ORIGINAL ARTICLE

Throwback on the Philippine regional fertility trends: A population health science inquiry

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ABSTRACT

The Philippines' population growth has been regarded as a hindrance to its economic development. One of the main factors that can be attributed to population growth is fertility. Measuring fertility requires the consideration of different factors that can lead to variations in overall fertility across regions. This study aims to compare fertility rates across regions in the Philippines for the last decade. This study also seeks to determine the relationship between fertility and several determinants including women's employment rate, educational attainment of women, use of contraceptives, and per capita Gross Regional Domestic Product (GRDP). A multiple linear regression model was used to show the relationship between fertility rate and its determinants. Using women's employment rate, women's educational attainment (measured by percentage of women with no education, percentage of women who completed primary, percentage of women who completed high school, and percentage of women who completed college), contraceptive prevalence rate, and per capita GRDP, only contraceptive prevalence rate was found to be significant. Another model was tested using women's employment rate, women's educational attainment (measured by percentage of women with no education and percentage of women who completed college), contraceptive prevalence rate, and per capita GRDP. The results showed that women's employment rate, contraceptive prevalence rate and per capita GRDP significantly affect fertility rate across regions in the Philippines for the last decade, while women's educational attainment does not.
Keywords: Economic; health; maternal; population; Philippines

INTRODUCTION

Over the last several decades, the Philippines has experienced rapid population growth which hindered the country's economic development [1]. While population growth rates substantially dropped to below 2% a year in other countries (such as Thailand, Indonesia, and Vietnam), the Philippines' high population growth rate of about 2% per year had hardly changed[1]. Addressing the poverty problem is a challenge facing the country today and one cannot ignore the growing number of empirical evidence linking population growth and poverty. To address the problem, the government must implement policies that include measures that will manage the country's burgeoning population and bring down the fertility rate to a level that is conducive to higher economic growth[1].

In most developing countries, fertility is one of the main factors that drive the current growth of population. Its measure is influenced by different factors that lead to variations in overall fertility across populations. Fertility rate refers to "the average number of children a woman will have during her lifetime, by country or by region"[2]. It measures "the number of children that would be born to a woman if she were to live to the end of her childbearing years"[2]. This study examines the differences in fertility rates among the 17 regions in the Philippines. Provided also are the factors that lead to such disparities. The variables to be considered are women's employment rate, women's educational attainment, use of contraceptives, and per capita Gross Regional Domestic Product (GRDP).

Limitations: The research focused on the fertility rate for each region in the Philippines for the last decade. This was regressed against independent variables including women's employment rate, educational attainment of women, use of contraceptives, and per capita Gross Regional Domestic Product (GRDP) by region for the last decade. Researcher relied on secondary data gathered from the National Statistical Coordination Board (NSCB) and the National Demographic and Health Survey (NDHS).

Conceptual framework of the study: Fertility rate refers to "the measure of the average number of children a woman will have during her lifetime"[3]. There are different factors that can affect the fertility rate and some of these are economic in nature and others are more social. In this study, the researcher will use some of the variables that determine the variations in fertility rate[2]. These include the rates of women's employment, educational attainment, use of contraceptives and per capita GRDP.

Many studies show how fertility rate changes because countries used different methods in reducing it. It is seen that education is an important factor to foster economic growth and promote smaller families[4]. "It is well-documented that education is one key determinant of fertility and child health"[5]. Researches show that as women experience high levels of education, the tendency is a decreasing fertility level. Conversely, women who have little or with no education are the ones who possess high levels of fertility.

In other studies, per capita Gross Domestic Product has been shown to have a large impact on the reduction of fertility rate. As the rate of development increases, fertility rate declines. This negative relationship between the total number of children and per capita GDP has been used to prove that development drives the demographic transition[6].

Employment of women, on the other hand, greatly affects fertility rate and at the same time it contributes to the rapid growth of population. Several researches showed the important role of employment in changing the fertility rates of women. Since women are the ones who are capable of producing an offspring, their work participation is a big factor in reducing the population growth.

Finally, the use of contraceptives delays or reduces fertility. However, other studies proved that it is not always the case. In some places, low number of children does not follow from the use of contraceptives. The study will use these variables in determining the variations in fertility and will show the effects of each on the said variable.

METHODOLOGY

Researcher utilized the quantitative analysis in describing the trends in fertility rates in the Philippines across regions for the last decade. The study used secondary data obtained from the National Statistical Coordination Board (NSCB), National Statistics Office (NSO) and National Demographic and Health Survey (NDHS).

Researcher used a multiple linear regression model to determine the relationship between fertility rate and its determinants such as women's employment, level of education, use of contraceptives and per capita GDP. The methods of research most appropriate for this study were descriptive analysis and correlational/regression analysis. In a correlational/regression analysis, the strengths of the relationships between two or more variables were analyzed. The researcher used the program Gnu Regression Econometrics and Time-series Library (GRETL) and will use the Ordinary Least Squares (OLS) to be able estimate the data. The following model represents the relationship between fertility rate and its factors.

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + U_i$$

where:

Y = Fertility Rate (children per woman)
X_2 = Employment Rate (%) women
X_3 = Contraceptive Prevalence Rate (%)
X_4 =Educational attainment of women as measured by percentage (%) of women who have no education
X_5 =Educational attainment of women as measured by percentage (%) of women who completed primary education
X_6 =Educational attainment of women as measured by percentage (%) of women who completed secondary education
X_7 =Educational attainment of women as measured by percentage (%) of women who completed college
X_8 = Per capita GRDP
U_i = other factors

RESULTS AND DISCUSSION

The results were obtained through the use of the software Gnu Regression Time-Series Library (GRETL) and were estimated using the Ordinary Least Squares (OLS) method. A test for multicollinearity and heteroskedasticity are conducted through the use of the Variance Inflation Factor (VIF) and White-test. Multiple linear regression model was performed in determining the effect of employment rate, educational attainment, contraceptive prevalence rate and per capita GRDP on fertility rate.

Regional Comparisons of Fertility Rates: There are differences in the levels of fertility for each region in the Philippines. These changes might be greatly caused by regional disparities and economic opportunities [7].

As shown in Table 1 and Figure 1, MIMAROPA in 2003 had the highest fertility rate among all regions in the Philippines which is 5.0 children per woman. However, in the last decade, the regions with highest rates of fertility were Region IV-B MIMAROPA, Eastern Visayas, Administrative Region of Muslim Mindanao (ARMM) and Caraga Region having a fertility rate of 4.3. This means that the fertility rate of MIMAROPA decreased by 0.7. The increase in Eastern Visayas was 0.3 and 0.2 for ARMM. Bicol Region also had a high fertility rate for the year 2003 but it decreased by 0.2 in the last decade. In CALABARZON, fertility rate was 3.2 in 2003 but 3.0 in the last decade. Zamboanga Peninsula, Davao Region and Caraga Region had fertility rates of 4.2 in 2003 but it all decreased in the last decade except in the case of Caraga which experienced an increase of 1.

On the other hand, the National Capital Region with 2.3 had the lowest fertility rate among all regions in 2003, much lower compared to Central Luzon and Davao Region which both have 3.1. Similarly, NCR also had the lowest fertility for the last decade with 2.3. CALABARZON's fertility rate decreased only by 1 child per woman while the decrease in fertility rate of Cordillera Administrative Region and Northern Mindanao is 0.5. In contrast, the fertility rate of Cagayan Valley increased by 0.7 which is larger than the increase in the fertility rate of Davao Region.

In a span of five years, Western Visayas' fertility rate fell by 0.7, larger than that of Ilocos Region and Central Visayas which decreased only by 0.4. Central Visayas had a fertility rate of 3.2, a little lower than that of the Cordillera Administrative Region (CAR), Western Visayas, Northern Mindanao and Davao Region. The Ilocos Region, on the other hand, had 3.4 fertility rate while Region XII had 3.6. The fertility rate of Region IX which is the Zamboanga Peninsula is 0.2 higher than that of SOCCSKSARGEN[3.6].

The fertility variations across regions in the Philippines for the last decade (2003 and 2008) did not differ largely. As we can see on Table 2, some regions had the same rates. The largest difference for 2003 is 2.2 between NCR and MIMAROPA while it was only 2 between ARMM, Caraga, MIMAROPA, Eastern Visayas and NCR or the last decade.

The regression results in Table 3 show a high adjusted R^2 which means that the model exhibits a strong linear fit. Based on the R^2 computed, 87.9% of the variation in fertility rates across regions for the last decade is explained by employment rate, educational attainment, contraceptive prevalence rate and per capita GRDP. The constant term implies that when all the variables are zero, fertility rate will decrease by 1.38. Although we obtained a high adjusted R^2 of 78.6%, only one independent variable which is contraceptive prevalence rate was found to be statistically significant. In contrast, employment rate, educational attainment and per capita GRDP were found to be insignificant. However, the model shows a significant result at an alpha level of 1%.

Contrary to other studies conducted, the expected relationship between employment rate and fertility rate does not support the past literatures such as the study conducted by Fang et al. in 2010. However, results obtained in Table 3 show that there is a positive relationship between employment rate and fertility rate across regions in the Philippines for the last decade. This shows that when the employment rate of women increases by 1%, the number of children per region will increase by almost .05 holding educational attainment, contraceptive prevalence rate and per capita GRDP constant.

Some studies also show that there are some cases that the two variables are positively correlated. According to Engracia and Herrin[8], work-fertility varies across ethnic groups with different household's opportunity structures. They found that "in the short run, women currently working end up with higher fertility while in the long run, having worked appears to be associated with lower fertility"[8]. There are some groups that exhibit a positive relationship between work and fertility in situations where working and caring for children are expected to be strongly incompatible[8].

Similarly, a positive relationship is found to exist between fertility rate and percentage of women with no education. When the percentage of women who have no education increases by 1%, the total fertility rate per region will increase by .058 not taking into account the employment rate, percentage of women who completed primary, percentage of women who completed high school, percentage of women who completed college, contraceptive prevalence rate and per capita GRDP. This supports the claim of Güneş[5] that women who have little or with no education possess high levels of fertility.

Likewise, percentage of women who completed primary and fertility rate is also positively correlated. A 1% percent increase in the percentage of women who completed primary will increase fertility by .064 holding employment rate, percentage of women who have no education, percentage of women who completed high school, contraceptive prevalence rate and per capita GRDP constant. When the change in fertility rate between percentage of women who have no education and percentage of women who completed primary is compared, it is clear that the change in fertility rate is greater by only .06 when there is an additional percentage in women who completed primary than an additional percentage in women who have no education. This result did not agree with the study of Wong [9] that number of children decreased among women as their educational levels increased.

Finally, an inverse relationship was found between fertility rate and percentage of women who finished high school. This confirms the hypothesis that fertility rate per region fall when the level of education increases. Specifically, this means that fertility rate will decrease by 0.01 when there is a 1% increase in the percentage of women who finished high school holding employment rate, percentage of women who have no education, percentage of women who finished primary, percentage of women who finished college, contraceptive prevalence rate and per capita GRDP constant. This result is similar to the previous studies such as that of Wong[9] where he found that high education has negative effects on fertility. Moreover, this also affirms the result found by Shapiro [10] that fertility differences by educational attainment tend to widen as one moves from lower-level to upper-level secondary schooling.

On the other hand, a study conducted by Leon[11] found that higher educational levels are associated with lower number of children. Contrary with the previous studies, fertility rate and percentage of women who finished college are positively correlated. A 1% increase in the percentage of women who completed college would lead to an increase of 0.01 in the total fertility rate per region regardless of employment rate, percentage of women who have no education, percentage of women who completed primary and high school, contraceptive prevalence rate and per capita GRDP. This supports the study conducted by Mathews and Ventura [12] wherein they found that, college educated married women has much higher birth rates compared to less educated women. Also, in some African countries, highly educated women are the ones who have larger families than those women who have only few years of schooling.

As what is expected, there is a negative relationship between contraceptive prevalence rate and fertility rate in this model. This means contraceptive use has a negative impact on the total number of children across regions for the last decade. When contraceptive prevalence rate increases by 1%, fertility rate per region will increase by .02 holding employment rate, educational attainment and per capita GRDP constant. This result was found to be significant at an alpha level of .01.

Additionally, studies on per capita GRDP and fertility rate also provide strong support to the results obtained in Table 3. As per capita GRDP increases, the fertility rate per region decreases. This is shown by the negative sign of the coefficient of per capita GRDP. When per capita GRDP increases by 1 peso, fertility rate per region will fall by .002, holding employment rate, educational attainment and contraceptive prevalence rate constant. Although the negative relationship between the two variables is expected, the changes in the fertility rate per region for the last decade when per capita GRDP changes is much lower compared with the changes in fertility rate when all other variables changes. However, this does not support the results of Herzer, Strulik and Vollmer [13] where they concluded that per capita GDP has a large impact on the reductions of fertility.

In general, we can see from Table 3 that there is a large change in the fertility rate across regions in the Philippines for the last decade when there is an increase of 1 child per woman in the percentage of women who have no education and percentage of women who completed primary. The changes in fertility are almost the same for every one percent increase in the percentage of women who completed high school and college which is .06. On the other hand, there is only a change of .01 in the total fertility rate across regions for every additional percentage in the contraceptive prevalence rate. Also, there is a change of .05 in fertility when employment increases by 1%. The smallest change was found in fertility rate which is only .002 when there is a one-peso increase in per capita GRDP. All these results are regardless the effects of all the other variables. To ensure that the model presented do not violate the assumptions of Classical Linear Regression Model (CLRM), researcher tested if multicollinearity occurred in the model using the Variance Inflation Factor (VIF) (Table 4).

Since all the values obtained from the four models are less than 10, then multicollinearity is not present in the data set. This means that the independent variables employment rate of women, educational attainment, contraceptive prevalence rate and per capita GRDP are not perfectly correlated with each other.

One of the important assumptions of CLRM is that the disturbances are homoscedastic, meaning they have all the

same variance[14]. In this model, detecting heteroskedasticity is important because it could lead to incorrect conclusions in hypothesis testing [15]. Therefore, to find out if this assumption is fulfilled, the researcher wanted to make sure that heteroskedasticity is not present in the data set.
Using White-test, results obtained are as shown in Table 5.

For the interpretations of the results in Table 5, we can see that there are large changes in the value of the coefficients of the variables. Similarly, the p-values or the significance level of the independent variables namely employment rate, percentage of women who have no education, percentage of women who completed primary, percentage of women who completed high school, percentage of women who completed college, contraceptive prevalence rate and per capita GRDP increased largely.
The regression equation using the result in Table 5 is;

$Y =$ -20.1962 + 0.393143X_2 + 0.0127808X_3 + 0.018725X_4 + 0.129425X_5 +

0.000872954X_6 + 0.0203840X_7 + 0.0000120770X_8

The coefficients of the variables are all positive except for the variable per capita GRDP. This means that employment rate, percentage of women who have no education, percentage of women who completed primary, percentage of women who completed high school, percentage of women who completed college and contraceptive prevalence rate are positively correlated with fertility rate. On the other hand, per capita GRDP and fertility have a negative relationship which proves the expected relationship between the two. The results found on employment rate, educational attainment and contraceptive prevalence rate are in opposition to the previous literatures. When the percentage of women who completed college increases by 1%, fertility rate will also increase by .0008 not taking into account all other variables. There is an increase of .02 in the fertility rate across regions when contraceptive prevalence rate increases by 1%. On the other hand, the reduction in fertility rate is small, which is .00001 if per capita GRDP increases by a percentage holding all other variables constant.

When all independent variables are 0, the rate of fertility across regions in the Philippines for the last decade will decrease by 20.2 children holding all other variables constant. On the other hand, a 1% increase in the employment rate would lead to an increase of .39 in the fertility rate regardless of educational attainment, contraceptive prevalence rate and per capita GRDP constant. Similarly, when there is a percentage added in the percentage of women who have no education, fertility will increase by .01. .13 is also added on the total fertility per region if there is a 1% increase in the percentage of women who completed primary holding everything constant. When there is also a 1% increase in the percentage of women who completed high school, fertility rate per region will also increase by .02.

All variables are statistically insignificant because of their higher p-values. This means that there is no statistically significant relationship between employment rate, educational attainment, contraceptive prevalence rate and per capita GRDP.

Since there is only one significant variable obtained in the first model which is contraceptive prevalence rate, the researcher tested another model using percentage of women with no education and percentage of women who completed college for educational attainment. The regression results for the second model (Table 6).

Results in Table 6 show a decrease in the value of R^2 and adjusted-R^2. 82.7% of the variation in fertility rates across regions for the last decade is explained by women's employment rate, percentage of women who have no education, percentage of women who completed college, contraceptive prevalence rate and per capita GRDP. The model is statistically significant at an alpha level of 0.001.

However, employment rate, contraceptive prevalence rate and per capita GRDP were found to be statistically significant at an alpha level of 0.1 or 10%. Employment rate is still positively correlated with fertility rate. When employment rate increases by 1%, fertility rate across regions for the last decade will also increase by 0.1 holding educational attainment, contraceptive prevalence rate and per capita GRDP constant. Also, a percentage increase in the percentage of women who have no education will lead to an increase of .06 in the total fertility rate across regions.

On the other hand, percentage of women who completed college and fertility rate are negatively related. This means that an increase in the percentage of women who completed college will decrease fertility rate by 0.0005 not taking into account all other variables in the model. Also, when contraceptive prevalence rate increases by a percentage, fertility rate across regions will decrease by 0.02 holding employment rate, educational attainment and per capita GRDP constant. Similarly, the value of the coefficient of per capita GRDP is negative which implies that fertility will decrease by 0.00002 for every one-peso increase in the per capita GRDP holding constant the employment rate, educational attainment and contraceptive prevalence rate. The change in fertility is larger in Model 2 when employment increases. On the other hand, almost no changes happened on fertility rate when variables such as contraceptive prevalence rate and per capita GRDP changed.

Table 1: Fertility rate across regions for 2003 and 2008

Regions	Fertility Rate	
	2003	2008
National capital region	2.8	2.3
Cordillera administrative region	3.8	3.3
I: Ilocos region	3.8	3.4
II: Cagayan valley	3.4	4.1
III: Central Luzon	3.1	3.0
IV: A Calbarzon	3.2	3.0
V: Bicol region	4.3	4.1
VI: Western visayas	4.0	3.3
VII: Central visayas	3.6	3.2
VIII: Eastern visayas	4.6	4.3
IX: Zamboanga peninsula	4.2	3.8
X: Northern men danao	3.8	3.3
XI: Davao region	3.1	3.3
XII: Soccsksargen	4.2	3.6
Autonomous region of muslim mindnanao	4.1	4.3
XIII: Caraga	4.2	4.3

Source: National Demographic and Health Survey (NDHS)
*** significant at the 1% level, ** significant at the 5% level

Table 2: Panel data for women's employment rate, educational attainment of women, use of contraceptives and per capita GRDP

	Employment rate% (Women) 2008	Highest educational attainment (women) 2008 %				Use of contraceptives % (2008)	Per capita GRDP at constant 1985 prices (pesos)
		No Education	Completed primary	Completed high school	Completed college		
NCR	88.6	0	6.4	31.1	44.2	54.1	41,541
CAR	95.7	1.5	12.7	23.0	37.6	54.9	19,021
I	92.7	0	11.1	33.1	36.7	54.2	8,277
II	96.6	0.4	15.0	24.5	32.7	54.3	8,504
III	91.5	0.2	12.9	36.6	30.6	57.8	12,039
IVA (Mamiropa)	91.3	0.1	8.9	36.9	34.2	46.8	14,750
IVB (Calabarzon)	94.7	5.8	15.5	24.4	25.4	53.6	13,536
V	94.0	0.3	17.9	22.1	27.8	39.4	7,210
VI	93.6	0.8	9.5	28.4	35.3	51.9	14,149
VII	93.9	0.9	14.4	25.7	26.6	55.7	14,997
VIII	95.2	0.8	14.9	20.2	28.8	47.5	7,007
IX	96.5	2.7	13.4	19.1	31.5	43.8	10,671
X	95.4	1.8	11.9	23.7	28.2	53.2	17,042
XI	93.6	1.1	13.3	23.1	25.6	60.2	15,139
XII	94.7	3.1	10.0	25.0	20.8	55.1	12,782
ARMM	94.8	12.6	13.2	9.8	18.6	51.7	7,525
XIII(Caraga)	94.3	0.9	12.5	24.2	24.6	15.1	3,563

*significant at the 10% level

Table 3: Regression results: (Dependent Variable: Fertility Rate)

	Coefficient	Standard Error	t-ratio	p-value	
constant	-1.3791	6.56369	-0.2101	0.83826	
employment rate	0.0545854	0.0651257	0.8382	0.42364	R^2 = 0.879697
educational attainment: no education	0.0577147	0.0405535	1.4232	0.18841	Adjusted-R^2 =0.786127
educational attainment: completed primary	0.0641592	0.0380482	1.6863	0.12602	P-value(F) =0.001626
educational attainment: completed high school	-0.00622464	0.0247697	-0.2513	0.80723	F(7,9) = 9.401549
educational attainment: completed college	0.00623032	0.0173785	0.3585	0.72823	
contraceptive prevalence rate	-0.0163219	0.00836696	-1.9508	0.08287*	
per capita GRDP	-2.22445e-05	1.63261e-05	-1.3625	0.20615	

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

Table 4. *Variance inflation factor*

Employment rate	3.814
Educational attainment: no education	3.493
Educational attainment: completed primary	2.450
Educational attainment: completed high school	5.797
Educational attainment: completed college	2.750
Contraceptive prevalence rate	1.644
Per capita GRDP	4.069

Table 5. White's Test for Heteroskedasticity

	Coefficient	Standard Error	t-ratio	p-value
Constant	-20.1962	218.501	-0.09243	0.9348
Employment rate	0.393143	4.62316	0.08504	0.9400
Educational attainment: no education	0.0127808	0.0515069	0.2481	0.8272
Educational attainment: completed primary	0.129425	0.236439	0.5474	0.6390
Educational attainment: completed high school	0.0184725	0.129802	0.1423	0.8999
Educational attainment: completed college	0.000872594	0.0925066	0.009433	0.9933
Contraceptive prevalence rate	0.0203840	0.0304434	0.6696	0.5721
Per capita GRDP	-1.20770e-05	3.18587e-05	-0.3791	0.7411

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

Table 6: Regression results: (Dependent Variable: Fertility Rate)

	Coefficient	Standard Error	t-ratio	p-value	
Constant	-4.79483	4.56028	-1.0514	0.31561	
Employment rate	0.100425	0.0476965	2.1055	0.05904*	R^2 = 0.827754
Educational attainment: no education	0.0557141	0.0313399	1.7777	0.10307	Adjusted-R^2 = 0.749460
Educational attainment: completed college	-0.000510092	0.0183071	-0.0279	0.97827	P-value(F) = 0.000665
Contraceptive prevalence rate	-0.0155842	0.0079059	-1.9712	0.07438*	F(5,11)= 10.57242
Per capita GRDP	-2.77471e-05	1.41781e-05	-1.9570	0.07620*	

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

Fig. 1: Determinants of Fertility Rate across Regions in the Philippines

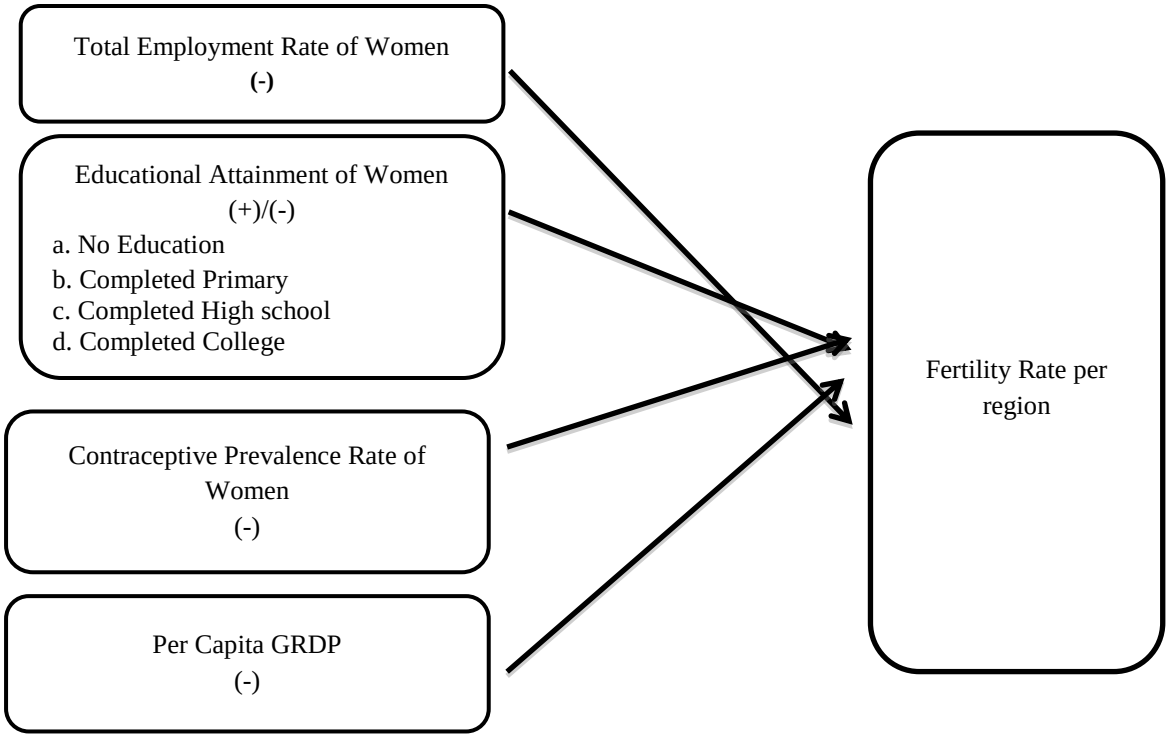
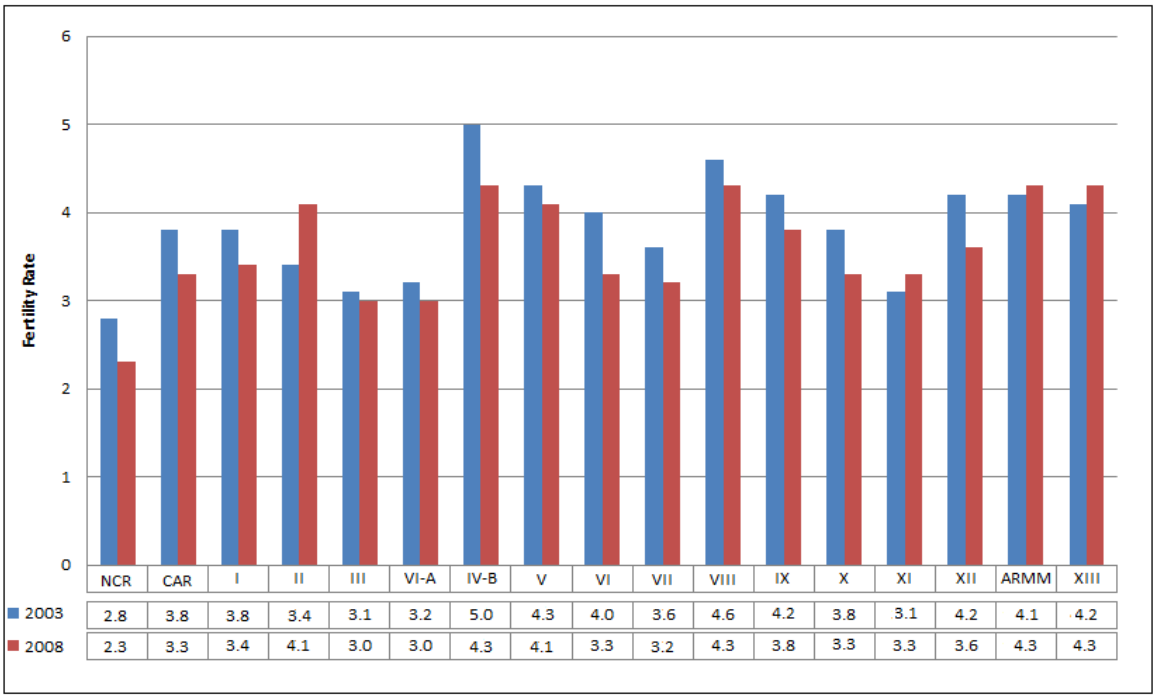


Fig. 2: Fertility rate across regions for 2003 and 2008



	NCR	CAR	I	II	III	VI-A	IV-B	V	VI	VII	VIII	IX	X	XI	XII	ARMM	XIII
2003	2.8	3.8	3.8	3.4	3.1	3.2	5.0	4.3	4.0	3.6	4.6	4.2	3.8	3.1	4.2	4.1	4.2
2008	2.3	3.3	3.4	4.1	3.0	3.0	4.3	4.1	3.3	3.2	4.3	3.8	3.3	3.3	3.6	4.3	4.3

CONCLUSION

The study aims to compare fertility rates across regions in the Philippines for the last decade and show the effects of each variable on fertility rate. The determinants of fertility used in determining the variations on each region are employment rate, educational attainment as measured by percentage of women who have no education, percentage of women who completed primary, percentage of women who completed high school, percentage of women who

completed college, contraceptive prevalence rate and per capita Gross Regional Domestic Product (GRDP).

The regions with highest fertility rate for the last decade were MIMAROPA, Eastern Visayas, Autonomous Administrative Region of Muslim Mindanao (ARMM) and Caraga region, while the region with the lowest fertility for the last decade is the National Capital Region with a rate of 2.3 children per woman.

The model used in this study is a multiple regression model. In order to ensure that the model does not violate the assumptions of Classical Linear Regression Model, a test for multicollinearity and heteroskedasticity were made. The independent variables namely employment rate, educational attainment, contraceptive prevalence rate and per capita GRDP are not perfectly correlated with each other.

Only one independent variable in the first model which is contraceptive prevalence rate was found to be statistically significant in explaining fertility rate across regions for the last decade. The expected negative relationships between fertility rate and educational attainment as measured by percentage of women with no education, percentage of women who completed primary, percentage of women who completed high school, contraceptive prevalence rate and per capita GRDP were also found. However, employment rate and educational attainment as measured by percentage of women who completed college were positively correlated with fertility rate.

The researcher tried another model using women's employment rate, educational attainment as measured only by percentage of women with no education and percentage of women who completed college, contraceptive prevalence rate and per capita GRDP. The results showed that employment rate, contraceptive prevalence rate and per capita GRDP significantly affect fertility rate across regions in the Philippines for the last decade. Furthermore, the signs of the coefficients of the independent variables were not changed.

Disregarding the two variables namely educational attainment as measured by percentage of women who completed primary and percentage of women who completed high school, the revised model shows a more significant result since the p-value obtained is higher which is 0.001. The model also shows more significant variables although the R^2 and adjusted-R^2 computed decreases.

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REFERENCE

1. Mapa DS, Lucagbo M, Balisacan AM, Corpuz JR, Ignacio CL. Is Income Growth Enough to Reduce Total Fertility Rate in the Philippines? Empirical Evidence from Regional Panel Data. Retrieved from https://mpra.ub.uni-muenchen.de/40750/
2. Soubbotina TP. Beyond economic growth: An introduction to sustainable development. The World Bank; 2004 Jun 30. https://doi.org/10.1596/0-8213-5933-9
3. Waseem HF, Yasmeen F. Predicting total fertility rates (tfr) of pakistan using arima models. In14th International Conference on 2016 Mar 14 (p. 187).
4. Population Reference Bureau. Is Education the Best Contraceptive?. 2000 May. Retrieved from http://www.prb.org/pdf/IsEducat-Contracept_Eng.pdf
5. Güneş PM. The impact of female education on teenage fertility: evidence from Turkey. The BE journal of economic analysis & policy. 2016 Jan 1;16(1):259-88. https://doi.org/10.1515/bejeap-2015-0059
6. O'Sullivan JN. Revisiting demographic transition: Correlation and causation in the rate of development and fertility decline. Retrieved from https://core.ac.uk/download/pdf/43378524.pdf
7. Costello MP, Casterline JB. Fertility decline in the Philippines: current status, future prospects. asdf. 2009:479. Retrieved from http://www.un.org/esa/population/publications/completingfertility/RevisedCOSTELLO- CASTERLINEpaper.PDF
8. Engracia LT, Herrin AN. Female work participation and fertility in the Philippines. 1984
9. Wong EL. Womens work fertility level and contraceptive use: a synthesis of results from Bolivia the Philippines and Zimbabwe. 2000 Retrieved from http://www.policyproject.com/pubs/commissionedresearch/fhi.pdf
10. Shapiro D. Women's education and fertility transition in sub-Saharan Africa. Vienna Yearbook of Population Research. 2012 Jan 1;10:9-30 https://doi.org/10.1553/populationyearbook2012s009
11. Leon A. The effect of education on fertility: evidence from compulsory schooling laws. unpublished paper, University of Pittsburgh. 2004 Nov. Retrieved from https://core.ac.uk/download/pdf/6388153.pdf
12. Mathews TJ, Ventura SJ. Birth and fertility rates by educational attainment: United States, 1994. Monthly vital statistics report. 1997 Apr 24;45(10). Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.218.7738&rep=rep1&type=pdf
13. Herzer D, Strulik H, Vollmer S. The long-run determinants of fertility: one century of demographic change 1900–1999. Journal of Economic Growth. 2012 Dec 1;17(4):357-85. https://doi.org/10.1007/s10887-012-9085-6
14. Gujarati DN. Basic econometrics. Tata McGraw-Hill Education; 2009.
15. Danao, R. Introduction to Statistics and Econometrics. The University of the Philippines Press. 2005.