Democracy, Genes, and the Male Survival Disadvantage

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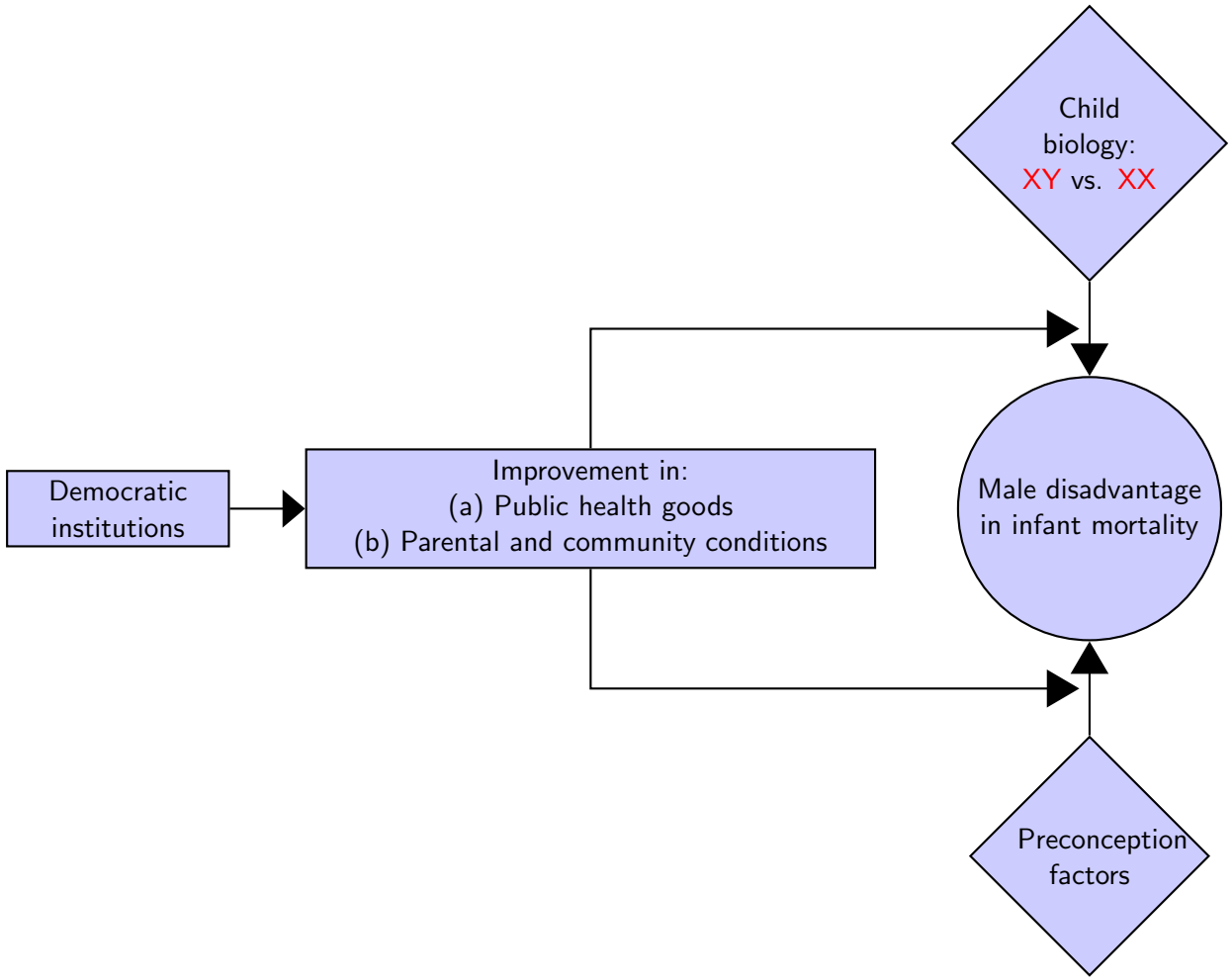
Motivation

- Globally, the under-five mortality rate is 1.15 times higher for boys compared to girls [UN (2015)]:
  - → **Genetic** and **preconception** factors are the main causes of the survival disadvantage of boys [Naeye et al. (1971); Waldron (1998), Pongou (2013, 2015)].
- At the same time, the male survival disadvantage varies widely across countries.
  - → But there is very little research on the **social and institutional mechanisms** that explain this variation.

Research Question

- To what extent do **democratic institutions** affect the male disadvantage in infant mortality?
- How?

Conceptual Framework: Why would democratic institutions matter?



Hypothesis: Improved democratic institutions translate into better public health services and better parental and community conditions, which in turn **constrain** preconception and biological influences on male mortality.

Main Results (preview)

- Moving from autocracy to consolidated democracy reduces the survival disadvantage of boys by **about 20%** of the average male-female difference in infant mortality.

- **Channel:**
  - → Better democratic institutions foster gender-neutral health interventions that have stronger benefits for the survival of boys (e.g: tetanus immunization)...
  - → ...and constrain biological influences on the male survival disadvantage.

Contributions to the literature

- Literature on the **determinants of sex-based disparities in child mortality** [Graunt (1662); Naeye et al. (1971); Waldron (1998); Pongou et al. (2017)].
  - → Additional evidence on the importance of political institutions: democracy matters.
  - → New insights on the potential mechanism.

- Literature that relates **public policies and genetic influences on health outcomes** [Boardman (2009, 2012)].
  - → Appropriate public health policies can mitigate the influence of genes on sex-gap in early-age mortality.

Data we need

- Sub-Saharan African countries.

- Mortality of boys (treatment group) and girls (counterfactual) within the first year of life.
  - → **Source: Demographic and Health Surveys** (1986-2017).
  - → Fertility history of woman between 15 and 49 years old.
  - → Socio-economic and health characteristics.

- Quality of democratic institutions.
  - → **Source: Political IV data series** (1800-2017).
  - → For each year and country, a "Polity Score" is determined which ranges from -10 to +10.
  - → Key features of regime legitimacy: (1) quality of executive recruitment, (2) constraints on executive authority, and (3) political competition.

Identification Strategy

$$M_{icmt} = \lambda_0 + \lambda_1 Male_i + \lambda_2 Demo_{ct} + \lambda_3 Male_i \times Demo_{ct} + X'_{imt}\pi + \alpha_m + \delta_t + \varepsilon_{icmt} \quad (1)$$

Where:

- M_{icmt}: dummy equals to 1 if a baby i born in year t from mother m in country c dies before age of 1.
- $Male_i$: dummy equals to 1 if child i is a boy.
- $Demo_{ct}$: score of polity IV for country c in year t.
- X_{imt}: vector of exogenous covariates.
- α_m *and* δ_t: refer to mother and year of birth fixed effects.

Main Results

Table 1: Level of democracy and the male survival disadvantage

More

Dependent variable:	Died in the first year after birth			
	(1)	(2)	(3)	(4) Pol>Median
Male	13.05***	13.48***	13.44***	14.61***
	(0.635)	(0.633)	(0.636)	(0.896)
Democracy by Polity IV	-0.53**	-0.39**	-0.13	-1.33
	(0.222)	(0.181)	(0.132)	(1.954)
Male × Democracy by Polity IV	-0.24***	-0.19***	-0.19***	-1.67**
	(0.060)	(0.064)	(0.064)	(0.676)
Year FE	✓	✓	✓	✓
Country FE	✓			
Mother FE		✓	✓	✓
Exogenous Covariates	✓	✓	See note	See note
Country-specific trend			✓	✓
N	3,792,650	3,792,650	3,792,650	3,792,650

Interpretation: Improved democratic institutions reduce the survival disadvantage of boys by about 20% of the average male-female difference in infant mortality.

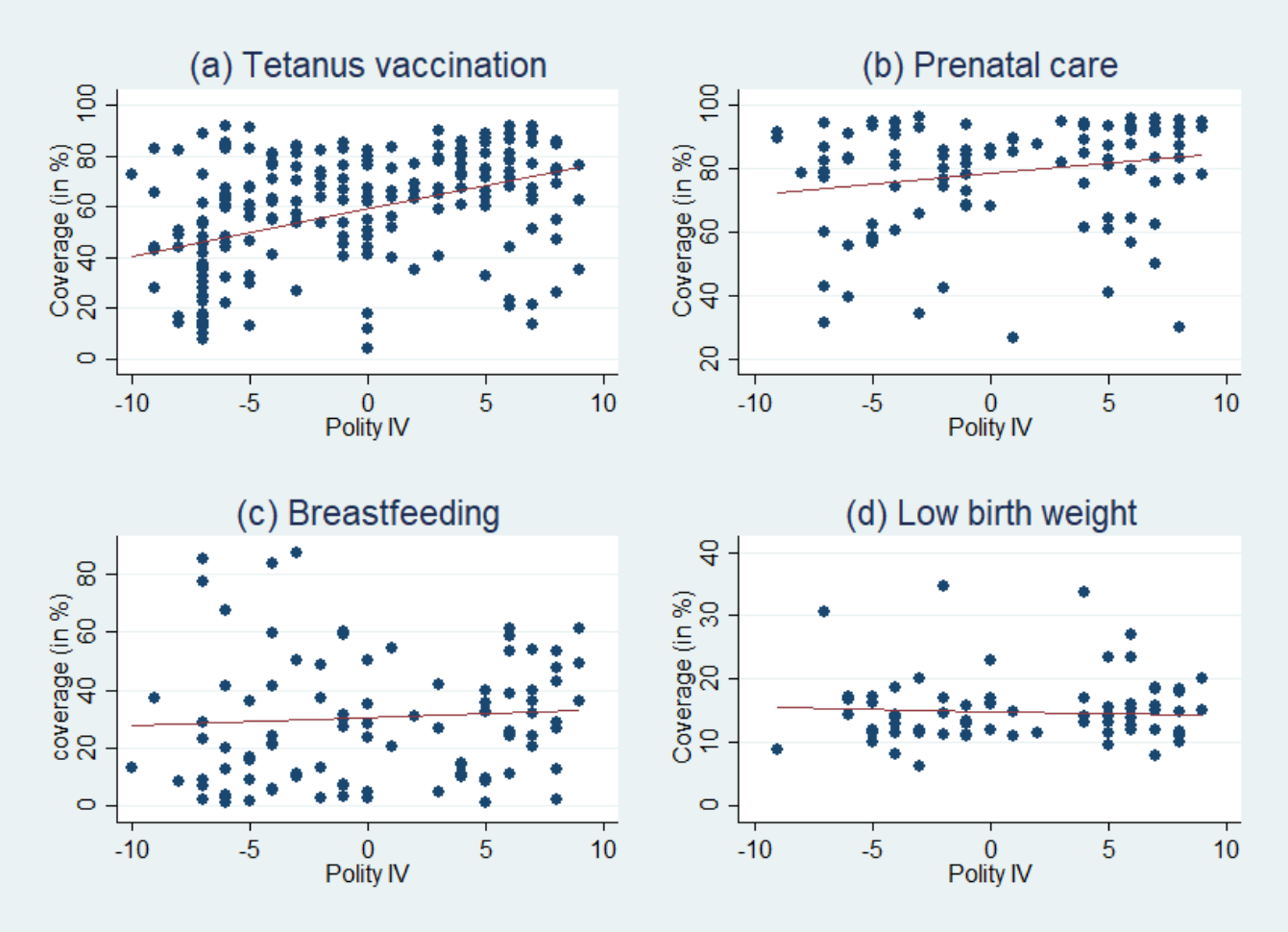
Mechanism

- **Prenatal tetanus vaccination, prenatal care services, exclusive breastfeeding and normal birth weight ($>= 2.5kg$)** are some health interventions/inputs known to prevent infant deaths.

    1. Provision of these health inputs increases with the quality of democratic institutions.
    2. Effectiveness of these health inputs is greater for boys.
    3. Contribution of biological factors decreases with the level of democracy.

Mechanism (con't)

Figure 2: Health inputs access and level of democracy



Interpretation: Improved democratic institutions is associated with increasing access to prenatal tetanus vaccination and prenatal care services, and expansion of exclusive breastfeeding practices.

Mechanism (con't)

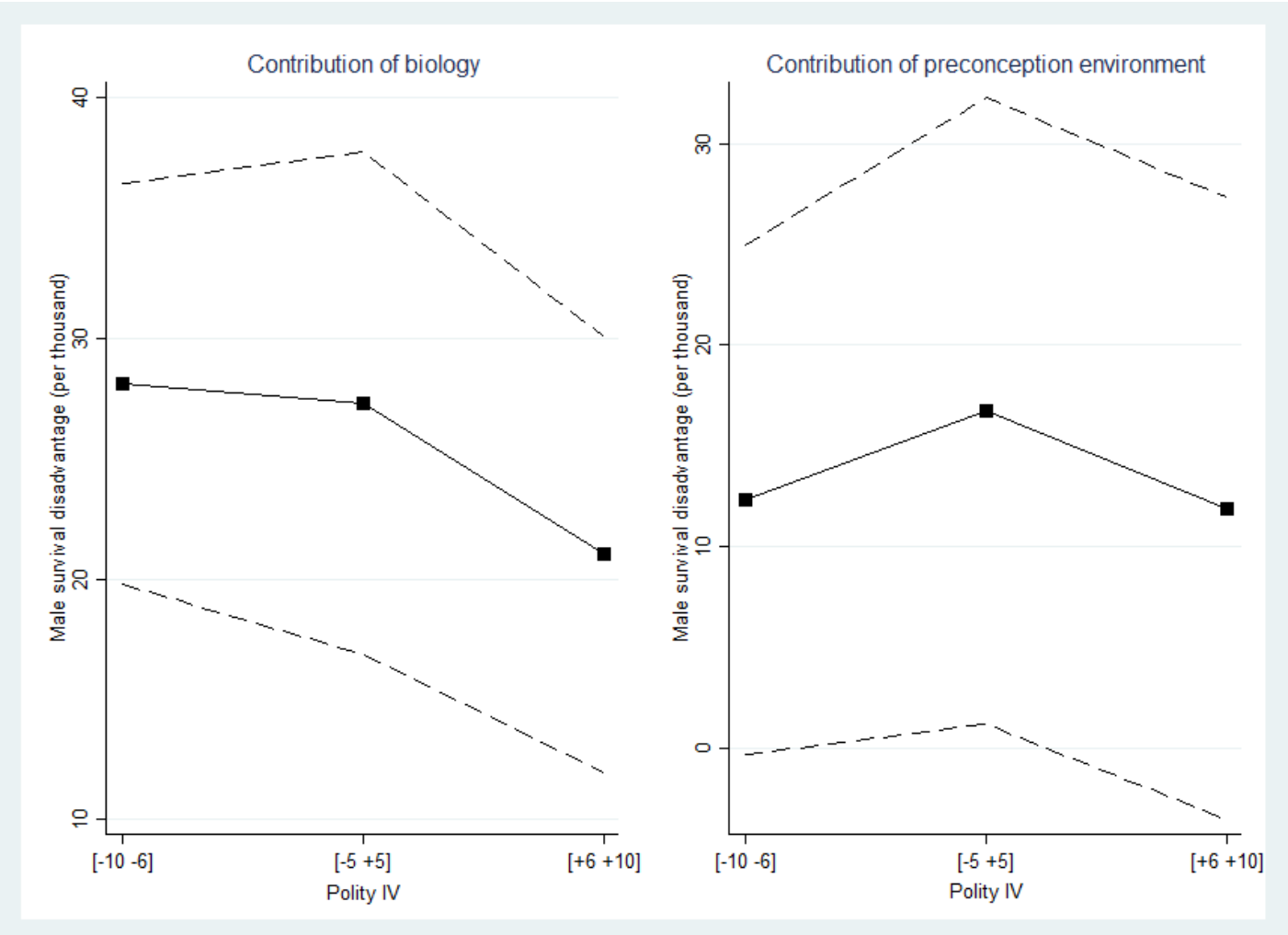
Table 2: Effectiveness of health inputs is greater for boys

Dependent variable:	**Died in the first year after birth**			
Type of health input:	Prenatal Tetanus	Prenatal Care	Birth Weight $>= 2.5kg$	Exclusive Breastfeeding
	(1)	(2)	(3)	(4)
Male	11.02***	9.48***	25.39***	28.37***
	(1.038)	(1.798)	(2.575)	(3.474)
health input	-13.77***	-19.80***	-30.74***	-233.65***
	(1.479)	(3.054)	(2.970)	(21.862)
Male × health input	-3.72***	-1.65	-19.17***	-28.15***
	(1.088)	(1.783)	(2.346)	(3.494)
Year FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Exogenous Covariates	✓	✓	✓	✓
N	755,629	713,309	442,798	107,776
Sample mean	0.722	0.840	0.891	0.704
Sd	0.45	0.37	0.31	0.46

Interpretation: Prenatal tetanus vaccination, prenatal care services, exclusive breastfeeding, normal birth weight, and exclusive breastfeeding have stronger benefits for the survival of boys.

Mechanism (con't)

Figure 3: Democracy, Biology and Preconception Factors, an Experiment with Twins



Interpretation: Improved democracy constrains genetic effects more than preconception effects on the male survival disadvantage.

Conclusion

- Improvement in the quality of democratic institutions **reduces significantly** the male disadvantage in infant mortality.
- **Mechanism:** Democratic governments are more likely to provide gender-neutral public health goods effective at reducing infant mortality;
  - $\rightarrow$ These interventions have stronger benefits for the survival of boys (e.g: tetanus immunization or exclusive breastfeeding practices).
  - $\rightarrow$ and they are likely to constrain the contribution of biological factors to the male survival disadvantage.

Thank you for your attention.

Table 1: **Descriptive Statistics**

	N	Mean	Std. de.	Min.	Max.
Child-level characteristics					
Infant Mortality (IM per thousand)					
IM Male	1,927,074	90.17	286.43	0	1000
IM Female	1,865,576	76.67	266.07	0	1000
IM Both gender	3,792,650	83.53	276.68	0	1000
Child is a boy	3,792,650	0.51	0.50	0	1
Child is a twin	3,792,650	0.03	0.17	0	1
Birth order number	3,792,650	3.38	2.28	1	21
Year of birth of child	3,792,650	1995	10.63	1960	2015
Age mother at delivery	3,792,650	25	6.25	15	49
Mother-level characteristics					
Year of birth of the mother	978,223	1973	11.33	1936	2000
Number of children	978,223	4.15	2.60	1	20
Mother is married	948,855	0.72	0.45	0	1
Mother has no education	978,159	0.55	0.50	0	1
Household wealth index					
Poor	703,667	0.42	0.49	0	1
Rich	703,667	0.38	0.49	0	1
Urban residence	978,223	0.32	0.47	0	1
Country-level characteristics					
Number of children per country	39	97,247	74,165	9,407	327,261
Polity IV	1,768	-2.68	5.60	-10	9
GDP per capita (2010 US)	1,657	1,280	1,927	116	19,493
ODA† as a percentage of GDP	1,646	0.10	0.11	-0	1.47

Note: †*Official Development Assistance.*

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Robustness checks 1

Table 2: **Robustness check**

			Different cut-off of Polity IV			
	Baseline	Covariates of democracy	Pol>Median	Pol>4	-6<Pol<=5	5<Pol<=10
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Probability of infant death						
Male	13.44***	13.46***	14.61***	14.38***	15.11***	15.11***
	(0.636)	(0.608)	(0.896)	(0.778)	(1.057)	(1.057)
Democracy by Polity IV	-0.13	-0.17	-1.33	-3.83**	-0.16	-3.06
	(0.132)	(0.134)	(1.954)	(1.424)	(2.738)	(2.502)
Male × Democracy by Polity IV	-0.19***	-0.19***	-1.67**	-2.74***	-1.78*	-3.09***
	(0.064)	(0.060)	(0.676)	(0.893)	(0.985)	(1.086)
Year FE	✓	✓	✓	✓	✓	✓
Country FE						
Mother FE	✓	✓	✓	✓	✓	✓
Exogenous Covariates	✓	✓	✓	✓	✓	✓
Country-specific trend	✓	✓	✓	✓	✓	✓
N	3,792,649	3,652,709	3,792,650	3,792,650	3,792,650	3,792,650

Note: Each entry is from a separate OLS regression. Robust standard errors are in parenthesis, adjusted for clustering by country. Each specification controls for an indicator for multiple birth, a set of birth order dummies, a set of year of survey fixed effects, the mothers's number of child at the time of delivery, the age of mother at delivery and the square of the age of mother at delivery. Columns (2) adds controls for both the log of GDP (2010 US) and the level of ODA as a percentage of GDP. In columns (3) and (4) we use an indicator of democracy equal to 1 if Polity IV is strictly greater than the median (-4) and +4 respectively. Columns (5) and (6) display estimates from a unique regression where we define a country as "autocratic", "anocratic" or democratic if Polity IV is respectively strictly less than -5, between -5 and 5 or strictly greater than 5. $***p < 0.01, **p < 0.05, *p < 0.1$.

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Unbundling Democracy

Table 3: **What type of political change matters?**

	Executive Recruitment			Executive authority	Political competition	
	Regulation	Competitiveness	Openness	Constraints	Regulation	Competitiveness
Dependent variable: Probability of infant death						
Male	15.33***	14.43***	14.37***	15.74***	9.89***	16.33***
	(1.421)	(0.732)	(0.956)	(1.030)	(1.513)	(1.188)
Components of Polity IV	-0.05	-0.02	0.46	0.09	0.61	-0.81
	(1.290)	(0.675)	(0.474)	(0.377)	(1.188)	(1.022)
Male × Components of Polity IV	-0.91	-0.77***	-0.32	-0.70***	1.15**	-1.21***
	(0.615)	(0.257)	(0.262)	(0.190)	(0.487)	(0.324)
Year FE	✓	✓	✓	✓	✓	✓
Country FE						
Mother FE	✓	✓	✓	✓	✓	✓
Exogenous Covariates	✓	✓	✓	✓	✓	✓
Country-specific trend	✓	✓	✓	✓	✓	✓
N	3,571,491	3,571,491	3,571,491	3,571,491	3,571,491	3,571,491

Note: Each entry is from a separate OLS regression. Robust standard errors are in parenthesis, adjusted for clustering by country. Each specification controls for an indicator for multiple birth, a set of birth order dummies, a set of year of survey fixed effects, the mothers's number of child at the time of delivery, the age of mother at delivery and the square of the age of mother at delivery. $***p < 0.01, **p < 0.05, *p < 0.1$.

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Robustness checks 2

Table 4: **Robustness to alternative measures of democracy**

	PRS (1)	FH (2)	PS (3)	BMR (4)	ANRR (5)
Male	14.67***	14.21***	14.55***	14.28***	14.24***
	(1.230)	(0.777)	(0.753)	(0.784)	(0.840)
Democracy measure	-0.73*	-0.22	-3.13*	-2.53	-2.42
	(0.416)	(1.439)	(1.638)	(1.845)	(1.508)
Male × Democracy measure	-0.52	-1.23	-2.06*	-2.00**	-1.21
	(0.319)	(0.829)	(1.029)	(0.968)	(0.924)
Year FE	✓	✓	✓	✓	✓
Country FE					
Mother FE	✓	✓	✓	✓	✓
Exogenous Covariates	✓	✓	✓	✓	✓
Country-specific trend	✓	✓	✓	✓	✓
N	2,669,871	3,719,303	2,892,174	3,636,890	3,636,897

Note: Each entry is from a separate OLS regression. Robust standard errors are in parenthesis, adjusted for clustering by country. Each specification controls for an indicator for multiple birth, a set of birth order dummies, a set of year of survey fixed effects, the mothers's number of child at the time of delivery, the age of mother at delivery and the square of the age of mother at delivery. In columns 1-5 the democracy measure is based on 5 indexes: the democratic accountability index defined by Political Risk Services, the Freedom House index, a measure of democracy derived from Papaionnou and Siourounis's classification, a dichotomous index from Boix Miller and Rosato, and a measure of democracy defined by Acemoglu et al. respectively. $***p < 0.01, **p < 0.05, *p < 0.1$.

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Model Specification for the twin-based regression

$$M_{icmt} = \lambda_0 + \lambda_1 Male_i + X'_{imt}\pi + \alpha_c + \theta_t + \varepsilon_{icmt} \quad (2.1)$$

$$M_{icmt} = \lambda_0 + \lambda_1 Male_i + X'_{imt}\pi + \gamma_{twin} + \theta_t + \varepsilon_{icmt} \quad (2.2)$$

where:

- M_{icmt} is a dummy that equals 1 if a baby i born at time t from mother m in country c dies before age 1.
- $Male_i$ dummy equals to 1 if child i is a boy.
- X_{imt} vector of exogenous covariates(maternal and child characteristics).
- α_c Country fixed effects.
- γ_{twin} Twin fixed effects.
- θ_t Year fixed effects.

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