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Does Pension Coverage Predict Fertility? International Evidence from OLS, Fixed Effects and Machine Learning Random Forests

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Abstract

We complement existing literature by estimating determinants of the total fertility rate for 183 economies between 2000 and 2023. Methodologically, we utilise pooled OLS and economy/country fixed-effects regressions and complement them with exploratory random forests, which take into account non-linearities and interaction effects. Variable importance measures suggest that after two indicators for life expectancy, GDP per capita, and schooling, pension coverage is among the more important predictors of fertility. Our results suggest that acknowledging the costs of childbearing and childrearing in pension systems may be a method to address declining fertility.

JEL classification

C53, H55, J13

Keywords

demography, birth rate, retirement, pay as you go

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1 Introduction

Fertility has declined globally in recent years, with many economies now having a total fertility rate (TFR) below the replacement rate of 2.1. Although fertility remains comparatively high in some economies, it has fallen for most of the past two decades (Figure A1). It is also striking that several economies which might be regarded as socially conservative now also exhibit fertility around or below replacement. This development has reignited the debate on low fertility rates and appropriate policy responses (De Sandre 2000, Blake and Mayhew 2006, Cigno 2007, Werding 2014, Regős 2015, Kendzia and Zimmermann 2013, Wolf 2026a-c).

Potential reasons for the fertility decline include improved fertility control and women's autonomy (Becker 1960, Goldin and Katz, 2002), higher opportunity costs of childbearing due to women's improved earnings potential, and higher incomes allowing for alternative uses of consumption, as far as having children can be seen economically as a form of consumption (Folbre 1994).

Our focus is the role of the public pension system, which may lower fertility due to moral hazard problems: children have traditionally also been a form of investment. First and foremost, they can be an investment for old-age support, both in the form of income and care. Second, this investment can be extended to children's productive potential, predominantly their education (Becker, 1960). Modern pension insurance provides old-age benefits which are usually independent of the number of children a parent has invested in. They thus insure both against unwanted childlessness and ingratitude of existing children. However, pension systems also entail incentives to free-ride by deliberately not having and investing in children (Folbre 1994), who are supposed to pay the future pensions for their parents' generations in pay-as-you-go pension systems (Sinn 2004). Although childcare and education subsidies can partially mitigate these moral hazard effects (Fenge and Meier 2005, Cremer et al. 2011, Yasuoka and Miyake 2014), the empirical relevance of pension systems relative to other potential fertility determinants remains unclear.

Previous evidence from diverse settings generally supports a negative association between public pensions or social security and fertility. Fenge and Scheubel (2017) find fewer births in

German regions with higher pension enrolment between 1895 and 1907. For 46 Sub-Saharan countries (1960-2007) Holmqvist (2011) reports declining fertility following public pension introduction. Cross-country analyses of around 100 countries in 1994 and 1995 report negative associations between social security or pension spending and fertility (Galasso et al. 2009, Boldrin et al. 2015). Using person-level data between 1994 and 2000, Del Boca et al. (2005) similarly find that social transfers in Italy, France, and the UK are negatively associated with fertility.

We estimate traditional OLS and fixed-effects models and complement them with modern exploratory random forests to study associations with fertility using recent data across 183 economies and to some extent across time to exploit institutional differences. Our contribution is the broader economy/country coverage and the use of internationally comparable data on pension coverage, which has been made available comparatively recently for a larger set of economies (for 2019). Additionally, the explorative random forests allow for non-linearities and interactions and provide evidence on variables' relative predictive relevance (variable importance).

The remainder is structured as follows: Section 2 describes the data. Section 3 presents the results from pooled OLS, fixed-effects and random forests and Section 4 concludes.

2 Data and descriptive statistics

We compile an economy-year panel for the years 2000-2023 from the World Bank, the United Nations, the International Labour Organization, and Barro and Lee (2013) databases, following the World Bank's list of economies.[1] Our dependent variable, the TFR, combines the age-specific fertility rates for all women up to age 55 in the respective year. Pension coverage, which is the share of the population above the legal retirement age that receives an old-age pension, is only available sparsely across economies apart from the years 2000 and 2019.

Gender equality is measured using the Women, Business and the Law index (WBL, World Bank 2024a), alternatively including the overall score or its subcomponents (excluding the pension

[1] The data sources, as well as the python code for the main results can be found in the following GitHub repository: https://github.com/puhanipa/Does-Pension-Coverage-Predict-Fertility-

component). The subcomponents assess gender differences in rights regarding property, entrepreneurship, marriage and mobility as well as pregnancy-related work protections, laws on gender-based occupational segregation, pay differences and women's legal capacity to work. Higher scores may imply women's empowerment towards making more independent fertility choices and pursue education or careers, thus potentially reducing fertility. We further control for women's status using the sex ratio at birth. Higher values may indicate son preference, reflecting underlying gender discrimination, and thus potentially influence fertility decisions.

To account for economic and social development, we include life expectancy at birth and the under-five mortality rate, as higher child survival rates may reduce the perceived need for additional children, while contemporaneously increasing the cost of successfully raising children. Mean years of schooling control for the opportunity costs of children. We use the logarithm of GDP per capita to represent overall economic development. Furthermore, we include an index of political stability and the absence of violence or terrorism. Finally, we control for demographic differences with the logarithms of the total population and population density, the share of urban population and net migration. Table A1 provides variable definitions and their sources.

Plotting fertility against the pension coverage for our unbalanced panel of 738 observations between the years 2000 and 2023 shows substantial variation in the pension coverage, despite some clustering at full coverage (Figure A2). The relationship is negative. A striking feature of our sample is that the variation in all variables between economies is much larger than the variation within economies over time (Table A2), limiting our potential to identify meaningful and precise fixed-effects estimates. The panel is highly unbalanced over time with 122 observations being available for 2000 and 130 for 2019, but coverage is sparser in most other years. This pattern provides limited consecutive economy-year observations and therefore constrains the analysis of alternative lag structures. Table A3 lists the 183 included economies and the number of observations over time for each economy.

3 Empirical results

3.1 Pooled ordinary least squares and fixed-effects regressions

Table 1 reports coefficients and standard errors for the pooled OLS regressions and the economy-fixed-effects regressions in columns (1)/(2) and (3)/(4), respectively. Columns (1) and (3) include the overall score of the Women, Business and the Law index, whereas columns (2) and (4) include its subcomponents less its pension component, in case it absorbs some of the variation in our key variable, pension coverage.

In the pooled OLS regression, pension coverage is significant at the one percent level with a coefficient of -0.004 in column (1). This implies that a ten percentage point decrease in pension coverage would be associated with an increase in fertility by 0.04, if the estimate had a causal interpretation. In order to achieve an associated increase in the TFR by 0.4, that is for example from 1.6 to 2.0 (still below the replacement rate), pension coverage would have to go from full to no coverage.

Replacing the aggregate Women, Business and the Law index with its subcomponents leaves the coefficient largely unchanged at -0.003 and statistically significant at the five percent level (column 2). Exploiting only the within-economy variation yields estimates of the same magnitude, although the coefficient decreases slightly to -0.002 in column (4), remaining statistically significant (columns 3 and 4). Thus, pension coverage is negatively associated with fertility across all specifications.

Considering the estimates of the other variables in our main pooled OLS estimates, we find that the coefficients of log GDP per capita are negative and highly statistically significant. A ten percent increase in GDP per capita is associated with a decrease in the TFR of 0.020 in column (1) and 0.019 in column (2). The sex ratio is highly significant in columns (1) and (2) and the estimates suggest that an increase from 1 to 1.1 is associated with a decrease in fertility of 0.81 and 0.69, respectively. Part of this large association might be direct by not completing pregnancies with female foetuses. Several Women, Business and the Law index subcomponents are statistically significant, but the implied magnitudes are small relative to their observed ranges (Table A2).

3.2 Machine learning to take into account non-linearities and interactions: random forests

Linear models may not capture non-linear relationships or the effects of interactions between explanatory variables on fertility. Thus, we estimate two exploratory random forest models, which differ only by how we include the Women, Business and the Law index. Random forests combine regression trees with random choices of explanatory variables and training and validation data for each regression tree (Breiman 2001). We estimate 400 regression trees without further hyperparameter tuning using "RandomForestRegressor" in Python's "scikit-learn" module (version 1.7.2 in Python 3.12, Pedregosa et al. 2011). We report both impurity-based and permutation-based measures of variable importance (Figure 1 and Figure 2). The former summarises each variable's contribution to reducing the prediction error across the forest, whereas the latter measures the deterioration in predictive performance after a variable is randomly permuted. Thus, they should not be interpreted as causal effects or direct measures of effect size.

Our machine learning random forests markedly improve in-sample fit. The root mean square error, which is 0.54 and 0.51 for the two pooled OLS models (Table 1, columns (1) and (2), drops to only about 0.12 for both corresponding random forest models. Hence, our exploratory random forests are able to capture more complexity in the relationships between the explanatory and dependent variable, thus being able to meet the challenge posed by the "tendency of independent variables to affect fertility in joint fashion" (Hohm 1975, p. 641).[2]

Figures 1 and 2 report impurity-based and permutation variable importance measures from the two random forest models. While the absolute magnitudes of the two measures are not directly comparable, because of their normalisation to their respective maximum, their rankings provide a useful assessment of the robustness of variables' relative contribution to model performance. The five highest-ranked predictors are identical in the same order across both random forest specifications and importance measures. Pension coverage, our variable of interest, ranks fifth following mean years of schooling. Under-five mortality, life expectancy, and GDP per capita are consistently the most

[2] The python code was written using OpenAI ChatGTP 5.6 Terra as distributed via Leibniz University Hannover artificial intelligence (LUHKI).

important predictors. Rankings become less consistent beyond the five leading predictors across both random forest specifications and variable importance measures, although most variables differ by no more than one rank between the latter.

According to permutation importance, political stability and absence of violence ranks sixth in the specification including the overall score of the Women, Business and the Law index, while it ranks eighth in the specification using the subcomponents. It ranks eighth in both specifications according to impurity importance. Under permutation importance, the sex ratio ranks seventh in the specification including the aggregate Women, Business and the Law index and sixth in the specification using the subcomponents. These positions are reversed under impurity-based importance. The Women, Business and the Law index, its subcomponents, and the remaining demographic variables appear in the lower part of variable importance rankings under both importance measures.

4 Conclusions

Declining fertility rates are putting social security systems, especially public pension systems, under strain. This paper uses data made available recently for a larger set of economies than in previous literature to show that pension coverage is consistently negatively associated with fertility across our pooled OLS and economy fixed-effects specifications.

In our complementary exploratory random forest regressions, pension coverage ranks among the more important predictors of fertility, after indicators of child survival, life expectancy, GDP per capita and schooling. With most industrialised economies already near the frontier of longevity and child survival, and with higher GDP per capita and education associated with lower fertility, these results underline the potential relevance of pension system adjustments in moderating the ongoing fertility decline.

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Declaration of generative AI use

During the preparation of this work the authors used OpenAI ChatGTP 5.6 Terra as distributed via Leibniz University Hannover artificial intelligence (LUHKI) to write python code, improve language, clarity and conciseness of text written by the authors. After using this service, the authors reviewed and edited the content.

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Table 1: Determinants of the total fertility rate: economy-year evidence, 2000-2023

	(1) Pooled OLS	(2) Pooled OLS	(3) Fixed effects	(4) Fixed effects
Pension coverage (% of population above legal retirement age receiving a pension)	-0.004***	-0.003**	-0.003**	-0.002**
	(0.001)	(0.002)	(0.001)	(0.001)
Women, business and the law (WBL) index, overall score (0-100)	-0.005	-	-0.002	-
	(0.003)	-	(0.004)	-
WBL assets indicator score (0-100)	-	-0.007***	-	-0.006**
	-	(0.002)	-	(0.002)
WBL entrepreneurship indicator score (0-100)	-	0.004*	-	-0.004**
	-	(0.002)	-	(0.002)
WBL marriage indicator score (0-100)	-	-0.002	-	-0.003
	-	(0.003)	-	(0.002)
WBL mobility indicator score (0-100)	-	-0.005**	-	-0.001
	-	(0.003)	-	(0.002)
WBL parenthood indicator score (0-100)	-	0.001	-	-0.002
	-	(0.001)	-	(0.001)
WBL pay indicator score (0-100)	-	-0.002	-	-0.001
	-	(0.002)	-	(0.001)
WBL workplace indicator score (0-100)	-	0.004**	-	0.001
	-	(0.002)	-	(0.001)
Sex ratio (males over females)	-8.107***	-6.947***	2.355	1.997
	(1.940)	(1.922)	(2.198)	(2.173)
Life expectancy at birth (years)	0.030**	0.011	0.018	0.018
	(0.013)	(0.012)	(0.012)	(0.011)
Under-five mortality rate (per 1,000 live births)	0.024***	0.023***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Mean years of schooling	-0.014	-0.007	-0.009	-0.024
	(0.027)	(0.028)	(0.031)	(0.032)
Log. of total population	-0.025	-0.026	0.345	0.085
	(0.027)	(0.027)	(1.181)	(1.048)
Log. of population density	-0.107***	-0.093***	-1.692	-1.380
	(0.026)	(0.024)	(1.155)	(1.023)
Urban population (% of total)	-0.002	-0.002	-0.015*	-0.013*
	(0.003)	(0.003)	(0.008)	(0.008)
Log. of GDP per capita (constant 2015 USD)	-0.203***	-0.185***	0.175	0.165
	(0.074)	(0.070)	(0.125)	(0.124)
Political stability and absence of violence/terrorism (std. units)	-0.117	-0.045	-0.130***	-0.128***
	(0.085)	(0.075)	(0.044)	(0.044)
Net migration (millions)	0.159	0.156	-0.097	-0.087
	(0.109)	(0.106)	(0.081)	(0.081)
Constant	11.754***	11.842***	-	-
	(2.040)	(2.081)	-	-
R2/R2 within	0.825	0.846	0.648	0.665
N	183	183	183	183
T bar	4.0	4.0	4.0	4.0
Observations	738	738	738	738

Notes: Pooled OLS in cols. (1)/(2); specifications with economy fixed effects in cols. (3)/(4). Unit of observation: economy-year, 2000-2023. Dependent variable: total fertility rate. Cols. (1) and (3) include the overall Women, Business and the Law index (WBL); cols. (2) and (4) use its subcomponents (entered jointly minus its pension subcomponent). Controls as in Section 2. Standard errors clustered at the economy level (in parentheses). *, **, *** denote p<0.10, p<0.05, p<0.01. *Sources and variable definitions*: Table A1; own calculations.

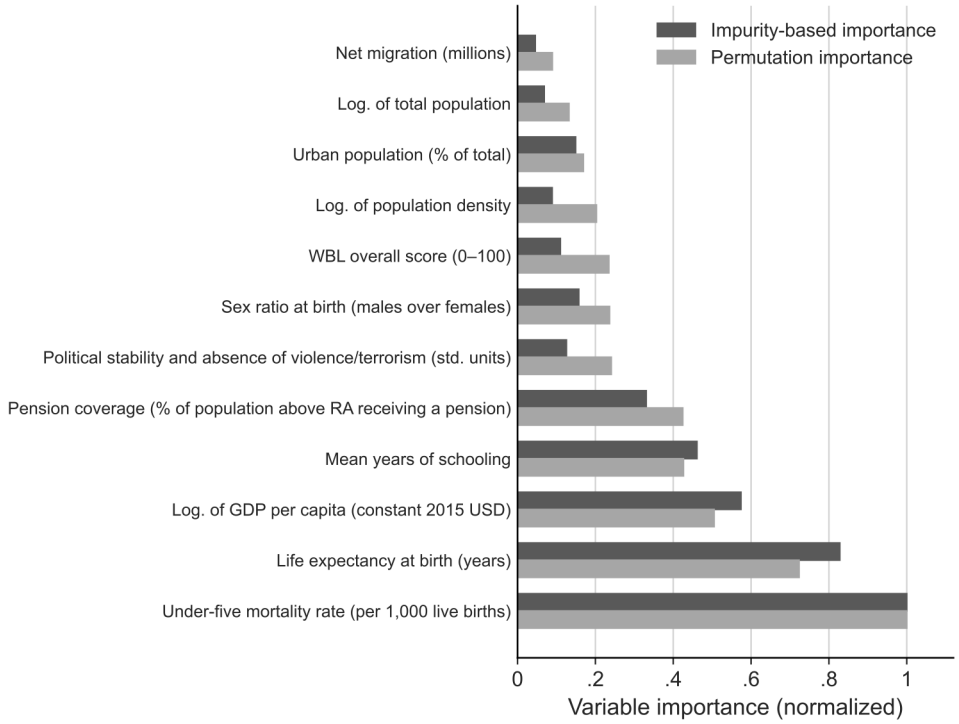


Figure 1. Variable importance in a random forest including the overall Women, Business and the Law index score.
Notes: legal retirement age (RA); Women, business and the law index (WBL)
Sources and variable definitions: see Table A1; own calculations.

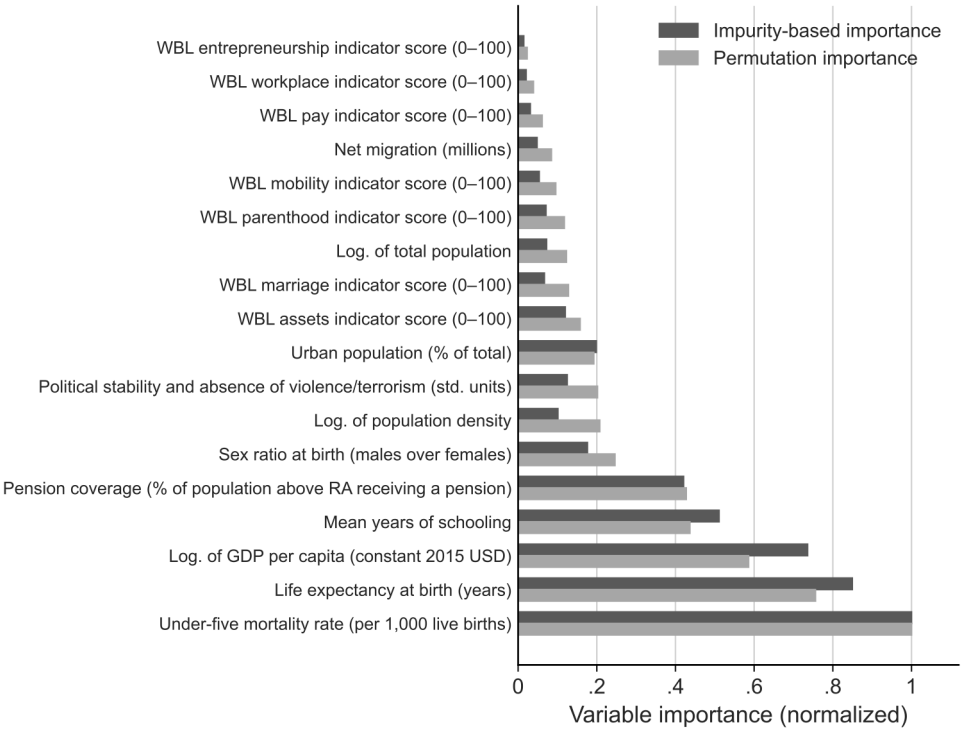


Figure 2. Variable importance in a random forest including the Women, Business and the Law index subcomponents.
Notes: legal retirement age (RA); Women, business and the law index (WBL)
Sources and variable definitions: see Table A1; own calculations.

Appendix

Table A1: Variable definitions and sources

Variable	Definition	Source
Total fertility rate	number of births per woman	WB – *World Development Indicators (WDI)*
Pension coverage	share of the population above the legal retirement age that effectively receives an old-age pension, %	ILO - *Labour Market-Related SDG Indicators (ILOSTAT)*
Women, business and the law index (WBL), overall score	index on laws and regulations affecting women's economic opportunity, 0-100	WB – *Women, Business and the Law Dataset*
WBL assets indicator	gender differences in rights to property, 0-100	WB – *Women, Business and the Law Dataset*
WBL entrepreneurship indicator	gender differences in legal requirements to start a business, 0-100	WB – *Women, Business and the Law Dataset*
WBL marriage indicator	gender differences in marriage and divorce rights, 0-100	WB – *Women, Business and the Law Dataset*
WBL mobility indicator	gender differences in freedom of movement, 0-100	WB – *Women, Business and the Law Dataset*
WBL parenthood indicator	laws affecting women's work during and after pregnancy, 0-100	WB – *Women, Business and the Law Dataset*
WBL pay indicator	laws on occupational segregation based on gender and the gender pay gap, 0-100	WB – *Women, Business and the Law Dataset*
WBL workplace indicator	laws affecting women's legal capacity and ability to work aa well as workplace protections against discrimination and sexual harassment, 0-100	WB – *Women, Business and the Law Dataset*
Sex ratio	male births over female births	UN – *World Population Prospects*, WB – *WDI*
Life expectancy at birth	number of years a newborn is expected to live	WB – *WDI*, UN – *World Population Prospects*
Under-five mortality rate	probability of dying between birth and five years of age, per 1000 live births	UN – *World Population Prospects*
Mean years of schooling	average number of years of education received by individuals aged 25 and above	UNDP – *Human Development Report*, Barro and Lee (2013)
Log. of total population	logarithm of total population	WB – *WDI*
Log. of population density	logarithm of people per square kilometre of land area	WB – *WDI*
Urban population	population living in urban areas, % of total population	WB – *WDI*
Log. of GDP per capita	logarithm of gross domestic product per capita, constant 2015 dollars	WB – *WDI*
Political stability and absence of violence/terrorism	estimates perceived stability of political power and governance (security from destabilisation, risk that authority will be challenged or altered through violent, coercive, or unconstitutional means), units of a standard normal distribution (approximately -2.5 to 2.5)	WB - *Worldwide Governance Indicators*
Net migration	number of immigrants minus number of emigrants, in millions	WB – *WDI*

Notes: When two sources are listed, the baseline source is the first one mentioned while the second was used to supplement missing observations.
Sources: Barro and Lee (2013), International Labour Organization (ILO; 2025), United Nations (UN; 2024), United Nations Development Programme (UNDP; 2025), World Bank (WB; 2024b, 2024c, 2024d).

Table A2: Sample means, overall, between and within variation in the panel data context

Variable		Mean	S.d.	Minimum	Maximum
Total fertility rate (births per woman)	overall	2.63	1.41	0.75	7.83
	between		1.44	0.98	7.52
	within		0.35	1.42	4.27
Pension coverage (% of population above legal retirement age receiving a pension)	overall	61.63	38.25	0.00	100.00
	between		37.30	0.00	100.00
	within		11.25	-5.93	107.96
Women, business and the law (WBL) index, overall score (scale 0-100)	overall	74.96	17.89	23.75	100.00
	between		17.17	25.83	98.54
	within		7.24	35.77	94.34
WBL assets indicator score (scale 0-100)	overall	84.17	25.11	0.00	100.00
	between		27.08	0.00	100.00
	within		6.30	20.17	137.51
WBL entrepreneurship indicator score (scale 0-100)	overall	83.64	17.15	0.00	100.00
	between		16.06	0.00	100.00
	within		9.41	1.50	133.64
WBL marriage indicator score (scale 0-100)	overall	78.67	27.60	0.00	100.00
	between		28.70	0.00	100.00
	within		9.30	27.24	113.67
WBL mobility indicator score (scale 0-100)	overall	88.69	21.77	0.00	100.00
	between		22.68	0.00	100.00
	within		5.54	51.19	126.19
WBL parenthood indicator score (scale 0-100)	overall	54.07	31.99	0	100
	between		30.2	0	100
	within		12.1	-9.93	99.07
WBL pay indicator score (scale 0-100)	overall	63.65	31.11	0.00	100.00
	between		28.11	0.00	100.00
	within		14.08	-11.35	130.32
WBL workplace indicator score (scale 0-100)	overall	74.36	32.28	0.00	100.00
	between		28.64	0.00	100.00
	within		18.34	-11.36	130.61
Sex ratio (males over females)	overall	1.05	0.02	1.01	1.17
	between		0.02	1.01	1.14
	within		0.01	1.02	1.10
Life expectancy at birth (years)	overall	71.77	8.50	31.53	85.51
	between		8.56	31.53	83.68
	within		2.55	57.85	80.05
Under-five mortality rate (per 1,000 live births)	overall	30.65	37.53	1.80	238.21
	between		38.82	2.53	238.21
	within		15.17	-30.34	121.40
Mean years of schooling	overall	8.91	3.31	1.16	14.30
	between		3.27	1.30	13.90
	within		0.80	5.17	11.64

Log. of total population	overall	15.97	1.98	9.79	21.08
	between		2.04	9.79	21.05
	within		0.12	15.48	16.35
Log. of population density	overall	4.30	1.42	0.46	9.02
	between		1.41	0.67	8.99
	within		0.12	3.80	4.68
Urban population (% of total)	overall	59.34	22.57	8.25	100.00
	between		22.66	11.15	100.00
	within		3.32	38.21	69.65
Log. of GDP per capita (constant 2015 USD)	overall	8.73	1.44	5.54	11.62
	between		1.4	5.63	11.56
	within		0.21	7.41	9.27
Political stability and absence of violence/terrorism (std. units)	overall	0.00	0.94	-2.77	1.76
	between		0.92	-2.59	1.44
	within		0.30	-1.66	1.80
Net migration (millions)	overall	0.02	0.25	-1.35	1.77
	between		0.19	-0.94	1.60
	within		0.12	-0.80	0.90

Notes: Estimation sample, unbalanced economy-year panel 2000-2023 (N = 738; 183 economies). Units as labeled; unweighted.
Sources and variable definitions: see Table A1; own calculations.

Table A3: Observations by economy in the sample

Economy	Obser-vations	Economy	Obser-vations	Economy	Obser-vations	Economy	Obser-vations
Afghanistan	3	Dominica	4	Lebanon	2	Samoa	3
Albania	3	Dominican Republic	4	Lesotho	3	Sao Tome and Principe	5
Algeria	3	Ecuador	4	Liberia	1	Saudi Arabia	2
Angola	3	Egypt, Arab Rep.	3	Libya	3	Senegal	4
Antigua and Barbuda	2	El Salvador	4	Lithuania	4	Serbia	4
Argentina	4	Equatorial Guinea	1	Luxembourg	6	Seychelles	4
Armenia	4	Estonia	6	Madagascar	3	Sierra Leone	3
Australia	5	Eswatini	3	Malawi	4	Singapore	3
Austria	6	Ethiopia	2	Malaysia	4	Slovak Republic	5
Azerbaijan	3	Fiji	6	Maldives	4	Slovenia	7
Bahamas, The	3	Finland	6	Mali	4	Solomon Islands	1
Bahrain	3	France	6	Malta	4	Somalia	1
Bangladesh	4	Gabon	1	Marshall Islands	1	South Africa	4
Barbados	4	Gambia, The	2	Mauritania	4	Spain	5
Belarus	5	Georgia	4	Mauritius	5	Sri Lanka	5
Belgium	6	Germany	8	Mexico	8	St. Kitts and Nevis	3
Belize	3	Ghana	5	Micronesia, Fed. Sts.	3	St. Lucia	5
Benin	5	Greece	4	Moldova	4	St. Vincent and the Grenadines	1
Bhutan	2	Grenada	3	Mongolia	7	Sudan	4
Bolivia	6	Guatemala	4	Montenegro	4	Suriname	2
Bosnia and Herzegovina	3	Guinea	3	Morocco	3	Sweden	6
Botswana	6	Guinea-Bissau	2	Mozambique	7	Switzerland	5
Brazil	4	Guyana	3	Myanmar	1	Syrian Arab Republic	2
Brunei Darussalam	4	Haiti	3	Namibia	5	Tajikistan	4
Bulgaria	7	Honduras	6	Nepal	5	Tanzania	5
Burkina Faso	3	Hong Kong SAR, China	4	Netherlands	6	Thailand	4
Burundi	2	Hungary	4	New Zealand	7	Timor-Leste	4
Cabo Verde	9	Iceland	4	Nicaragua	4	Togo	5
Cambodia	5	India	5	Niger	2	Tonga	3
Cameroon	3	Indonesia	4	Nigeria	4	Trinidad and Tobago	4
Canada	8	Iran, Islamic Rep.	3	North Macedonia	4	Tunisia	5
Central African Republic	1	Iraq	2	Norway	6	Turkiye	4
Chad	4	Ireland	4	Oman	4	Uganda	6
Chile	4	Israel	7	Pakistan	4	Ukraine	5
China	9	Italy	4	Palau	1	United Arab Emirates	2
Colombia	4	Jamaica	3	Panama	3	United Kingdom	6
Comoros	1	Japan	6	Papua New Guinea	4	United States	7
Congo, Dem. Rep.	6	Jordan	5	Paraguay	4	Uruguay	6
Congo, Rep	2	Kazakhstan	4	Peru	4	Uzbekistan	7

Costa Rica	3	Kenya	4	Philippines	4	Vanuatu	2
Cote d'Ivoire	3	Kiribati	2	Poland	2	Viet Nam	3
Croatia	4	Korea, Rep.	6	Portugal	3	West Bank and Gaza	3
Cyprus	5	Kuwait	4	Qatar	2	Yemen, Rep.	3
Czechia	5	Kyrgyz Republic	7	Romania	4	Zambia	4
Denmark	6	Lao PDR	4	Russian Federation	6	Zimbabwe	5
Djibouti	1	Latvia	4	Rwanda	4		

Sources: see Table A1; own calculations.

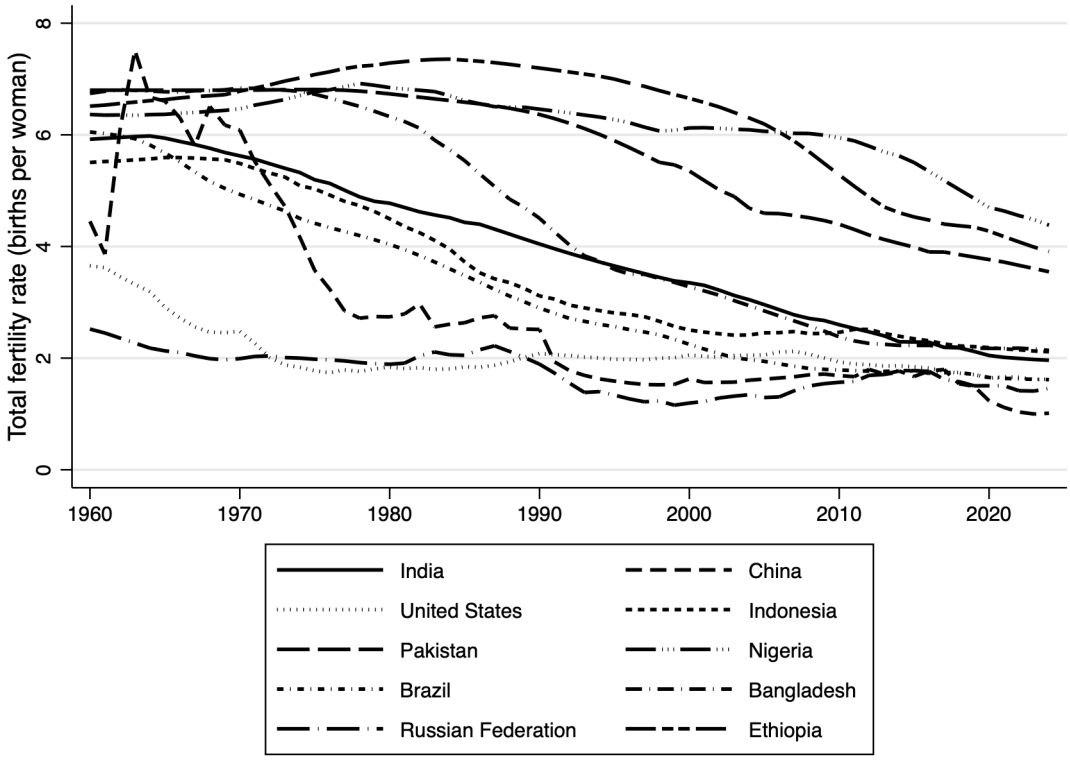


Figure A1a. Total fertility rates of the world's 10 most populous economies over time.
Sources: see Table A1; own calculations.

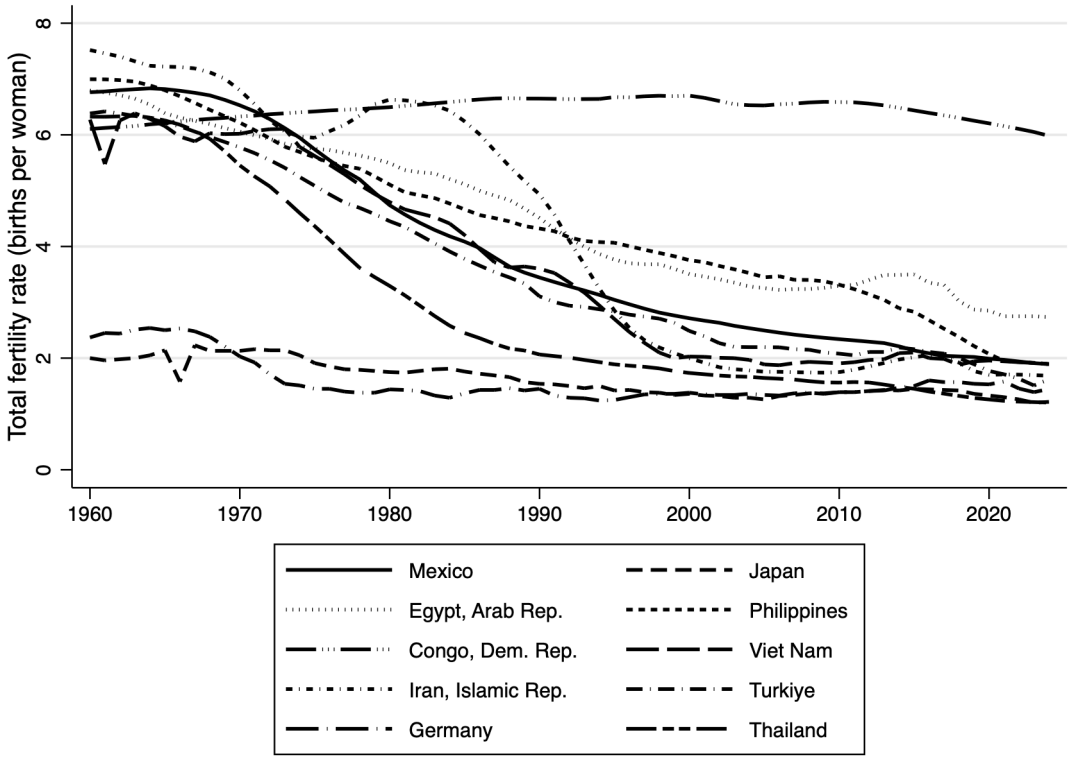


Figure A1b. Total fertility rates of the world's 11th to 20th most populous economies over time.
Sources: see Table A1; own calculations.

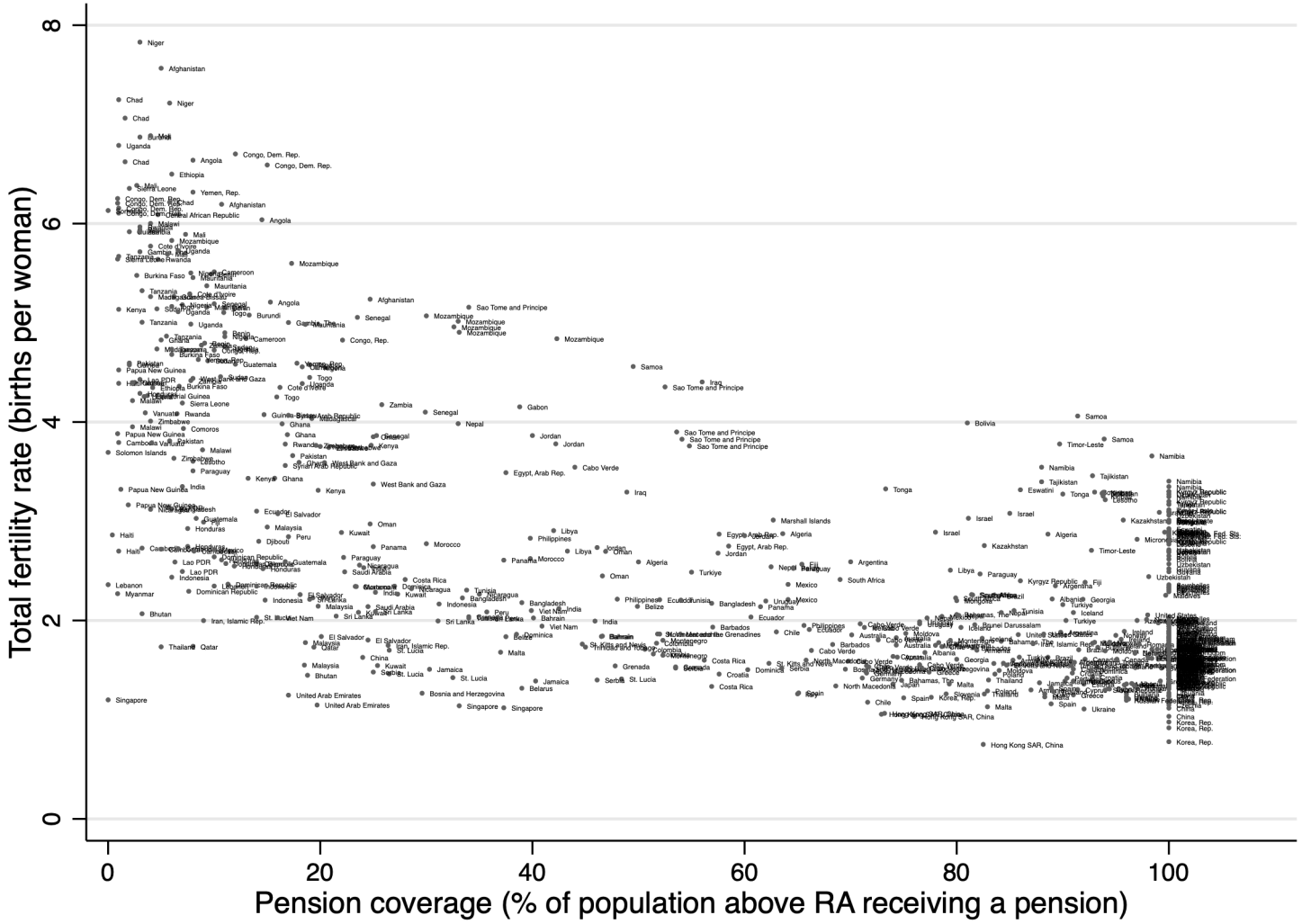


Figure A2. Scatter plot of the total fertility rate against the percent of the population above legal retirement age (RA) receiving a pension.
Sources: see Table A1; own calculations.