formal sector :

- public administration, formal private enterprise or NGO.
- a family enterprise or if a woman does domestic work in another household *and* earns regular wages or salary for that work.

## B. Informal Sector:

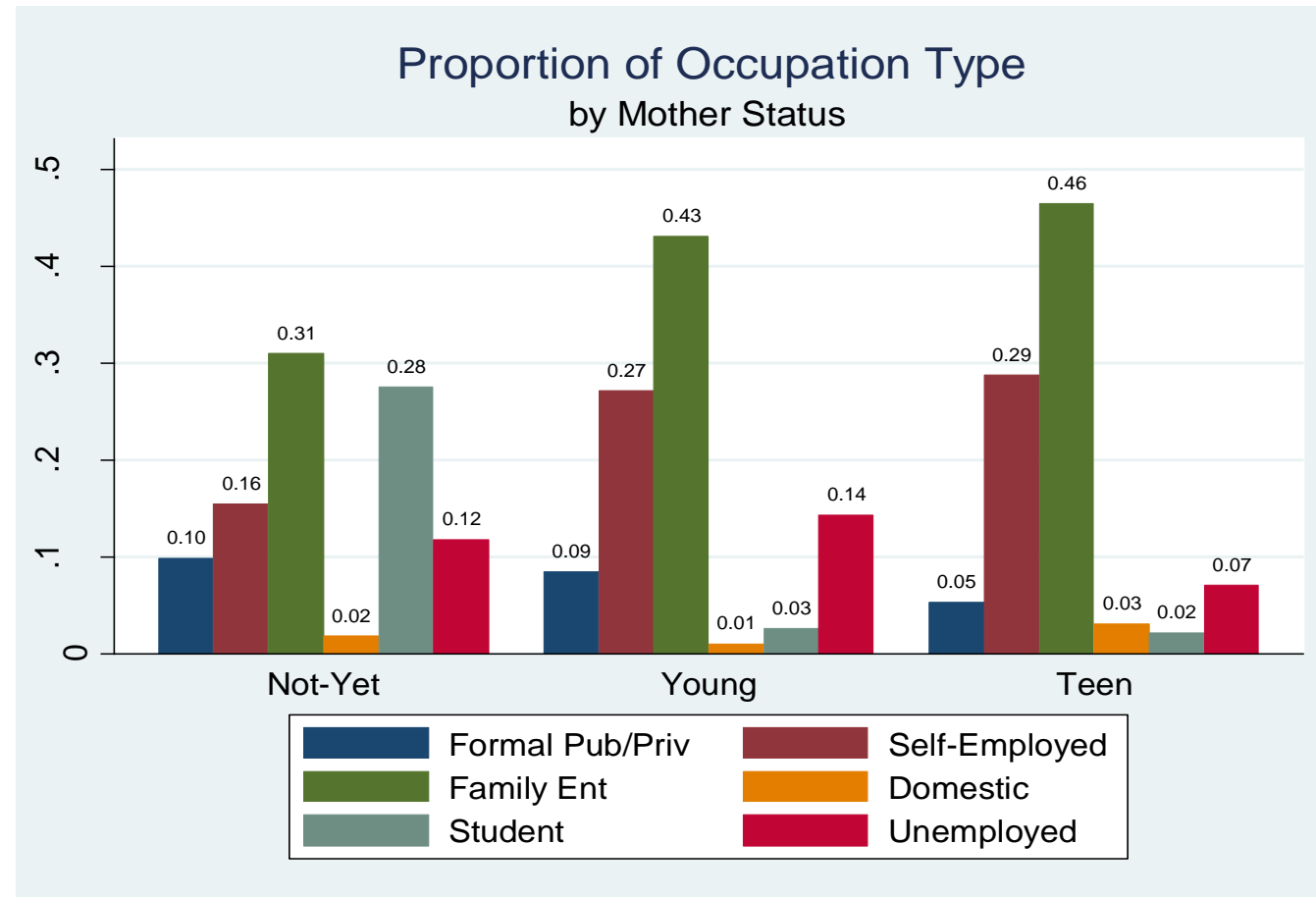
- in a family-owned enterprise or domestic work in another household *and* her remuneration status is listed as self-employed or unpaid.
- her main employment activity is listed as self-employment
- she works in any informal activities and reports her remuneration status as unpaid.
- Performing domestic work in her own household was not counted.

# Fertility and Labor Market Sectors

- Compared to not-yet mothers, young and teen mothers are more likely to work in the informal sector.

	Not-Yet Mothers	Young Mothers (AFB > 18)	Teen Mother (AFB < 18)	Total
Non-participation (%)	12.44	14.63	10	12.25
n	48	30	25	103
<b>Informal (%)</b>	<b>47.15</b>	<b>74.15</b>	<b>77.6</b>	<b>62.78</b>
n	182	152	194	528
Formal (%)	13.99	9.27	10.4	11.77
n	54	19	26	99
Student(%)	26.42	1.95	2	13.2
n	102	4	5	111
<b>Total (%)</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
n	386	205	250	841

# Fertility and Labor Market Sectors



- 90% of the sample women who report working in a family-owned enterprise report their remuneration status in this occupation as “unpaid”.

# Empirical Strategy

- Endogeneity between fertility and labor market outcomes: IV-control function approach or two-stage residual inclusion method (Terza et al, 2008)

## I. First Stage

- A. Multinomial Logit of Maternal Status: Probabilities for *teen mother*, *young mother and not-yet-mother* in function of family planning variables (IV)
  - Hazard Models of Age of First Birth
- B. OLS school attainment in function of 2004 primary school infrastructure (IV)

## II. Second Stage

- C. Multinomial logit for employment status
  - 3 categories: Non-participation, Working and Student
  - 4 categories: Non-participation, Informal Employed, Formal Employed and Student

# A. First Stage-Fertility

- We predict maternal status as multinomial logistic function where the probability of a young woman  $i$  in community  $j$  and region  $r$  being in maternal status  $m$ :

$$(1) \quad P_{ijr}^m = \frac{e^{\alpha^m Z_{ijr}}}{\sum_{n=1}^3 e^{\alpha^n Z_{ijr}}} \quad \text{Where} \quad m \in \{1, 2, 3\}$$

$$(2) \quad \alpha^m Z_{ijr} = \alpha_0^m + \alpha_2^m \text{Condom}_{jr} + \alpha_3^m X_{ijr} + \alpha_4^m C_{jr} + \alpha_5^m R_{ir}^m$$

Where  $\text{Condom}_{jr}$ : is Community level-access/exposure to condoms;  $X_{ijr}$ ,  $C_{jr}$  are individual and community controls and  $R_r$ : Regional Variables

- The predicted maternal residuals are:  $\varepsilon_{ijr} = (\varepsilon_{ijr}^1, \varepsilon_{ijr}^2, \varepsilon_{ijr}^3)$   $\sum_{m=1}^3 \hat{P}_{ir}^m = 1$   $\sum_{m=1}^3 \hat{\varepsilon}_{ir}^m = 0$
- *Not-yet-mothers* probability and residuals are excluded from the second stage.

# A. First Stage-Fertility

## Contraception Use and Access by Fertility Status

	<b>Not-Yet Mothers</b>	<b>Young Mothers (AFB &gt; 18)</b>	<b>Teen Mother (AFB &lt; 18)</b>	<b>Total</b>
Family Planning Use (%)	18.1%	36.2%	47.4%	31.2%
Access to Condoms (%)	84.5%	72.3%	66.4%	76.1%
N	N=374	N=188	N=226	N=788

- Concerns regarding program placement endogeneity of community level access/exposure to condoms and robustness checks to validate exclusion restriction are addressed in Herrera and Sahn (2015).
- Chi-square test of condoms: 13.05 (p-value 0.012)

## B. First Stage-Education

$$Grade_{ijr} = \pi_0 + \pi_1' Sch_{jr} + \pi_2' X_{ijr} + \pi_3' C_{jr} + \pi_4' R_r + \mathcal{G}_{ijr}$$

- Where  $X_{ijr}$ ,  $C_{jr}$  and  $R_{ij}$  are individual, community, regional controls
- $Sch_{jr}$ : 2004 primary school characteristics: i) the distance to the town center, ii) whether participated in a government nutrition program, iii) facilities quality index, and iv) whether is private.
- The 2004 primary school information does not necessarily correspond to the school attended by young women: no school choice issue.
- Assumption: Primary school conditions in the community area where women grew up are unlikely to directly affect their labor decisions, only influence them through the impact on education.
- Weak correlation between primary school quality and secondary school quality

## C. Second Stage: Labor Market Outcomes

- Multinomial Logit: Estimate selection into 4 sectors of employment: i) unemployed; ii) formal; iii) informal; and v) student.  $V_{ij}$ : Utility of woman  $i$  in sector  $j$

$$V_{ijr}^k = \beta_0^k + \beta_1^k M_{ijr} + \beta_2^k \text{Grade}_{ijr} + \beta_3^k X_{ijr} + \beta_4^k C_{jr} + \beta_5^k R_r + \beta_6^k \hat{\varepsilon}_{ijr}^m + \beta_7^k \hat{\vartheta}_{ijr} + u_{ijr}^k$$

Where

$M_{ijr}$ : two dummy variables for *teen mother* and *young mother*. Excluding *not-yet mother*

$\hat{\varepsilon}_{ijr}^m$ : a vector of the first stage residuals for *teen mother* and *young mother*

$\text{Grade}$ : 2012 Highest Grade Attained

$\hat{\vartheta}_{ij}$ : Predicted School attainment (Grade) residuals from first stage

- The Probability of individual  $i$  being employed in sector  $j$  is given by:

$$P_{ijr}^k = \Pr(V_{ijr}^k > V_{ijr}^l) \text{ for all } l \neq k$$

- Normalization: formal sector as base category



# Summary Statistics

**Table 1: Socioeconomic Characteristics by Fertility Status**

	<b>Not-Yet Mothers</b>	<b>Young Mothers (AFB &gt; 18)</b>	<b>Teen Mother (AFB &lt; 18)</b>	<b>Total</b>
	N=374	N=188	N=226	N=788
Age	21.77	22.50	21.71	21.93
	1.13	1.13	1.2	(1.24)
Highest Grade	9.36	7.18	5.90	7.85
	(3.71)	(3.28)	(2.77)	(3.68)
2004 Asset Index	0.26	0.03	-0.23	0.06
	(1.10)	(0.95)	(0.61)	(0.97)
Mother's Highest Grade	5.50	4.60	3.83	4.80
	(3.64)	(3.41)	(3.16)	(3.52)
Father's Highest Grade	6.20	5.48	4.23	5.46
	(3.94)	(4.17)	(3.39)	(3.93)
Community Health Center Present	0.60	0.65	0.69	0.64
	(0.49)	(0.48)	(0.47)	(0.48)
Community Hospital Present	0.16	0.14	0.08	0.13
	(0.37)	(0.35)	(0.28)	(0.34)
Upper Secondary School Present	0.71	0.57	0.49	0.62
	(0.45)	(0.50)	(0.50)	(0.49)

Note Standard errors in parentheses

**Table 1 CONT**

	<b>Not-Yet Mothers</b>	<b>Young Mothers (AFB &gt; 18)</b>	<b>Teen Mother (AFB &lt; 18)</b>	<b>Total</b>
	N=374	N=188	N=226	N=788
Piped Water in Community	0.57	0.56	0.47	0.54
	(0.50)	(0.50)	(0.50)	(0.50)
Access to Weekly Market	0.69	0.55	0.54	0.61
	(0.46)	(0.50)	(0.50)	(0.49)
Access to Paved Road	0.43	0.44	0.37	0.42
	(0.50)	(0.50)	(0.48)	(0.49)
Electricity in Community	0.57	0.45	0.37	0.48
	(0.50)	(0.50)	(0.48)	(0.50)
School Facility Quality Index	0.12	-0.09	-0.11	0.00
	(0.82)	(0.71)	(0.71)	(0.77)
Distance Town Center and Primary School	0.96	0.98	1.02	0.98
	(1.18)	(1.30)	(1.18)	(1.21)
Government Nutrition Program in Primary School	0.47	0.50	0.47	0.48
	(0.50)	(0.50)	(0.50)	(0.50)
Private School in Community	0.39	0.30	0.22	0.32
	(0.49)	(0.46)	(0.41)	(0.47)

# Multinomial Logits: 3 Categories

(Average Marginal Effects)

	Instrumented Maternal Status		
	NO IV	Grade Included	
	Grade Excluded	Instrumented	
	(1)	(2)	(3)
<b>Non-Participation</b>			
Young Mother (AFB>18)	0.038 (0.031)	-0.127 (0.162)	-0.141 (0.219)
Teen Mother (AFB<18)	0.007 (0.029)	-0.420*** (0.140)	-0.434** (0.173)
Education Level			0.051 (0.039)
<b>Working</b>			
Young Mother (AFB>18)	0.167*** (0.035)	0.342*** (0.103)	0.336*** (0.127)
Teen Mother (AFB<18)	0.186*** (0.034)	0.595*** (0.125)	0.487* (0.293)
Education Level			-0.036 (0.054)
<b>Student</b>			
Young Mother (AFB>18)	-0.205*** (0.022)	-0.215 (0.160)	-0.194 (0.148)
Teen Mother (AFB<18)	-0.194*** (0.024)	-0.175 (0.141)	-0.053 (0.292)
Education Level			-0.015 (0.042)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors calculated with delta method. Models include all control variables.

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Education Level			-0.015 (0.042)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors calculated with delta method. Models include all control variables.

# Results

- Unlike earlier studies, we find that young and teen mothers are more likely to work compared to their childless counterparts.
- Timing of the first birth matters: the likelihood of working is significantly higher for young women who have their first child before the age of 18.
- School attainment explains part of the effect of early childbearing on female labor supply for mothers who have their child at age 18 or earlier but not for post-adolescent childbearing (after 18)

# Multinomial Logits: 4 Categories

(Average Marginal Effects)

	Instrumented Maternal Status		
	NO IV	Instrumented Maternal Status	
	Grade Excluded	Grade Included Instrumented	
	(1)	(2)	(3)
<b>Non-Participation</b>			
Young Mother (AFB>18)	0.037 (0.031)	-0.134 (0.211)	-0.151 (0.170)
Teen Mother (AFB<18)	0.008 (0.029)	-0.421** (0.174)	-0.437*** (0.134)
Education Level			0.052 (0.038)
<b>Informal</b>			
Young Mother (AFB>18)	0.218*** (0.040)	0.193 (0.277)	0.165 (0.265)
Teen Mother (AFB<18)	0.224*** (0.038)	0.613*** (0.155)	0.513* (0.284)
Education Level			-0.074+ (0.050)
<b>Formal</b>			
Young Mother (AFB>18)	-0.050* (0.029)	0.154 (0.293)	0.172 (0.263)
Teen Mother (AFB<18)	-0.038 (0.029)	-0.017 (0.069)	-0.014 (0.074)
Education Level			0.038 (0.047)
<b>Student</b>			
Young Mother (AFB>18)	-0.206*** (0.022)	-0.213 (0.184)	-0.187* (0.102)
Teen Mother (AFB<18)	-0.193*** (0.024)	-0.176 (0.186)	-0.063 (0.295)
Education Level			-0.015 (0.035)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors calculated with delta method. Models include all control variables.

# Multinomial Logits: 4 Categories

(Average Marginal Effects)

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Education Level			-0.015 (0.035)	

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors calculated with delta method. Models include all control variables.

# Results

- Teen mothers are more likely to work in the informal sector even when we account for endogeneity of fertility and sectoral selection.
  - This effect is not statistically significant for young mothers.
  - School attainment explains part of this effect: childbearing during adolescence presents a larger disruption of completed schooling → increasing likelihood of informal sector employment.
- Labor market sectorial selection does not significantly differ between women who had their first child post-adolescence and those who have not yet had a child.
  - Fertility increases likelihood *Young Mothers* are working, it does not significantly influence selection into labor market sectors

# Hazard Models-Age of First Birth

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

$$h_j(t) = h_o(t) \exp\{\delta' X_{ij} + \beta' Condom_j + \alpha' C_{ij} + \rho' R_{ij}\}$$
$$h_o(t) = pt^{p-1}$$

- $h_j(t)$  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 the labor market selection outcomes in the second stage:

$$V_{ijr}^k = \beta_0^k + \beta_1^k PredAFB + \beta_2^k Grade_{ijr} + \beta_3^k X_{ijr} + \beta_4^k C_{jr} + \beta_5^k R_r + \beta_7^k \hat{\mathcal{G}}_{ijr} + u_{ijr}^k$$



# Hazard Models: Age of First Birth

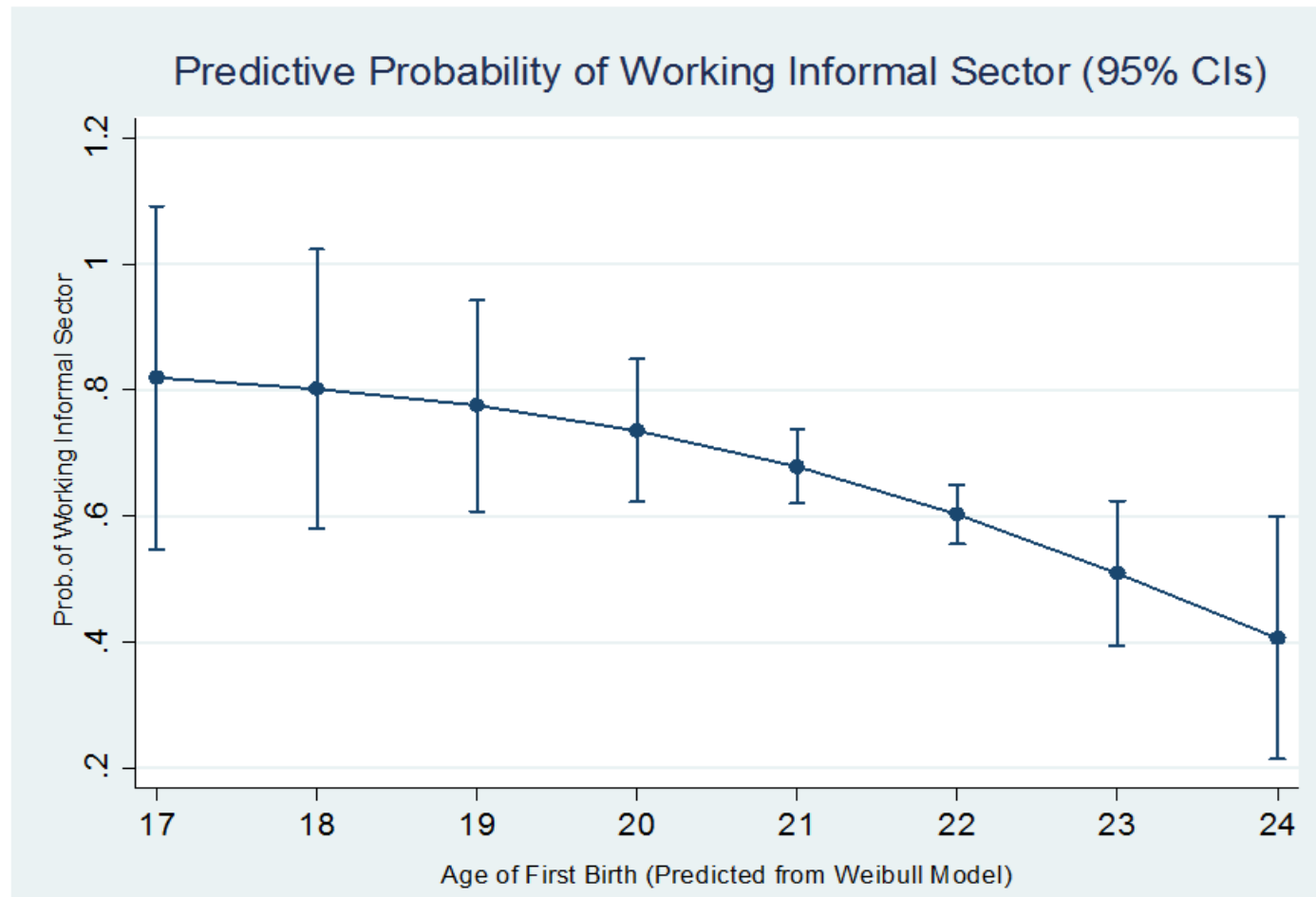
## Average Marginal Effects

	<b>Non- Participation</b>	<b>Informal</b>	<b>Formal</b>	<b>Student</b>
<i>Panel A</i>				
Predicted Age of First Birth	0.037	-0.084**	-0.01	0.057*
Grade Excluded	(0.029)	(0.034)	(0.023)	(0.029)
<i>Panel B</i>				
Predicted Age of First Birth	0.042	-0.073**	0.02	0.051*
Grade Instrumented	(0.03)	(0.032)	(0.023)	(0.026)
	0.048	-0.083*	0.031	0.004
	(0.036)	(0.049)	(0.04)	(0.032)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Standard errors calculated with delta method. All the models include the individual, household and community controls described in the empirical section.

# Hazard Models-Age of First Birth

- The younger the mothers, the more likely they are to work in the informal sector once we account for endogeneity.



# Placebo Tests

## Marginal Effects of Fertility Instruments on Young Women's Employment Sectors (Reduced Form)

	Condom Access	Condom Exposure
	(1)	(2)
<b>Unemployed</b>	0.051* (0.030)	0.007+ (0.005)
<b>Informal</b>	-0.113*** (0.044)	-0.009+ (0.006)
<b>Formal</b>	-0.013 (0.034)	-0.004 (0.004)
<b>Student</b>	0.074*** (0.029)	0.006 (0.005)
Chi-Square Statistic	8.94	5.35
P-Value	0.0301	0.1476

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Standard errors calculated with delta method. All the models include the individual, household and community controls described in the empirical section.

# Placebo Tests

## Marginal Effects of Fertility Instruments on Parents' occupation

	<u>Condom Access</u>		<u>Condom Exposure</u>	
	<b>Mother</b>	<b>Father</b>	<b>Mother</b>	<b>Father</b>
	(1)	(2)	(3)	(4)
Agriculture/Livestock	-0.010 (0.046)	0.031 (0.044)	-0.004 (0.006)	0.002 (0.006)
Manual Labor/Low Skill	0.035 (0.037)	0.016 (0.044)	0.000 (0.004)	0.001 (0.005)
Service	-0.041 (0.036)	0.006 (0.028)	-0.002 (0.005)	0.000 (0.004)
High Skill	-0.025 (0.031)	-0.052 (0.040)	-0.002 (0.004)	-0.002 (0.005)
Homemaker	0.041 (0.035)		0.007 (0.005)	
Chi-Square Statistic	3.50 0.4784	1.72 0.6314	2.74 0.6014	0.22 0.9742

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Standard errors calculated with delta method. All the models include the individual, household and community controls described in the empirical section.

- The coefficient of Access/Exposure to Condoms on young women and parents' height is not statistically significant.

# Conclusions

- Teen and young mothers, compared to not-yet mothers, are more likely to participate in the labor force in our sample of young women in Madagascar.
- The timing of the first birth matters for the selection into the informal sector:
  - Teen mothers, compared to young and not-yet mothers, are more likely to work in the less productive and lower quality jobs.
- School attainment explains the effect of early childbearing on labor force participation and selection into informal sector for teen mothers.
  - There is not only a direct effect of fertility on labor market through demands of motherhood but also an indirect effect through human capital investments.

# Policy Implications

- Policies that can enhance women's labor productivity are those that allow teen mothers to catch up with their education and those that delay early childbearing.
- Family Planning and Reproductive Health policies: can have a role in young women's education and productivity beyond preventing poor pregnancy outcomes.
  - Regardless of the Family Planning effect on total fertility, the effect on the timing of births can have potential economic benefits.

# Thank You !

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