
| RESEARCH ARTICLE

An Exploratory Analysis of Related Macroeconomic Indicators as Determinants to Economic Growth

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| ABSTRACT

The relative movement of certain individual economic indicators to the movement of per capita income is a well-researched field. In addition to that space, this study aimed at regressing economic development in terms of per capita incomes to selected miscellaneous indicators. This by itself may not be a new approach to understanding the interrelationships that exist between other relevant economic parameters, but localized and exploratory research in this regard does prove to have some key insights regarding the interactions of economic indicators in the Philippines. Using the Classical Linear Regression Model (CLRM), The results show that increases in Net Domestic Credit, Foreign Direct Investment, and Ratio of Female to Male Labor Participation Rate increased per capita income significantly, while increases in Real Interest Rate and Carbon Dioxide Emissions decreased per capita income significantly. This meant that increasing credit and investment and incorporating more women into the labor force is a significant impetus for growth and development, while environmental degradation and the high cost of borrowing harms it.

| KEYWORDS

Economic Development; GDP per capita; Regression Analysis; Labor Force; Credit; Investment; Growth; Development; Interest Rate; CLRM; Income

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1. Introduction

Striking a balance between limited resources and unlimited wants is the central problem of Economics. But for contemporary economic policy, collective prosperity and growth for tens to thousands of millions of people year-on-year against political, social, and economic turmoil remains the principal endeavour for policymakers and stakeholders. This is not to say that the central problems of Economics and Economic Policy are different, but rather that the endeavour of the latter is the fundamental application of the former. The complication, however, is that there are simply too many factors to consider that can also be found to affect per capita income in an economy either directly or indirectly (i.e., factors involving labor, credit, the environment etc.). Individual and specific indicators are devised to help track, analyze and predict these changes, but no singular model besides the National Income Account model, otherwise known as GDP, has been developed to encompass all of these factors yet. Mathematically, we can see why this is the case. GDP (expenditure-approach) is calculated as follows:

$$Y = C + I + G + X_n \quad (\text{eq. 1})$$

where:

Y = Gross Domestic Product

C = Consumption

I = Investment

G = Government Expenditure

X_n = Net Exports (Exports minus Imports)

As can be seen from equation 1, GDP is the summation of four main components: Consumption, Investment, Government Expenditure, and Net Exports. Analyses with regard to other factors beyond these four components cannot be done or gained from merely the GDP model. Fortunately, with the use of Econometric analysis, we can try and relate exogenous variables to GDP, and measure the change of the latter over the change in the former, *ceteris paribus*.

The reason for using GDP for this study is that it is also known as a country's measure of income, or how much a domestic economy has earned in a given year. Production equals income in this model. Thus, analyzing GDP in this regard and for this study provides insight into what exogenous indicators contribute to the Philippines' per capita income over a year.

GDP by itself would suffice in the analysis needed in this study. However, the researchers decided that it would be better if GDP was divided per person, otherwise known as GDP per capita, for the following reasons:

GDP per capita is the Gross Domestic Product divided by the number of people in a specific country. In modern macroeconomic theory, this measurement is used to determine the total economic output contributed by each person in a country, assuming equal production/income. This, in effect, gauges overall economic activity at an individual level. In addition, it can also be an indicator of the standard of living in a particular country or state. A higher GDP per capita generally means a higher standard of living for the members of that particular economy. These things said, there are now several key questions that come to mind that this study can answer: What indicators outside of the GDP model affect GDP significantly? What indicators should be targeted to raise the standard of living of Filipinos year-on-year, and by how much do their changes affect GDP per capita?

2. Literature Review

2.1 The Effect of Net Domestic Credit on Economic Growth

Didelija (2017) used financial factors such as deposit interest rates, financial market development, and stock market development; demographic factors such as dependent population rates, life expectancy, and urbanization rates; public policy factors such as public revenues and expenditures, public savings, and forms of social assistance; and economic factors such as income or macroeconomic uncertainty as variables in her study. This literature is vital in helping future models progress. It demonstrated the impact of the financial sectors on economic growth by assessing literature on current saving determinants to achieve her research goal of creating a thorough and systematic evaluation. The researcher employed inductive, deductive, analysis, generalization, classification, and compilation methods. Overall, the researcher found out that money creation is a key source in developing well-being and suggested that the government and society, as a whole, must look to develop domestic credit in the financial sector.

Ciftci et al. (2017) augmented the Solow-Swan Model by adding financial market variables such as Bank Credit, Value Traded and relating them to real GDP per Capita and population growth. The panel data analyses revealed that both channels have positive long-run effects on the steady-state level of GDP per capita and found the contribution of the credit markets to be substantially greater. The researchers gave a special emphasis on implementing policies that deepen financial markets, including institutional and legal measures to strengthen creditor and investor rights and contract enforcement, resulting in fostering the development of a country's financial sector and the acceleration of economic growth.

Moreover, Kuhe and Torruam (2020) studied the causal relationships between Nigeria's domestic savings, investment, and economic growth. To measure the impact of domestic savings and domestic investment on economic growth, the researchers estimated the cointegrating regression equation using modified OLS. The Granger Causality Test results showed that Gross Fixed Capital formation (domestic investment) leads to economic growth. It also found that there was a two-way causal relationship between investment and savings. Findings show a positive relationship between domestic savings and economic growth in the long run, but the same data showed a low impact result on savings and economic growth in the short run. Granger Causality Test results show that there is a bilateral causal relationship between domestic savings and economic growth.

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In addition, Camba and Camba (2020) studied the relationship between domestic credit and stock market liquidity to economic growth in the Philippines using Auto-Regressive Distributed Lag (ARDL) to determine the cointegration. The results show that there is a long-run relationship between domestic credit and stock market liquidity on GDP growth. It was also found that a weak

cointegration is present if the GDP per capita is set as the dependent variable. Also, using Granger Causality Test and Vector Error Correction Model (VECM), the researchers learned that there is a long-run causality running from domestic credit and stock market liquidity to GDP growth. At levels, domestic credit has a significant and positive short-run causal relationship with GDP growth. The same with the stock market liquidity variable, which has a significant and positive short-run causal relationship with GDP growth. Their research showed that the development of financial markets has a significant impact on economic growth, where domestic credit and stock market liquidity are their major policy variables that could contribute to the country's economic growth.

Ribaj and Mexhuani (2021) studied how the accumulation of savings of commercial banks in Kosovo affected economic growth. Using the Granger causality test and the regression analysis results showed a causal relationship between the accumulation of savings and economic growth in Kosovo. The researchers concluded that an increase in savings could reduce the unemployment rate, increase technological development and the GDP, and the well-being of the people in Kosovo.

2.1.1 The Effect of Real Interest Rate on Economic Growth

Mishkin (1982) studied the real interest rate movements in Organisation for Economic Co-operation and Development (OECD) countries. This literature is relatively rare in the field. Studying its movement, according to his paper, is extremely important because it is not only a measure of foreign real interest rates in and of itself, but it also has the additional benefit of generating more powerful statistical tests of propositions previously tested on data from the United States and yielding information on whether results found for the United States are applicable to data from other countries.

Moreover, Solina and Ocampo (2017) studied the relationship between real interest rates and economic growth. The researchers looked at money supply data, inflation rates, interest rates, and Gross Domestic Product in the Philippines using the Vector Autoregressive Model (VAM) that they adopted from Atangan (2011) and Gatawa et al. (2017). The researchers found out that as the inflation rate increased, economic growth decreased, and as the money supply increased, economic growth also increased. Based on the estimates, there was a significant relationship between money supply, inflation rate, and economic output. However, no results show that these macroeconomic indicators can have a huge impact on the economy in the long run.

Cavallo (2020) studied how the inflation rate had affected the fluctuations in the economic output of a country and specifically the consumption basket of the people in that certain society. The researcher looked at data from the Opportunity Insights Tracker that includes transactional Official CPI data from January 2019 to May 2020, combining it with the data obtained from the respective country's official national statistics office (NSO). With the latest official CPI weights, the researcher estimated the Covid spending shares by multiplying them by the average monthly percentage change in the appropriate expenditure category. The researcher concluded that as the inflation rate increased over time, people's consumption baskets had continuously changed. However, in certain contexts, real interest rates may not be as clear-cut as expected.

Drobyshevsky et al. (2017) employed nominal and real interest rates as variables in their study. In order to deduce if real interest rates or nominal interest rates impact economic growth, the SVAR Model was utilized. They concluded that the effect of interest rates on economic growth "appears to be mixed" and that the rise of ex-post real interest rates has no significant effect on output or its components in Russia.

2.1.2 The Effect of Merchandise Trade on Economic Growth

Harrod, Kaldor, and Thirlwall examined the prospect of an open economy. The researchers proposed that some external forces and characteristics can spur economic growth in this kind of system. Marin (1992) and Meier (1984) contributed an export-led growth thesis that illustrated and validated how international trade can positively impact economic growth. As exports rise, ceteris paribus, GDP will rise, resulting in greater economic well-being and societal prosperity for all (Morgan and Katsiekas, 1997).

Bhattacharya and Bhattacharya (2011) focused on merchandise trade and FDI inflows on economic growth and found that merchandise trade volume and FDI influence economic growth. The researchers conducted their study using VECM and Granger causality to estimate and validate the impact of their variables such as Merchandise Trade and FDI on economic growth. Specifically, a unidirectional causality exists from merchandise trade to economic growth. This means that there is a positive causal relationship between the volume of merchandise traded and economic growth in India, which has even convinced their government to employ liberalization measures to a greater extent in hopes of gaining momentum in terms of FDI inflow. The researchers essentially discovered that India's ability to progress would be tied to its ability to attract international investment.

In addition, Were (2015) conducted a similar study in Africa; however, the results showed that merchandise trade had an insignificant effect on economic growth for least developed countries (LDCs). The researcher followed the Standard Growth Regression to determine the contribution of trade to economic growth, focusing on the trade determinants that include the total sum of exports and imports, and the separate data of exports' and imports' share on GDP, and the GDP per capita rate of the

country as variables in her paper. Much like the previous literature on the topic, the researcher illustrated how vital trade is in strengthening economic growth and welfare. However, the researcher was able to investigate this concept by studying multiple countries that are bound to differ as they had differential effects of trade. The standout of the study were the results in LDCs. It was detected that trade is insignificant to GDP per capita, the complete opposite to developed and developing countries' results. Ultimately, the findings indicate the need of the less developed countries, specifically in Africa, to reform their structure and pattern of trade akin to other developing countries. However, the paper held that trade remains a key determinant of foreign direct investment (FDI) across all country groups.

According to Verter (2017), trade has been an agent in maintaining the demand and supply that allows smooth exchange of goods and services, which will stimulate economic growth. The researcher assessed the challenges and performance in trading that his country, Africa has. This includes the problem and the benefits of high trade. A high trade would have a negative impact on businesses as they are having a hard time acquiring new technologies and intermediate inputs, which can also prevent them from entering the global chain. On the other hand, high trade costs deteriorate consumer welfare by constricting the range of goods and services, which leads to increased prices. The researcher concluded that trade costs are not the only variable that can explain economic growth, but it just plays an important role in why African countries and Less Developing countries are unable to grow and develop economically even if they want to.

Kalaitzi and Chamberlain (2020) have similar findings. The researchers applied the Johansen Cointegration Technique and Dynamic Ordinary Least Squares (DOLS) regression to determine the existence of a long-run relationship between exports and economic growth, while the short-run causation is examined using the multivariate Granger causality test. Their study aimed to validate the Export-Led Hypothesis, where it states that GDP is dependent on the export variables, which is consistent with previous studies on the matter, where export-oriented industries are used to boost domestic growth. The merchandise exports, imports of goods and services, and other exogenous variables were used with Gross Domestic Product as the dependent variable. The researchers learned that merchandise exports have a short-run causality relationship with economic growth. Despite that, no causality relationship was detected in the long-run. The researchers concluded that the ELG hypothesis is proven in the United Arab Emirates in the short-run. Therefore, policymakers in the UAE should not rely solely on merchandise exports to drive the country's future prosperity. For the UAE, economic development must take place in a balanced manner, with an emphasis on both exports and investments in physical and human capital, as well as fostering productivity-enhancing imports.

2.1.3 The Effect of CO2 emissions on Economic Growth

Andrei et al. (2016) studied how industrial competitiveness is affected by the short-run effect of environmental taxation. Meanwhile, environmental policies have influenced the structure of the national economy in the long run through managing and reducing carbon emissions, carbon intensity, and energy consumption. Their study focused on Romania and attempted to identify the influence of environmental taxation on ensuring green economic development, starting from the premise that for emergent economies. These taxes provide both a GDP increase and prevent environmental degradation by decreasing the pollution and environmentally harmful supplies and practices. Granger causality was used to know the causal relationship between environmental taxes and economic growth. The researchers also used the variables such as GDP per capita, the primary production of renewable energy, domestic material consumption, the final energy consumption of petroleum, total gross electricity generation, and environmental subsidies and tons of oil equivalent as proxy variables of Primary production of renewable resources. The researchers found out that there is a long-run causal relationship between the independent variables and GDP per capita and concluded that environmental taxation could also help to achieve sustainable development goals. It is critical for policymakers in a developing economy to understand the connection between GDP and environmental taxation and how that affects welfare because the findings of this type of research may be used to improve energy policy formulation and implementation.

Asia and Asia-Pacific studies have been investigating the effects of externalities, which include the relationship of air pollution to economic growth. The study of Khoshnevis and Khannalizadeh (2017) showed that economic growth has the risk of environmental degradation to support the health expenditure that the Middle East and North Africa (MENA) would have to deal with. There is a positive relationship between economic growth and health expenditure. Researchers concluded that in MENA, health care is a "need" and a normal good; the behaviour in health also changes into different levels of economic development. A focus on environmental quality can reduce the health expenditure of a certain country.

Zaidi and Saidi (2018) used GDP per capita as their dependent variable and CO2 emissions, health expenditure, nitrous oxide emissions, improved sanitation facilities, and urban population as their independent variables. They used the VECM Granger causality to know the causal relationship between the variables in Sub-Saharan Africa. The researchers found a bi-directional relationship between CO2 emissions and economic growth in the short run and the long run. Eventually, the researchers concluded that CO2 emissions increase with economic growth. The researchers concluded that as the economy grows, so do CO2 emissions,

and countries should consider investment requirements to improve environmental protection and increase technology transfer to reduce environmental pollution.

Phuong and Tuyen (2018) studied how an increase in income per capita increases environmental degradation. The researchers used CO₂ emissions to represent the economic degradation and GDP per capita to represent the income in Vietnam. The Granger Causality Test was used to investigate the causal relationship between CO₂ emissions, Foreign Direct Investment, and per-capita GDP. The results showed that CO₂ emissions have a one-way relationship to FDI, but CO₂ emissions are found to have a two-way relationship to GDP per capita. The empirical results showed a U-shaped relationship between environmental degradation and economic growth. These researchers concluded that Kuznets' hypothesis on the inverted U-shaped can be seen in the relationship of economic growth and environmental quality in Vietnam. The findings of the study implicate the need to address the increase in CO₂ emissions hastily. They recognize how it has been a prolonged struggle in Vietnam that most definitely requires long-term effort.

Environmental indicators might also affect GDP per capita. Recent studies in European countries conducted by Lyeonov et al. (2019) employed the data of GDP per capita, private investments, jobs, and gross value added related to circular economy sectors, GHG emission, the share of renewable energy in the total energy consumption. The methods used by the researchers are the panel unit root tests using the Im, Pesaran, and Shin's (IPS); Levin, Lin, and Chu test (LLC); and the Fisher-type tests (Augmented Dickey-Fuller test (ADF) Fisher and Phillips-Perron test (PP) Fisher). The term "green investment" refers to the investment activity of companies that are committed to environmental protection, pollution reduction, carbon emission reduction, and the utilization of renewable energy sources while conserving natural resources; it also includes how this type of investment can lead to higher profit and revenue of organizations (Chitimiea et al. 2021). A goal of the study was to examine whether or not green investments may assist achieve three key sustainable development goals: GDP per capita growth, an increase in the use of renewable energy sources, and a reduction in greenhouse gas emissions showed that green investments produced positive economic effects as Green investments can increase GDP per capita by 6.03% and decrease Greenhouse Gas (GHG) emissions by 3.03%, an increase in renewable energy in the total final energy consumption by 5.6%.

Nguyen (2019) studied the relationship between economic growth, energy consumption, and CO₂ emissions, focusing on five countries in Central Asia by using the Vector Autoregressive (VAR) Model. The researcher found out that per capita energy consumption has a positive relationship with per capita GDP, while CO₂ emissions negatively affect per capita GDP in Central Asia. Furthermore, per capita GDP has a negative impact on per capita energy consumption in the region. In short, the results implied that the economic growth of Central Asian countries still heavily depended upon energy consumption. The researcher deduced that CO₂ emissions should be lessened as it has a negative impact on economic growth.

2.1.4 The Effect of Unemployment Rate on Economic Growth

A study on the relationship between labor productivity and economic growth in the 8 OECD countries has been conducted by Korkmaz and Korkmaz (2017). They found out that there is a unilateral relationship between the two variables. They estimate the directions of the relationship between labor productivity and GDP using the Granger Causality Test and Panel Data analysis. They conducted their study using the variables such as labor productivity per hour and economic growth of eight (8) OECD countries. According to the results, between 2008 and 2014, an equilibrium relationship was found between labor productivity and economic growth. The causality test results show only a unidirectional relationship between economic growth and labor productivity. However, it does not show that Labor Productivity can affect GDP. The researchers only confirm that labor productivity is only significant in countries that provide economic development.

The Keynesian theory of unemployment has been proved by Imoisi et al. (2017) in their study on the significance of the unemployment rate to economic growth in Nigeria. The secondary data that was gathered by the researchers from the Central Bank of Nigeria statistical bulletin, National Bureau of Statistics, and World Development Indicators are Gross Domestic Product (dependent variable), Unemployment rate, Minimum Wage, labor force, and population (independent variables). Using OLS multiple regression, the analysis revealed that in Nigeria, unemployment, population, and labor force have a significant impact on economic growth. The researchers also discovered that their findings strongly support the Keynesian Theory of unemployment as this theory can help them recover from the economic recession that happened in their country. It also shows in the results that an increase in economic activity reduces unemployment and deflation. Therefore, the researchers recommended that their government should provide support in the agricultural and private sectors to lessen unemployment.

Another study that focuses on labor mobility and exchange rate on GDP per capita was conducted by House et al. (2018). In line with Mundell's conjecture, greater labor migration and exchange rate adjustment reduce cross-sectional dispersion in unemployment and per capita GDP. The results show that labor mobility can bring higher output in locations with higher demand and lower output in locations in which the demands are low.

Victoria (2019) studied unemployment, and as he talks about how this problem causes a huge waste of manpower resources, as it also generates a loss in productivity in output which can lead to lower-income and a poor standard of living of the people in the society. In his study, he adopted the VAR Granger Causality approach to examine the causal relationship between the unemployment rate and economic growth in Nigeria. The results showed that there was a unidirectional causal relationship between unemployment and economic growth. This means that the long-term growth in the real output does not cause unemployment in their study.

2.1.5 The Effect of Foreign Direct Investment on Economic Growth

Simionescu et al. (2017) studied the best predictor of economic growth in the V4 countries (Czech Republic, Hungary, Poland, and Slovakia). The Real GDP growth, inflation rate, employment rate (as a percentage of the total population aged 15-64), FDI inflows as a percentage of GDP, workforce with secondary and tertiary education (as a percentage of the total labor force), government education spending and R&D spending were all considered as variables in the current empirical analysis of their study. The empirical method that was followed by the researchers is the Bayesian approach using estimations of the Bayesian Generalized Ridge regression. The findings show that FDI, public expenditure on education, and expenditure on R&D tend to correlate with economic growth. However, it does vary in magnitude for each country. FDI is a dominant predictor of economic growth in all V4 countries except the Slovak Republic. Education expenditure is positively correlated with economic growth only in the Slovak Republic, while expenditure on Research and Development, or R&D, are significant predictors only in Romania, Hungary, and the Slovak Republic. The same studies made by Lawrence et al. (2017) about how public expenditure can affect economic growth show that an increase in government expenditure boosts economic growth in the low-income countries in Sub-Saharan Africa.

The impact of FDI is so ambiguous that Malikane and Chitambara (2017) study the relationship between FDI, democracy, and economic growth. The researchers utilized the generalized-method-of-moment estimator as they conducted the study. The results showed that in the eight Southern African countries, FDI has a positive effect on economic growth, and having strong democratic institutions is significant to the growth of the economy in their countries. However, they also claimed that FDI is dependent on the level of democracy of a certain country, where they explained that having strong democratic institutions can really help absorb the spillovers easily from Foreign Direct Investment. Other researchers have explored how other variables can also affect FDI. This includes the paper of Khan and Ozturk (2019) revealing how significant is economic growth and trade openness to FDI; it also mentioned the presence of the bilateral relationship between FDI and CO2 emissions.

Dua and Garg (2019) used Panel Cointegration and fully modified OLS regression to find how capital deepening, human capital, technology, institutional quality, and macroeconomic variables, which includes the size of the government and its openness to trade, affect the labor productivity in the Asia- Pacific region. The researchers also revealed that foreign direct investment and trade openness positively impact developing countries, unlike in developed countries, where trade openness was the only one that affects them among the two variables such as FDI and trade openness.

The aid of Foreign Direct Investment to support private investment in the developing countries had been studied by Tung (2019). The researcher focused on Vietnam as it is an emerging country, as the country is also known to have its success in attracting Foreign Direct Investments for years. Despite having many studies that prove how FDI affects economic growth positively, the lack of study and evidence about how FDI can affect private investment has caught the attention of the researcher to conduct this type of study. Through the error correction model, the researcher estimated the results, which shows that FDI and GDP per capita has a positive impact on private investment in the short run and in the long run.

Due to the fewer studies about how FDI affects economic growth in the short run and long run, Dinh et al. (2019) studied how Foreign Direct Investment affects economic growth in the emerging markets and developing countries, but just focused on a particular period which is the economic turmoil that has a global financial crisis. The researchers revealed that FDI helps in driving economic growth in the long run, but it showed that FDI could have a negative impact on economic growth in the short run. The researchers also added how other macroeconomic indicators affect economic growth, specifically money supply, human capital, total domestic investment, and domestic credit for the private sector.

Another study of Foreign Direct Investments in energy consumption, environmental consumption, and its effect on economic growth was conducted by Ahmad et al. (2020). The researchers revealed that the empirical consumption model reflected that per capita income and industrialization had played an important role in energy consumption and FDI. They also found out how FDI, fossil- fuels, and innovation can be a determinant of CO2 emissions in the OECD countries. This study is supported by the paper of Phuong and Tuyen (2018), who also found that an improvement in lessening environmental pollution can help attract more Foreign Direct Investment.

2.1.6 The Effect of Female-to-Male Ratio to Economic Growth

The study on the convenience of the participation of the women laborers in the economy has been studied by several researchers in the past. Gadoth and Haymann (2019) studied gender parity in work and education. The first process is that the researchers tallied the number of countries represented by each gender parity indicator, broken down by geographic location and socioeconomic status. Using gender parity indices and Pearson correlation coefficients, the researchers looked at the relationship between health outcomes and the health outcomes of interest. The researchers next ran multivariable ordinary least squares regression models utilizing the health and development variables listed above to look at the ecological link between overall health outcomes and national gender parity in education and employment. The researchers found out that gender parity has a significant and positive relationship with improved health outcomes as the government controls the health expenditures in the country. The increase in gender parity at work has also led to a lower maternal death rate.

On the other hand, the study of the relationship of different indicators and female labor force participation had been studied by Idowu and Owoeye (2019). The variables used were GDP, Inequality, GDP per capita, wages and poverty. The researchers found a positive relationship between GDP and inequality to the female labor force participation in Africa. A negative relationship between GDP per capita, poverty and wages was observed in the female labor force participation rate. The researchers also suggested that they should increase the female labor force participation in their country as it can boost economic growth.

In addition, the study on the inequality in education and employment as well as the effects of trade liberalization has been conducted by Farooq et al. (2019). The group examined the relationship of the variables with the use of the Panel ARDL approach; the results showed that there is an indirect relationship between inequality of ratio of female to male in the labor force and GDP per capita. Additionally, a direct relationship between trade liberalization or trade openness and economic growth has also been found in the study. The researchers had suggested how gender equality and trade openness can play a key role in developing the economy. Studies into the determinants of female labor participation in individual countries and/or regions imply that female labor participation in the economy is a universal endeavour for countries, as exemplified by Shami et al. (2019) and Bloom et al. (2009) due to its importance to economic development. Trends and observations in relation to the variable of interest, such as in Klasen (2019), where the importance of female labor participation in economic structures cannot be discounted and therefore must be studied more. Studies mainly focus on the determinants of female labor participation, but there are studies that exist gauging the effect of female participation on economic growth, particularly in Su et al. (2018), where researchers explored how female labor force participation can affect or promote economic development. Their study's variables include FLFPR (female labor force participation rate) and GDP per capita as their proxy variable for economic development. Using the Panel Causality Test, they examined the link or causality between female labor force participation and GDP per capita. Female labor force participation impacts or causes GDP per capita in China, Korea, and Japan. This suggests that increasing female labor force participation can improve economic development or GDP per capita. But they determined that GDP per capita is the Granger cause of female labor force participation. They recommended that in order to increase FLFPR, effective and efficient policies must be implemented to remove or minimize barriers to female labor participation, such as legislative changes, curriculum improvements, and increased female school enrollment. The main takeaway here is that, from a purely number-aggregate perspective, the incorporation of as many women into the labor force holds significant untapped potential for the economy, and as such, warrants study to better gauge its relationship to the context of country-building (World Health Organization, 2019).

2.1.7 Synthesis of the Reviewed Literature and Studies

Economic growth and its determinants – both endogenous and exogenous in nature – are extensively researched in the field. For the most part, variables of interest in this study have had related literature with conflicting results from each other. It is reasonable to presume that this has to do primarily with locale (i.e. the country/region of interest) because circumstances behind the metadata analyzed are not the same across countries and regions.

The multiple regression model is an extended linear regression model that includes more than one (1) independent variable. Multiple regression, in many cases, tends to be more accurate than simple regression because it accounts for more factors that could affect the research work. Some of the purposes of using multiple regression analysis are for 1) Planning, 2) Forecasting, and 3) Control. This regression model gives the current researchers more information in estimating the dependent variable. In this paper, the researchers used the multiple regression analysis in estimating and predicting the value of GDPC using NDC, RIR, MT, COE, FDI, RFML, and INTRUNP as independent variables with 26 numbers observations included.

In the reviewed literature and studies, it is evident that different researchers used different methods in estimating the economic growth depending on the variable of interest and country of interest. Didelijia (2017) employed inductive, deductive, analysis, generalization, classification, and compilation methods, while Ciftci et al. (2017) augmented the Solow-Swan Model and used panel data analysis. Solina and Ocampo (2020) used the Vector Autoregressive Model (VAM), while Drobyshevsky et al. (2017) used the SVAR model. Bhattacharya and Bhattacharya (2011) used VECM and Granger causality, while Kalaitzi and Chamberlain (2020)

applied the Johansen Cointegration Technique and Dynamic Ordinary Least Squares (DOLS) regression. Lyeonov et al. (2019) employed panel unit root tests using the Im, Pesaran, and Shin's (IPS); Levin, Lin, and Chu test (LLC); and the Fisher-type tests (Augmented Dickey-Fuller test (ADF) Fisher and Phillips–Perron test (PP) Fisher) while Nguyen (2019) used Vector Autoregressive (VAR) Model. Obviously, there are many ways to estimate and predict the economic growth of a country. Despite the many methods and techniques, some researchers might still encounter a problem in predicting economic growth due to limited data or no available data.

Moreover, based on the reviewed literature and studies above, some studies showed a significant and positive relationship of variables to economic growth while other studies showed a negative impact on economic growth. Kuhe and Torruam (2020) showed a positive relationship between domestic savings and economic growth in the long run, but the same data showed a low impact result on savings and economic growth in the short run. Ribaj and Mexhuani (2021) concluded that an increase in savings could reduce the unemployment rate, increase technological development and the GDP, and the well-being of the people in Kosovo. Solina and Ocampo (2020) showed that there was a significant relationship between money supply, inflation rate, and economic output. Bhattacharya and Bhattacharya (2011) showed that there is a positive causal relationship between the volume of merchandise traded and economic growth in India. Lyeonov et al. (2019) showed that green investments produced positive economic effects as Green investments can increase GDP per capita by 6.03% and decrease Greenhouse Gas (GHG) emissions by 3.03%, an increase in renewable energy in the total final energy consumption by 5.6%.

Economic growth can be reflected among the most important indicators released and measured. It plays a major pivotal role in any research paper because it indicates the growth in economic output that can be measured by Gross Domestic Product (GDP), Gross Value Added (GVA), or any other measure. However, different research papers show different results depending on the availability of data, variables, and country of interest. Nonetheless, every research paper contributes to the ever-increasing body of knowledge, and it can be used for policy development and decision making.

2.2 Theoretical Background

The study hinges on several key economic theories and warrants a thorough discussion on their inclusion and application in the research. These theories are the following:

GDP per capita's drivers are known. There is a specific set of determinants based on the components of GDP as discussed in the background of this study. But what drives these components are not as easy to measure as opposed to measuring GDP per se. These drivers are the other factors in an economy that are interconnected in nature. Factors concerning changes in the labor situation, the markets, gender, and the environment are constantly moving 'parts' of the economy that manifest themselves indirectly in the estimation of GDP but cannot be accurately calculated in terms of their effects on the national product. But at the moment, we know that credit is important to an economy; the Credit Theory of Money by Alfred Mitchell-Innes emphasizes the role of money as an instrument of credit, that an economy with financial intermediaries that help expand credit through lending is an economy set to prosper. The modern financial system is hinged on this principle. It is possible that the Harrod-Domar Growth model also explains how the net domestic credit influences GDP per capita. This growth model is geared at sustainable economic growth and the conditions that enable it. According to Olaniyi (2013), A combination of the national savings rate and the national capital to output ratio sets the rate of growth. The strength of the economy may be evaluated through the capital-output ratio and savings. Consequently, this theory claims that investments and savings will result in an increase in economic growth. And therefore, this theory asserts that an increase in savings and investments will bring about a rise in economic growth. The capital ratio refers to the total amount of money in the economy that companies and industries can borrow at any moment in order to invest in long-term fixed assets. As established in Chapter 1, the entire claims of the central bank, other sectors in the economy, and financial aid in the private sector make up the net domestic credit. Therefore, a rise in the net domestic credit inside the economy can assist in spurring economic growth.

Another theory that forms the core of this research is the Fisher Effect. Developed by Irving Fisher, this theory posits that the 'actual' yield of interest is one that is adjusted for inflation. This is a crucial differentiator for the study because past literature has shown that nominal interest rates are the variables of choice in most econometric analyses. This study hopes that if interest rates have had inflation accounted for, we could have significant and more nuanced findings in the research process.

According to the article of Laura (2021), Because of an increase in real interest rate, an increase in interest rates makes saving more enticing. In other words, as long as people's wages remain stable, savings will rise in the economy, reducing consumption. As interest rates rise, the cost of borrowing and, by extension, the cost of investing increases as well. As a result, firms are less likely to invest, which reduces overall investment in the economy. They can't anticipate how rising borrowing costs will affect government expenditure; therefore, interest payments on the government debt will go up. On the net exports, an increase in real interest rate would lead to their trading partners' interest rate movements will have an impact on net exports. The exchange rate will rise if

these variables remain constant. As a result, foreign imports become cheaper for the citizens while their exports become more costly for other nations, resulting in a reduction in net exports. Where the Aggregate Demand function would be applicable. An increased consumption, investment, government expenditure and net exports are all economic growth factors. But a decrease in the variables of Aggregate Demand would make the AD curve shift inward as a consequence, and the AS curve will contract as a result. Both the price level and the actual GDP will decline. As a result, if interest rates rise, ceteris paribus, real GDP will also fall (Laura, 2021). A rise in real interest rates, which they found, may harm the economy's overall performance. This is also the goal of the current researchers, who needs to understand how the real interest rate impacts the country's GDP per capita.

The model created by Matarr Njie and Momodou Badjie in 2021 in their paper "The Effects of Interest Rate on Economic Growth: Further insights from The Gambia" can be used to support the usage of Real Interest rate and its impact on GDP per capita by the researchers in their study. They created the economic model below:

$$GDP_1 = f(Rx, Rint_n) \quad (eq. 2)$$

Where:

GDP1 = Gross Domestic Product

Rx = Real effective exchange rate

Rint_n = Real interest rate in (annual %)

Econometric Model:

$$GDP_1 = \beta_0 + \beta_1 Rx + \beta_2 Rint_n + \mu \quad (eq 3)$$

A Log model generates, however, the elasticity coefficients for the dependent variable in relation to the explanatory factors. As a result, all interest variables have been converted into logarithms (Njie & Badjie, 2021). They came up with their second equation:

$$LnGDP = \beta_0 + \beta_1 LNR_x + \beta_2 LNRint_n + \mu \quad (eq 4)$$

The results demonstrate that a long-run relationship exists between real interest rate and real exchange on the one hand and gross domestic product or economic growth on the other. In addition, the report indicates that there is no short-run relationship between real interest rate and gross domestic product or economic growth and that there is no relationship between real exchange rate and gross domestic product (Njie & Badjie, 2021). Therefore, the two concluded that the real interest rate has a negative impact on the performance or on economic growth. Njie and Badjie's model refers to the objective of the researchers to understand the impact real interest rates have on economic growth or GDP per capita. Therefore, it is similar to the current researchers' consideration of choosing real interest rates as one of the variables that might contribute to GDP per capita.

The model created by Mousomi Bhattacharya and Sharad Nath Bhattacharya in 2011 in their study entitled "The Interrelationship Between Merchandise Trade, Economic growth and FDI Inflows in India" supports the goal of the current researchers in knowing the impact of Merchandise Trade and Foreign Direct Investment to GDP per capita. As Bhattacharya and Bhattacharya had used the cointegration equation to know the relationship between GDP growth, merchandise trade and Foreign Direct Investment:

$$\beta (r, 1) LnFDI + \beta (r, 2) LnGDP + \beta (r, 3) LnMERTRADE \quad (eq. 5)$$

where:

LnFDI - Foreign Direct Investment

LnGDP - Gross Domestic Product

LnMERTRADE - Merchandise trade

$\beta (r, k)$ – restrictions

Their equation and analysis found that foreign direct investment had a causal link to GDP. They stated that an increase in FDI might contribute to economic development. The results show that FDI is boosting its growth along with domestic investment and has a statistically significant impact, in that a higher FDI ratio in gross capital formation has a positive effect on the GDP level and thus on growth (Bhattacharya & Bhattacharya, 2011). On the other hand, they also found that an increase in Merchandise trade might boost economic growth.

This hypothesis of Bhattacharya and Bhattacharya in 2011 is related to the current researchers' goal of knowing the effects and contribution of Merchandise Trading and FDI to the per capita GDP.

In terms of the environment, this research is based on the Environmental Kuznets Curve, otherwise known as EKC. The Kuznets curve posits that economic development initially leads to a deterioration in the environment, but after a certain level of economic growth, it is said that the country and society in question begins to compensate and reverse, if not mitigate, the effects of economic activity on the environment, bettering its relationship with nature in the long run. This is important because the Philippines also produces its fair share of CO₂ emissions into the atmosphere. This theory will guide the research analysis and conclusion of the current researchers.

The approach, Talent Reduction Model by Berta Esteve-Bolart, may be used to support the current researchers' variable, the ratio of females to males in the labor force, and its influence on economic growth. Additionally, Esteve-Bolart also believed that occupational choice with heterogeneous talent models indicates exogenous obstacles to the involvement of women in the labor market and entrepreneurship lower per capita aggregate production and output (Esteve-Bolart, 2004). Esteve-Bolart also believes that gender discrimination might hinder economic progress. In order to test the model, she used the regression method below:

$$y_{st} = \delta r_{st} + x_{st} \xi + \alpha_s + \gamma_t + \varepsilon_{it} \quad (\text{eq. 6})$$

Where:

y = the log of per capita net state domestic product

r = the ratio of the number of females to males in a certain class of the labor force (namely managers and total workers),

x = controls (human capital and other socioeconomic controls such as population growth, the ratio of urban to total population, and the ratio of capital to labor)

α = a state effect

γ = year fixed effect

In the framework provided, the relationship between the ratio of women to men in a specific labor force variable and economic development is a key component in determining the impact of gender discrimination. The current researchers will test the theory on its own and discover how discrimination in the labor force may influence GDP per capita. The results of this study will confirm and prove the 2004 hypothesis and model of Esteve-Bolart, who asserted that gender discrimination would result in negative economic development.

W. Arthur Lewis' Theory of Economic Growth would also be employed as a basis for assessing the impact of gender equality, or increasing women's involvement in the workforce might be an agent for stimulating economic growth. Lewis' eclecticism was represented in his analysis, where he employed a variety of social categories from various viewpoints. It relates to major class and racial groups and often analyzes concerns with the role of women in society and its economic repercussions (Figueroa, 2005). In his concept, he also claimed that 'growth is limited when the tradition demands that women work solely in their homes; or that if they do work outside their homes, they can only be domestic maids or typists, or crammed in a small variety of other occupations, where his hypothesis is comparable to one of the current researchers' objectives, which is to know if women's involvement in the labor force would indeed be regarded as a predictor of economic growth or a predictor of GDP per capita growth.

For the current researchers' foundation in their variable: unemployment rate and knowing about its relationship to GDP per capita, they anchored it to the Okun's Law. Okun's Law is an experimentally observed link in a country's production between unemployment and loss (Kenton, 2020). This is comparable to the current researchers' study, as Arthur Okun also proposed his 1980 study on the influence of unemployment on GDP. According to Furhmann (2020), The rationale behind Okun's law is straightforward. Output depends on the quantity of work in the production process, and the connection between output and labor is thus positive. Total employment is equal to the labor force minus the unemployed, and hence the ratio between production and unemployment is negative (conditional on the labor force). The hypothesis just asserts that a reduction in the rate of unemployment would lead to increases in output. It also covers how a rise in labor productivity would likewise increase, as the economy produces according to the quantity of work in the economy. According to Kenton (2020), Okun's Law may be defined as a "rule of thumb" since it is based on actual data observation and not on a finding obtained from a theoretical prediction. Therefore, knowing that unemployment might lead to a drop in economic growth is not enough to establish that certain notions on the rate of unemployment and the economic growth need a proper test and an actual data observation.

Okun's Law is similar to the current researcher's goal of knowing how the unemployment rate can lead to economic growth. On how the unemployment rate may be utilized in a given nation to estimate GDP per capita. The current researchers were also interested in determining how the unemployment rate affects GDP per capita, based not only on a theoretical prediction but simply on actual data observation.

Economic experts have observed a general tendency for inflation to grow until the unemployment rate returns to what economists call its natural rate when the unemployment rate falls below that level. Conversely, if the unemployment rate increases above the natural rate, the rate of inflation slows. The level of unemployment consistent with sustainable economic growth is considered to be at the level of the natural rate of unemployment. Having a low unemployment rate indicates that the economy is growing faster than its maximum sustainable growth. This increases wage and price growth, which leads to higher inflation (Labonte, 2016). According to the Phillips Curve, there is a negative relationship between unemployment and inflation. It was suggested by the Natural Rate Model that a specific level of unemployment should be maintained in order to achieve stable inflation (natural rate of unemployment). Thus, if the unemployment rate happens to be above the natural rate of unemployment, an increase in inflation would be expected. In relation to the statement of Labonte (2016), the natural rate of unemployment is the level of unemployment consistent with sustainable economic growth. Therefore, if the government or the policymakers tend to maintain the unemployment rate below the natural unemployment rate, this would lead to a continuous increase in inflation which will tend to negatively affect the economic growth, as an increase in inflation can directly affect the individuals and businesses' optimal spending, saving and investment decisions.

Finally, the Neoclassical Growth Theory is an economic theory that is also important in understanding and interpreting the results of this study. This is because this theory posits that a steady growth rate is driven by three determinants: labor, capital, and technology. Robert Solow and Trevor Swan first introduced this theory, which is also known as the exogenous growth model. Chirwa and Odhiambo (2016) note that this theory encompasses the accumulation of physical capital as a driver of economic growth in the short run, while technological advancements are the key factor of economic growth in the long run. This theory postulates that short-term economic equilibrium is a result of varying amounts of labor and capital that play a vital role in the production process. The theory argues that technological change significantly influences the overall functioning of an economy. In addition, it outlines the three factors necessary for a growing economy. However, the theory puts emphasis on its claim that temporary or short-term equilibrium is different from long-term equilibrium and does not require any of the three factors.

The Neoclassical Growth Model claims that capital accumulation in an economy and how people make use of it is important for determining economic growth. It further claims that the relationship between capital and labor in an economy determines its total output. Finally, the theory states that technology augments labor productivity, increasing the total output through increased efficiency of labor. Therefore, the production function of the neoclassical growth model is used to measure the economic growth and equilibrium of an economy. The general production function in the neoclassical growth model takes the following form:

$$Y = AF(K, L) \quad (\text{eq. 7})$$

Where:

Y – Income, or the economy's Gross Domestic Product (GDP)

K – Capital

L – Amount of unskilled labor in the economy

A – Determinant level of technology

$$Y = F(K, AL) \quad (\text{eq. 8})$$

This states that technology is labor augmenting and that workers' productivity depends on the level of technology.

2.2.1 Assumptions of the Neoclassical Growth Model:

1. Capital subject to diminishing returns: An important assumption of the neoclassical growth model is that capital (K) is subject to diminishing returns provided the economy is a closed economy.

2. Impact on total output: Provided that labor is fixed or constant, the impact on the total output of the last unit of the capital accumulated will always be less than the one before.

3. Steady-state of the economy: In the short term, the rate of growth slows down as diminishing returns take effect, and the economy converts into a "steady-state" economy, where the economy is steady, or in other words, in a relatively constant state.

The Solow Growth Model is also crucial to incorporate into the analysis of this study because this model involves changes in population and labor on top of technological advancements as a determinant of economic growth. Solow-Swan Growth Model is the simplest and most popular version of the Neoclassical Growth Model. This model is an exogenous model of

economic growth that analyzes changes in the level of output in an economy over time as a result of changes in the population growth rate, the savings rate, and the rate of technological progress.

2.2.2 Assumptions of Solow-Swan Growth Model:

The population grows at a constant rate, g . Therefore, the current population (represented by N) and future population (represented by N') are linked through the population growth equation

$$N' = N(1+g) \quad (\text{eq. 9})$$

2. All consumers in the economy save a constant proportion, ' s ', of their incomes and consume the rest. Therefore, consumption (represented by C) and output (represented by Y) are linked through the consumption equation:

$$C = (1-s)Y \quad (\text{eq. 10})$$

3. All firms in the economy produce output using the same production technology that takes in capital and labor as inputs. Therefore, the level of output (represented by Y), the level of capital (represented by K), and the level of labor (represented by L) are all linked through the production function equation

$$Y = aF(K,L) \quad (\text{eq. 11})$$

The Solow Growth Model assumes that the production function exhibits constant- returns-to-scale (CRS). Under such an assumption, if we double the level of capital stock and double the level of labor, we exactly double the level of output. As a result, much of the mathematical analysis of the Solow model focuses on output per worker and capital per worker instead of aggregate output and aggregate capital stock.

4. Present capital stock (represented by K), future capital stock (represented by K'), the rate of capital depreciation (represented by d), and level of capital investment (represented by I) are linked through the capital accumulation equation

$$K' = K(1-d) + I \quad (\text{eq. 12})$$

The neoclassical growth model has been widely used in determining the growth of a country and uses different tests to give proper estimates, which are also the objectives of the researchers. The researchers aim to use this model and acquire proper estimates that can be useful for students, researchers, and the government.

Therefore, the Credit Theory of Money; Harrod- Domar Growth Model, Environmental Kuznets Curve; Fisher Effect; Model of Matarr Njie and Momodou Badjie (2021); Aggregate Demand Function; The Talent reduction channel by Esteve- Volart (2009); The Theory of Economic Growth of W. Arthur Lewis; The Model of Bhattacharya and Bhattacharya (2011); Okun's Law; Phillips Curve; Neoclassical Growth Model; and Solow Growth model will be significant in supporting the exploration of the current researchers in knowing how each variable affect and give its impact to the Philippines' GDP per capita.

Solow formed an exogenous growth theory. Paul Romer began working on his endogenous growth theory in the 1980s. It was a conventional view among economists that productivity growth could not be influenced by anything in the rest of the economy (Jones, 2019). Jones (2019) mentioned that some economists developed models predicting economic growth. However, others appear to have limited scope about the determinants of economic growth. That is why Romer developed an endogenous model that claimed that research and entrepreneurship are the driving forces behind technological change. Additionally, tax policy, fundamental research funding, and education, for example, can all have an effect on how the economy develops in the long run (Jones, 2019). In Romer's model, he stated that new knowledge is the ultimate determinant of long-run growth, which is determined by investment in research technology. He also explained how a non-rivalry of ideas would lead to economic growth. The point here is that nonrivalry leads to higher returns to scale (Jones, 2019). He also emphasized how a nonrivalry of ideas can be an essential part of the replication argument. Businesses do not have to reinvent the idea for a computer every time one is produced. In addition, according to Benny (2021), the firm investing in research technology will not be the exclusive beneficiary of the increase in knowledge, but the other firms may also use the new knowledge because of the inadequacy of patent protection and increase in their production. In other words, because it is nonrival, the same idea (by providing manuals) can be employed in a new factory, or any number of new factories, as long as it is precise enough. Increasing returns to the rival inputs (factories, employees, and materials) and the rival inputs and ideas taken together means that if you double the rival inputs and the quality or quantity of the ideas, you'll more than double overall production (Jones, 2019).

Therefore, knowledge or the stock of ideas for each person is tied up to the income per person in the economy. The output per person is dependent on the total stock of knowledge. There is no need to split this pool of information among all the members of the economy when production per person is reliant on the entire stock of knowledge. While Solow's approach focuses on

aggregate growth, Romer's takes a more detailed look at individual growth. The emphasis was placed on the individual's or per capita contribution (through ideas and knowledge) to the total output. As a result of nonrivalry ideas, more researchers developed more ideas, which eventually improved everyone's quality of life, says Romer. Every 25 years, or 100 years, or even 1,000 years, there has been a significant increase in the number of ideas and individuals creating them (Jones, 2019). According to Romer, these ideas and knowledge are crucial in increasing people's standard of living or sustaining the growth of their living standards. Overall, his theory claimed how knowledge and ideas are critical for increasing economic progress.

Other economic growth theories and variables were explored by Romer as well, which ties in with the work of the present researchers. He also proved and researched how these variables that are like ideas and knowledge are tied up or can explain the income per person in the economy. Romer's contribution is his deep understanding of some economic ideas and how important newly discovered ideas are to economic growth. Also, how much of these new economic ideas are growing because of focusing on the heart of economic growth or focusing on the desire to improve the economy (Jones, 2019). An in-depth look at all the variables that can affect a country's economic growth is critical to the development of new economic concepts that could have a significant impact on the economy of a particular country. Lastly, this theory may also explain the findings of the current researchers.

An economist by the name of Robert E. Lucas Jr. assumed that investment in education leads to the production of human capital, which is a crucial determinant in the growth process. He emphasized the internal effects of human capital where each worker who undergoes training becomes more productive and its external effect of increasing the productivity of capital and other workers in the economy. It is really important to not just invest in the physical capital but also in the human capital, where the investment in human capital would have spillover effects that can increase the level of technology. According to Benny (2021), each firm benefits from the average level of human capital in the economy rather than the aggregate of human capital. As a result, training employees on the job or enhancing their stock knowledge is an important part of a company's investment in human capital. It is not about the stock or accumulated knowledge that individuals might possess, but it is about the average skills and knowledge in the economy that would be significant for economic growth (Benny, 2021). Another connection is made between the prior statement and what Leeuwen (n.d.) mentioned to how Lucas anchored economic growth on the growth of human capital (Leeuwen, 2007).

The current researchers found this theory useful because it is similar to their purpose of discovering what other factors can influence economic growth. Lucas' theory, on the other hand, focuses on the importance of investing in human capital in order to achieve economic growth. Some of the current researchers' findings, such as how the unemployment rate can become an insignificant determinant of economic growth or, specifically, its impact on GDP per capita in the Philippines, may also be explained by this model.

3. Methodology

In this chapter, the methods of the study are presented – including the research design, data sources, sample and sampling technique/s that may be employed, instrumentation processes, procedures, and the statistical treatments to be used.

This section should contain detailed information about the procedures and steps followed. It can be divided into subsections if several methods are described.

3.1 Research Design

The aim of this study is to measure the relationship of the selected variables to GDP per capita. Hence, the study utilized a quantitative research design with observational data, specifically multiple regression analysis, to quantify the relationship. The study will collect data only from the World Bank database for all data to ensure that they are consistent and from a singular source. More specifically, the study utilized Ordinary Least Squares (OLS) Regression to regress the independent variables on GDP per capita, with Econometric Views (Eviews) as the software of choice. Along with this, tests for violation of regression assumptions are taken into account and treated to produce the best possible result. The inherent limitations of the model and the method are noted while in the process of interpreting results to make sure that the reader is guided in digesting the paper's findings. This way, the reader is reminded of the risks and caveats associated with the chosen method as it relates to the research objectives. To analyze the research question for this study, a regression model is adopted.

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \dots + \beta_nX_n + \epsilon \quad (\text{eq. 13})$$

This can be represented in the mathematical equation below:

$$GDPC = \alpha + \beta_1NDE + \beta_2RIR + \beta_3MT + \beta_4COE + \beta_5UNP + \beta_6FDI + \beta_7RFML + \epsilon \quad (\text{eq. 14})$$

or

$$GDPC = f(NDE, RIR, MT, COE, UNP, FDI, RFML) \quad (\text{eq. 15})$$

where,

GDPC = per capita gross domestic product,

NDE = Net Domestic Credit

RIR = Real Interest Rate

MT = Merchandise Trade

COE = CO₂ Emissions

UNP = Unemployment Rate (%)

FDI = Foreign Direct Investment

RFML = Ratio of female to male labor force participation rate (%)

3.2 Instrumentation and Data Collection Technique

Table 1 shows the number of the available years and data for each Macroeconomic Indicator that is utilized by the current researchers in this study.

Table 1:

World Bank Indicators Data Table

Indicator	Observations	Available data (years)
Net domestic credit (current LCU)	60	1960-2019
Real Interest Rate (%)	44	1976-2019
Merchandise Trade (%)	60	1960-2019
Carbon Dioxide (CO ₂) emissions (metric tons per capita)	57	1960-2016
Unemployment (%; National Estimate)	47	1969, 1971-2001, 2003-2019
Foreign Direct Investment (FDI) net (BoP, current US\$)	43	1977-2019
Ratio of female to male labor force participation rate (%) (national estimate)	30	1990-2019
GDP Per Capita (current LCU)	60	1960-2019

The number of observations for the model itself will depend on the least number of observations available. In this case, the variable/s with the least recorded data points is the ratio of female to male LFPR and unemployment rate, having 26 observations from 1991-2016. This range effectively becomes the range for all other data sets, taking only values from 1991 to 2016 for the entire model. However, one setback does exist: there are, at least according to the World Bank, no official unemployment rate estimated from government figures, specifically in 2002. Fortunately, the data may either be interpolated, or the ILO estimate for the unemployment rate in 2002 may be taken as a proxy. The researchers will take the latter solution due to the high similarity between data points year-on-year.

3.2.1 Dependent Variable

- GDP per Capita (Current LCU)

3.2.2 Independent Variables

- Net domestic credit (current LCU)
- Real Interest Rate (%)
- Merchandise Trade (%)
- Carbon Dioxide (CO₂) emissions (metric tons per capita)
- Unemployment Rate (%; national estimate)
- Foreign Direct Investment (FDI) (net BoP, current US\$)
- Ratio of female to male labor force participation rate (%) (nationalestimate)

The summary of the current researcher's assumptions and relationships of each independent variable to the dependent variable was presented in Table 2.

Table 2:
Variables Assumptions and Relationships

Independent Variables	Assumptions	Expected Sign
Net domestic credit (current LCU)	As net domestic credit increases, per capita income increases, vice versa.	(+)
Real Interest Rate (%)	As the real interest rate increases, per capita income decreases.	(-)
Merchandise Trade (%)	As merchandise trade increases, per capita income also increases, vice versa	(+)
Carbon Dioxide (CO ₂) emissions (metric tons per capita)	As CO ₂ emissions increase, per capita income decreases.	(-)
Unemployment Rate (%) (national estimate)	As the unemployment rate increases, per capita income decreases.	(-)
Ratio of female to male labor force participation rate (%) (national estimate)	As the ratio of female to male labor force participation rate increases, per capita income also increases, vice versa.	(+)
Foreign Direct Investment (FDI)net (BoP, current US\$)	As Foreign Direct Investment increases, per capita income also increases, vice versa.	(+)

The researchers utilized Econometric Views (Eviews) to conduct the multivariate OLS Regression and the treatments that would be used for the mitigation and/or circumvention of problems in the regression process. These include using the aid of the coefficient of determination (R^2) to gauge the relationship of predictors to each other, if it exists; hypothesis testing for the individual significance of parameters; test for multicollinearity; test for serial correlation or autocorrelation; test for Heteroskedasticity, for Misspecification and test for normality. Each independent variable that the current researchers utilize will be assessed using these tests to determine its influence and significance to the dependent variable (GDP per capita). These tests also serve to provide a model that can be used to investigate the relationship between the independent variables (Net Domestic Credit, Real Interest Rate, Merchandise Trade, Ratio of Female to Male in the Labor Force, Carbon Dioxide Emission, Unemployment rate, and Foreign Direct Investment) on the dependent variable. (GDP per capita).

3.3 Data Analysis and Results Interpretation

This major section will highlight the rules and tests that will be used by the researchers. The initial data gathering of variables began in March 2021, which included time-series data for the variables of this study. All time-series data will come from the World Bank database and be compiled in an Excel spreadsheet. From there, the researchers will use this data for analysis using the Econometric software of choice. Econometric/Statistical analysis of data is outlined below:

The following treatments are made as provided by Studenmund (2017) and Gujarati (2004) to determine whether or not the resulting model will be spurious or reliable:

3.3.1 Coefficient Determination

The R^2 measures the degree of variance of one variable against another. In this case, the coefficient is useful in gauging the relationship between 2 predictors in the set. In this context, an unusually high R^2 may signal the presence of multicollinearity among two variable sets, but when it comes to a regressor and the regressand, a high R^2 is a good sign.

3.3.2 Hypothesis Testing for the Individual Significance of Parameters

The t-test is the usual method employed to examine whether the regression coefficients are significantly different from zero and if it has a significant impact on the regressand. In this method, the null hypothesis, which implies that the regression coefficient is equal to zero ($\beta_n = 0$), and must be rejected in order to conclude that the individual regressor is significantly different from zero. To reject the null hypothesis, the computed t-statistics must be greater than the critical t-value. The critical t-value is obtained using the t-table, given the degrees of freedom, which is defined as the number of observations minus the number of coefficients estimated (including the constant), and the level of significance. An alternative approach in testing the significance of individual parameters is by measuring the p-value or the marginal significance level of the coefficient, which is automatically calculated in most econometric or statistical software. Using this method, the computed p-value must be less than the level of significance in order to reject the null hypothesis.

3.3.3 Hypothesis Testing for the Overall Significance of the Model

In finding the significance of the overall model, F- test is applied. It is used to give a formal hypothesis that compromises the multiple hypotheses or, in simpler terms, a single hypothesis about a group of coefficients. In this test, the F- statistic should be greater than the critical F-value in order to reject the null hypothesis, which states that all the regression coefficients are equal to zero ($\beta_1 = \beta_n = 0$). The critical F- value is obtained by using the F- table where the degrees of freedom is given, which is defined as the number of observations minus the number of coefficient estimates (including the constant), and the level of significance.

The measurement of the p-value of the F-statistics, which is automatically produced in most econometric or statistical software, is another way to examine the overall significance of an individual model. To reject the null hypothesis using this method, the estimated p-value must be less than the level of significance.

3.4 Diagnostic Checks

To check the validity of the model, the researchers used a variety of diagnostic tests. They are explained as follows:

3.4.1 Test for Multicollinearity

The Variance Inflation Factor (VIF) measures the severity of multicollinearity in an ordinary least square regression analysis. It provides an index that measures how much the variance of an estimated regression coefficient increased because of collinearity. There is no serious multicollinearity when the VIF is less than ten.

3.4.2 Test for Serial Correlation

The researchers used the Durbin-Watson Statistic to detect the presence of autocorrelation in the residuals from a regression analysis. A value of two indicates that there appears to be no autocorrelation, either positive or negative.

3.4.3 Test for Heteroscedasticity

Heteroscedasticity occurs when the residuals (or error terms) are derived from a distribution with an inconstant variance – also a violation of one of the assumptions in the CLRM model. To detect whether the model's residuals have inconstant variance, the White Heteroscedasticity test is employed. This test also checks specification errors when cross-product terms are employed. In this test, in order to not reject the null hypothesis of homoscedastic residuals, the chi-square probability of the auxiliary regression's product of observations and r-squared and the p-value of the regressors should be greater than the level of significance.

3.4.4 Test for Misspecification

Misspecification, which is also known as a specification error, occurs when the model has: (1) omitted variable or (2) irrelevant variable or (3) wrong functional form, which violates the assumption of CLRM stating that the model employed in the analysis is "correctly" specified. In order to detect whether the model used in this study has a misspecification issue, the Ramsey RESET test can be employed. In this test, in order to avoid rejecting the null hypothesis, the F-test of the auxiliary regression should exceed the value of the level of significance.

Next to the Ramsey RESET Test is the Chow BreakPoint Test- The Chow test tells you if the regression coefficients are different for split data sets. Basically, it tests whether one regression line or two separate regression lines best fit a split set of data.

3.4.5 Test for Normality

The researchers used the Jarque-Bera test to determine whether the sample data has the skewness and kurtosis matching the normal distribution. The null hypothesis for normality is rejected when the JB statistic is greater than the chi-squared critical value at a given level of significance. The Jarque-Bera test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution. In order to find out whether the model fits this assumption, the histogram of residuals should be a bell-shaped curve.

3.5 Interpretation of Data

Finally, data will be interpreted according to the results of the regression and the succeeding treatments and presented systematically in this paper. In addition, further analysis into why the model is reliable or unreliable (depending on the results of the treatment) will have been made to rule out or affirm other viewpoints of interpretation based on the regression results. This is also where the theories behind the paper will have been cited in support or against the results of the model.

4. Results and Discussion

In this chapter, the findings of the study are discussed, including the results of multivariate Ordinary Least Square regression, Net domestic credit, Real Interest Rate, Merchandise Trade, Carbon Dioxide (CO2) emissions, Unemployment Rate, Foreign Direct Investment (FDI), Ratio of female to male labor force participation rate to GDP per capita, and other statistical treatments applied.

This section is a comparative or descriptive analysis of the study based on the study results, previous literature, etc. The results should be offered in a logical sequence, given the most important findings first and addressing the stated objectives. The author should deal only with new or important aspects of the results obtained. The relevance of the findings in the context of existing literature or contemporary practise should be addressed.

4.1 Model 1 (Original Model)

Ordinary Least Squares (OLS) Regression techniques were used to evaluate the impact of independent factors on the dependent variable. An econometric model 1 was employed to see if the factors chosen had a substantial impact on GDP per capita. The models' estimation outcomes as presented in the succeeding discussions. Tabulated below are the results of the initial regression analysis (Model 1) using Econometric Views. The resulting figures are as follows:

Table 3:
Tabulated Results of Regression Analysis

Dependent Variable: GDPC				
Method: Least Squares				
Date: 10/05/21 Time: 01:59				
Sample: 1991 2016				
Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-47481.21	56643.22	-0.838250	0.4129
NDC	1.65E-08	1.72E-09	9.590348	0.0000
RIR	-765.4378	316.4236	-2.419029	0.0264
MT	-34.87566	84.71501	-0.411682	0.6854
COE	-60976.83	19436.03	-3.137308	0.0057
FDI	1.75E-06	6.65E-07	2.635409	0.0168
RFML	2039.048	927.5059	2.198421	0.0412
INTRUNP	-214.1863	679.2440	-0.315330	0.7561
R-squared	0.993799	Mean dependent var	68853.02	
Adjusted R-squared	0.991387	S.D. dependent var	39376.59	
S.E. of regression	3654.428	Akaike info criterion	19.49293	
Sum squared resid	2.40E+08	Schwarz criterion	19.88003	
Log likelihood	-245.4080	Hannan-Quinn criter.	19.60440	
F-statistic	412.0764	Durbin-Watson stat	2.171382	
Prob(F-statistic)	0.000000			

4.1.2 Coefficient Determination

In this section, the researchers answer the following question, as shown on the Statement of the Problem section of this paper: by how much does GDP per capita in the Philippines increase or decrease with a corresponding increase or decrease in the regressors, ceteris paribus: As shown in Figure 4, The R-squared coefficient of the model indicates that the variability in Net Domestic Credit, Real Interest Rate, Merchandise trade, Carbon Dioxide Emissions, Foreign Direct Investment, Ratio of Female to Male LFPR, and the Unemployment rate can explain 99.4% of the variability of the dependent variable, GDP per capita in the Philippines. This indicates that the overall model is robust since it is more than 80% in terms of the explained variability. The adjusted R-squared of the GDPC model also indicates that the variability in these variables can explain 99.1%, given the adjustment for degrees of freedom, of the variability in GDPC. The adjusted R-squared ultimately becomes the basis of the model's fitness because it indicates that the model is not overfitted even with the presence of seven regressors.

Given the information shown by Table 2, the empirical model that is presented in Methodology can be restated as follows:

$$GDPC = -47481.21 + (1.650E-08) NDC - (765.4378) RIR - (34.87556) MT - (60976.83) COE - (214.1863) INTRUNP + (1.75E-06) FDI + (2039.048) RFML + \epsilon$$

Model 1 indicates that:

1. If the values of NDC, MT, COE, INTRUNP, FDI, and RFML are zero, the value of GDPC is negative, at -44781.21 PHP.
2. For every 1 PHP increase in Net Domestic Credit (NDC), holding RIR, MT, COE, INTRUNP, FDI, and RFML constant, GDPC increases by 1.650E-08 PHP.

3. For every 1 percent increase in Real Interest Rate (RIR), holding NDC, MT, COE, INTRUNP, FDI, and RFML constant, GDPC decreases by 765.4378 PHP.
4. For every 1 percent increase in Merchandise Trade as a percentage of GDP (MT), holding NDC, RIR, COE, INTRUNP, FDI, and RFML constant, GDPC decreases by 34.87556 PHP.
5. For every 1 metric ton per capita increase in Carbon Dioxide Emissions (COE), holding NDC, MT, INTRUNP, FDI, and RFML constant, GDPC decreases by 60,976.83 PHP.
6. For every 1 percent increase in Unemployment Rate, as interpolated (INTRUNP), holding NDC, MT, COE, FDI, and RFML constant, GDPC decreases by 214.1863 PHP.
7. For every 1 USD increase in FDI in the balance of payments, holding NDC, MT, COE, INTRUNP, and RFML constant, GDPC increases by 1.75E-06 PHP.
8. For every 1 percent increase in RFML, holding NDC, MT, COE, INTRUNP, and FDI constant, GDPC increases by 2039.048 PHP.

4.1.3 Hypothesis Testing for the Individual Significance of Parameters

In this section, the researchers answer the following question, as shown on the Statement of the Problem section of this paper: Are the regressors, as individual parameters, statistically significant at a 5% level of significance?

The study used Multiple Regression analysis to estimate the relationship between the dependent variable and independent variables. The results shown in Figure 2 show that the computed t-value probability of the independent variables such as NDC, RIR, COE, FDI, and RFML is less than five (5) percent level of significance when taken as an individual variable; they are statistically significant variables. MT and INTRUNP are variables that are found to exceed the five (5) percent significance threshold and thus has no statistically significant impact on the regressand when taken as an individual variable. There simply is a margin of error too large to call any statistical link for both regressors in this case. The coefficients of RIR, MT, COE, and INTRUNP are negative, which indicate an inverse relationship to GDPC. This means that decreases in these variables are seen to have an increasing effect on GDPC. On the other hand, the coefficients of NDC, FDI, and RFML are positive, which indicate a direct impact on GDPC. An increase in these indicators exhibits an increase in GDPC. The dataset for Unemployment Rate (INTRUNP) had to be interpolated due to deficiencies (i.e. missing data points). The resulting regression, however, remains insignificant. This may be mainly due to the said deficiency in data or in inconsistencies in the estimation of data that led to the high inaccuracy of results. Economist Benjamin Diokno and current Bangko Sentral ng Pilipinas (BSP) governor, then Secretary for Budget and Management, once noted that the huge number of unpaid workers, which is approximately 4 million Filipinos, has "bloat(ed)" the rate of the employed and makes unemployment rate less serious than usual. Therefore, made the unemployment rate was inaccurate in 2015. Other competing interpretations for this also involve inequality of incomes and wealth, that is to say, that over the course of the past few decades, income distribution can become so significantly skewed to the point that the incomes earned by the higher percentiles of earners in the country more than offsets the incomes lost by the lower percentiles. If such is the case, this could inadvertently obscure the plight of poorer Filipinos, especially when it comes to policy decisions based on aggregated national measures. Finally, as regards Merchandise Trade (MT), The Philippines has been going through a trade deficit, where the country's imports exceed its exports, which could explain the Merchandise Trade's (MT) lackluster performance. This negates the Model of Bhattacharya & Bhattacharya (2011), which asserts that merchandise trade and GDP per capita have a direct relationship.

4.1.4 Hypothesis Testing for the Overall Significance of the Model

In this section, the researchers answer the following question, as shown in the Statement of the Problem section of this paper: Is the model significant as a whole at a 5% level of significance?

In this study, the application of the F-test was utilized to test the overall significance of the independent variables to dependent variables. Since the computed F-value of 412.0764 is greater than the critical F-value of 2.711 with degrees of freedom 5 and 20 at five (5) percent levels of significance, this means that the regressors have a significant effect on the regressand when taken collectively. Since the computed F-value of 412.0764 is greater than 2.711, and the p-value equals 0.0000, which is less than 0.05, reject the null hypothesis. Thus, R-squared is significantly different from zero. In other words, the model is assumed to be statistically significant.

4.1.5 Diagnostic Checks

In this section, the researchers answer the following question, as shown in the Statement of the Problem section of this paper: Is the model reliable? Model 1's validity is checked using a variety of diagnostic tests. They are explained as follows:

4.2 Test for Multicollinearity

The Variance Inflation Factor (VIF) analysis detects multicollinearity in econometric modelling. Multicollinearity occurs when there is a correlation between predictors such as independent variables in a model; its presence should be given due note because it

can adversely affect the regression results. The VIF estimates how much the variance of a regression coefficient is inflated due to multicollinearity in the model. Based on the results in Table 5, since the computed Centered VIF of variables RIR, MT, COE, FDI, and INTRUNP are all less than 10, then it indicates that there is little to moderate presence of multicollinearity among these variables. Variables with cause for concern have a computed Centered VIF that are greater than 10. This indicates multicollinearity for the variables NDC and RFML.

In a bid to optimize the model and explore it, the researchers decided to omit the variables with VIF greater than 10 to resolve the multicollinearity problem in the regression model and ran the regression a second time.

4.2.1 Model 2 (Second Model)

An econometric model 2 was employed to see if the factors chosen had a substantial impact on GDP per capita. The models' estimation outcomes as presented in the succeeding discussions.

4.2.2 Regression Results

In this regression analysis, the model has been modified to omit variables that are shown to have a large margin of error (>5%). The modified model, otherwise known as model 2, is as follows:

Table 4:
Tabulated Results of Regression Analysis: Model 2

Dependent Variable: GDPC				
Method: Least Squares				
Date: 10/05/21 Time: 02:23				
Sample: 1991 2016				
Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-44730.35	37560.84	-1.190877	0.2476
NDC	1.71E-08	8.11E-10	21.09342	0.0000
RIR	-693.5715	253.6732	-2.734115	0.0128
COE	-66960.71	12518.72	-5.348845	0.0000
FDI	1.87E-06	5.68E-07	3.285571	0.0037
RFML	1986.551	596.5262	3.330198	0.0033
R-squared	0.993736	Mean dependent var		68853.02
Adjusted R-squared	0.992170	S.D. dependent var		39376.59
S.E. of regression	3484.314	Akaike info criterion		19.34910
Sum squared resid	2.43E+08	Schwarz criterion		19.63943
Log likelihood	-245.5384	Hannan-Quinn criter.		19.43271
F-statistic	634.5746	Durbin-Watson stat		2.211777
Prob(F-statistic)	0.000000			

4.2.3 Coefficient Determination

In this section, the researchers answer the following question, as shown on the Statement of the Problem section of this paper: by how much does GDP per capita in the Philippines increase or decrease with a corresponding increase or decrease in the regressors, ceteris paribus:

The model's R-squared and adjusted R-squared have maintained an upwards of 90% variability, with the R-adjusted slightly higher even with 2 less regressors by omission. As shown in Figure 3, the model has an R-Squared of 0.993. This indicates that 99.3% of the changes in the variability of GDPC can be explained by NDC, RIR, COE, FDI and RFML. It also implies that the model is a robust econometric model since the R-squared is closer to 1 (100%). Moreover, the value of the adjusted R-Squared shown in the figure is 0.992170 or 99.2%, which shows the model is 99.2% best fitted.

Moreover, based on the result above, the values for the proposed multivariate OLS regression model is:

$$GDPC = -44730.35 + (1.71E -08) NDC - (693.5715) RIR - (66960.71) COE + (1.87E-06) FDI + (1986.551) RFML + \epsilon$$

This modified model shows that:

1. If the values of NDC, COE, FDI, and RFML are zero, the value of GDPC is negative, at -44730.35 PHP.

2. For every 1 PHP increase in Net Domestic Credit (NDC), holding RIR, COE, FDI, and RFML constant, GDPC increases by $1.71E-08$ PHP;
3. For every 1 percent increase in Real Interest Rate (RIR), holding NDC, COE, FDI, and RFML constant, GDPC decreases with -693.5715 PHP.
4. For every 1 metric ton per capita increase in Carbon Dioxide Emissions (COE), holding NDC, FDI, and RFML constant, GDPC decreases with -66960.71 PHP.
5. For every 1 USD increase in FDI in the balance of payments, holding NDC, COE, and RFML constant, GDPC increases by $1.87E-06$ PHP.
6. For every 1 percent increase in RFML, holding NDC, COE, and FDI constant, GDPC increases by 1986.551 PHP.

4.2.4 Hypothesis Testing for the Overall Significance of the Model

In this section, the researchers answer the following question, as shown in the Statement of the Problem section of this paper: Is the model significant as a whole at a 5% level of significance? In terms of the model's overall significance, the F-test shows that since the computed F-value of 634.5746 is greater than the critical F-value of 2.577 with degrees of freedom 7 and 18 at five (5) percent level of significance, the regressors as a whole have a significant relationship to the regressand. This means that the model is significant with a narrow margin of error.

The coefficients of RIR and COE are negative, which indicate an inverse impact on GDPC. On the other hand, the coefficients of NDC, FDI, and RFML are positive, which indicate a direct impact on GDPC.

4.2.5 Hypothesis Testing for the Overall Significance of the Model

In terms of the model's overall significance, the F-test shows that since the computed F-value of 634.5746 is greater than the critical F-value of 2.577 with degrees of freedom 7 and 18 at five (5) percent level of significance, the regressors as a whole have a significant relationship to the regressand. This means that the model is significant with a narrow margin of error.

Based on the result presented in Table 4, the F significance or Prob (F- statistics) is 0.0000. Making use of the decision rule for the p-value of the overall model that if the Prob (F statistics) is less than the level of significance (0.05), reject the null hypothesis of R-squared = 0. Since 0.0000 is less than 0.05, accept the null hypothesis. Thus, the model is assumed to be statistically significant.

4.2.6 Diagnostic Checks

In this section, the researchers answer the following question, as shown in the Statement of the Problem section of this paper: Is the model reliable? As can be inferred, this diagnostic and reliability test is for the modified/secondary model. This is to ensure that the model is reliable even as two insignificant variables were omitted from the model. The modified model's viability as a predictive model is checked using a variety of diagnostic tests. They are explained in the succeeding discussions.

4.2.7 Test for Multicollinearity: Variance Inflation Factor

Based on the results, since the computed Centered VIF of variables NDC, RIR, COE, FDI, and RFML are all less than 10, no concerning level of multicollinearity is present.

4.2.8 Test for Serial Correlation: Durbin Watson Test

Based on the regression results presented in Table 4, the computed Durbin-Watson statistic is 2.2118. This means that there is no higher-order serial correlation in the model.

4.2.9 Test for Heteroscedasticity: White Test

Results show that the computed p-value of 0.5596 exceeds the 5 percent level of significance, which means that there is no heteroskedasticity in the model, and therefore the result indicates homoscedastic variance in the model.

4.2.10 Test for Misspecification – Ramsey RESET Test and Chow Breakpoint Test

Based on the results, the t-statistic and F-statistic computed p-value is 0.0481, which is less than the 5 percent chosen level of significance. The researchers can therefore say that there is a concern that the model is misspecified. The researchers tried to use the log form of the variables to further test the RESET. However, it was not permitted because of some negative values of variables leading to insufficient observations. RESET, being a general test for model misspecification, does not specify which type of specification error is present. RESET may signal improperly specified functional form, omitted-variable bias, overfitting, or simultaneity bias. We can rule out omitted-variable bias because, as seen from Model 1, even before MT and UNP was omitted, the model failed RESET as it did in Model 2. The specification error also cannot be simultaneity bias, because as seen in equation 1 of this paper, GDPC is not endogenous in any way to the independent variables. Functional form issues in this model is also a

possibility, but it was seen in the data treatment process that transforming the datasets also was not an option because it yielded negative values that rendered the model useless. That leaves the model with the possibility of overfitting, and this specification error is most likely to be the case because of the high R^2 as seen in the regression results in Table 4. It is necessary to point out that RESET alone has its inherent limitations as a mainly functional form test. RESET being a general test means that the model has specification issues but does not necessarily render the model useless (Woolridge, 1995). Burnham and Anderson (2002) said that indeed all models would have some form of specification error due to the fundamental nature of statistical modelling as an approximation task as a basis for, in this case, econometric inference. There is some hope in this model once more data points can be incorporated and re-estimated into the model. But for now, as mentioned in this study's Scope and Limitations section, the current researchers have already assumed the presence of misspecification because the variables were chosen at random without any consideration for a commonality. This factor has already been taken into account by the researchers when selecting the variables to be explored in the study. As a matter of ensuring the model is stable and can be represented by a regression line, the researchers employed the Chow Breakpoint test.

The Chow Breakpoint test tells if the regression coefficients are different for split data sets. Mainly, it tests whether one regression line or two separate regression lines best fit a split set of data. Breakpoint year is set in 2002 as the middle year of 1991 to 2016. Based on the regression result, since the computed F-value of 0.5948 with degrees of freedom 6 and 14 at five (5) percent chosen level of significance is greater than the F-critical value, then the data set can be represented by one regression line.

4.2.11 Test for Normality

The results show the presence of normality of the data because the p-value of the Jarque-Bera test is greater than 5%.

4.3 Economic Impact and Implications Analysis

In this section, the researchers answer the following questions, as shown in the Statement of the Problem section of this paper: Which variables have the greatest impact on economic growth and what are the implications of these findings in monetary/practical terms? And What implications do these statistical relationships have on economic policy?

4.3.1 Overall Model

Based on the Chow Breakpoint Test, a single regression line is present because there are no breaks detected in the model. No first-order correlation is present, as shown by its Durbin-Watson coefficient of 2.359. The model has exhibited a 0.99 r-squared and adjusted r-squared coefficient, suggesting that the increases (or decreases) in independent variables correlate strongly with the increase in GDP per capita for the past few decades. The model is reliable enough to draw individual conclusions from each independent variable.

Table 5:
Models 1 and 2 Coefficient Tables

Variable	Unit of Interest	Coefficient (in PhP)	Coefficient multiplied by Population ¹ (in PhP)	P-value
NDC**	PHP	1.71E-08	₱1.86	0.0000
RIR**	%	-693.572	-₱75,623,806,397.52	0.0128
COE**	metric ton per capita	-66960.7	-₱7,301,083,982,373.53	0.0000
FDI**	BoP, USD	1.87E-06	₱203.90	0.0037
RFML**	%	1986.551	₱216,604,269,671.99	0.0033
MT*	% of GDP	-34.8757	-₱3,802,683,911.87	0.6854
UNP*	%	-214.1863	-₱23,353,876,686.40	0.7561

*based on original regression model (model 1); insignificant results exhibited
**based on modified regression model (model 2)
¹ Population based on September 2021 estimate of the Philippine Statistics Authority

5. Conclusion

This study has sought to explore relationships that would otherwise be outside of known determinants to economic growth. This exploration has led to the strategic selection of miscellaneous time-series datasets from the World Bank, spanning 26 years, and incorporating these indicators into a Classical Linear Regression Model (CLRM) with the aid of Econometric Views (Eviews). The aim of this study is to explore whether or not there are significant relationships between chosen independent variables and GDP per capita both as a policy aid and as a contribution to the rolling body of study in the field. As summarized, the model states:

1. For every 1 PHP increase in Net Domestic Credit (NDC), holding RIR, MT, COE, INTRUNP, FDI, and RFML constant, GDPC increases by 1.71E-08 PHP;
2. For every 1 percent increase in Real Interest Rate (RIR), holding NDC, MT, COE, INTRUNP, FDI, and RFML constant, GDPC decreases with -693.5715 PHP;
3. For every 1 metric ton per capita increase in Carbon Dioxide Emissions (COE), holding NDC, MT, INTRUNP, FDI, and RFML constant, GDPC decreases with -66960.71 PHP;
4. For every 1 USD increase in FDI in the balance of payments, holding NDC, MT, COE, INTRUNP, and RFML constant, GDPC increases by 1.87E-06 PHP;
5. For every 1 percent increase in RFML, holding NDC, MT, COE, INTRUNP, and FDI constant, GDPC increases by 1986.551 PHP.
6. MT and UNP have ambiguous effects on GDPC, meaning that the resulting regression has a margin of error that is too large to be considered reliable or has other factors at play that affect the resulting coefficients.

These things said, the researchers have concluded, based on the model, the following:

- 1. On Real Interest Rate and Credit.** The economic policy aimed at enriching opportunities and fostering inclusion for all Filipinos can lead to an exponential increase in GDP. This is most true in terms of predictors RIR NDC. In RIR and NDC, we can see that access to credit at low interest can lead to output that is many times its original investment. Credit is crucial to gain access to opportunities for Filipino families who are trying to make ends meet on a day-to-day basis, and we can see that excessive interest for loans effectively cost-prohibits most families or places them at risk of a debt trap or indeed limit their socioeconomic mobility and growth.
- 2. On Carbon Dioxide emissions.** Environmental degradation as measured by CO2 emissions is shaping out to be more than just a nuisance or eyesore in the context of aggregate economic development. That is to say that there is a heavy economic incentive for the Philippines to reduce emissions per capita because the model shows that the byproduct of emissions has actually hindered Filipinos from more economic prosperity over the past three decades. It is for this express reason that the fight to prevent irreversible climate change and global warming must be in full swing to ensure the continuous and sustainable growth of industries and to prevent the decline of production and consumption in the economy. Reducing carbon footprint per capita, not just through emissions, can prove to be a significant step towards ensuring prosperity and security for the country in any time frame, be it short-, medium-, or long-term. The opportunity cost of not expediting the process of sustainable production and consumption towards net zero carbon emissions is proving to be a very costly arrangement year-on-year.
- 3. On female labor participation.** The model is clear and direct: participation of women in the labor force leads to more prosperity and wealth for all of its participants when more women are encouraged to find jobs outside of the home.
- 4. On Foreign Direct Investment.** Foreign investment has been a beneficial force in the context of Filipino economic growth for the past three decades. The model proves this claim, showing that investment in the country generates as much as four times its value in terms of output/income.
- 5. On Merchandise Trade.** The effect of Merchandise Trade as a percentage of GDP to GDPC is insignificant as per the model; hence there is not a viable conclusion to be had from the regression model. However, this does not outright rule out the effect of merchandise trade in nominal terms to GDPC and so warrants a separate analysis in its own right.
- 6. On Unemployment.** On the matter of the unemployment rate has an unclear effect on economic growth, there are competing reasons for why the resulting regression result is ambiguous at the very least and contrary to Okun's Law at worst. The researchers believe that the finding points to a bigger and more systemic problem than what is originally sought after in this analysis because we know that an increase in unemployment by the percentages should mean an inevitable economic decline in the aggregate. There are two (2) possible reasons as to why this result is concerning:

Firstly, income inequality in the country has historically been high. According to the World Bank, although the Philippines is improving on the index, its 2018 coefficient of 42.3 still means that high inequality in income is evident. High-income inequality means that high-income earners in the economy possess a percentage of the income that is disproportionately more significant than lower-income earners. This, in effect, means that the poorest workers are reduced to such an expendable status that even as they are excluded from the labor force in droves, their effect on national income as a whole becomes insignificant and negligible. This signals a concern because, with a heavy skew towards high-income earners in the economy, GDP per capita becomes a less reliable barometer of prosperity at the individual level in the Philippines, which becomes a huge problem when gauging socioeconomic policy at the aggregate level.

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