# Birth Rate Plummets, Economy Rockets: Impact of Birth Rate on Economic Indicators in the Philippines

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*Abstract*—**This study sought to understand the relationship between birth rate trend per annum; and the economic growth in the Philippines from 1975-2000. It is intended to prove the primary hypothesis: *The prevailing birth rate is a determining factor of the economic growth of a developing country.* The hypothesis is based on the presumed benefits of being raised in households with fewer children, where the individual children have more access to both material resources and parental attention. This is evident in third-world countries such as the Philippines, where resources are scarce. The researchers utilized the Internet as a means of acquiring data, and statistical software for generating equations for linear regression, Pearson correlation coefficient, and coefficient of determination. The results indicate that there is an inverse relationship between birth rate and economic indicator. The study concludes that the economy of the Philippines is gradually increasing and improving throughout the years, and as the economy progresses, people experience less idle time and even personal time.**

*Index Terms*—**Birth rate, economic growth, economic indicator, relationship.**

## I. Introduction

Birth rate, a demographic trend, suggests a significant impact on a country's economic prosperity [1] which manifests by the ascent of the country's total output or the Gross Domestic Product (GDP) and Gross National Product (GNP) that includes various economic indicators such as OFW population, OFW remittance, import rate, export rate, unemployment rate, and employment rate. Economic growth alleviates the standards of living and dwindles poverty [3]. With this, the population structure, which has drastically construed the global economy, may either serve as a potential or an impediment on economic growth [2].

The correlation between birth rate and economic growth is perceived as positive when the birth rate condition prompts the economic indicator to boom, which entails an upturn in the standards of living as population growth promotes competition in the field of commerce that bolster the potential of the market to have an edge of being ahead of other countries. In contrary, the rendition of the trend is negative when the birth rate is perceived as an impediment to the economic development. The rapid escalation of population size may lead to an economic repercussion as people face scarcity of resources while dependency ratio increases. These dependents include infants who are regarded as economically unproductive [1], [4], [5].

This study primarily investigates the relationship of birth rate trend per annum as a determining factor of the economic growth in the Philippines from 1975–2000. The researchers aim to determine the type of relationship birth rate have on six economic indicators, specifically the OFW population, OFW remittance, import rate, export rate, unemployment rate, and employment rate in the Philippines through statistical analysis using linear regression, Pearson correlation coefficient, and coefficient of determination. The study did not account for any other external factors and components of economic growth.

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## II. Background of the Study

### A. Economic Context of the Philippines

The economic growth of the Philippines increased during 1970–2000, in spite of the slow global growth progress of the economy after World War II. In 1970, the Philippines failed to have a better performance or

fast economic growth due to recurring economic crises. However, after many years, the economy grew rapidly, with Gross National Income growing at an average rate of 5.7% per annum from 1970 to 1980, mostly because of the increased exports and government investments [17]. The economic growth of the Philippines does not compare to other Asian countries like Singapore, Japan, and Taiwan, even though it is rich in natural and human resources.

Despite the soaring prices of commodities brought by inflation, the Philippines remained as one of the most competitive countries, economically speaking—ranking 5th in Southeast Asia, and 56th in the global scale [15], [16], [17]. Analyzing the Philippine economy, its structure promises for commercial headway with its faster growth percentage of 6.8% in 2018, as compared to previous year's position with 6.5% in the 4th quarter. Factors that contributed to this minimal growth includes the minimal allaying of unemployment, from a rate of 5.7% to 5.5% in 2017 [18], [19]. Albeit these recent positive economic outcomes, studies suggest that the country's economy is overheating:

> When an economy overheats, it means there are more goods and services produced in an economy than expected. This is typically in response to greater demand from consumers and producers, and manifested by rising inflation or accelerating prices [23].

With its current status, the demand for the workforce is unceasing which contributes to the debilitation of the economy [20]. An underlying source of this economic complication is the fertility rate of 2.93% in 2017 [21], [22]. Unemployment is still a perpetual economic obstacle with 1.4 million males and 783, 000 women that still do not belong to the labor force [24] because the population of the country is huge [25], [26].

### B. *Definition of Terms*

This section is provided for further understanding of the following terms which will be used cohesively in the context of the study.

#### Annual Deployment of OFW

Annual deployment of overseas Filipino workers is the amount of OFW dispersed from the Philippines to other countries for a certain amount of time containing the rehires and new hires [29].

#### Crude Birth Rate

Crude birth rate is the annual number of live births occurring among the population of a given area per 1,000 mid-year total population of the given area during the same year [6].

#### Economic Indicator

Economic indicators are factors that are used to assess, measure, and evaluate the overall state of health of the economy. It is often collected by a government agency or private business intelligence organization in the form of a census or survey, which is then analyzed further to generate an economic indicator [10].

#### Employment Rate

Employment rate is the percentage of the labor force that is employed. It is one of the economic indicators that economists examine to help understand the state of the economy [11].

#### Export Rate

Export rate is the amount by which the value of an economy's exports grows over a period of time. It contributes to the overall growth or decline of an economy [7].

#### Gross Domestic Product

Gross Domestic Product measures the total market value of all final goods and services produced within a country in one year [12].

#### Gross Domestic Product Per Capita

Per Capita GDP is the Gross Domestic Product being split up equally by the population of the country to showcase the division of the sum of all the services and goods made by the economy with respect to the total population [34].

#### Import Rate

Import rate is the percentage of the good or service brought into one country from another [13].

#### OFW Remittance

OFW remittance is the money that OFW's send to their families in the Philippines. OFW remittance is either sent through formal or informal channels [8].

#### Unemployment Rate

Unemployment rate is the percentage of unemployed workers in the total labor force. Workers are considered unemployed if they currently do not work despite the fact that they are able and willing to do so. [14]

## III. Methodology

### A.  *Instrument*

In this research, the Internet and Microsoft Excel were the instruments utilized. The Internet was fundamentally utilized to acquire the data set of birth rate and economic indicators to recognize the correlation of the trend. The researchers opted to use reliable sources, particularly the Bangko Sentral ng Pilipinas, Asian Development Bank, and Philippine Statistics Authority. Data gathering using the Internet served as an efficient and effective tool as the researchers involve statistical analysis. Microsoft Excel served a crucial role in tabulating and generating equations from the data.

### B.  *Method*

Using Microsoft Excel, the data gathered were tabulated to visualize the trends and generate the statistical formula of multiple linear regression. Pearson correlation coefficient was used to determine the congruence of the birth rate trend and economic indicators such as the OFW remittance trend, which is the largest contributor of the country's GDP, to illustrate poverty. Linear regression was incorporated by manipulating the independent and dependent variables correspondingly: x-axis for birth crude rate and y-axis for the economic indicators. Pearson correlation coefficient was also used to measure the relationship and orientation between the dependent and independent variable.

### C.  *Equations*

The equations below were used to analyze the data.

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\left(N\sum X^2 - (\sum X)^2\right)\left(N\sum Y^2 - (\sum Y)^2\right)}} \quad (1)$$

$$r^2 = \frac{\left(n\sum R_{xi}R_{yi} - \sum R_{xi}\sum R_{yi}\right)^2}{\left[n\sqrt{\sum (R_{xi})^2 - (\sum R_{xi})^2}\right]\left[n\sqrt{\sum (R_{yi})^2 - (\sum R_{yi})^2}\right]} \quad (2)$$

## IV. Results and Discussion

The correlation coefficient r is negative and near to approaching -1, so there is a strong downhill linear relationship between the birth rate and export rate. This explains the inverse relationship between the birth rate and the export rate. As seen from the graph, the birth rate is high while the goods exported were low and vice versa. Thus, making the export rate of the Philippines increase while the birth rate decreases throughout the years.
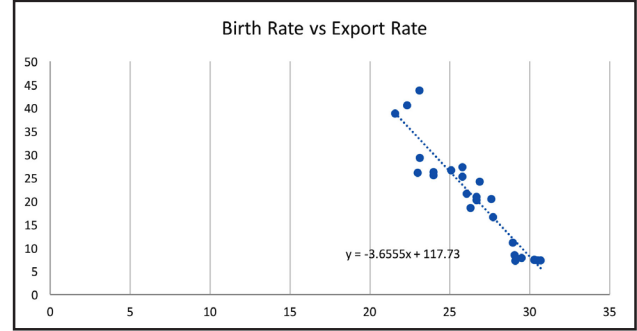


**Fig. 1.** Export rate.

Pearson r = -0.942118065

r^2 = 0.8875864475

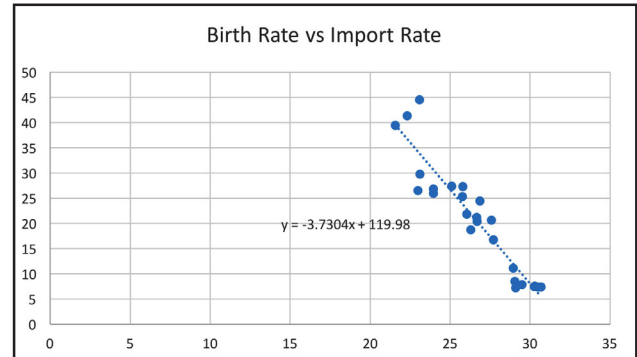Thus, 88.76% of the variation is explained by the model.



**Fig. 2.** Import rate.

Pearson r = -0.943117594

The correlation coefficient is near -1, so we can assert that there is a strong downhill linear relationship between the birth rate and import rate. This implies that as the birth rate increase, the import rate decreases. However, since we know that as the years pass by the birth rate decreases, so the import rate increases.

r^2 = 0.8894707958

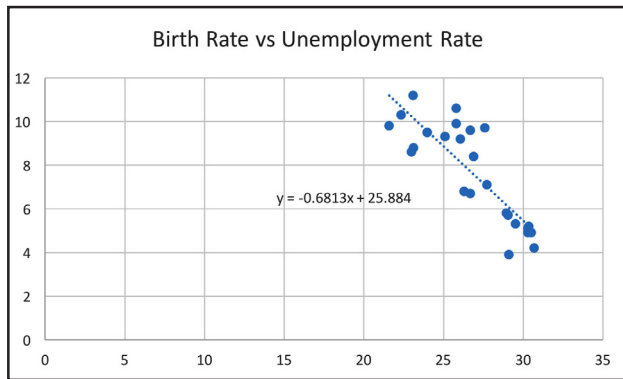Therefore, this means that 88.95% of the variation is explained by this model.

**Fig. 3.** Unemployment rate.

Pearson r = -0.84848048

The value of Pearson r is below -0.70 that is why there is a strong downhill relationship between birth rate and unemployment rate. This connotes that when the birth rate increases, the unemployment rate decreases. As noted earlier, from 1975 to 2000, the birth rate approximately decreased, which explains why the number of unemployed increased.

$r^2 = 0.7199191245$

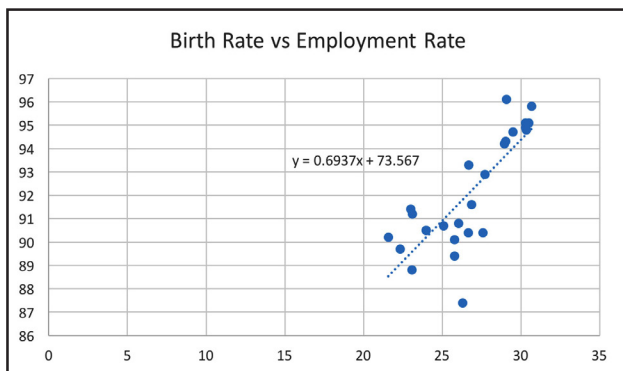This means that approximately 71.99% of the variation is explained by the graph.



**Fig. 4.** Employment rate.

Pearson r = 0.799376981

The correlation coefficient r is positive and above 0.70, so there is a strong uphill linear relationship between birth rate and employment rate. Hence, there is a direct relationship between the birth rate and the employment rate as when the birth rate increases, the employment rate increases as well.

$r^2 = 0.63900355573$
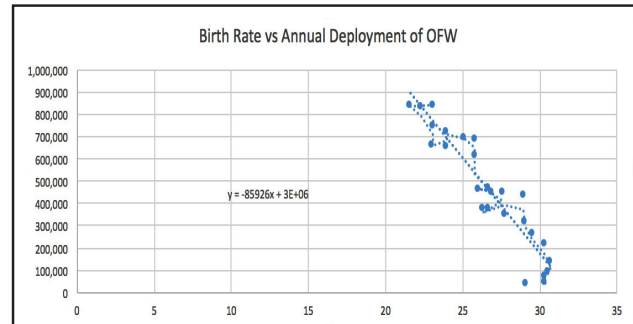
Hence, 63.9% of the variation is explained by the model.



**Fig. 5.** Annual deployment of OFW.

Pearson r = -0.939516219

The correlation coefficient is super close to negative, making us say that there is a strong downhill linear relationship between birth rate and the annual deployment of OFW. This would then imply that even if the birth rate decreases, there is an increase of OFWs for reasons such as that the employment rate in the Philippines is bad or the salary they earn here is not enough for their families.

$r^2 = 0.8826907266$

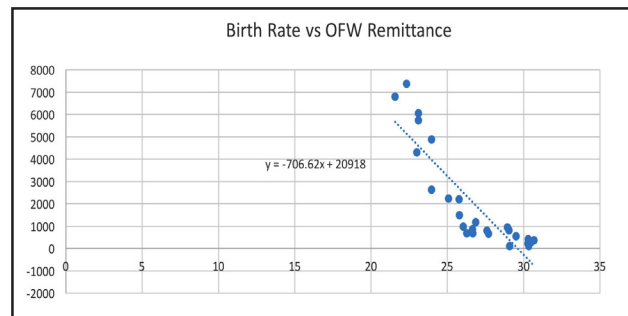This would mean that 88.27% of the variation is explained by the model.



**Fig. 6.** OFW remittance

Pearson r = -0.87881902

The value of Pearson r is a strong negative linear relationship since the value is near -1 and below -0.70. Thus, we can infer that the birth rate is inversely proportional to the OFW remittance. This would imply that throughout the years, the remittance of OFWs is increasing since their families need a larger budget to survive despite the decrease in the birth rate.

$r^2 = 0.7723228706$

Approximately 77.23% of the variation is[1] explained by this graph.

## V. Conclusion

Based on the gathered data, an inverse relationship between birth rate and the various factors for GDP or economic growth has been evident.

The results of the study generated the following conclusions: Five of the dependent variables or the economic indicators namely the export rate, import rate, unemployment rate, OFW population, and OFW remittance have a negative or inverse relationship with the birth rate. One economic indicator—employment rate—attained a positive relationship with the birth rate.

The export rate increases as the birth rate decreases, which connotes that as there are fewer people in the country, the products produced by the country for the benefit of other countries would be greater. On the other hand, the import rate increases as the birth rate decreases, which implies that the imported goods remain high due to external factors such as the fact that part of the Filipino culture is having a colonial mentality wherein people have a preference of purchasing goods that are manufactured abroad. The OFW population has an increasing pattern as the birth rate is decreasing which does not imply that if there are fewer people in the country, there would be less OFW workers. This phenomenon is similar to the bearing of the OFW remittance, which connotes that the cash being remitted by the relatives of the OFW worker becomes higher each year. The employment rate increases as the birth rate increases, which means that as there are more dependents, which includes the infants, then there would be more labor force power.

As the economy progresses, people experience less idle time and even personal time. This is evident in countries such as Japan and Korea, developed countries but are still rapidly thriving as they both have rigid work cultures. For instance, Japan has a phenomenon called salaryman (サラリ［マン, *Sararīman)*. They are characterized as a white-collar being overworked who eventually develops a loss of interest in improving personal relationships as they are expected to work extensively for a long span of time on their desks [27], [28]. On the other hand, the Philippines is a developing country where opportunities are just starting to rise and spike where the employment rate rises, which implies that the workforce population would increase; thus, their life may revolve on the company as they spend less time with their family.

To resolve the birth problem in the country, sex education could be an option as a short-term solution, whereas underpinning economic policies to improve our economy may serve as a long-term solution in terms of birth rate.

## References

[1]   F. Furuoka, "Population growth and economic development: Empirical evidence from the Philippines," *Philippine Journal of Development*, vol. 37, no. 2, pp. 81–93, 2010.

[2]   C. Cheadle, "Dropping fertility rates are a threat to the global economy," *Business Insider,* Nov. 28, 2016. [Online]. Available: https://www.businessinsider.com/dropping-fertility-rates-will-affect-the-economy-2016-11. [Accessed Dec. 5, 2018].

[3]   P. Agarwal, "What is economic growth," *Commission on Filipinos Overseas,* Dec. 26, 2017. [Online]. Available: https://www.cfo.gov.ph/news/from-overseas-filipinos/481-worker-remittances-and-the-philippine-economy.html. [Accessed Dec. 5, 2018].

[4]   J. Mayuga, "Cimatu: PHL facing natural resource scarcity," *Business Mirror,* May 27, 2018. [Online]. Available: https://businessmirror.com.ph/cimatu-phl-facing-natural-resource-scarcity/ [Accessed Dec. 5, 2018].

[5]   C. White, "Potential growth in the Philippines: Problem or potential?" *National Review,* Feb 8, 2011. [Online]. Available: https://www.nationalreview.com/corner/population-growth-philippines-problem-or-potential-christopher-white. [Accessed Dec. 5, 2018].

[6]   United Nations, *Handbook of Vital Statistics Systems and Methods, Volume 1: Legal, Organisational and Technical Aspects*, United Nations Studies in Methods, Glossary, Series F, No. 35, New York: United Nations, 1991.

[7]   "Export rate," *Farlex Financial Dictionary,* 2009. Available: https://financial-dictionary.thefreedictionary.com/Export+Rate. [Accessed Dec. 6, 2018].

[8]   M. Neri, "How does remittance from OFWs help the Philippine economy?," *Money Gizmo,* Sept. 25, 2013. [Online]. Available: https://moneygizmo.net/remittance-ofws-help-philippine-economy/. [Accessed Dec. 5, 2018].

[9]   Population Reference Bureau, "Glossary of demographic terms," August 25, 2018. [Online]. Available: https://www.prb.org/glossary/. [Accessed Dec. 5, 2018].

[10]  "Economic indicators," *Corporate Finance Institute.* [Online]. Available: https://corporatefinanceinstitute.com/resources/knowledge/economics/economic-indicators/. [Accessed Dec. 5, 2018].

[11]  "What is employment rate?" advfn.com, n.d. [Online]. Available: https://www.advfn.com/money-words_term_6849_Employment_Rate.html/. [Accessed Dec. 5, 2018].

[12]  M. Schmidt, "Gross Domestic Product GDP, Gross National Product GNP, and Gross National Income GNI," *Business Encyclopedia,* n.d. [Online]. Available: https://www.business-case-analysis.com/gross-domestic-product.html. [Accessed Dec. 5, 2018].

[13]  K. Amadeo, "Imports and how they affect the economy," *The Balance,* Sept. 19, 2018. [Online]. Available: https://www.thebalance.com/imports-definition-examples-effect-on-economy-3305851. [Accessed Dec. 5, 2018].

[14] "What is unemployment rate?," *Focus Economics,* Nov. 15, 2018. [Online]. Available: https://www.focus-economics.com/economic-indicator/unemployment-rate. [Accessed Dec. 5, 2018].

[15] L. Desiderio, "Global competitiveness report: Philippines ranks 56th," *Philippine Star,* Oct. 17, 2013. [Online]. Available: https://www.philstar.com/headlines/2018/10/17/1860773/global-competitiveness-report-philippines-ranks-56th. [Accessed Dec. 5, 2018].

[16] "Philippines 5th most competitive economy in Southeast Asia," *Manila Standard,* Oct. 25, 2018. [Online]. Available: http://manilastandard.net/news/national/278915/philippines-5th-most-competitive-economy-in-southeast-asia.html. [Accessed Dec. 5, 2018].

[17] A. Masigan, "How competitive is the Philippine economy today?" *Business World,* Oct. 25, 2018. [Online]. Available: https://www.bworldonline.com/how-competitive-is-the-philippine-economy-today-2/. [Accessed Dec. 5, 2018].

[18] L. G. Bersales, "Philippine economy grows by 6.8 percent in the first quarter of 2018," *Philippine Statistics Authority*, May 20, 2018. [Online]. Available https://psa.gov.ph/content/philippine-economy-grows-68-percent-first-quarter-2018. [Accessed Dec. 5, 2018].

[19] "A closer look at the 'darling' Philippine economy," *The Philippine Star*, July 13, 2018. [Online]. Available: https://www.philstar.com/business/2018/07/13/1833196/closer-look-darling-philippine-economy. [Accessed Dec. 5, 2018].

[20] C. Chikiamco, "The structural weaknesses of the Philippine economy," *Business World,* Sept. 29, 2018. [Online]. Available: https://www.bworldonline.com/the-structural-weaknesses-of-the-philippine-economy/. [Accessed Dec. 5, 2018].

[21] "*Population and the economy," The Manila Times,* March 2, 2015. [Online]. Available: https://www.manilatimes.net/population-and-the-economy/166764/. [Accessed Dec. 5, 2018].

[22] `"Fertility rate, total (births per woman)," *The World Bank,* 2018. [Online]. Available: https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=PH. [Accessed Dec. 5, 2018].

[23] J. Punongbayan, "Is the Philippine economy overheating?," *Rappler*, Sept. 29, 2018. [Online]. Available: https://www.rappler.com/thought-leaders/213015-is-philippine-economy-overheating. [Accessed [Accessed Dec. 5, 2018].

[24] J. Urrutia, R. Tampos, and J. Atienza, "An analysis on the unemployment rate in the Philippines: A time series data approach," *Journal of Physics: Conference Series*, vol. 82, no.1, pp. 51–63, 2017.

[25] A. Rey, "Unemployment rises under Duterte's watch," *Rappler,* May 01, 2018. [Online]. Available: https://www.rappler.com/nation/201462-duterte-unemployment-labor-day-2018. [Accessed Dec. 5, 2018].

[26] "Population - a problem but also a blessing," *Manila Bulletin*, July 27, 2017. [Online]. Available: https://news.mb.com.ph/2017/07/17/population-a-problem-but-also-a-blessing/. [Accessed Dec. 5, 2018].

[27] N. Thomson, "Think your week was hard? Tokyo salary man's insane work diary goes viral" *Quartz,* March 7, 2015. [Online]. Available: https://qz.com/357606/think-your-week-was-hard-tokyo-salary-mans-insane-work-diary-goes-viral/. [Accessed Dec. 17, 2018].

[28] "The salaryman in Japanese business culture The salaryman in Japanese business culture," *Venture Japan,* n.d. [Online]. Available: https://www.venturejapan.com/business-in-japan/doing-business-in-japan/secrets-of-japanese-business-culture/the-salaryman-in-japanese-business-culture/. [Accessed Dec. 17, 2018].

[29] M. Domingo, "Deployment profile and remittance patterns of overseas Filipinos," *Banko Sentral ng Pilipinas Economic Newsletter,* no. 09-02, June 2009. [Online] Available: http://www.bsp.gov.ph/downloads/EcoNews/EN09-02.pdf. [Accessed Dec. 17, 2018].