Empirical Analysis of Fertility

A Cross-Country Study of the Pacific Islands

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1. Introduction

- Declining Total Fertility Rate (TFR) is important for economies with both small and mature populations – impacts labor force and human capital.
- *Demographic Transition* was late coming to the Pacific. In the pre- contact period, fertility was low amongst most of the Islands.
- History confirms a slow increase in population where high fertility was followed by high mortality as well- *The Epidemiological Transition*
- All the countries in the Pacific will converge to replacement level fertility (2.1) in short to medium term (Alam, Molla, Rahman and Murad, 2009).

Cont'd

- Drastic changes in fertility within the ethnic groups in a country can also influence major socio-economic decisions.
- Long-run economic growth trajectory becomes uncertain for high mortality and migration regime countries (unless fertility breaks the bounds of replacement level).
- Hence, it is vital to identify determinants of fertility in PICs. This will help government to device effective plans to manage population and financial resources (Siddiqui, 1996).

2. Literature Review

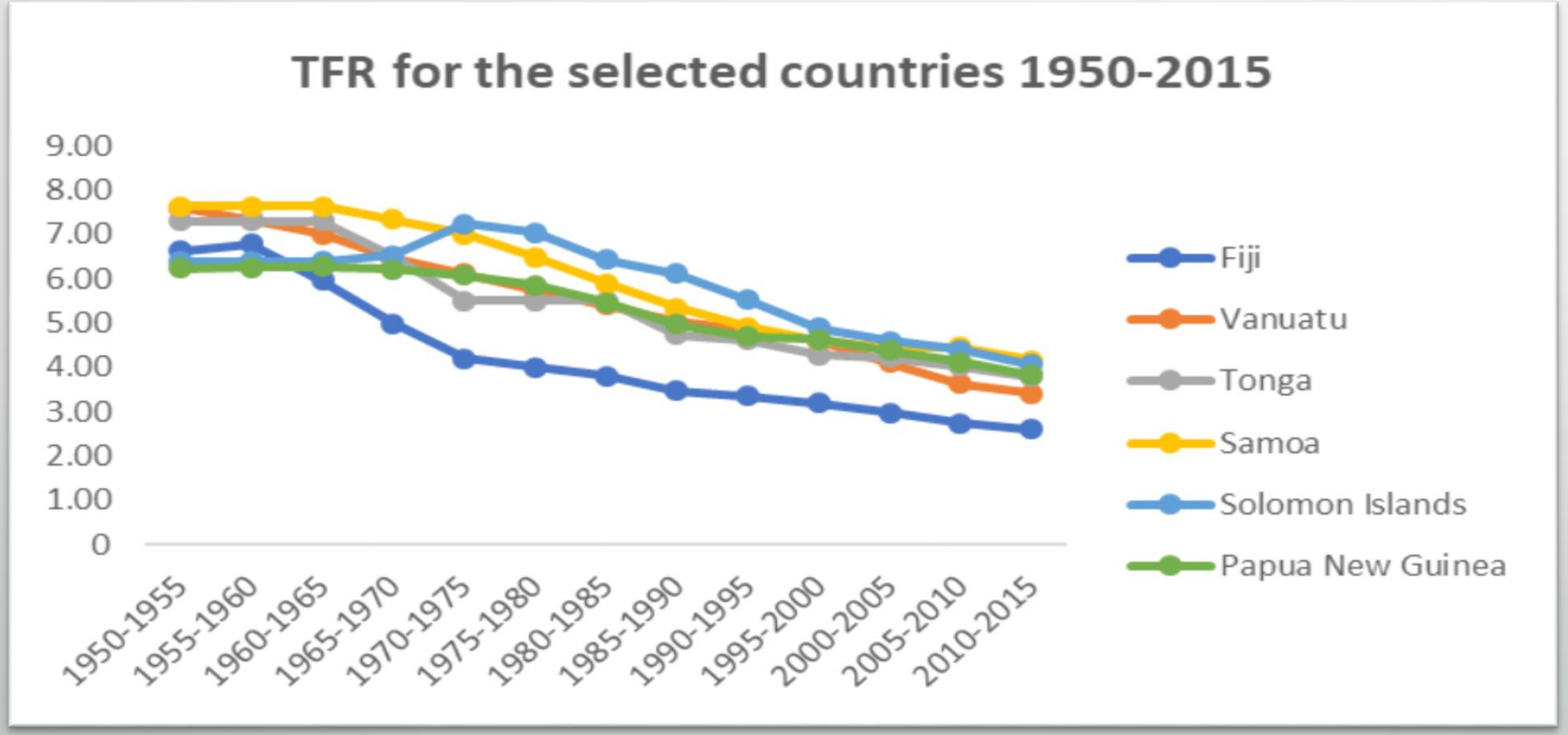
- The United Nations Population Fund (2017) expects that the world's population will reach 8 billion by 2023.
- Davis & Blake (1956) suggest that fertility is shaped by a woman's ability to reproduce as well as her socio-economic environment.
- Davis (1962) used other second-order/ultimate variables to explain the fertility changes- Kingsley Davis circle.
- Dutt & Ros (2008) explained the role of global diffusion process in setting up correlation between fertility, life expectancy and other factors such as female education and contraceptive use.

Cont'd

- Islam (2017) show that family planning, prolonged duration of postpartum infecund period, contraceptive use and many more as important determinants of fertility.
- Mosley (2006) conceptualizes exposure to intercourse, exposure to conception, gestation and successful parturition as additional factors.
- Statistics show that more than 46% of world's population has fertility below replacement level of 2.1 (United Nations; Economic and Social Affairs; Population Division, 2015).

3. Fertility Trends in Pacific

Figure 1: Fertility Trends in Six Major PICs (1950-2015)



Source: (The United Nations Population Division)

3. Fertility Trends in Pacific

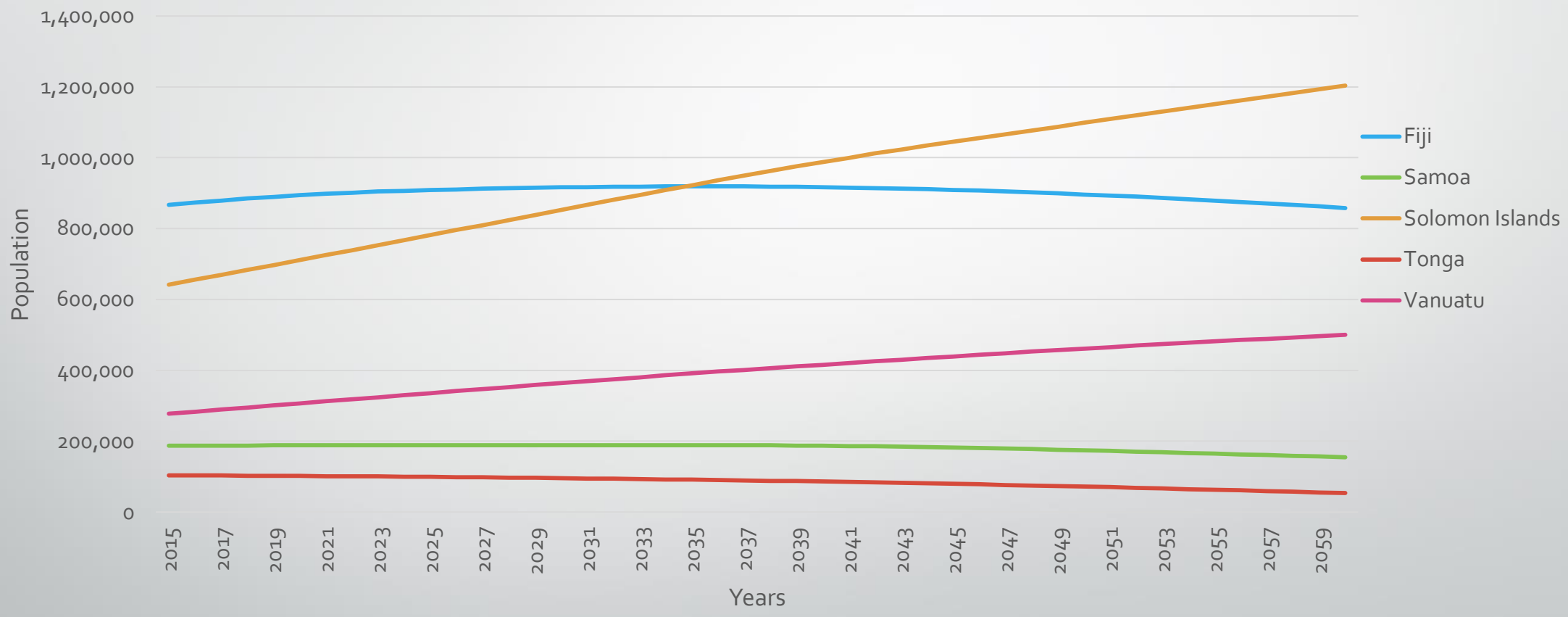
Table 1: List of Intermediate Fertility Countries

Country, Territory or area	Intermediate Fertility *(TFR=2.11-4.99)*			Percentage change		Maximum	Minimum
	1950-1955	1970-1975	1995-2000	1950-1955 to 1970-1975	1970-1975 to 1995-2000		
French Polynesia	6.0	5.2	2.6	-13.3	-50.0	6.50	2.60
Solomon Islands	*6.40*	*7.24*	*4.91*	*13.1*	*-32.19*	*7.24*	*4.91*
Tonga	*7.30*	*5.50*	*4.29*	*-24.7*	*-22*	*7.30*	*4.29*
New Caledonia	5.0	5.0	2.6	4.0	-50.0	5.30	2.60
Fiji	*6.6*	*4.2*	*3.2*	*-36.4*	*-23.8*	*6.79*	*3.20*
Guam	5.5	4.1	4.0	-25.5	-2.4	6.03	3.08
Samoa	*7.3*	*5.7*	*4.5*	*-21.9*	*-21.1*	*7.30*	*4.51*
Papua New Guinea	*6.2*	*6.1*	*4.6*	*-1.6*	*-24.6*	*6.29*	*4.60*
Vanuatu	*7.6*	*6.1*	*4.6*	*-19.7*	*-24.6*	*7.60*	*4.59*

Source: Adapted from (Gubhaju & Moriki-Durand, 2003)

5. Population Projection

Figure 2: Projected Pacific Population, (2015-2050)



Source:(Authors Computation)

4. Proximate Causes of Fertility

4.1 Health Indicators

According to the Classical Demographic Transition Theory, the driving factor behind declining fertility is high health status (mortality rates and life expectancy).

4.2 Income and Affordability

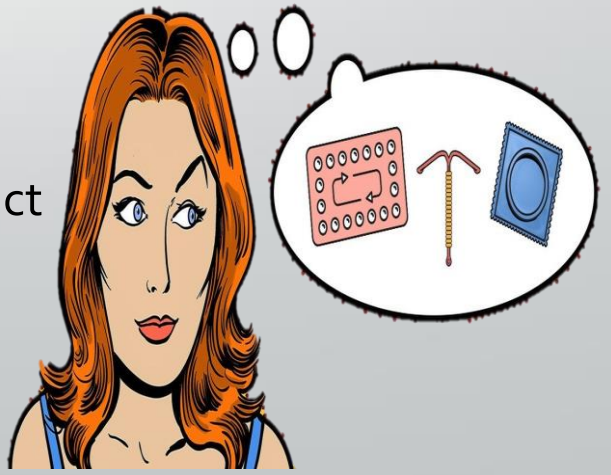
Household income plays an important role in influencing fertility. The cross-country per-capita income and fertility share a distinct relationship.

4.3 Contraception Use

The strength of the relationship between TFRs and contraceptive prevalence is phenomenal as it explains the largest variations in TFR in Pacific.

4.4 Modern Living

Modern living involves small (one or two-child) family and this can impact fertility rates in the region, as it does globally.



4. Proximate Causes of Fertility

4.5 Female Education

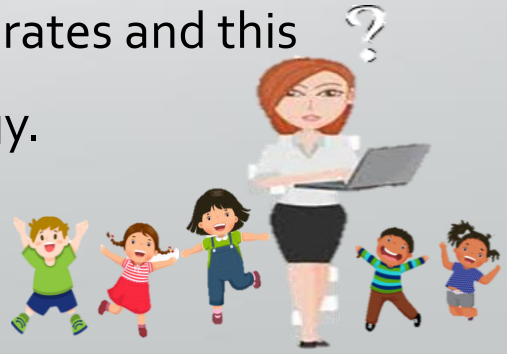
Female education is very important in explaining fertility rates as an increase in educational attainment has been linked to improved access to sexual and reproductive rights.

4.6 Women in Employment

Over the past few decades, there has been continued growth of women's involvement in PICs' labour force. It strongly coincides with female education.

4.7 Modes of Interactions

As the medium of people's interaction increased, so did fertility rates and this is highly likely through the use of mobile and internet technology.



5. Methodology

Panel data methods is used to estimate the determinants of fertility in the region. All estimates are made in STATA-14. The empirical model is for six PICs from 1989-2017 and is as follows:

$$\boldsymbol{lnTFR_{it} = \alpha_i + \beta_i \sum_{x=1}^{n} lnX_{it} + \epsilon_{it}}$$

Where TFR is the total fertility rates in country i, and X's represent the proximate variable set that measure causes of TFR (in logs). The tested variables with their expected signs (in brackets) are:

1. EDU – gross enrolment of females in secondary schools (-)
2. INC – per capita income (in constant US dollars), (-)
3. MOB – log of annual mobile subscriptions in country i (+)
4. CPR – contraceptive prevalence rate (in % of population) (-)
5. LFE – life expectancy at birth (in years) (-/+)
6. EMP – the number of women in total labour force (-)
7. POP – population density (person per hectare of land) (+)
8. URBAN –urban concentration ratio (%) (+)

The error term ϵ_{it} is assumed to follow the white noise process.

6. Empirical Results

Table 2: Panel Estimates of TFR in Pacific Economics

Sample: (1989-2018)

	RE	FE	GMM1	GMM2
Constant	9.695 [0.00]***	7.798[0.00]	-0.206[0.00]***	-0.229[0.00]***
Women Education	---	---	-0.009[0.00]***	-0.013[0.00]***
Mobile Suscription	0.042 [0.00]***	0.026[0.00]***	0.001[0.00]***	0.001[0.01]***
Per-capita Income	-0.182 [0.00]***	-0.066 [0.00]***	-0.003[0.00]***	-0.002[0.04]***
Life Expectancy	-1.524 [0.00]***	-1.228[0.00]***	0.051[0.00]***	0.058[0.00]***
Women in Employment	-0.261 [0.00]***	-0.236 [0.00]**	---	---
Contraceptive Prévalence	-1.050 [0.00]***	-1.509[0.00]***	-0.082[0.00]***	-0.061[0.00]***
Modernisation	-0.997 [0.00]***	-1.135[0.00]***	-0.371[0.00]***	-0.261[0.00]***
R-bar Squared	0.966	0.905	0.857	0.842
Arellano-Bond Test for AR(1), AR(2)	---	---	0.663 [0.32] 0.527 [0.27]	0.719 [0.39] 0.646 [0.19]
Wald χ^2	4701.13 [0.00]	626.5[0.00]	10905.6 [0.00]	8931.9 [0.00]

Notes: (i) The p-values are in brackets beside the coefficients. *** indicates significance at 1% (ii) vce(robust) option was adopted to control for heteroscedasticity and autocorrelation in the RE models, see Stock and Watson (2008). The missing 2018 observations for some indicators were obtained using linear interpolations.

7. CONCLUSION

- Fertility Transition is more apparent than real. It is not just a common phenomenon for developed countries.
- It can be concluded that TFR will continue to decline until 2045 when all countries will reach their replacement level.
- This will continue to have implications on major socio-economic outcomes of the region.
- The empirical findings suggest that ..... in the Pacific.
- If TFR does not pick-up sharply in the near future, the Pacific will have serious consequences on human capital and economic productivity.
- We need to manage Pacific population growth – you heard of "ghost towns" I am predicting "ghost island countries"

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