GENDER INEQUALITY AND FERTILITY DECLINES:
A SUB-NATIONAL ANALYSIS FOR THE CONTEMPORARY DEVELOPING WORLD

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Background

- Sociological research stresses role of gender norms and equality for fertility (McDonald 2000, Kohler et al. 2002)
- Economic literature identifies advances in human development (income, health, education) as important factor for desired family size → higher opportunity cost of having children (Becker and Lewis 1973, Galor and Weil 1998, Galor 2012)
- Recent literature focusing on developed countries: Gender equality necessary precondition for reversing below-replacement fertility (e.g., Luci-Greulich and Thévenon 2014, Esping-Andersen and Billari 2015, Myrskylä et al. 2011)

Theory

- McDonald (2000) differentiates 2 kinds of gender inequality:
  - „Family-level“ social institutions (private sphere, includes norms of intra-household labour division, child-rearing,…)
  - „Individual-level“ social institutions (public sphere, includes edcuation, female labour force participation,…)
  - We differentiate between the 2 concepts using two distinct measures of gender inequality

Motivation

- No rigorous empirical cross-country evidence on the impact of gender inequality on fertility in a developing country, high-fertility context (see Mills 2010 for an overview)
- Many country case studies, mostly finding the expected negative relationship, but many suffer from endogeneity & rely on cross-sectional data (Upadhyay et al. 2014 provide an overview)
- We are the first to empirically investigate the development-gender-fertility nexus in a cross-country set-up, using subnational panel data
- We also address endogeneity through a difference-in-differences approach exploiting information on law changes affecting gender inequality

Data & model

- Subnational (regional) data on 647 developing country regions between 2000-2015 from the Global Data Lab (GDL)
- Dependent variable: Total fertility rate (TFR)
- Variables of interest: development, measured by the region-level HDI, and gender:
  - „Individual-level“ gender inequality: education gap between boys and girls
  - „Family-level“ gender inequality: age difference between husband and wife
- Control variables: age at first birth (to control for „tempo-effects“), female education levels (ages 20-39)
- Basic fixed effects panel estimation equation:

$$\mathrm{TFR}_{i,t} = \alpha + \rho \mathrm{HDI}_{i,t-1} + \beta \mathrm{GENDER}_{i,t-1} + \gamma \mathrm{HDI}_{i,t-1} * \mathrm{GENDER}_{i,t-1} + \sum_{k} \delta_k \mathrm{X}_{i,k,t-1} + y_t + \mu_i + \varepsilon_{i,t}$$

Descriptive statistics

FE sample (1364 obs.)	mean	sd	min	max
Total fertility rate	4	1.56	2.04	6.71
Human Development Index (multiplicative version)	0.55	0.13	0.2	0.82
Mean age difference between husband and wife	5.95	2.45	1.27	14.2
Age at first birth	20.15	1.33	17.2	23.7
Age at marriage	19.16	1.69	13.9	27
Avg. years of education of women ages 20-39	6.66	3.13	0.22	14.1
Education gap (males/females)	1.32	0.55	0.57	5.55

FIXED EFFECTS RESULTS	(1)	(2)	(3)	(4)	(5)
VARIABLES (all t-1)	full sample	gender	gender	Adding	w/ individual
Year FE included		control	interaction	controls	gender ineq.
HDI	-4.337***	-4.376***	-6.515***	-24.74**	-23.64**
	(1.597)	(1.591)	(2.386)	(11.75)	(10.93)
HDI*Spouse_agediff			0.289	0.483**	**0.604*****
			(0.226)	(0.211)	**(0.218)**
Spouse_agediff		-0.0822	-0.207*	-0.301**	**-0.369****
		(0.0812)	(0.117)	(0.126)	**(0.141)**
HDI*Age_firstbirth				0.951	0.842
				(0.571)	(0.523)
Age_firstbirth				-0.499	-0.453
				(0.339)	(0.301)
Educ_females 20-39				-0.165**	-0.119
				(0.0765)	(0.0788)
Education gap					**0.214****
					(0.107)
Effect of HDI…					
at mean spouse agediff.			-4.8	-2.7	-7.9
…at 1stdv above mean			-4.1	-1.5	-6.4
…at 1stdv below mean			-5.5	-3.9	-9.4
at mean age at childbirth				-5.6	-11.48

Difference-in-differences strategy

- We exploit information on changes in federal law (i.e., *hypothetical* measure affecting all regions in a country equally regardless of their fertility rates and their HDI)
  - World Bank's "Women, Business and the Law" (WBL) database, recording law reforms with implications for gender inequality (e.g., accessing public institutions, to non-discrimination clauses in hiring decisions, to restrictions on the type of work women are allowed to perform)
  - Biennial data, starting in 2010 → we exploit the first wave, recording law changes occurring between June 2009-March 2011
  - Empirical strategy: difference-in-differences design with interacted treatment variable

Difference-in-differences strategy

- binary variable recording whether a region experienced gender parity-enhancing law changes ("treated") → absorbed by the fixed effects
- binary variable indicating the treatment period (2009 and later), "treatment"
- interaction of treated*treatment = coefficient of interest; in our case interacted with the HDI

$$\begin{aligned}\mathrm{TFR}_{i,t} &= \alpha + \rho \mathrm{HDI}_{i,t} + \beta \mathrm{TREAT}_t + \gamma \mathrm{HDI}_{i,t} * \mathrm{TREAT}_t + \eta \mathrm{HDI}_{i,t} * \mathrm{TREATED}_i \\ &+ \boldsymbol{\theta HDI_{i,t} * TREAT_t * TREATED_i} + \sum_k \delta_k \mathrm{X}_{i,k,t} + y_t + \mu_i + \varepsilon_{i,t}\end{aligned}$$

Estimation results DiD

- more gender equality lead to a more effective reduction of fertility as countries develop
- coefficient around 0.5,→ one out of two women has one child less on average after gender-parity friendly law changes have taken effect

HDI	-3.384**
	(1.559)
treatment	-0.706**
	(0.302)
Treatment*HDI	0.682
	(0.442)
treated*HDI	-2.474
	(1.813)
treatment*treated*HDI	**-0.494****
	(0.213)
female education 20-39	-0.196***
	(0.0638)
Constant	7.558***
	(0.584)
Observations	1,530
Number of regions	657
R-squared	0.351
Year FE	YES

Conclusion

- gender equality norms at the family level matter greatly for the fertility-development relationship
- fertility-decreasing effects of development are larger when there is more gender equality
- effect "individual-level" gender inequality is different: direct negative association with fertility
- possible interpretation: as countries develop, the persistence of low female autonomy within families prevents women from seizing the benefits of increased opportunities outside the family
- we can confirm the catalyzing effect of gender inequality in a more causal empirical set-up
- policies aiming at fertility reductions should promote gender equality alongside other development efforts in education, health, and living standards to reap the full benefits for potential fertility reductions

THANK YOU FOR YOUR ATTENTION

QUESTIONS, COMMENTS?

DiD sample (1530 obs.)	mean	sd	min	max
Fertility	4.1	1.6	0.87	8.58
HDI	0.54	0.13	0.19	0.81
Education levels of women of reprod. age	6.5	3.2	0.21	14
Only treated regions (284 obs.)				
Fertility	3.9	1.2	1.4	7.7
HDI	0.56	0.12	0.25	0.78
Avg. years of education of women ages 20-39	6.3	3.1	0.2	14
Only untreated regions (1246 obs.)				
Fertility	4.2	1.6	0.9	8.6
HDI	0.54	0.13	0.19	0.81
Avg. years of education of women ages 20-39	7.5	3.2	0.4	12.6
Pre-treatment period, <2009 (823 obs.)				
Fertility	4.1	1.6	0.9	8
HDI	0.53	0.13	0.19	0.78
Avg. years of education of women ages 20-39	6.4	3.2	0.2	14
Post-treatment period, >=2009 (707 obs.)				
Fertility	4.2	1.6	1.3	8.6
HDI	0.56	0.12	0.24	0.81
Avg. years of education of women ages 20-39	6.7	3.2	0.3	13.7

	(1)	(2)	(3)	(4)	(5)
VARIABLES (all lagged by t-1)	full sample	gender control	gender interaction	gender interaction & controls	including individual gender ineq.
HDI	-4.337***	-4.376***	-6.515***	-24.74**	-23.64**
	(1.597)	(1.591)	(2.386)	(11.75)	(10.93)
HDI*Spouse_agediff			0.289	0.483**	0.604***
			(0.226)	(0.211)	(0.218)
Spouse_agediff		-0.0822	-0.207*	-0.301**	-0.369**
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Age_firstbirth				-0.499	-0.453
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Educ_females 20-39				-0.165**	-0.119
				(0.0765)	(0.0788)
Education gap					0.214**
					(0.107)
Constant	6.688***	7.221***	8.263***	18.73***	17.79***
	(0.790)	(0.995)	(1.307)	(6.920)	(6.193)
Year fixed effects	YES	YES	YES	YES	YES
Observations	1,364	1,364	1,364	1,364	1,364
R-squared	0.236	0.240	0.245	0.273	0.286
Number of regions	647	647	647	647	647
Effect of HDI					

Robustness tests:

- Split sample by fertility (3 grous)
- Additive instead of multiplicative HDI
- Run model separately for each HDI component