

The influence of financial development on total fertility rate in Indonesia

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Abstract

This study investigated the impact of financial development on the total fertility rate in Indonesia, hypothesizing that financial development significantly influences fertility rates. The objective was to ascertain the effects of financial development on Indonesia's total fertility rate, utilizing annual time series data from 1980 to 2021 obtained from the official websites of Bank Indonesia, the Central Bureau of Statistics, and the World Bank. The analysis employed the Autoregressive Distributed Lag (ARDL) method to examine the influence of the money supply in circulation (M2), Gross Domestic Product, and household consumption on the total fertility rate, with these variables serving as proxies for financial development. The study utilized a comprehensive data analysis approach, including stationary tests, cointegration bound tests, ARDL Model analysis for long-term and short-term effects, and classical assumption tests. The findings revealed that the money supply (M2) has a negative and significant impact on the total fertility rate, the Gross Domestic Product also negatively and significantly affects the total fertility rate, while household consumption positively and significantly influences the total fertility rate. These results underscore the multifaceted relationship between financial development and fertility trends in Indonesia.

Keywords: *ARDL method, Financial development, Total fertility rate.*

JEL Classification: O160, J110, C180

INTRODUCTION

The global population continues to rise, a trend evident in Indonesia. High fertility rates primarily drive this growth. Fertility, the capacity of humans to produce offspring, is defined in demography as the actual reproductive results of an individual or a group of women. According to Leibenstein (1975), the total birth rate in a region reflects the number of newborns to women of childbearing age within that area. The 2020 population census data revealed that Indonesia's population had reached 270.2 million.

The high fertility rate has negative consequences, such as a population explosion, which leads to shortages of land and food and increased competition for resources. As science, industrialization, and modern lifestyles have evolved, Becker (1960) pointed out the critical importance of fertility concerning opportunity costs. The fertility issue is

not solely about the number of children; it encompasses many complex and varied aspects.

According to World Bank data from 2022, the global population reached 7.837 billion people in 2021, marking an increase of 72.7 million or 0.94 per cent from the previous year. In 2021, China had the largest population, totalling 1.412 billion people, representing 18.02 per cent of the global population. India was the next most populous country, with a population of 1.393 billion, followed by the United States at 331.89 million and Indonesia at 276.36 million. Becker (1960) introduced an economic approach to fertility analysis, highlighting the impact of parental income levels and the costs associated with child care and upbringing on fertility rates. He suggested that an increase in parental income alters the desire for children, with a preference for quality over quantity.

Financial development is crucial in influencing fertility rates, primarily because advancements and enhancements in the financial intermediation sector have enabled labour transition from traditional to modern sectors, contributing to the reduction in fertility rates observed in numerous developing countries. Mantra (2003) asserts that the interplay between social and economic conditions significantly affects fertility.

Financial development is characterized by improvements in the financial system's quantity, quality, and efficiency, as proposed by Čihák et al. (2012). The evolution of the financial sector exerts a significant impact on fertility rates. The expansion and advancement of the financial intermediary sector facilitate labour movement from traditional to modern sectors, playing a pivotal role in the fertility decline in many developing countries, according to Svirydzenka (2016).

Figure 1. illustrates the increasing trend in financial sector development alongside a declining birth rate. Initiating family planning (KB) programs in Indonesia in 1970 has significantly reduced the birth rate from 5.65 in 1960 to 2.28 births per woman in 2020. The program was rigorously implemented until 1998, achieving notable success. However, following the monetary crisis, the control and oversight of the family planning program by the National Population and Family Planning Board (BKKBN) weakened, leading to a less-than-optimal decline in the trend.

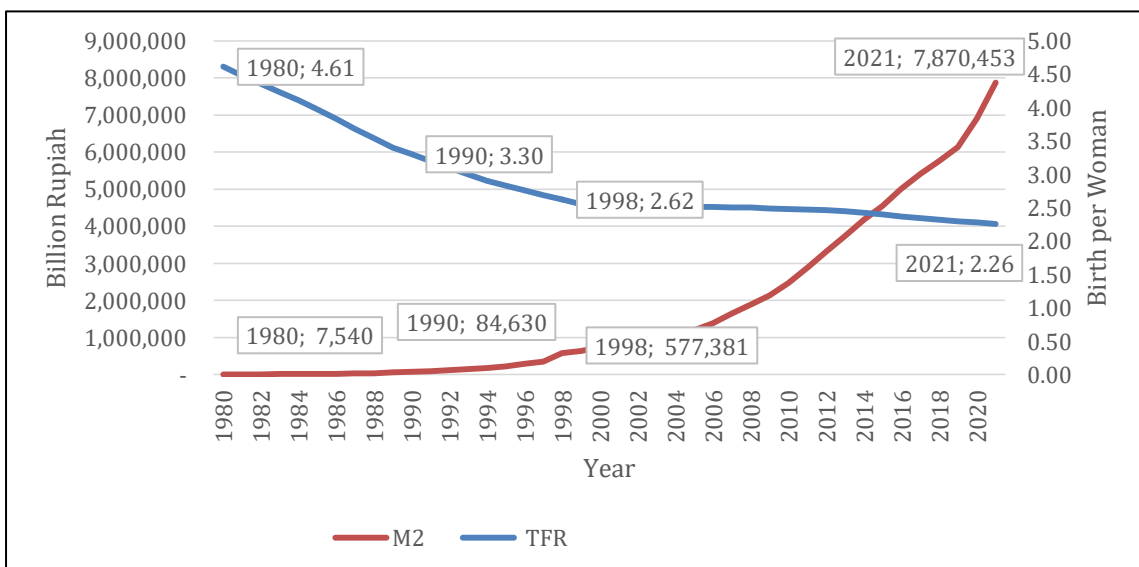


Figure 1. Growth of the fertility and M2 Indonesia, 1980-2020

Source: World Bank, Bank Indonesia (2022)

On the side of the financial sector, its impact on fertility rates is mediated through increased economic welfare. Developing a well-managed financial sector enhances the economic welfare of individuals, as evidenced by the increased money supply within the community. The economy of a country is fundamentally linked to monetary transactions. The interplay between socioeconomic changes, financial development and fertility trends has garnered significant attention from researchers and policymakers alike. Studies by Sethi et al. (2021) and Idris et al. (2018) have demonstrated that financial development has decreased fertility rates in the South Asian Region.

Household decisions regarding fertility are influenced by the costs associated with childcare, which is considered a component of household consumption expenditures. Becker & Lewis (1973) posited that parents consider not only the quantity but also the quality of their children. The concept of 'quality' of children is linked to the accumulation of human capital and its potential for consumption. A greater demand for consumption within households tends to reduce birth rates in developing countries, while it may lead to increased birth rates in developed countries. A study by Filoso and Papagni (2015) found that financial development positively affects fertility in high-income countries. Yet, it has a negative impact on fertility rates in low-income countries.

Economists acknowledge that decisions regarding childbirth must adapt to changes in financial development. The theoretical and empirical research conducted by Filoso & Papagni (2015) underscores the connection between fertility rates and financial development. While empirical studies investigating this link are not extensive, the existing research has delved into the potential correlation between fertility and financial development. The anticipated outcome of such studies is that financial development, income, and household consumption expenditure negatively correlate with fertility levels.

This existing research gap motivated the author to undertake a study of a similar nature, which has not been extensively conducted in Indonesia, incorporating various factors related to financial development. This study aims to provide empirical evidence on whether financial development in Indonesia influences the country's total fertility rate. Given the background information, the author is contemplating a research project titled "The Influence of Financial Development on the Total Fertility Rate in Indonesia."

METHODS

The quantitative approach utilized in this study involves employing time series and secondary data sourced from the official websites of Bank Indonesia, the Central Statistics Agency, and the World Bank. The dataset spans from 1980 to 2021 and is composed of annual reports. The Autoregressive Distributed Lag (ARDL) model offers several operational benefits, including applicability to short-series data and adaptability to variables at different levels of stationarity, whether in the first or second difference.

Pesaran & Shin (1999) demonstrated that the ARDL framework ensures consistent parameter estimation in short-term relationships and highly consistent coefficients in long-term relationship estimations, even with small sample sizes. Moreover, they noted that ARDL could simultaneously address issues related to residuals and endogenous variables. In this study, data normalization was performed using natural logarithms to align the measurement scales of dependent and independent

variables due to their differing scales. This normalization involved the total fertility rate (TFR), money supply (M2), gross domestic product (GDP), and household consumption (HC), with the independent variables being converted into natural logarithms (LM2, LGDP, LHC) to mitigate excessive data fluctuations.

The ARDL equation for analyzing long-term relationships is as follows:

$$TFR_t = \beta_0 + \sum_{i=1}^p \beta_1 TFR_{t-i} + \sum_{i=1}^p \beta_2 LM2_{t-i} + \sum_{i=1}^p \beta_3 LPDB_{t-i} + \sum_{i=1}^p \beta_4 LHC_{t-i} + \mu_t \dots\dots\dots(1)$$

For investigating short-term relationships, the ARDL Error Correction regression is applied:

$$\Delta TFR_t = \vartheta_0 + \sum_{i=1}^p \vartheta_1 TFR_{t-i} + \sum_{i=1}^p \vartheta_2 \Delta LM2_{t-i} + \sum_{i=1}^p \vartheta_3 \Delta LGDP_{t-i} + \sum_{i=1}^p \vartheta_4 \Delta LHC_{t-i} + \eta ECT_t + \mu_t \dots (2)$$

The Error Correction Term (ECT) measures the speed of adjustment in response to changes, with a valid ECT indicated by a negative value at a 5% error probability. The ECT is derived from:

$$ECT_t = TFR_t - \beta_0 - \sum_{i=1}^p \beta_1 TFR_{t-i} - \sum_{i=1}^p \beta_2 LM2_{t-i} - \sum_{i=1}^p \beta_3 LGDP_{t-i} - \sum_{i=1}^p \beta_4 LHC_{t-i} \dots\dots(3)$$

ECT_t = Adjusting level Error Correction, β = Koefisien long-term relationship, ϑ = Koefisien short-term relationship, μ_t = error term.

This study focuses on the TFR, defined as the average number of children a woman is expected to give birth to during her reproductive years, utilizing birth rate data per woman in Indonesia from the World Bank. Financial development, represented by the money supply, alongside GDP and household consumption, is an independent variable influencing the TFR, highlighting its role in the development of the financial sector. Transforming these variables into natural logarithms ensures that their large numerical values are simplified without altering the proportionality of their actual values.

RESULTS AND DISCUSSION

Descriptive statistics

The descriptive statistical analysis conducted in this research encompasses secondary time series data on an annual basis for the period from 1980 to 2021. The data were sourced from the official websites of Bank Indonesia, the Central Bureau of Statistics (BPS), and the World Bank, totalling 42 observations. This study employs quantitative variables and provides a descriptive analysis that outlines the mean or average, minimum and maximum observation values, and the standard deviation for each variable under investigation. The outcomes of the descriptive statistical analysis are presented in Table 1.

Table 1. Descriptive statistics of variables

Variable	Mean	Median	Max.	Min.	Std. Dev
TFR	2.926	2.538	4.610	2.260	0.687
M2	1,759,576	795,540,5	7,870,453	7,540	2,217,439
GDP	5,216,806	4,381,918	11,118,869	1,585,089	2,904,222
KSM	2,877,540	2,515,488	6,194,120	827,271	1,583,793

From the statistical results in Table 1, it is observed that the total fertility rate in Indonesia ranges from a maximum of 4.610 births per woman to a minimum of 2.260, indicating variability in fertility trends over the study period. The financial sector development variable, represented by the money supply, exhibits a broad range between

its maximum (Rp. 7,870,453 billion) and minimum values (Rp. 7,540 billion). The Gross Domestic Product shows a significant range from Rp. 11,118,869 billion to Rp. 1,585,089 billion, reflecting economic fluctuations. The household consumption variable also shows a wide disparity between its highest (Rp. 6,194,120 billion) and lowest values (Rp. 827,271 billion), based on the 2010 base year.

The mean values indicate that Indonesia's average total birth rate is approximately 3.043 births per woman, with a standard deviation of 0.687, suggesting variability in birth rates. The money supply has an average value of Rp 1,759,576 billion and a substantial standard deviation of 2,217,439, indicating fluctuations in financial sector development. The GDP and household consumption expenditures similarly show variability, as evidenced by their respective averages and standard deviations, reflecting the economic dynamics and consumption patterns over the period studied.

Stationarity test: Unit root test

The ARDL estimation process involves several steps: the stationarity test, classical assumption test, cointegration bound test, and the ARDL model itself, which includes analysis of both long-term relationships and short-term corrections. The initial phase in this sequence is the stationarity test, which is crucial for ensuring the reliability of the estimated results. This test, conducted using the Augmented Dickey-Fuller (ADF) method as described by Dickey and Fuller and further discussed by Gujarati & Porter (2009), aims to verify the stationarity of each variable. Stationarity implies that the variable's fluctuations around its mean value are consistent over time, and its variance does not depend on time. This test's rejection of the null hypothesis indicates stationarity, meaning the data does not contain unit roots.

Table 2. Unit root test results

Variable	Level				First Difference			
	ADF Statistik	Critical Value			ADF Statistik	Critical Value		
		1%	5%	10%		1%	5%	10%
TFR	-5.557498	-3.588509	-2.929734	-2.603064	-0.808251	-3.584743	-2.928142	-2.602225
LM2	-0.109076	-4.175640	-3.513075	-3.186854	-5.667737	-4.180911	-3.515523	-3.188259
LGDP	-1.860514	-3.584743	-2.928142	-2.602225	-5.140424	-3.588509	-2.929734	-2.603064
LHC	-0.808251	-3.584743	-2.928142	-2.602225	-5.808801	-3.588509	-2.929734	-2.603064

The ADF test outcomes indicate that the TFR variable is stationary at the level stage as its ADF statistic is greater than the critical values at the 1%, 5%, and 10% levels. The other variables—LM2, LGDP, and LHC—are not stationary, necessitating a first difference test. Following this adjustment, all variables except TFR become stationary at the first difference level, as their ADF statistics surpass the respective critical values. This finding supports the application of the ARDL method to this study, given the stationarity conditions met by the variables after adjustment.

Cointegration bound test

Following the ARDL model analysis, the subsequent diagnostic step involves a Cointegration Bound Test to evaluate the suitability and appropriateness of the ARDL model. This test is crucial for determining the significance level as a benchmark for the ARDL model estimation outcomes. Furthermore, Pesaran & Shin (2001) highlight that the cointegration bound test is instrumental in identifying long-term relationships between variables.

The bound test, a specific cointegration test, is employed to ascertain the best model by examining the Schwartz Bayesian Criterion (SBC) and Akaike's Information Criterion (AIC) values, especially pertinent for small sample sizes. This test's critical

aspect compares the F-statistic value against critical values at both I(0) and I(1) levels. A long-term cointegration is confirmed if the obtained F-statistic value exceeds the critical values at these levels.

Table 3. Cointegration bound test results

Test Statistic	Value	K
F Statistic	6.216294	3
Significance	I(0) Bound	I(1) Bound
10%	2.72	3.77
5%	3.23	4.35
2,5%	3.69	4.89
1%	4.29	5.61

The F statistic value of 6.216294 from the cointegration bound test results, as shown in Table 4.3, indicates that it surpasses the I(0) and I(1) bounds. This outcome allows for a significance level up to $\alpha = 1\%$, leading to rejecting the null hypothesis (H0) and confirming the occurrence of cointegration within the model. Thus, the results affirm the presence of a long-term relationship between the variables under study.

ARDL estimation

Following the confirmation of a long-term relationship between variables from the cointegration bound test, the next step involves conducting long-term analysis using the long-run form of the ARDL model. The estimation results for both the long-term and short-term ARDL models are presented in Table 4.

Table 4. ARDL estimation results

Dependent variable	Independent variables	Coefficient	Std. Error	t-Statistic	Prob.
Long-term					
TFR	LM2	-0.344564	0.109039	-3.160011	0.0033***
	LGDP	-0.781828	0.358564	-2.180446	0.0362**
	LHC	0.574525	0.053822	1.674560	0.0000***
	C	10.108786	3.053492	3.310566	0.0022***
Short-term					
$\Delta(TFR)$	$\Delta(TFR(-1))$	0.350190	0.127966	2.736574	0.0102**
	$\Delta(LM2)$	0.021874	0.021821	1.002424	0.3239
	$\Delta(LM2(-1))$	-0.056317	0.024043	-2.342332	0.0259**
	$\Delta(LGDP)$	-0.073928	0.037079	-4.151339	0.0002***
	$\Delta(LHC)$	0.045066	0.067907	3.608871	0.0011**
	$\Delta(LHC(-1))$	0.057423	0.064973	3.961983	0.0004***
	$\Delta(LHC(-2))$	-0.281202	0.053021	-1.531513	0.1358
	CointEq(-1)*	-0.163508	0.011337	-1.916302	0.0000

*** significant at the level 1%, ** significant at the level 5%, * significant at the level 10%

In the long-term ARDL model, financial development, as indicated by the money supply (LM2), negatively and significantly influences Indonesia's total fertility rate (TFR). A 1% increase in M2 is associated with a 0.344564% decrease in TFR. The Gross Domestic Product (LGDP) also negatively and significantly affects TFR. At the same time, household consumption (LHC) positively and significantly impacts TFR, indicating a 0.574525% increase in TFR with a 1% increase in household consumption.

The short-term ARDL model results, highlighted by the error correction coefficient (CointEq(-1)), show the proportion of disequilibrium corrected each period,

with a significant negative value of -0.163508 , indicating an adjustment of approximately 16.4% of any disequilibrium in the data annually.

These findings underline the complex interplay between financial development and fertility rates, with the increase in the money supply leading to lower fertility rates in the short term. This supports the notion that financial development, through its influence on general prices and inflation, impacts parental decisions regarding the number and quality of children, as corroborated by research from Sethi et al. (2021) and Idris et al. (2018). Becker (1961) also discusses the demand factors for children, suggesting that income increases or decreases in the costs associated with raising children can influence both the quantity and quality of children, leading to a decrease in the desired number of children as incomes rise.

Elevated income levels significantly influence the demand for children (quantity) and the costs associated with their care and upbringing. An increase in income leads to a higher circulation of money within society, making the time and financial resources required for child-rearing more costly. Consequently, this reduces the demand for a higher number of children. Furthermore, advancements in financial development have eased the labour transition from traditional to modern sectors, contributing to the decline in birth rates observed in many developing countries, including Indonesia.

GDP has a notable negative impact on birth rates in Indonesia. Short-term study results indicate that a 1% increase in GDP in a given year results in a 7.3% decrease in birth rates. The rise in GDP, facilitated by higher household incomes, promotes behaviours contributing to lower birth rates. Income levels affect the amount spent on each child, leading to a preference for enhancing the quality of children over increasing their quantity. Caldwell (1982) highlighted that the dynamics of family economic relationships focus more on individual fertility behaviour, boosting labour force participation, especially among women of childbearing age. Due to their potential for high earnings, the increased value of women's time encourages them to join the labour market, reducing the time available for childbirth and child-rearing. This is supported by the findings of Idris et al. (2018), which indicate a negative correlation between the country's income growth and the total birth rate.

Contrastingly, consumption has a significant positive effect on birth rates in Indonesia. Short-term findings reveal that a 1% increase in consumption within a year leads to a 5.7% increase in birth rates. These results diverge from those of Idris et al. (2018), which found a negative relationship between household consumption expenditure and birth rates. The present study, however, demonstrates that household consumption negatively and significantly influences birth rates, suggesting that an increase in consumption is associated with a rise in the fertility rate in Indonesia. According to Leibenstein (1975), the economic theory of fertility, to some extent, guides the decision to have children.

The consumer behaviour theory posits that individuals aim to maximize satisfaction by considering the variety of goods, prices, and personal preferences. Larasati et al. (2018) found that increased household consumption leads to optimal birth rates among parents, thereby influencing higher birth rates. From the perspective of consumption expenditure, the ability of households to meet their needs implies that they face fewer concerns about increasing the number of children they desire.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study, utilizing the Autoregressive Distributed Lag (ARDL) model to analyze the effects of financial developments on the total fertility rate in Indonesia, reveals that changes in the money supply, both in the short and long term, have a statistically significant negative correlation with the total fertility rate. This finding suggests that an increase in the money supply, indicative of enhanced economic liquidity, reduces the fertility rate. Furthermore, Indonesia's Gross Domestic Product (GDP) significantly and negatively impacts the total fertility rate (TFR), demonstrating an inverse relationship wherein higher GDP levels correlate with lower fertility rates. This trend is attributed to the shifts in human behaviour and income levels accompanying economic growth. Additionally, household expenditure has a positive and significant impact on the total birth rate, indicating that higher consumption levels, which reflect the ability of households to meet their needs, may alleviate concerns about the financial implications of expanding family sizes.

Recommendations

This study could serve as a foundational resource for further research, especially regarding the evolution of financial systems. While this investigation focused on certain proxy variables for financial development, future research could broaden the scope by including a wider array of variables. This expansion would provide a more detailed understanding of how financial growth influences Indonesia's total fertility rate.

Financial development is a critical factor affecting fertility rates in developing and developed countries. Policymakers, recognizing the dependence of fertility decisions on financial development levels, must focus on enhancing financial development in Indonesia to manage fertility rates effectively. The study's findings, which establish a link between financial development and the total fertility rate, suggest that the banking sector should intensify efforts to improve existing financial policies. Enhancing these policies could be vital in moderating the fertility rate and aligning with national development goals.

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