FERTILITY DECLINE: LONG AND SHORT RUN EFFECTS ON ECONOMIC GROWTH AND LABOR MARKETS IN SOUTHEAST ASIA

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Abstract

This study aims to analyze the effect of fertility decline on the growth in per capita income and labor force participation rates in Southeast Asia during the 1993-2018 period. This study applies the Autoregressive Distributed Lag (ARDL) panel model using PMG, MG and DFE estimators to make forecasts related to fertility decline in the short and long term. The results showed that all countries in the Southeast Asian region responded to a decline in fertility as an increase in per capita income growth and labor force participation, except for Singapore, which responded to a decrease in fertility as a decrease in per capita income growth and the level of labor force participation. Based on the Pooled Mean Group (PMG) estimator, the decline in fertility in the long term have a positive and significant effect on the growth of per capita income in Southeast Asia, while the labor market is not significantly affected by a decline in fertility based on these three estimators.

Keyword: Fertility, Economic Growth, Labor Supply

1. INTRODUCTION

Fertility rates in Southeast Asia have declined over the past 50 years. Southeast Asia's Total Fertility Rate (TFR) fell from 5.5 in 1970 to 2.11 in 2019 (EIU, 2019). Total Fertility Rate (TFR) has decreased in Southeast Asia, except Indonesia. Significant TFR declines occurred in Cambodia and Laos from 4.1 and 4.5 in 2005 to 2.6 and 2.7 respectively in 2018. In the case of Brunei Darussalam, Malaysia, Singapore, Thailand, and Vietnam, the TFR decreased to below the average of 2.1 in 2018 (Aseanstat.org, 2019). The Southeast Asian country has achieved tremendous economic growth with a GDP contribution of approximately 3.3% of the global total (EIU, 2019). The improvement in the region's economy is related to demographic conditions, especially the high fertility such as the Philippines, Thailand, Singapore, including Indonesia which has impacted the increasing proportion of the working age population since the 1980s. This empirically indicates that the high birth rate is defined as an economic advantage.

Declining fertility conditions should be watched, as it risks the economy in the long term (Ashraf et al., 2013). This condition related to demographic changes will have an impact on the overall working market conditions. Several empirical studies discussing the relationship between fertility and the job market, Shittu & Abdullah (2019) found that there is a negative and positive relationship between fertility and labor force participation. Fertility relationship with the job market is very close (Martinez & Weyman, 2017). In line with this, increased fertility will have a positive impact on the increasing participation of the female workforce (Bratti, 2003). The high risk of fertility has an impact on the condition of rising youth unemployment (Adsera, 2011). Contrasting conditions associated with increased female labor force participation will reduce fertility in the long term (Bhalotra et al., 2018).

During demographic transitions, decreased fertility causes major changes in the population age structure in low fertility groups that will lower the adolescent dependency ratio and will implicitly increase output per capita if output per worker, labor force, labor age population participation remains constant. These conditions will result in demographic dividends (Bloom & Freeman, 1986; Brander &

Dowrick, 1994 ; Kelley & Schmidt, 1995; Bloom & Williamson, 1998; Bloom et al., 2003; Li et al., 2018).

Consistent with this, Karra et al., (2017) revealed that changes in demographic conditions caused by decreased fertility are one of the determining factors of economic growth. The debate over empirical studies on the impact of fertility on economic growth can be seen from differences in empirical studies including Prettner et al., (2012) which found there was a significant trade off between fertility and economic growth. In line with this Li et al., (2018) proves that there is a very strong link between fertility and economic growth. In contrast to fox et al.'s study, (2019) which found that fertility negatively affects economic growth and the after future will be responded positively.

Based on the case of declining fertility in Southeast Asia will raise the question of how the impact of the decline in fertility is responded to by the labor market and economic growth. For this reason, the relationship between fertility, the labor market and economic growth is an important research topic in economic and demographic studies in Southeast Asia. This paper will analyze the long-term effects of fertility reduction on economic growth and the dynamic relationship between fertility and the macro labor supply.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

This paper refers to transition theory and demographic dividends (see, Bloom & Freeman, 1986; Bloom & Williamson, 1998; Bloom et al., 2003). This research will imply a demographic dividend model in Southeast Asia. This is specifically applied to the fertility model, the working age population and the labor supply (Ashraf et al., 2013; Karra et al., 2017) developed within the following conceptual frameworks:
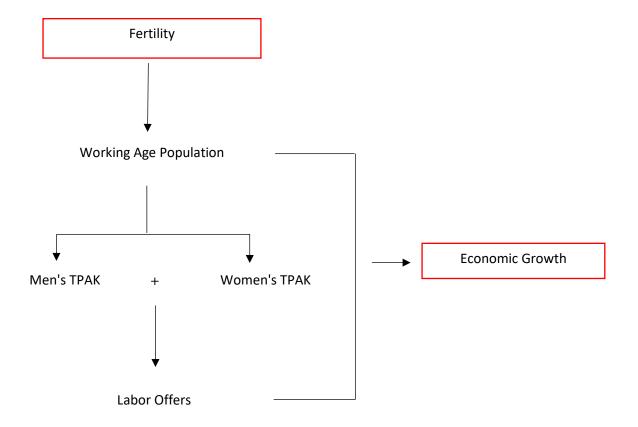

Figure 1: Conceptual Framework

Figure 1 illustrates the demographic transition model in terms of fertility decline will have a direct impact on the condition of the population in Southeast Asia. These implications for the response of the population will determine the number of age group populations categorized as young age groups and working age groups. Refers to the fertility framework that means *trade off* between the quality and quantity of Becker & Lewis (1973). *The trade off* will raise the question of whether fertility will have an adverse impact or have an economic advantage in the future. By accumulating groups of people aged 20-65 who enter the workforce categorized by gender which in a macro context is known as the Labor Force Participation Rate (TPAK) both female and male. This condition is very dynamic where the increase in labor force participation has an impact on the increasing per capita income, meaning that changes in fertility will respond negatively and positively to per capita income, this is related to changes in the structure of the working age population, some empirical studies including Mammen & Paxson (2000) which revealed that increased labor force participation had an impact on the increase in per capita income. Consistent with that Becker, (1960) the decline in fertility negatively affected per capita income. The fertility increase is inseparable from the increase in human capital demand in the development process and the transition to modern growth (Galor, 2012).

Differences in empirical studies related to fertility relations and economic growth include (Fox et al., 2019; Esping-Andersen & Billari, 2015; Goldscheider et al., 2015; Luci-Greulich & Thévenon, 2014; Myrskylä et al., 2009) which found negative fertility trends will be in response to increasing economic development both micro and regionally. The findings contrast with (Becker, 1960; Cleland & Wilson, 1987; Goldstein & Klüsener, 2014; Klüsener et al., 2018; Guinnane, 2011; Mason, 1997) which finds that the downward trend of fertility will be responded negatively to economic growth. This difference is due to several assumptions in the study in line with the basis of quality-quantity theory (Becker & Lewis, 1973) which impacts on negative and positive relationships, therefore it needs to be limited supported by government intervention with its policy direction (Sobotka et al., 2019; Tsuya & Bumpass, 2004; Myrskylä et al., 2009). Based on these assumptions, the hypothesis is formed as follows:

Table 1: Research hypothesis

No	Hypothesis
1	The decline of fertility has a long-term relationship of co-integration to economic growth.
2	There is a dynamic relationship between fertility, the Labor Force Participation Rate (TPAK) and economic growth.
3	There is a short- term and long-term influence between declining fertility and economic growth.
4	There is a short-term and long-term effect of decreased fertility on TPAK in both women and men.

3. Research Methodology

In particular this paper will discuss the impact of decreased fertility in the short and long term on economic growth and the labor market, with the downward trend of fertility will affect population structure patterns in Southeast Asia. This study used data on Total Fertility Rate (TFR), Per capita Income Growth and TPAK of men and women sourced from the World Bank during the period 1993-2018 in all Southeast Asian countries. Based on quantitative approaches, this study aims to discuss fertility change patterns using the *Autoregressive Distributed Lag (ARDL)* analysis tool to determine the impact of short-term and long-term fertility decline on economic growth and the labor market. The general model mathematically forms the following equations:

$$Growth = F(TFR) \tag{1}$$

$$LFP = F(TFR) \tag{2}$$

Autoregressive Distributed Lag (ARDL) approach (Pesaran, 1997) based on (Shin & Smith, 2001) ARDL approach to co-integration models is shown in equations (3) and (4):

$$\Delta\,Growth_{it} = \beta_0 + \beta_1\Delta TFR_{it} + \beta_2\Delta TFR_{it-1} + \varepsilon_t \tag{3}$$

$$\Delta\,LFP_{it} = \beta_0 + \beta_1\Delta TFR_{it} + \beta_2\Delta TFR_{it-1} + \varepsilon_t \tag{4}$$

The following *Error Correction Model* (ECM) is obtained using a single vector auto regression and uses lag length criteria in equations (5) and (6)

$$\Delta\,Growth_{it} = \beta_0 + \sum_{j=1}^{p}\beta_1\Delta\,Growth_{it-j} + \sum_{j=0}^{p}\Delta\beta_2 TFR_{it-j} + \beta_3 ECT_{it-j} \tag{5}$$

(5)

$$\Delta\,LFP_{it} = \beta_0 + \sum_{j=1}^{p}\beta_1\Delta\,GRROWTH_{it-j} + \sum_{j=0}^{p}\Delta\beta_2 TFR_{it-j} + \beta_3 ECT_{it-j} \tag{6}$$

where ECT_{it-i} is the term ECM described in (7) and (8):

$$\Delta\,ECT_{it} = \Delta\,GROWTH_{it} - \beta_0 + \sum_{j=1}^{p}\beta_1\Delta\,GROWTH_{it-i} + \sum_{j=0}^{p}\Delta\beta_2 TFR_{it-j} \tag{7}$$

$$\Delta\,ECT_{it} = \Delta\,LFP_{it} - \beta_0 + \sum_{j=1}^{p}\beta_1\Delta\,LFP_{it-i} + \sum_{j=0}^{p}\Delta\beta_2 TFR_{it-j} \tag{8}$$

4. RESULTS AND DISCUSSION

The first analysis was conducted descriptively related to fertility trends, economic growth and labor force participation rates in South East Asia.
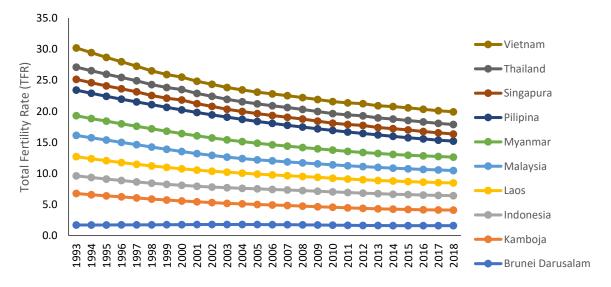

Figure 2: Fertility Trends in Southeast Asia During the Period 1993-2018

Overall, almost all countries in Southeast Asia experienced a decline in fertility except for Brunei Darussalam, which was seen to have fluctuating fertility changes. During the 1998-2007 period, fertility experienced an increase and decreased again in the following period with a constant change value.
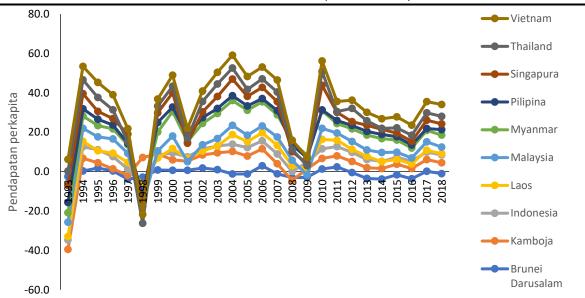
Figure 2: Trends in Per capita Income Growth in Southeast Asia During the Period 1993-2018

The trend of per capita income in the Asian Region shows a fluctuating movement, a negative trend occurred in two countries, namely the beginning of the period, namely Brunei Darussalam and Cambodia, which were respectively -2.5 percent and -37.0 percent. Meanwhile, for the 1998 period, almost all countries in the Southeast Asia region experienced negative growth, namely Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand.
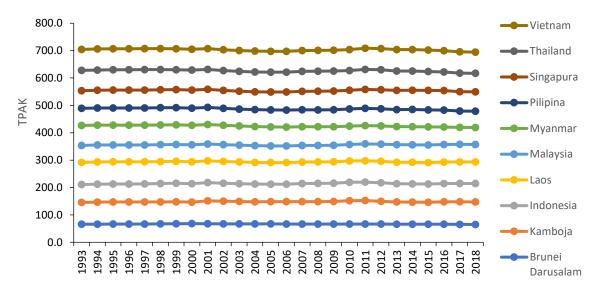

Figure 4: Trends in Per capita Income Growth in Southeast Asia During the Period 1993-2018

The labor force participation rate in Southeast Asia tends to fluctuate, but changes constantly. Some of the countries in the Region had the highest labor force participation rates over the past 26 periods namely Vietnam, Thailand in Singapore which ranged from over 70 percent. Based on the descriptive analysis, it shows that the trend of fertility is decreasing, as well as the growth in per capita income tends to fluctuate and the TPAK is constant. The next stage is to examine the impact of the decline in fertility on economic growth and the labor market in the short and long term. The initial process is *the cross-sectional dependence (CSD) test* and *the panel unit root test*.

In applying the first or second generation unit root test, the study conducted a cross sectional cross-sectional dependence (CSD) which is shown in Table 1. Based on the statistical results at the 1%

significance level, it indicates that there is a dependence between the variables studied. The conditions relate to the 10 countries in Southeast Asia which are members of ASEAN so that economic policies, regulations and trends in fertility, economic growth and the labor market tend to experience the same movement, therefore there is dependence between the variables studied based on the value of *the cross-sectional dependence.*

Table 1: Cross-sectional dependence (CSD) Test

Test	TFR		Growth		LFP	
	Statistics	Prob.	Statistics	Prob.	Statistics	Prob.
Breusch-Pagan LM	342.895	0.0000	173.1221	0.0000	808.6262	0.0000
Pesaran scaled LM	31.40089	0.0000	13.50526	0.0000	80.49326	0.0000
Bias-corrected scaled LM	31.20089	0.0000	13.30526	0.0000	80.29326	0.0000
Pesaran CD	-0.89014	0.3734	9.035606	0.0000	27.70332	0.0000

The second procedure was carried out by testing the second- generation unit root test panel Levin, Lin & Chu t * (Levin et al., 2002), Im, Pesar & Shin (Pesar et al., 2000), ADF Fisher Chi-square (Maddala & Wu, 1999) and PP - Fisher Chi-square (Perron, 1988). The following is the Unit Root Test Panel test which can be seen in Table 2:

Table 2: Panel Unit Root Test

Method (First Order)	TFR		Growth		LFP	
	Statistics	Prob.**	Statistics	Prob.**	Statistics	Prob.**
Levin, Lin & Chu t*	-10.241	0.000	-9.193	0.000	-1.822	0.034
Im, Pesaran and Shin	-9.111	0.000	-12.508	0.000	-3.335	0.000
ADF - Fisher	117.644	0.000	160.274	0.000	48.080	0.000
PP - Fisher	37.397	0.011	239.611	0.000	78.146	0.000

Based on the test it can be seen that the probability value of the test in the *First Order* is smaller than the α thus the TFR, GROWTH and LFP variables are stationary.

Fertility and Economic Growth

It can spatially be seen that almost all countries in Southeast Asia based on short-term testing show that fertility has a positive and significant effect on per capita revenue growth. This means that the fertility response in the short term will provide positive stimulus to per capita income. But in stark contrast to developed countries, fertility responded negatively to per capita income growth in the short term. Consistent with some studies that say that low fertility actually lowers per capita income (Bak, 2019). This case is more or less the same as the study conducted that in the short term Singapore experienced a decrease in fertility as economic growth declined in the country. This is reinforced by several studies with similar cases (Asher & Nandy, 2009; United Nations, 2015) which comparatively discusses the low fertility should be responded to by policy as a challenge in the future.
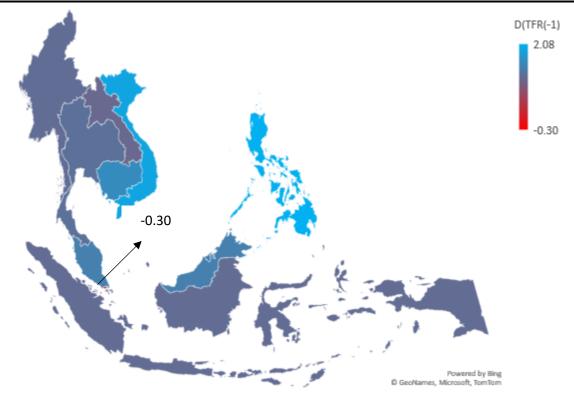
Figure 4: Spatial Condition Affects Fertility on Short-Term Per capita Revenue Growth in Southeast Asia.

Based on Table 3, it shows that the Error Correction Term (ECT) in several countries that have positive values, including Indonesia and the Philippines, are 0.006 and 0.004, respectively, indicating that the speed of adjustment from short-term equilibrium to long-term equilibrium shows a positive trend. Meanwhile, other countries have negative and significant ECT values, which means that the adjustment speed of the short-term equilibrium has a negative trend.

Table 3: PMG Estimation Results for Individual Countries in the Short Run (Economic Growth Model)

Country	Variable	Coefficient	P-value
Brunei Darussalam	Ect	0.017307	0.0000
	D (TFR (-1)	1.461989	0.0000
Cambodia	Ect	-0.016731	0.0000
	D (TFR (-1)	1.584894	0.0000
Indonesian	Ect	0.006733	0.0000
	D (TFR (-1)	1.158317	0.0001
Laos	Ect	-0.00777	0.0000
	D (TFR (-1)	1.106852	0.0000
Malaysia	Ect	-0.016	0.0000
	D (TFR (-1)	1.436916	0.0000
Myanmar	Ect	-0.00655	0.0000
	D (TFR (-1)	1.176029	0.0000
Philippines	Ect	0.00401	0.0000
	D (TFR (-1)	2.08282	0.0000
Singapore	Ect	-0.22200	0.0001
	D (TFR (-1)	-0.29767	0.0057

Thailand	Ect	-0.00877	0.0000
	D (TFR (-1)	1.22913	0.0000
Vietnamese	Ect	-0.01904	0.0000
	D (TFR (-1)	1.929466	0.0000

The estimation results are shown in table 4 shows that in the Pooled Mean Group (PMG) model, long-term fertility is proven to have a positive and significant effect on per capita income growth in Southeast Asia, different findings in the Dynamics Fixed Effect (DFE) model indicate that fertility has a negative and significant effect. significant at a 10 percent error rate. The value of Error Correction Term (ECT) shows a positive and significant effect, which means that there is a positive relationship between variables in the long term. The difference in long-term results in the three models (PMG, MG and DFE) shows that the estimation of dynamic panel estimators, meaning that changes in per capita income that tend to be dynamic will be responded negatively or positively according to the study of Fox et al., (2019) which reveals that the fertility response unpredictable economic growth due to changes in dynamic economic growth.

Table 4: Fertility and Per capita Income Growth

Estimator		PMG		Mg		DFE	
	Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Long Run	TFR (-1)	2.723878	0.0010	2.362564	0.6090	-1.95933	0.088
Short Run	Ect	0.702166	0.0000	0.780535	0.0000	0.746722	0.0000
	TFR (-1)	-5.36141	0.6160	17.91437	0.5670	-1.68801	0.8130

Fertility and Labor Market

The fertility response across Southeast Asian countries shows a positive and significant influence on TPAK in the short term, meaning increased fertility will increase TPAK in the long run. In contrast to Singapore which experienced a very significant decrease in fertility which impacted the decline of TPAK this is evidenced by the negative short-term coefficient value. This case occurs in developed countries (Raymo & Shibata, 2017) which discuss fertility patterns in Japan in the long term. Empirical studies with similar cases have predicted by (Cheung, 1990) that singapore in the next 20-24 years will experience labor scarcity conditions. Consistent with (Chuan, 2007) finding that the decline in fertility in Singapore has major implications on the position of the labor supply.
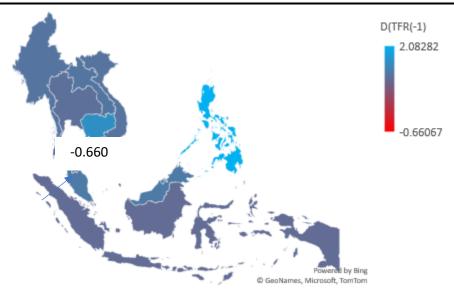
Figure 5: Spatial Condition Affects Fertility on TPAK in the Short Term in Southeast Asia

Table 3 shows that the Error Correction Term (ECT) values in several countries in Southeast Asia have positive values, namely Indonesia and the Philippines, which are 0.0016 and 0.004, respectively, indicating that the speed of adjustment from short-run equilibrium to long-term equilibrium shows a positive trend. This means that the adjustment of the fertility coefficient in the long term will be responded positively by the TPAK in the long term significantly. While almost all countries in the Southeast Asia region have negative and significant ECT scores, it means that the rate of fertility adjustment from short-term to long-term equilibrium has a negative response. The significant ECT probability value indicates that fertility and LFP are cointegrated in the long run

Table 5: Estimation Results of Individual Country's PMG in the Short Run (Labour Market Model)

Country	Variable	Coefficient	P-value
Brunei Darussalam	Ect	-0.01266	0.0001
	D (TFR (-1))	1.242789	0.0000
Cambodia	Ect	-0.01552	0.0000
	D (TFR (-1)	1.56319	0.0000
Indonesian	Ect	0.001679	0.0000
	D (TFR (-1)	1.026528	0.0000
Laos	Ect	-0.00679	0.0000
	D (TFR (-1)	1.18426	0.0000
Malaysia	Ect	-0.0156	0.0000
	D (TFR (-1)	1.241262	0.0001
Myanmar	Ect	-0.01004	0.0000
	D (TFR (-1)	1.165037	0.0000
Philippines	Ect	0.00401	0.0000
	D (TFR (-1)	2.08282	0.0002
Singapore	Ect	-0.1315	0.0000
	D (TFR (-1)	-0.66067	0.0003
Thailand	Ect	-0.00912	0.0000
	D (TFR (-1)	1.087047	0.0002
Vietnamese	Ect	-0.07064	0.0000
	D (TFR (-1)	1.144553	0.0001

Estimates using all three guesses (PMG, MG and DFE) show that the effect of fertility on the labor force participation rate has no significant effect in the short or long term. This condition indicates that the change in fertility is not able to explain the overall TPAK change. In line with this (Prettner et al., 2012) fertility changes do not directly affect labor offerings in the long term but take into account variables such as education and health. Error Correction Term (ECT) values throughout the estimator indicate a positive and significant influence meaning there is a positive relationship between variables in the long run.

Table 6: Fertility and Labor Force Participation Rate

Estimator		PMG		Mg		DFE	
	Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Long Run	TFR (-1)	34.18396	0.1790	0.003931	0.9880	-0.90673	0.458
Short Run	Ect	0.01149	0.0000	0.710811	0.0000	0.114118	0.0000
	TFR (-1)	-2.01611	0.3040	-0.33192	0.8540	0.947328	0.4120

5. CONCLUSIONS AND RECOMMENDATIONS

This study analyzes the impact of decreased fertility on the growth in per capita income in all Southeast Asian countries during the 1993-2018 period. After testing the Breusch-Pagan LM, LM scaled magnification, Bias-corrected scaled LM, and CD magnification there is a cross-sectional dependence and this study also tests stationarity with the estimation results showing that all variables are stationary in second order or first difference. Taking into account the heterogeneous nature of the data, the study applies the ARDL panel model using PMG, MG and DFE estimators to identify the effect of fertility on economic growth and the labor market in the long and short term. The PMG estimation results of individual countries in the short -term show that the effect of fertility in all Southeast Asian countries has a positive and significant effect, except for Singapore, which responds to the decline in fertility in the short term as a decrease in per capita income growth and a decrease in the level of labor force participation.

Further findings based on Pooled Mean Group (PMG) fertility decline in the long run proved to have a positive and significant effect on growth in per capita income in Southeast Asia, different findings in the Dynamics Fixed Effect (DFE) model indicate that fertility has a negative and significant effect. Meanwhile, based on the three prediction, namely (PMG, MG and DFE), the decline in fertility has no effect on the level of labor force participation, both in the short and long term. The recommendation of this issue is related to the decline in fertility in Singapore which has a negative impact in the short term on the growth of per capita income and the level of work participation. Thus these findings must be responded to with a form of policy in overcoming the problem of low fertility, especially family policies according to parameters (Sobotka et al., 2019) which recommend family planning that should be supported by the government psychologically the family.

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