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Relationship of Income Inequality and Labor Productivity on Fertility in the Philippines: 1985-2009.

by

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Abstract

This study investigates the relationship of income inequality (proxied by the Gini Coefficient), labor productivity (output per capita) on fertility rate in the Philippines. Specifically, this presents the trend of income inequality (ineq), labor productivity (lp) and fertility(tfr) in the Philippines from 1985 to 2009. The study uses Ordinary Least Square (OLS) estimates to study the relationship of the variables.

Results revealed that income inequality and labor productivity has a negative relationship with fertility. Hence, an increase in this variable decreases fertility rate. This means that income inequality and labor productivity is significant in achieving the replacement level of fertility.

Keywords: *Income Inequality, Labor Productivity, Fertility, Ordinary Least Squares, Replacement level.*

INTRODUCTION

Fertility is a choice by parents involving a life-cycle claim on their resources, from which they may receive satisfaction as consumers and benefit as producers from children's labor and care giving support (Schultz, 2007). Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates (<http://data.worldbank.org>).

High fertility is defined as a total fertility rate (TFR) of 5.0 or higher and constitutes an effect depending on the country's status. At the micro level, they include a relatively high incidence of births of order five and above, a relatively

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high fraction of women experiencing pregnancies of order five and above, and a greater likelihood of short inter-pregnancy intervals. At the macro level, the main demographic feature is relatively rapid population growth rate (and corresponding rapid growth in the size of successive birth cohorts). These micro- and macro-level demographic features have consequences that have been identified in a large body of research (Casterline, 2010).

Income inequality is a measurement of the distribution of income that highlights the gap between individuals or households making most of the income in a given country and those making very little (www.businessdictionary.com). A popular measure for income distribution inequality is the Gini coefficient. The Gini coefficient is a measure of the extent to which the distribution of income/expenditure among families deviates from a perfectly equal distribution, with limits 0 for perfect equality and 1 for inequality (www.nscb.gov.ph).

A nation's economic growth from one year to next depends on its increase in labor inputs and its increase in labor productivity. Labor productivity is the total output divided by the quantity of labor employed to produce it or the average product of labor or output per hour of work (McConnell and Brue, 2005). Among other productivity measures such as multi-factor productivity or capital productivity, labor productivity is particularly important in the economic and statistical analysis of a country. Labor productivity is a revealing indicator of several economic indicators as it offers a dynamic measure of economic growth, competitiveness, and living standards within an economy. It is the measure of labor productivity and all that this measure takes into account) which helps explain the principal economic foundations that are necessary for both economic growth and social development (Freeman, 2008).

Overview in the Philippines

For a developing country like Philippines, the lag of growth remains high. Fertility in the Philippines has experienced continuous decline from the 1950s to the present (Costello and Casterline, undated). These observe decline in fertility can be attributed to changes in family planning practices (NDHS, 2008). Figure 1

presents the trends of contraceptive use in the Philippines from 1993 to 2008. It shows that as the use of modern contraceptive increases for the past years, the traditional use decreases.

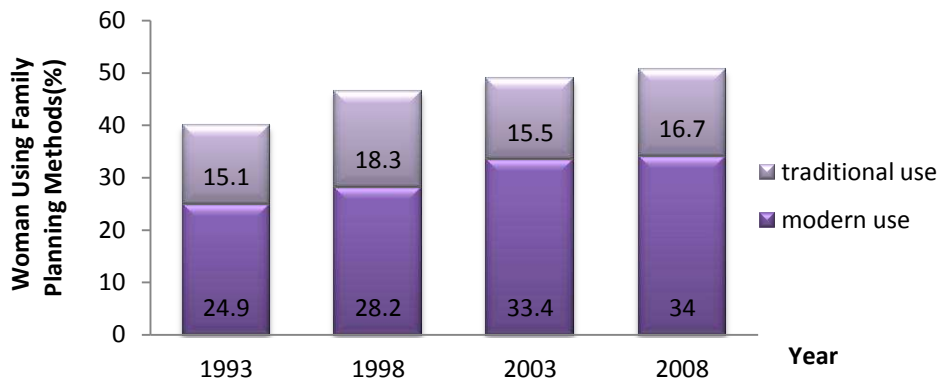


Figure 1. Trends of Contraceptive use in the Philippines. 1993-2008.

Source: National Demographic Health Survey (NDHS) and National Statistics Office (NSO) (accessed January, 2013).

The decline of fertility over time remains high among the poorest Filipinos at 5.2 in contrast to 1.9 among the wealthiest (World Bank, 2011). High fertility usually implies rapid population growth. This typically lowers the rate of growth of per capita income and, in addition, has serious consequences for the distribution of income across different classes of people (Eswaran, 2004).

Figure 2 presents the income distribution inequality in the Philippines. It shows that almost half (49.69%) of the total income earned in 2009 went to Filipinos in the top twenty percent of income whereas only 5.98% of the total income went to the lowest twenty percent of the Filipinos in the same year; a difference of 43.71% of the total income of the Filipinos in the country.

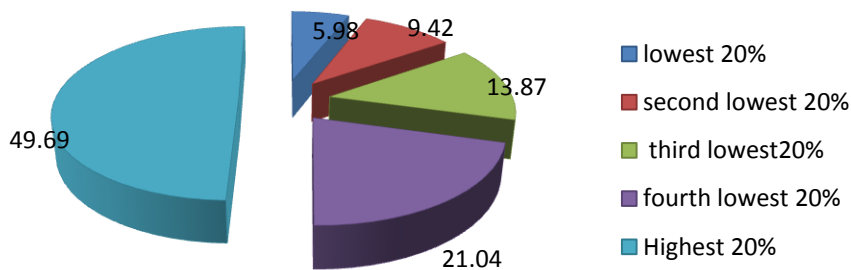


Figure 2. Income Distribution held by 20% quintile in 2009.

Source: World Bank, Development Research Group (accessed, December 2012)

Moreover, higher populations (caused by higher fertility) would mean that each agricultural worker, now having less land to work with, is less productive which lower productivity and lower per capita income. This retards the growth in per capita income because some production inputs, such as agricultural land, are fixed in supply.

Figure 3 presents the trend of employment in agriculture, industry and service sector in the Philippines. It shows that among the three sectors, the agriculture sector has a decreasing trend of employment due to the shifting of employment to service sector.

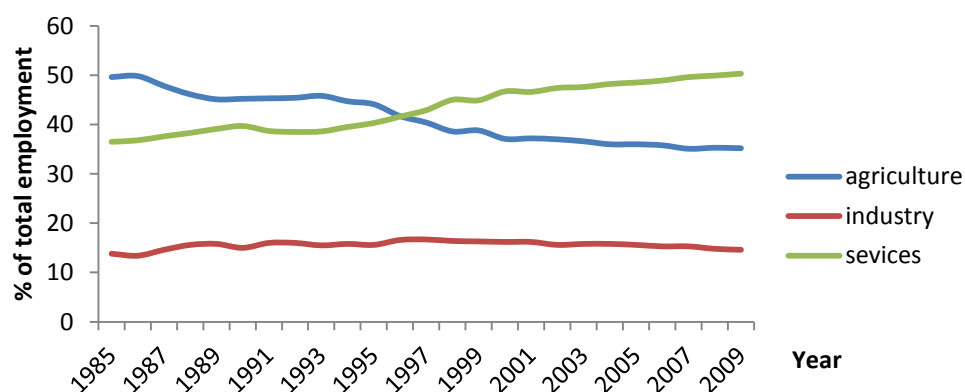


Figure 3. Trends of Employment on Agriculture, Industry and Service Sector (% of employment) in the Philippines in 2009.

Source: World Bank (accessed, December 2012).

Objectives of the Study

The main objective of the study is to investigate the relationship of income inequality and labor productivity on fertility in the Philippines. Specifically, the study aims to:

1. Present the trend of fertility, income inequality and labor productivity in the Philippines for the period 1985-2009; and
2. Determine the empirical relationship between fertility, income inequality and labor productivity in the Philippines

Methodology

Conceptual Framework

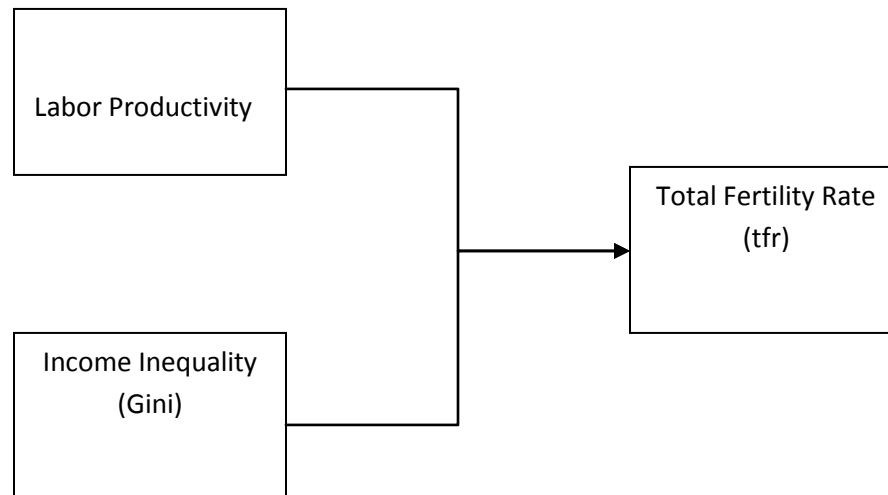


Figure 4. Possible direction of relationship of income inequality and labor productivity on fertility.

Statistical Method

I. Trends of Fertility, Income Inequality and Labor Productivity

Descriptive statistics was used to show the trends of fertility, labor productivity and income inequality in the Philippines from 1988-2009. The trends of the income inequality, labor productivity and fertility was examined through graphs using Microsoft Excel

II. Relationship between Fertility, Income inequality and labor productivity in the Philippines

In this study Ordinary Least Square is use to determine the relationship of the variables. The Ordinary Least Square (OLS) method is used to estimate the values of the parameters. Ordinary Least Square is a method that determines the estimate by minimizing the sum of the squared residuals (the difference between the predicted and the observed values).

Furthermore, OLS is a flexible method of data analysis that may be appropriate whenever a quantitative variable (criterion variable) is to be

examined in relationship to any other factors (predictor variables). Relationship may be non-linear, independent variables may be quantitative or qualitative, and one can examine the effects of single variable or multiple variables with or without effects to other variables taken into account (Berger, undated). Estimates are best linear unbiased estimators (BLUE) if the following assumptions are satisfied.

$$\text{a.) } E(\varepsilon) = 0, \quad (1)$$

implies that the mean of the error terms is zero.

$$\text{b.) } \text{Var}(\varepsilon) = \sigma^2 \quad (2)$$

the property of homoskedasticity, i.e. that the errors have a common variance.

$$\text{c.) } \text{Cov}(\varepsilon_i, \varepsilon_j) = 0 \text{ where } i \neq j, \quad (3)$$

the property of no autocorrelation, i.e. no errors are serially correlated.

Problems such as multicollinearity, heteroskedasticity and autocorrelation exist when any of these assumptions are violated. In the presence of heteroskedastic error terms (non-constancy of error variance), OLS estimates are still unbiased and consistent. However, they cease to be the Best Linear Unbiased Estimators (BLUE) of the coefficients. They become inefficient, and the reported standard errors are understated. The problem of heteroscedasticity is an important point to be considered. It normally occurs when we have a cross-section data and second assumption is violated. Moreover, when we have time-series data, where the observations follow a natural ordering through time, there is always a possibility that successive errors will be correlated to each other. When the third assumption is violated, then we have autocorrelation, maybe detected either by the residual plot or by Durbin-Watson (DW) exact statistic. The DW statistics, D is defined below;

$$D = \frac{\sum_{t=2}^{t=T} (\hat{e}_t - \hat{e}_{t-1})}{\sum_{t=2}^{t=T} \hat{e}_t^2}$$

Regression analysis will be used to convert the economic model (1) into empirical model; this would explain the influence and the relationship of explanatory variables and dependent variable. The statistical techniques will determine the effect of the explanatory variables to the dependent variable, holding other variables constant (Hill, *et al*; 1999).

The Empirical Model

$$tfr_t = \beta_0 + \beta_1 ineq_t + \beta_2 lp_t + \varepsilon_{it} \quad (4)$$

where: tfr_t = total fertility rate

$ineq_t$ = income inequality measured by the Gini Coefficient

lp_t = labor productivity in terms of GDP per employed person.

β 's = the parameters

ε_i = error term

In equation 4 total fertility rate (tfr) is a dependent variable of income inequality ($ineq$) and labor productivity (lp). The β 's are the parameters while ε_i is the random error term.

Estimation Procedure

The econometric package Shazam Version 9.0 was used for the estimation of all the parameters. SHAZAM is a command-driven computer program for econometric and statistical computing. It is an integrated, comprehensive and complete statistical package that can execute simple and complex estimations.

RESULTS AND DISCUSSION

Trends of Fertility Rate in the Philippines

Fertility is a demographic phenomenon greatly responsible for setting population trends. More often than not, it is viewed as the main variable in population change. Many times it has been hastily dismissed as the culprit variable in the country's increasing population (Philippine Yearbook, 2012).

Figure 5 presents the trends of fertility in the Philippines from 1985 to 2009. It shows that the behavior of the total fertility rate has been declining over time. The decrease in the fertility rate is caused by the increasing use in family planning over the last few years. However, the opposition of the Catholic Church to family planning, and to supply methods of contraception in particular, has prompted successive governments to balance interests in slowing population growth to improve economic conditions with the need to avoid calling for specific family size targets. According to Casterline (2010), religion does not exercise a strong direct influence on fertility desires but it is a major factor influencing population policy program.

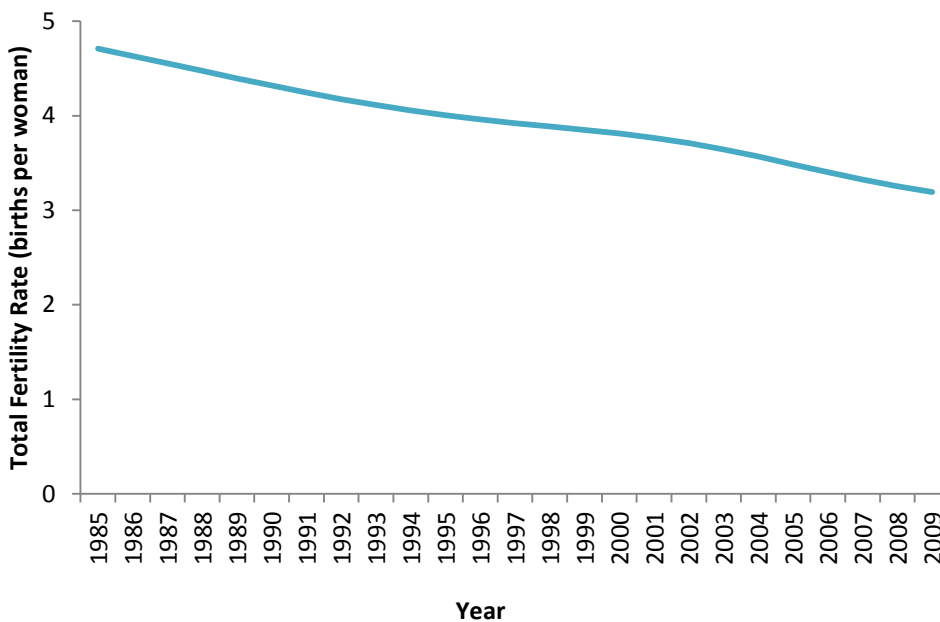


Figure 5. Trends of total fertility rate in the Philippines, 1985-2009.
Source: National Coordinating and Statistical Board (NSCB).

There have been constant shifts in policy with respect to fertility/population growth from a strong commitment if not outright rejection of policy under the Aquino administration to revival of commitment in fertility/population growth reduction under the Ramos, Estrada administrations, and to an ambiguous commitment under the Arroyo administration (<http://www.prb.org>). Despite this shifts in policy, total fertility rate continued to decline in the Philippines from 4.7 children per woman in 1985 to 4.2 in 1991 or a decrease of 0.5 births per woman. This is followed by the slow decline from 4.1 children per woman in 1991 to 1993, to 3.7 children per woman in 1995 to 1998, to 3.5 children per woman in 2000-2003 to 3.2 children per woman in 2003-2006 respectively (FPS, 2006).

Trends of Income Inequality in the Philippines

The income distribution in the Philippines remains highly uneven, and poverty rates are higher than in other ASEAN countries. Although poverty rates have declined over time, the rate of decline has been slower than that of other countries; and income inequality has been persistent (Gerson, 1998). Moreover, the prevailing problem of income inequality seems to be an old issue but currently a hot topic that drives much attention in policy discussions. The deterioration of income distribution has been widely felt by the public when the gap between the rich and the poor continue to increase (Asian Development Bank, 2007).

Figure 6 illustrates the trends of income inequality in the Philippines. It is observed that income inequality is at height in 1997, income distribution grew by 7% to 6% from the Family and Income Expenditure Survey (FIES) taken in 1997 Filipino families amassed a total income of 22.0 trillion pesos in 1997, translating to an average annual increase of 8.0%. With inflation adjustments computed at 22% from 1997 to 2000, total family income actually grew by 3.1% or an average annual increase of 1.0%. Over three years, aggregate family income went up by 25.8 %, completing the rising number of families in the country.

Income inequality in the Philippines has been persistent due to historically slow economic growth, owing in part to poor policies, as well as to past failures to reduce structural impediments to a more equal distribution of income (Gerson, 1998). Furthermore, Gerson (1998) added that for many years, the Philippines

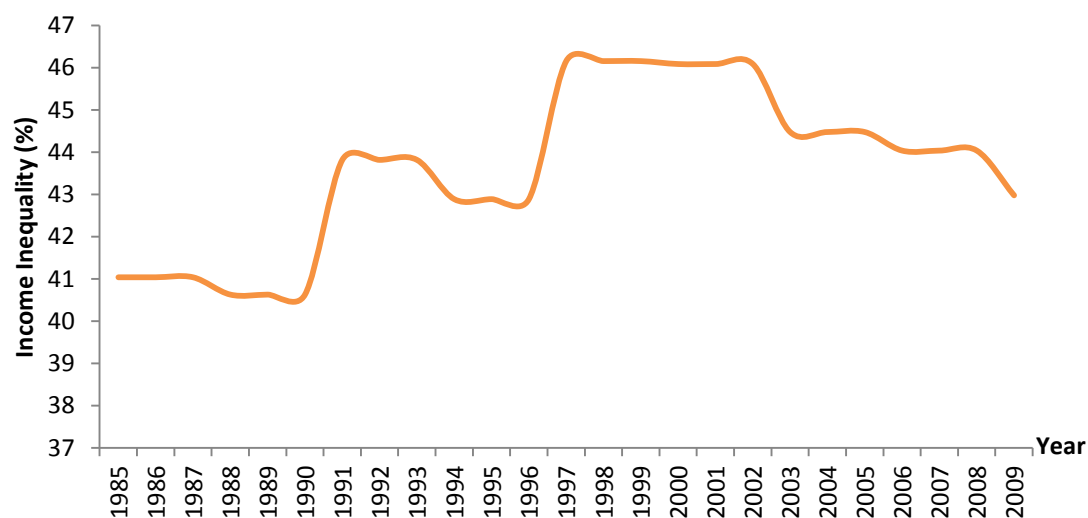


Figure 6. Trends of income inequality in the Philippines, 1985-2009.

Source: World Bank, Databank (December, accessed, 2012)

pursued an import-substitution industrialization policy and maintained an overwhelmed exchange rate. These policies combined to distort the flow of investment away from agriculture toward manufacturing, to discourage agricultural exports, and to encourage the substitution of capital for labor. Heavy regulation of the agricultural sector also stifles growth. Underfunding of health and education has also discouraged human capital development among the poor.

Trend of Labor Productivity in the Philippines

Productivity growth is crucial to a country's future economic prospects. There are many possible factors affecting labor productivity growth, this includes changes in technology, capital investment, capacity utilization, use of intermediate inputs, including purchased services and contract labor, improved

managerial skills or organization of production, and improved skills of the work force (www.bls.gov.ph).

Figure 7 presents the trend of labor productivity growth in the Philippines from 1985-2009. The figure shows that the overall labor productivity or the average contribution of an employed person to the total value of production/output in the Philippines has been unstable over the last years. In 2000, a sharp decline occurred which implies that employment (labor demand) is growing at same pace with population

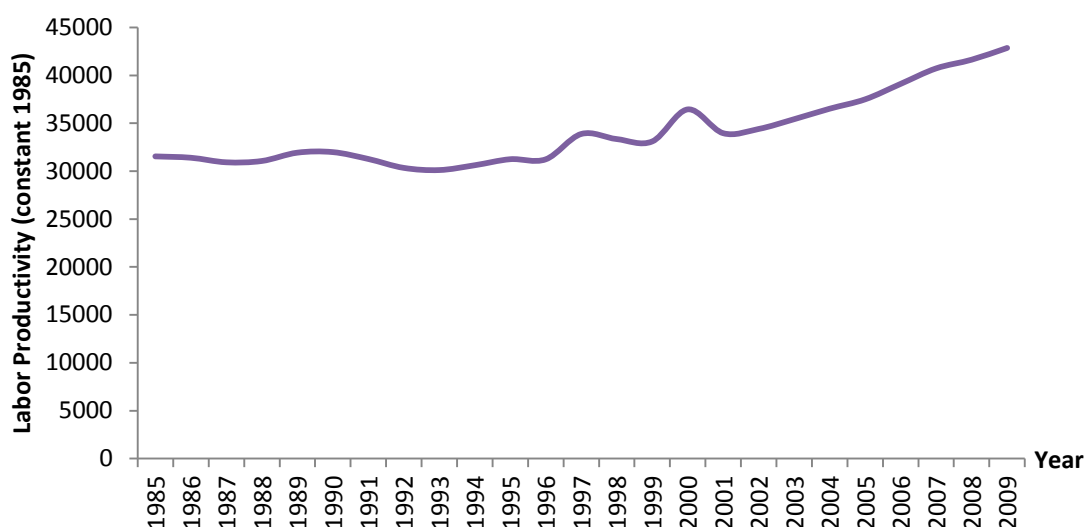


Figure 7. Trends of labor productivity in the Philippines (at 1985 constant prices), 1985-2009

Source: Bureau of Labor and Employment Statistics (BLES) - Department of Labor and Employment (DOLE).

growth. Note that in the same year; fertility/population growth is at slow paced. Furthermore, the Millennium Development Goals (MDG's) added that employment growth should exceed population growth. However, job gains should be well paid, productive and secure (decent work).

Labor productivity levels were down in 1999, 2001 and 2009 as indicated by the negative growth rates in these years. The fall of labor productivity in 2009 at the height of the global financial crisis was followed by a regain of 4.7 percent

in 2010. Over the period 2002 to 2008, labor productivity, however, consistently improved but at nearly constant pace (Labstat update, 2012).

Relationship between Income Inequality and Labor Productivity on Fertility in the Philippines

The relationship of the variables is estimated using econometric procedure. Ordinary Least Square (OLS) is used to estimate the unknown regression coefficients. Table 2 shows the auto-corrected OLS estimation of the parameters. Results show that income inequality and labor productivity has a significant negative relationship to fertility; an increase in these variables will result to a decrease in fertility rate.

The result of the relationship is consistent with Wei and Jinju (2009) and Mapa, Lucagbo and Ignacio (2012). In the former paper, it is found that equalizing the distribution of income reduces fertility. In the latter, it is found that increasing per capita income indeed reduce the total fertility rate but the impact is minimal given that the country's average per capita is low, it will take some time before the country benefits from the demographic transition.

It is generally observed that the relationship between income and fertility varies widely among different levels of development. It is possible for the developing countries to achieve lower fertility if they reach the per capita income level attained by highly developed countries. Moreover, rapidly growing population has become an obstacle for their socio-economic progress. When developing countries are trying to put one step forward they are forced to go two steps backward (Rao, undated).

Meanwhile, the negative relationship of labor productivity on the total fertility rate is consistent with the result of Guest and Swift (2012) wherein raising fertility is associated with a decrease in productivity. Also, having children increases the need for home production which not only has a direct effect on employment but also reallocate hours worked at home from women to men. This raises the cost of children relative to income thereby reduces fertility (Siegel, 2012). However, this means that the Philippines benefits from the macro-

demographic feature of fertility (population growth) wherein higher human capital induces growth.

Table 1. OLS estimation result of income inequality, labor productivity on total fertility in the Philippines

Variable	Estimated Coefficient	Standard Error	t-ratio	P-value	R ²
ineq	-0.060259**	0.022272	-2.70	0.0129	
lp	-0.000080**	0.000012	-6.58	0.0000	0.92
constant	9.3122**	0.96264	9.67	0.0000	

**significant and ^{ns} not significant at 0.05% level of confidence interval.

If the fall to replacement fertility is a unique and precious opportunity for higher economic growth then, the fertility rate consistent with stable population for developing countries of about 3.0 (also known as the replacement level of fertility).

The R² is 92% which means that the variation of total fertility rate that can be explained by the changes in income inequality and labor productivity.

SUMMARY, CONCLUSION, RECOMMENDATIONS, AND AREAS FOR FURTHER RESEARCH

Summary and Conclusion

This study aims to determine and analyze the relationship income inequality and labor productivity on fertility in the Philippines from 1985 to 2009 using Ordinary Least Squares (OLS) regression.

The result of the study shows that fertility in the Philippines has been declining. It is also found that the decrease in fertility is caused by the increasing use of family planning over the last few years and the opposition of the Catholic Church to family planning. There is also a constant shift in policy with respect to fertility/population growth of the different government administration.

Meanwhile, income inequality in the Philippines remains highly uneven, although poverty rates have declined overtime, the rate of decline has been slower than that of other countries. The persistent income inequality has been due to historically slow economic growth, poor policies and the past failures to reduce structural impediments.

The labor productivity growth in the Philippines has been unstable over the last years. It is found that changes exist whenever employment (labor demand) is growing at same pace with population growth. Moreover, global financial crisis also causes the labor productivity to change. However, labor productivity in the Philippines consistently improved but at nearly constant paced.

Finally, the result of the estimation shows that there is a significant negative relationship between income inequality and labor productivity on the total fertility rate. This means that income inequality and labor productivity is significant in achieving the replacement level of fertility.

Recommendations

The following recommendations are made based on the result of the study:

- a.) Since it was found that labor productivity and income inequality are significant variables that can affect the reduction of fertility rate, the government should enhance the policy implementation that may help improve labor productivity growth and reduce income inequality.
- b.) Since the country still faces the consequences of population growth brought by stalled decline in fertility, government must include development policies aimed at addressing effect of population growth.
- c.) The challenge to attain the replacement level of fertility must include individuals specially that fertility is still a choice.

Areas for further Research

This study only limited in the Philippines and used Ordinary Least Square (OLS) estimate. Furthermore:

- a.) to use a cross-sectional analysis to control for variables which cannot be controlled such as cultural factors, religion and other differences in that may influence fertility rate.
- b.) as an extension of this research, the use of different method to explore and compare the relationship of the labor productivity, income inequality and fertility such as time series analysis and Granger Causality test may be appropriate.

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