

DEMOGRAPHIC TRANSITION AND DECLINING IN FERTILITY RATE: THE LABOUR PRODUCTIVITY MATTER

Achmad Sjafii¹

Doris Padmini Selvaratnam²

Muhammad Adib³

Nyigit Wudi Amini⁴

Abstract

Demographic transition (declining mortality and fertility rate) experienced by Indonesian population in the last four decades has led to changes in the age structure of the population significantly. The decline in mortality rate has been one of the causes of increase in life expectancy and old-age structure of the population. The higher life expectancy caused by better health may improve worker productivity. Declining fertility rates has been followed by increased 'proportion of the working age population' / WAP (15-64 years). Experience in some newly industrialized countries (NICs) as well as some developing countries show that the decline in fertility rates has led to the increase in economic performance. This condition is due to the burden 'young people' (0-14 years) to the WAP relatively becomes smaller. The young dependency ratio which is smaller has provided benefits to the economy. Falling young dependency ratio to the total dependency ratio contributed to the economic growth. Another consequence of the demographic transition is the shift to having fewer but better educated children, which lead to more available aggregate human capital and increasing labour productivity in the future. The paper examines the impact of demographic changes on labour productivity in Indonesia based on data of 33 provinces from 2006 to 2012. Results of the study show that the young dependency ratio has a significantly negative effect on labour productivity in Indonesia. While the old dependency ratio, number of labour force and education levels have a positive effect on labour productivity in Indonesia.

Keywords: Demographic Transition; Fertility Rate; Dependency Ratio; Labour Productivity

2016 GBSE Journal

¹ Universiti Kebangsaan Malaysia. Email: achmadsjafii@gmail.com

² Universiti Kebangsaan Malaysia. Email: Pegasus@ukm.edu.my

³ Airlangga University-Indonesia. Email: moh.adib@fisip.unair.ac.id

⁴ National family planning coordinating Board – East Java Province-Indonesia. Email: wudiaminin@gmail.com

Background

Declining fertility rate has occurred almost in the entire world in the last two centuries. At first, it occurred in high-income countries, and then in the middle-income and finally low income countries. Generally the experience of demographic changes both in developed and developing countries can be characterized by the decline in mortality and followed by fertility rate. The decline in fertility rate was followed by increase in percentage change of the working-age population. These conditions will cause burden of the working-age population to young people became smaller. Bloom, et al. (1999); Birdsall, et al. (2001); McNicoll (2006); Fent, et al. (2008) explain that this condition will provide benefit to economic growth.

Indonesia has been undergoing a period of demographic transition over the last four decades (1970s to 2010s) and is still ongoing. These conditions have led to changes in the age structure of the population of Indonesia significantly. The changes are caused by decreasing both crude birth rate (CBR) and the crude death rate (CDR), especially infant mortality rate (IMR). Trends of CBR and CDR in Indonesia in the last four decades is shown in Figure 1.

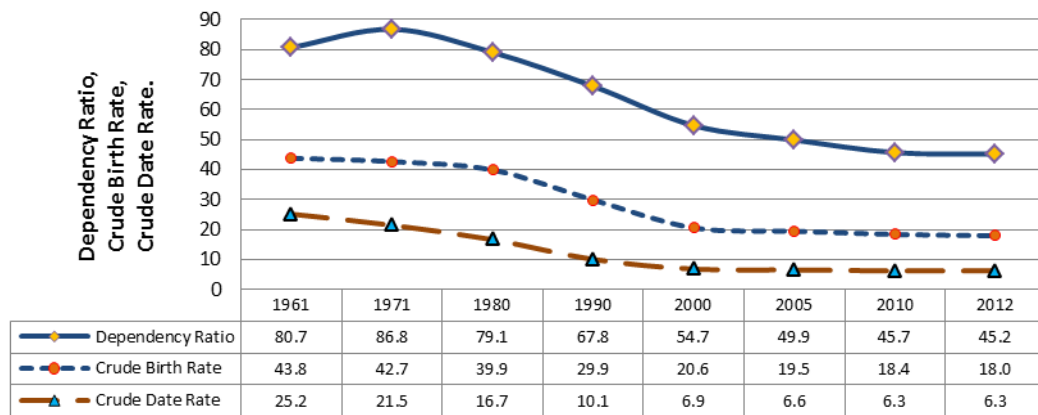


Figure 1: Trend in Dependency Ratio, CBR, CDR, 1961-2012

Sources: Census, Indonesia Demographic and Health Survey, Various Years.

The decline in fertility rates have led to the proportion of young people/ POP_Y (<15 years) to the total population to become smaller. Meanwhile, the situation is followed by the increase in the proportion of WAP. This causes ratio POP_Y (<15 years) to WAP (15-64) to become smaller. The burden of POP_Y (<15 years) to WAP (15-64 years) is known as the young-dependency ratio (DR_Y).

In this period, the proportion of old population/ POP_O (65 <years) increased but at a slower rate. It looked from the relatively smaller contribution of the old population for dependency ratio/ DR_O . So, in the phase the number of WAP is greater proportion than POP_Y and POP_O . Thus, the overall dependency ratio (DR) gets smaller (Figure 1). Indeed, on one hand the number of WAP (15-64 years) has provided a great opportunity to boost economic growth because it can lead to the increase in labour supply, when it is accompanied by the increase in the quality or human resources. The number of WAP will be an opportunity to obtain a demographic dividend if workers have adequate education and skills (Choudhry dan Elhorst, 2010). However, the availability of job opportunities should be considered.

In line with the miracle of economic growth in East Asia (1965-1990) as a caused of demographic changes (Bloom and Williamson, 1998), Indonesia has experienced demographic changes also, especially in the decade of 1970-2010. The demographic changes during the last four decades have changed the Indonesian population age structure significantly. One of the phenomena which appear on demographic change is a decreasing total fertility rate (TFR). Generally, countries which experience declining fertility rate will be followed by economic benefit such as abundant supply of labour particularly for female labour supply supporting the economic development. The decreasing fertility rate causes the women to raise their participation in the labour force market, in turn, enhancing their social status and personal independence. Family income can be focused to provide better food or nutrition for infants. Further, effect of nutrition is important to determine the level of attendance of children at school, and improve the quality of education. The quality of education influences the human capital and labour productivity in the future.

The paper estimates the impact of demographic changes on labour productivity in Indonesia based on longitudinal data from 2006 to 2012. The paper contributes to the empirical evidence in Indonesia concerning the demographic changes (i.e. declining in fertility) and labour productivity. The findings can be used as a guideline for policy makers as well as the various stakeholders in Indonesia especially by National Family Planning Coordinating Board.

Literature Review

Solow neoclassical growth model theory focuses on determinants of the growth of labour productivity (or per capita income growth, as a proxy) both in the steady state as well in the transition state (Barro, 1991). Some of studies examine effect of the age structure of the labour force on labour productivity (Feyrer, 2007; Choudhry and Van Ark, 2010). The investigation of Kögel (2005) argues that there is negative relationship between youth dependency ratio and total factor productivity. His study found that the youth dependency ratio (the population below working age divided by the population of working age) reduces residual growth, which measures total factor productivity growth. The result of his study demonstrates that age structure has an effect on the most important determinant of international differences in output per worker. The other finding is that a high youth dependency ratio will reduce aggregate savings, and that declining aggregate savings will reduce TFP growth.

Interesting phenomenon in the demographic transition is economic implications such as supply labour, labour productivity, domestic savings and capital formation, expenditures for human resources. All of them contribute to economic growth (Bloom and Williamson, 1997; Bloom, et al, 2003; Mason, 2005; McNicoll, 2006; Fent, et al., 2008; Lee, et al, 2012; Song, 2013). The effect of demographic transition can be caused by an increase in the number of productive age population and decreased the proportion of young population. This has implications for reducing the amount of investment for the fulfilment of their needs, so that costs can be converted to stimulate economic growth, which in turn can improve the welfare of nation.

Singariya (2012) stated that the demographic dividend as the increase in the level of economic growth due to the increasing number of people of working age in the population. United

Nations Economic Commission for Africa (2013) asserts that economic growth is a consequence of changes in population structure. This phenomenon occurs due to a decrease in fertility rates and increasing the working age population in age structure of population.

The investigation of Kögel (2005) argues that there is negative relationship between youth dependency ratio and total factor productivity. His study find out that the youth dependency ratio (the population below working age divided by the population of working age) reduces residual growth, which measures total factor productivity growth. The result of his study demonstrates that age structure has an effect on the most important determinant of international differences in output per worker. The other find is that a high youth dependency ratio will reduce aggregate savings, and that declining aggregate savings will reduce TFP growth.

Barro (1991) said that increase in the quantity of human capital per person tend to lead to higher rates of investment in human and physical capital, and hence, to higher per capita growth. The other phenomenon are the shift in having fewer but better educated children (Prettner and Prskawetz, 2009), which lead to more available aggregate human capital and increasing labour productivity in the future. This condition could be expected accelerate technological progress and economic growth (Becker, 1993).

Study by Sweetman (2002), Todaro (2006), Marelli and Signorelli (2008) states that the education levels correlated significantly on labour productivity. Higher the level of education can improve the quality of human resources that will promote economic development through labour productivity.

Based on the background and literature review above, the hypothesis is the young dependency ratio, old dependency ratio, the labour force, and education level have a significantly effect on labour productivity. Following a literature review and a hypothesis that has been arranged, the model used to determine the effect of young dependency ratio, old dependency ratio, the labour force, and education level on labour productivity is a multiple regression model using panel data. The models are as follows:

$$Y_{it} = \alpha + \beta DRy_{it} + \gamma DRo_{it} + \pi L_{it} + \mu MYS_{it} + e_{it}$$

whereby,

i = cross section unit, provinces i in Indonesia;

t = time series unit, 2006 – 2012;

α = constant;

β, γ, π, μ = coefficient;

e_{it} = disturbance error

Methodology

The data used is the population dependency ratio is calculated from population data by age group. Dependency ratio (DR) is the ratio of the number of unproductive age population (not / does not work) to the number of productive age population (work). Dependency ratio divided

into “young dependency ratio” (DR_y) and “old dependency ratio” (DR_o). While the total dependency ratio (DR) is calculated as follows:

$$DR_y = \frac{\text{Age group 0-14 years}}{\text{Age group 15-64 years}} \times 100; \quad DR_o = \frac{\text{Age group > 65 years}}{\text{Age group 15-64 years}} \times 100$$

$$DR = \frac{< 15 + 64 \text{ years} <}{15 - 64 \text{ tahun}} \times 100$$

L (labour force): the economically active population (ILO) or people ages 15 and older who supply labour for the production of goods and services during a specified period. MYS (mean years of schooling): Average number of years of education received by people ages 25 and older (UNDP). Estimation technique of the factors which affect the labour productivity is based on the panel data approach (time series data 2006-2012 and cross-sectional 33 provinces).

The Empirical Results And Analysis

Demographic Transition and Labour Productivity in Indonesia

Dynamics of demographic transition in Indonesia started in the 1970s. One indicator that contributes to the economic performance is a reduction in the total fertility rate (TFR). Based on data from the Census of Population and Indonesia Demographic and Health Survey (IDHS) indicates that the TFR continued to decline. The declining TFR has slowed since 1994 when the TFR of about 2.9 to 2.6 per woman as in 1994-2012.

Family planning programs contributed to in the Contraceptive Prevalence Rate (CPR) of 26 percent (1976) to 60 percent (2002). The program is lowering the TFR from 5.6 to 2.6 per woman, during the same period (Schoemaker, 2005). Based on the 2007 IDHS shows trends of contraceptive use between 1994 and 2012 is likely to increase steadily. CPR with any method of moving from 55 percent (1994), 57 percent (1997), 60 percent (2002-2003), 61 percent (2007) and 62 percent (2012) respectively (CBS, 2012).

One of the effects the decline in TFR is the lower the population dependency ratio. The low dependency ratio indicates the lower the economic burden of productive age population (15-65 years) to the non-productive age population (0-14 and 65+ years). This is a signal that Indonesia experienced a "window of opportunity" that is likely to get the demographic dividend. Some countries utilize demographic dividend to boost economic growth, which is South Korea from 7.3 to 13.2, Singapore increased from 8.2 to 13.6 and Thailand increased sharply from 6.6 to 15.5. (www.bkkbn.go.id).

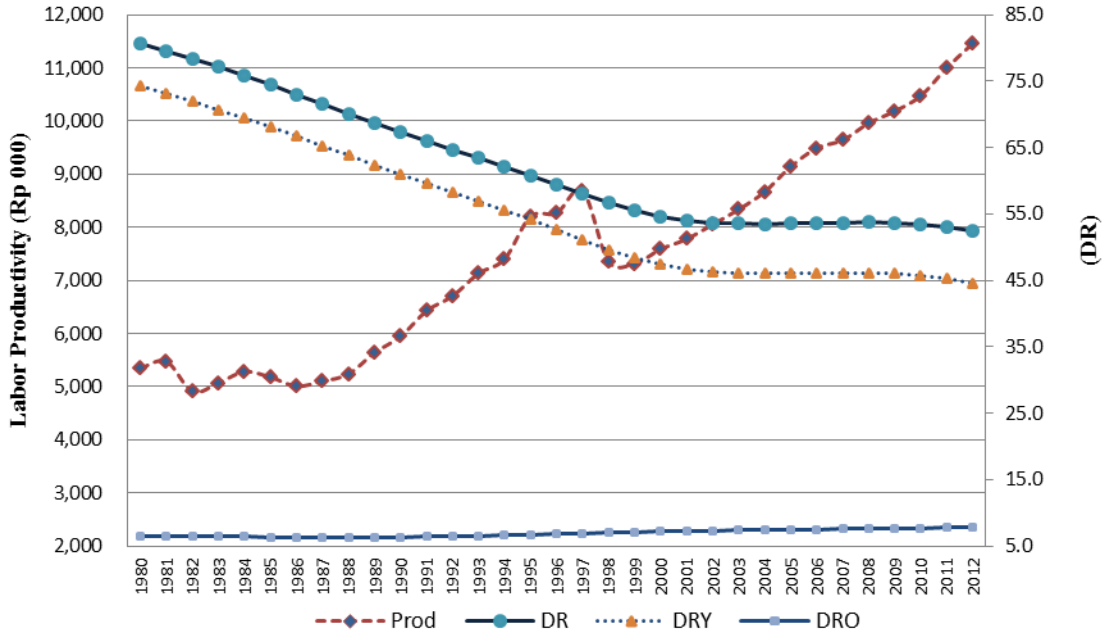


Figure 2. Dependency Ratio (DR) and Labour Productivity (Rp 000) Indonesia 1980-2012

The young dependency ratio is lower while the old dependency ratio increases. Declining young dependency ratio is due to a decrease in TFR among people aged 0-14 years, while the increase in the old dependency ratio due to the increase in the elderly population (65 < years). Declining total dependency ratio due to a decrease in the population aged 0-14 years is greater than the increase in the elderly population is relatively small. While an increasing number of productive age population is growing fast.

Based on the Chow test and Hausman test showed that the analysis is used the fixed effect model. The estimation results for the DR_Y of -1947378 shows a significant relationship negatively on labour productivity (Y). Coefficients for DR_O (23219762), L (3.208526), and MYS (4,596,212) significantly positively related to labour productivity. All variables DR_Y ($\alpha = 0.01$) in, DR_O ($\alpha = 0:01$), L ($\alpha = 0:10$), MYS ($\alpha = 0.01$) in partially significant effect on labour productivity. Based on F test variables DR_Y , DR_O , L , and MYS significantly affect labour productivity (Y). The value of R^2 (0.961973) shows that the variation of the variable DR_Y , DR_O , L , and MYS be explained by 96.19 percent variable labour productivity (Table1).

Table 1. The Result of Fixed Effect Estimasi

Dependent Variable: PROD (Y)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-53522860	24505949	-2.184076	0.0302
DRY	-1947378.	237060.8	-8.214680	0.0000
DRO	23219762	1801380.	12.88999	0.0000
AK	3.208526	1.828395	1.754833	0.0809
MYS	4596212.	1566849.	2.933412	0.0038

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.961673	Mean dependent var	80109125
Adjusted R-squared	0.954561	S.D. dependent var	48993451
S.E. of regression	8783200.	Sum squared resid	1.50E+16
F-statistic	135.2145	Durbin-Watson stat	1.077010
Prob(F-statistic)	0.000000		

Influence of Demographic Transition on the Labour Productivity

During a "window of opportunity", the dependency ratio (especially DR_O) will decrease because of the increase in the productive age population. DR_O has a significant negative relationship on labour productivity in Indonesia. In the other words, that the increase in youth dependency burden will reduce labour productivity in Indonesia. This is consistent with studies by Kogel (2001), Prskawetz et.al (2007), Choudry and Elhorst (2010) which states that the DR_O is negatively correlated significantly on labour productivity. The increase in DR_O will reduce labour productivity because of the increasing number of young people (0-14 years), the burden for the population aged 15-64 years.

Increasing the number of old population (65^+ years) led to an increase in the old dependency ratio (DR_O). Number of old population growing due to increased life expectancy in Indonesia. The increase in life expectancy can increase labour productivity. In other words, any increase in DR_O will increase labour productivity in Indonesia. This is possible because the old people who are still working to meet the needs.

Unidirectional relationship between old dependency burden and labour productivity has been investigated by Phang (2012) which states that the old worker can improve productivity because of the spirit for the work and presence of government facilities for the elderly to get the training and skills. In addition, the part-time job good with flexible hours make it easier for elderly people to keep working. Study of the relationship between the increases in the labour force with labour productivity was also carried out by Marelli and Signorelli (2008) which states that the labour force participation rate has a significant positive correlation to the productivity of the labour force. The labour force is one of the factors of production, thus the increase in the labour force could generate labour of productivity.

Level of education (MYS) was positively correlated significantly on labour productivity, meaning that each increase in educational level can increase labour productivity in Indonesia. The average length of education increased from 2006 to 2012 from 7.4 years to 8.1 years. This is in line with the increase in labour productivity which in 2006 productivity was 34.98 million by the year 2012 reached 74.27 million rupiahs.

Policy Implication

The above study shows that the young dependency ratio which is smaller has provided benefits to the Indonesian economy. Falling young dependency ratio to the total dependency ratio contributed to the economic growth. Having fewer children, the families are able to concentrate in giving better education and nutrition for the family members and are also able to devote more time for paid labour activity. Chances are greater that the mother will also be able to return to paid job faster compared to if she had to spend more years looking after more children. This will lead to more available aggregate human capital and increasing labour productivity in the future.

The government needs to invest more in early childhood education to ensure a higher human capital value for the nation. Besides that women needs to be given opportunity enter the labour force at a flexible pace. Some women may opt out of the labour market after marriage to take care of their family. But once the children are schooling, they will be more prepared to re-enter the labour force. Therefore besides having a flexible work arrangement, the re-entry access can be made available with increased age entry.

Results of the study showed that the young dependency ratio has a significantly negative effect on labour productivity in Indonesia. While the old dependency ratio, number of labour force and education levels have a positive effect on labour productivity in Indonesia.

Conclusion

Demographic transition could change the age structure of the population leading to the economic benefits called demographic dividend. This benefit can be seen from the growing number of labour force that could be used for the production process at the same time in order to increase productivity in the economy. This is because the reduction in the proportion of young population to total population by the impact of the decline in the total fertility rate. This change causes the young dependency ratio becomes smaller.

Demographic transition is characterized by increasing life expectancy and the structure of "old people". Increased life expectancy caused by including better health, improved sanitation, better nutrition, and healthy behaviors can increase worker productivity. But the quality of the population as a subject of development needs to be improved. Improvement of population quality could through education. Increased education is believed to be the dominant factor in the increased productivity of labour.

Based on the data, descriptions and discussions can prove that the young dependency ratio is a significant negative impact on labour productivity in Indonesia. While the old dependency ratio, number of labour force and education level and significant positive effect on labour productivity in Indonesia.

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