Master's Thesis of Public Administration

Determinants of Gross Value Added (GVA) of Major Export Sectors in the Philippines

필리핀 주요 수출 부문의 부가가치를 결정하는 요인

August 2019

Graduate School of Public Administration
Seoul National University
Global Public Administration Major

Kirbie Mae Pacinabao

Determinants of the Gross Value Added (GVA) of Major Export Sectors in the Philippines

Academic Advisor: Koo, Min Gyo

Submitting a master's thesis of Public Administration

April 2019

Graduate School of Public Administration
Seoul National University
Global Public Administration Major

Kirbie Mae Pacinabao

Confirming the master's thesis written by
Kirbie Mae Pacinabao

June 2019

Chair	**Kwon, Huck Ju**
Vice Chair	**Kim, Bonghwan**
Examiner	**Koo, Min Gyo**

Abstract

Determinants of the Gross Value Added (GVA) of Major Export Sectors in the Philippines

Kirbie Mae Pacinabao
Global Public Administration Major
The Graduate School of Public Administration
Seoul National University

Philippines lags behind its ASEAN neighbors in terms of export performance. Philippine exports grew slower than its peers from 2006 to 2013, expanding only at 4.6 percent annually, compared to Vietnam's 17.9 percent, Indonesia's 9 percent and Thailand's 9.2 percent (Canivel, 2017). A component of GDP, Gross Value Added (GVA) is the value of output less the value of intermediate consumption. It is the measure of the contribution to GDP made by an individual producer, industry or sector. To determine the factors affecting the performance of the five major export sectors in the Philippines, this study used Fixed Effects Model from a pooled cross-section time-series data of 16 regions within the period 2011-2016. Results of the study showed that Internal Revenue Allotment (IRA) or the monetary fund provided to each region for development projects has a positive relationship at 0.01 significance level to four out of five export sectors. Pooling the GVA of all sectors in one regression model, labor force population has also came out as a very significant factor. As a conclusion, Philippine Government should pay attention on how IRA can be used more efficiently and how to maximize the available labor force population considering that changes to these factors affect the productivity of the export sectors.

Keywords : Gross Value Added (GVA), Fixed Effects Model, export, Philippines, Internal Revenue Allotment (IRA)
Student ID: 2017-28249

Table of Contents

Abstract i

Table of Contents iii

List of Figures and Tables v

Chapter 1. Introduction 1

Chapter 2. Review of Related Literatures

2.1 Gross Value Added (GVA) 7

2.2. Gross Regional Domestic Product (GRDP) 9

2.3 Relationship of Infrastructure with Productivity 10

2.4 Relationship of Government Support with Productivity 12

2.5 Relationship of Inflation with Productivity 14

2.6 Relationship of Education and Training with Productivity 15

2.7 Relationship of Labor Abundance with Productivity 16

Chapter 3. Methodology

3.1 Conceptual Framework 18

3.2 Research Design 20

3.3 Data Collection 22

3.4 Data Analysis 22

Chapter 4. Results and Discussion 27

4.1 Descriptive Statistics

4.2 Multiple Regression Result 32

4.2.1 Determinants of the GVA of Agriculture, Hunting, Forestry, and Fishing

4.2.2 Determinants of the GVA of Construction Sector 35

4.2.3 Determinants of the GVA of Manufacturing Sector 37

4.2.4 Determinants of the GVA of Mining and Quarrying Sector 40

4.2.5 Determinants of the GVA of Other Services Sector 41

4.2.6 Determinants of the GVA of all Sectors Combined 44

4.2.7 Summary of Significant Variables 45

4.2.8 Summary of Model Fit 48

Chapter 5. Summary and Conclusions 49

Chapter 6. Recommendations for Future Research 55

Bibliography 56

Abstract in Korean 60

List of Figures and Tables

Figure

Figure 1. Gross Value Added of All Sectors (2011-2016) 28

Tables

Table 1. Descriptive Statistics of Variables 31

Table 2. Multiple Regression Result for GVA_Agriculture 35

Table 3. Multiple Regression Result for GVA_Construction 37

Table 4. Multiple Regression Result for GVA_Manufacturing 39

Table 5. Multiple Regression Result for GVA_Mining 41

Table 6. Multiple Regression Result for GVA_Services 44

Table 7. Multiple Regression Result for GVA_All Sectors 45

Table 8. Summary of Results of Regression 47

Table 9. Summary Results of Model Fit 49

Chapter 1. Introduction

It is already widely-accepted that trade has a very important key role in the development process of a country, region, and world economy. General Agreement on Tariffs and Trade (GATT) has published the first set of articles recognizing the role of exports in economic development. A constitutional basis has been made for GATT to promote exports of developing countries or the world's poorest countries considering that trade is the "engine of growth". Trade permits a country to reallocate its resources more efficiently. However, due to sluggishness in transforming resources released from domestic consumption to either increased exports or import substitutes, some countries have been under severe balance-of-payments pressures. Under these circumstances, increased exports have a crucial role in a strategy of development. By permitting a country to break the bottlenecks on the side of imported materials they bring into play idle human and capital resources. For developing countries experiencing severe balance-of-payments stringencies, increased exports in terms of greater domestic output will pay-off their value of imports (Frank, 1968).

Many Asian countries that are characterized as developing countries face special difficulties due to multilateral trading systems. World Trade Organization (WTO) in fact is making continuous efforts to meet the developing countries' special needs by building "trade capacity" to enable them to trade more effectively and helping developing countries participate more fully in the global trading system. Developing countries that trade

successfully tend to be those which have made the most progress in alleviating poverty and raising living standards. But there are countries, including a large number of least-developed countries (LDCs), where trade is failing to make contribution that it should be making in economic growth and poverty reduction. Because many countries simply don't have the human, institutional and infrastructural capacity, they won't be able to expand the quantity and quality of goods and services they can supply to world markets at competitive prices (Building Trade Capacity).

Many countries in the Southeast Asian region are developing countries. The regional bloc Association of Southeast Asian Nations (ASEAN) was formed to enhance trading capacity, among other reasons. The association seeks to channel the often-divergent trade interests of its 10 member-states by aligning trade deals and agenda. They are small as individual countries but together, they have the potential to become a globally-significant presence: With 690 million people, the ASEAN bloc comprises 3.3 percent of global gross domestic product, trades goods totaling $2.27 trillion and boasts robust economic growth. Since 2000, the bloc has successfully negotiated six ASEAN+1 trade deals with non-members including China, South Korea, Australia/New Zealand, Japan, India and most recently Hong Kong. In 2015, the bloc also established the ASEAN Economic Community, lowering some internal trade barriers with the hope of integrating and strengthening members' supply chains and infrastructure (Trade Profile: ASEAN Pulls the Threads Together, 2017).

Philippines, one of the members of ASEAN, was hailed as the 'rising tiger' by World Bank in 2013 because of its going strong economy despite global uncertainty. The Philippines posted a 6.6% growth in 2012, better than its closest rival, Indonesia (Rappler.Com, 2013). Many have expected the Philippines to continuously grow and become an upper middle income country soon but the most recent economic reports say otherwise. Just within the ASEAN bloc, Philippines has the third lowest GDP per capita and one of the countries with the least trade deals and total trade (Trade Profile: ASEAN Pulls the Threads Together, 2017). Philippines has not been as open to trade as its ASEAN neighbors. Its trade openness declined from 105 percent in 2000 to 62 percent in 2016 while Singapore had 318 percent; Thailand, 123 percent; Vietnam, 185 percent, and Malaysia, 128 percent. According to the Philippine Export Development Plan (PEDP) 2015-2017, Philippine exports grew slower than its peers from 2006 to 2013, expanding only at 4.6 percent annually, compared to Vietnam's 17.9 percent, Indonesia's 9 percent and Thailand's 9.2 percent. Moreover, it said that Philippine export volume in 2013 accounted for just over a quarter of Thailand's, half of Vietnam's and a third of Indonesia's. Exports also "contributed much less" to national income compared to the exports of other ASEAN economies to their respective national incomes. By most measures, the Philippines lags behind its neighbors in export performance (Canivel, 2017). So, what then are the possible causes behind this problem?

Usually, a nation's economy is measured by its Gross Domestic Product (GDP) or the sum of private consumption, gross investment in the economy, government investment, government spending and net foreign trade (difference between exports and imports). If one wants to know the problems specifically in the export side, one should focus on investigating the production performance of the country or its major export sectors. A component of GDP, Gross Value Added (GVA) is the value of output less the value of intermediate consumption. It is the measure of the contribution to GDP made by an individual producer, industry or sector (Glossary of Statistical Terms, 2001). GVA provides the amount of goods and services produced in an economy after deducting the cost of inputs and raw materials that have gone into the production of those goods and services. It is the total output and income in the economy and it gives sector-specific picture like what is the growth in an area, industry or sector of an economy. It is a measurement in the production side acting as the balancing item of the national accounts. Simply put, GDP provides the economic output from the consumer's side or demand perspective while GVA provides the state of economic activity from the producers' side or supply perspective (Nayak, 2017).

As GVA gives the status report sector-wise, this thesis will use it as the production performance measurement. Results of this study will provide policymakers which factors affecting it should be given more attention,

incentives, or stimulus. In the future, information provided by this thesis will help create reliable, sector-specific policies for the Philippines.

A study in South Korea discussed about the "Determinants of Value Added in Exports and Their Implications". Results of the study showed that trade costs such as tax and transportation costs reduce value added in exports, implying that trade facilitation measures and tax policy lowering trade costs are vital for the promotion of value added in exports (Choi, 2016).

Another research has also provided empirical results showing a strong positive association between the average growth of investment to GDP ratio and economic growth. It also showed a positive correlation between average years of schooling and economic growth. The study hence emphasized that countries that have grown faster are typically those that have invested more in physical capital and those that started out the postwar era with greater human capital. However, further analysis of data points out that focusing only on physical and human capital is not sufficient (Acemoglu, 2007).

In both cases, it is evident that there are different factors that can affect the productivity of a country or its industries. Determinants of the Gross Value Added per sector per region can be affected not just by the internal factors of business operations within the businesses but also by external environments some uncontrolled and some are actions by the government.

Philippine Statistics Authority reported on December 2017 that Philippines' total export sales reached $4.72 billion, recording a decline of 4.9 percent over the value of $4.97 billion in the same month of previous year. This was due to the decreases posted by four out of the top ten commodities for the month, namely: coconut oil (-56.7%); ignition wiring set and other wiring sets used for vehicles, aircrafts and ships (-27.1%); other manufactured goods (-24.4%) and metal components (-3.0%). Looking at the export performance per sector, total agro-based products had an export value of $150.40 million and a share of 3.2 percent, declined by 61.71 percent in December 2017. Exports from Mineral Products accounting for a 6.01 percent share amounted to $283.75 million, with an increase of 11.7 percent in December 2017. Exports of Manufactured Goods, with a share of 87.9 percent of total exports, were valued at $4.15 billion, in December 2017. It decreased by 1.1 percent compared to $4.20 billion export value in December 2016. Petroleum Products with 0.1 percent share amounting to $3.70 million, declined by 65.1 percent from $38.05 million in December 2016. Exports of Forest Products accounting for 0.3 percent share of the total exports had a value of $15.53 million. Exports of this goods surged by 195.2 percent in December 2017 (Highlights of the Philippine Export and Import Statistics: December 2017, 2018).

Chapter 2. Review of Related Literature

This study wants to investigate the factors that affect the Gross Value Added (GVA) of the main export sectors of the Philippines. Below are literatures that provide theoretical background on the variables used in this study.

2.1. Gross Value Added (GVA)

A research by Volek & Novotna in 2014 focused on the Gross Value Added and Total Factor Productivity in Czech Sectors. The main objective of the study is to consider the development of total factor productivity in the development of the gross value added in the individual sectors. They used the national accounts data from 1996 to 2011. They highlighted the importance of studying the sectoral performance in order to measure the productivity and efficiency of the whole economy. GVA is basically used in the study because it measures the output sectors or the small regions. Results of their study suggested development of the total factor productivity does not constitute growth of GVA. Growth of GVA is actually a function of extensive and intensive sources of growth. Furthermore, there are differences in the sources of growth in the individual sectors.

A study entitled “Forecasting Gross Value-Added at the Regional Level: Are Sectoral Disaggregated Predictions Superior to Direct Ones?” by Lehmann & Wohlrabe in 2014 identified seven categories in forecasting

GVA. The categories are (1) Macroeconomic which is represented by the german industrial production and new orders in manufacturing; (2) Financial which included interest rates, exchange rates, and government bond yields; (3) Prices which is composed of price indeces for exports and imports and consumer and producer prices; (4) Wages; (5) Surveys that include consumer surveys, business surveys, and expert surveys; (6) International large economies; and (7) Regional economies represented by the qualitative data (surveys) and quantitative data (new orders and prices).

Vyklyuk et. al (2016) researched on the proportions and rates of economic activities as a factor of Gross Value Added maximization in transition economies (Ukraine and Romania). The study emphasized that there is a need to rethink on the priorities of economic development policies. Previously, we deal with the hard factors of competitiveness which are natural resources and geopolitical location. But “new sources” of competitiveness require highly-skilled employees, innovation, knowledge and information in the organization. New tools on management, marketing, branding and outsourcing have shaped the current standards. Neo-economic model highlights the symbiosis of technological and non-system factors such as ethnic, national, psychological and cultural factors. New growth model of production focuses in the higher value-added activities. There is a need to establish sectoral distribution of value added in connection with structural changes, the regulation on these structural changes and empirical analysis on the development of the information society. As the study aimed to determine

the future dynamics of the economic activities with increasing value added, it utilized the Hopfield's Neural Network method. Results showed that state regulation can build the basis for further improvements in the economic policy.

2.2. Gross Regional Domestic Product (GRDP)

Considering that GRDP is an aggregate of GVA of the sectors in the region, researches discussing the factors affecting GRDP are explored.

According to the study of Feriyanto (2014), multiple regression estimation shows that employment has negative effect to GRDP of Yogkarta in Indonesia. Meanwhile, investment and the number of tourists have a positive relation towards the dependent variable, GRDP. The researcher considered other factors such as agricultural production, value of construction work, exports, and imports as factors that could also influence GRDP per capita. Based on the result, the researcher concluded that the government should entice more tourists and increase its investment to Yogkarta in order to improve its overall local economy.

Another study conducted in Indonesia but in a different province, Bali, had presented a different result. Entitled "Labor Absorption and Its Impact on Gross Regional Domestic Product", the research proved that increase in employment and workers productivity have a positive and significant effect toward the GRDP, specfically in the trade, hotel and restaurant sector in Bali Province. The researcher utilized a panel data comprising nine cities at Bali

Province in the period 2003-2009. Methods applied are fixed effect model and simultaneous equation model of Two-Stage Least Square (Prastyadewi et. al, 2013).

The determinant effect of industry sub-sectors on the GRDP of Maluku, Indonesia was studied by Leasiwal in 2015. The researcher used panel data to measure GDP growth through industrial sector based on the effects of investment, employment, and number of companies located in the area. It worked under the premise of Solow-Swan model wherein long-term economic growth is a function of labor and exogenous capital. Result of the study showed that increase of GRDP is characterized by increase in investment, employment and number of companies.

2.3. Relationship of Infrastructure with Productivity

Depending on the policy discussion, infrastructure can be defined in a number of ways. But in general, infrastructure refers to long-lived, capital-intensive systems and facilities such as roads, bridges, and water treatment facilities. It enables private businesses and individuals to produce goods and services more efficiently. In the short run, increase in infrastructure spending by the government is generally expected to result in higher economic output by stimulating demand. While in the long run, there will be increase in overall economic output by increasing overall productivity caused by the infrastructure spending (Stupak, 2017).

A study on the “Analysis of the Impact of Public Infrastructure on Productivity Performance by Mexican” by Mamatzakis (2007) revealed that returns to infrastructure capital are significant and positive. The study used a dual profit theoretical framework of measuring the effects of infrastructure on economic performance in terms of gains in profit, cost savings, and productivity growth enhancement. Empirical estimates showed that infrastructure capital is a productive input for the Mexican industry though over time the impact declines. Another method, decomposition of the Total Factor Productivity (TFP) demonstrated that infrastructure investment could be responsible for the observed slow down in economic performance since the mid 1980s. It specified that the pathogenic causes of the low economic performance of the Mexican economy is the chronic shortage in infrastructure capital in roads, electricity system, water supply, and water treatment.

Almost the same study was done in Quebec economy by Boccanfuso et al. (2015) wherein they measured the contribution of public capital to sector economic growth for 1997-2002. Methods used are the Multifactor Productivity (MFP), in which analysis of MFP for each sector determined the significance of the contribution of public infrastructure capital to industry productivity, and the CGE model that allowed integration of various economic agents and production sectors which interact in various markets. Results of the study showed that with respect to public capital, its contribution is stronger in the sectors: (1) construction, (2) retail and

wholesale trade, (3) administrative services, and (4) other service industries. Results confirm the positive contribution of public capital to production whose average exceeds 0.09, therefore a positive relationship between public infrastructure capital and economic growth.

2.4. Relationship of Government Support with Productivity

In 2002, Ball & Norton conducted a research on the sources of agricultural productivity growth at the state level from 1960-1993. They examined the contributions of public agricultural research, agricultural extension, and highway infrastructure to the agricultural productivity of regions. Specifically, they estimated the separate contributions of state's own public agricultural research, spillovers of agricultural research from other states, and the effects of their interaction. It assumed that research and development, measured by the public research expenditures, will result to having a knowledge on higher-yielding crop varieties, better breeding practices, more effective fertilizers and pesticides, and effective farm management practices. Another assumed source of agricultural productivity is the government's extension programs which involve decoding scientific and market information that will help farmers make good production and market decisions. Extension agents are particularly expected to disseminate information on crops, livestock, and management practices at the same time demonstrating new techniques and consulting with the farmers.

Results of the study showed that public agricultural research and government infrastructure programs have large positive effect toward agricultural productivity growth. The study has also been important in contributing literature about agricultural productivity at state level which is not common in the field of research. The researchers concluded that there is a need for regional coordination of public agricultural research funding and provision.

In the cases of Zambia, Malawi, South Africa and Tanzania, the impact of Government spending on agricultural growth was investigated by Jambo (2017). The author's objective was to determine the component of public expenditures that is more growth-enhancing for the agricultural sector. Four spending types of government expenditures are being identified: (1) Agricultural Research Programs or ARPs; (2) Infrastructure Development Programs or IDPs; (3) Input Subsidy Programs or ISPs; and (4) Price Support Programs or PSPs. To determine both the contemporaneous effects and lagged effects of government spending on the types of growth, the author utilized the time series data. Then, she used the Vector Error Correction Model (VECM) to determine what drives growth among the identified government spending types. Results of which are expected to give government the idea on which areas to prioritize and disburse funds to.

For the state of Zambia, bulk of public expenditure is given to ISPs and PSPs. However, result of the study showed that IDPs or Infrastructure Development Programs are more growth-enhancing even though it only

constitutes one-third of the total budget. In the case of Malawi, Agricultural Research Programs showed to be the biggest contributor of growth wherein agricultural productivity grows by 13% for every 1% change in the research spending. While only 4.33% and 4.17% are the growth contributed by PSPs and IDPs, respectively. Considering the results of the study, it is recommended that the government should redirect its public investments in favor of the identified growth-enhancing expenditure categories.

2.5. Relationship of Inflation with Productivity

There is a positive correlation between the magnitude of changes in relative prices and the increase in industrial productivity according to the statistical study on Inflation, Productivity, and Relative Prices by H. Glejser (1965). As labour productivity cannot augment, or can augment only slowly in several branches, especially services (transport, distribution, entertainment, domestic services, etc.) the rise in their relative price is, ceteris paribus, an increasing function of productivity gains in the other branches (mainly industry). However, there could still be different responses to inflation rate changes depending on the industry. If the industry is for processing, inflation rate hike for its raw materials will consequently increase its expenses which my limit or lower its productivity. Whereas if the industry is a provider of raw materials to other industries, inflation rate increase might give them opportunity to increase their selling price too which is favorable for them (Glejser, 1965).

2.6. Relationship of Education and Training with Productivity

Author S. J. Prais (1995) in his book "Productivity, Education, and Training: An International Perspective" discussed that in the two phases in the progress of technology, 1) mechanization; 2) automation, progressive application of human knowledge to industry lead to higher productivity and higher living standards. The book has presented a series of empirical international comparisons of productivity, schooling, and training which Britain has been compared with France, Germany, the Netherlands, Switzerland, and Japan as examples of rapidly advancing industrial countries. The said countries see higher levels of education and modern work-trainings as self-evident priorities.

In Africa, a literature review discussed the theoretical link between higher education and economic development. It also involved the topics on knowledge economy, innovation, and local and regional development. The study surveyed three successful innovation-driven OECD countries and eight African nations and universities. The research led to key findings in three broad areas, the needs: for a 'pact' that sees governments, universities, funders and other stakeholders agree on a central role for higher education in economic development and the knowledge economy; for strengthening the 'academic core' of universities that is essential to producing knowledge, reproducing the academy and providing the high-level skills that drive development; and for improving policy (and implementation) coordination at

national and institutional levels in ways that help to connect universities more effectively to development (Cloete, Bailey, & Maassen, 2011).

Another theoretical linkage between higher education and productivity was presented by Andersson et al. (2009) wherein the researchers investigated the economic effects of the decentralization of post-secondary education by the Swedish government. The effects are measured on the level of productivity and innovation and their spatial distribution in the national economy. Results of the study revealed that aggregate productvity was increased due to the investment policy. It also suggests that the decentralization has affected regional development through local innovation and increased creativity.

2.7. Relationship of Labor Abundance with Productivity

The Heckscher-Ohlin (OH) model explains that trade commodities are bundles of factors (land, labor, and capital). In factor-proportions theory of comparative advantage, the model further states that international commerce compensates for the uneven distribution of productive resources. Countries that are richer in labor than land export labor-intensive agricultural products, and as a result of trade, have wages that approach levels prevailing in high-wage labor-scarce countries (Leamer, 1995).

A study by Benhabib & Spiegel (1994) used cross-country estimates of physical and human capital stocks to run a growth accounting regressions implied by a Cobb-Douglas aggregate production function. Although it has long been considered that human capital accumulation is an important factor

in economic development, their study showed that human capital accumulation is not a significant factor in the determination of economic growth and it even had a negatve point estimate. But when they used human capital accumulation as determinant of total factor productivity, they got positive results. The researchers delved further into the phenomena and realized that human capital affects growth through two mechanisms: 1) human capital levels directly influence the rate of domestically produced technological innovation; 2) human capital stock affects the speed of adoption of technology from abroad. It is therefore concluded by the researchers that the significance of their alternative model is that human capital stocks in levels, rather than their growth rates, play a role in determining the growth of per capita income.

Chapter 3. Methodology

This chapter includes: (1) the conceptual framework which will provide the snapshot or general overview of this study's purpose and logic; (3) the research method and variables to be used and the hypotheses subject for testing; (4) the data collection method to be applied based on the type of data required by the study ; and (5) the type of analysis to be conducted that will process the variables and provide the answers to the research questions of this study.

3.1. Conceptual Framework

This study aims to identify the determinants of Gross Value Added (GVA) of major export sectors in the Philippines. GVA is used as dependent variable which is hypothesized to be affected by selected variables.

As discussed in the Review of Related Literature, some of the external factors that can affect firms' productivity are infrastructure, government support, inflation rate, education and training, and labor. The infrastructure factor is not of the firm but the quantity and quality of infrastructure surrounding the it built by the government. In this study, four variables have been used to represent infrastructure which are: 1) number of concrete bridges, 2) length of concrete bridges, 3) length of paved road, and 4) Gross Registered Tonnage (GRT). It is assumed in this study that if there are more and longer concrete bridges and paved road, it will be easier and faster to receive and deliver the goods and services for export which will

consequently result to higher production or GVA. On the other hand, Gross Registered Tonnage (GRT) is the volume of all enclosed spaces of a ship. The measure of the internal volume of space within a vessel expressed in terms of 100 cubic feet a ton (Philippine Ports Authority). GRT represents the total shipping capacity of ships that transport raw materials for production and finished products for exports. It is assumed in this study that the higher shipping capacity or GRT will consequently result to higher productivity or GVA.

The fifth variable used in this study is inflation rate. As defined by the United Nations, inflation rate is the annual percentage increase of the cost of living as measured by the consumer price index. As prices of goods go up, it is assumed that productivity of firms will go down. They are expected to have an inverse relationship.

Another factor that is considered to have an effect to productivity or GVA is the provision of education and trainings. The more educated and trained the people are, the more likely that they will produce more goods. In this study, this factor is represented by two variables. One is the number of Higher Education Institutions (HEIs) within the area or region and the number of trainings provided by the government per region. It is hypothesized in this study that increase in the number of HEIs and trainings provided will also result to increase in the region's productivity or GVA.

In the Philippines, Local Government Units (LGUs) get their funds from the national government in the form of Internal Revenue Allotment

(IRA). IRA is used by the local government to spend for projects within their area of jurisdiction such as farm-to-market roads, health institutions, and other development program (Canare, 2016). Although not all percentage of IRA goes to the direct support for local businesses, developmental projects in the community may have spill-over effects for the firms within the region with higher funds or IRA.

The last variable considered in this study is regional population of persons age fifteen years and above. The said population bracket in the Philippines is considered as available labor force and is hypothesized to have a positive significant effect on the productivity or GVA of a region.

The problem raised in this study is that the national export performance of the Philippines is weak and therefore needs to be investigated. There are many different products that contribute to the annual export volume but this study will just focus on the five major export sectors of the Philippines, namely: 1) Agriculture, Hunting, Forestry, and Fishing; 2) Mining and Quarrying; 3) Construction; 4) Manufacturing; and 5) Other Services.

3.2. Research Design

Panel study is a type of longitudinal study in which data are collected from the same set of people at several points in time (Babbie, 2013). In this study, the researcher takes into account the Gross Value Added (GVA) of the major export sectors within the period 2011-2016 (six years) wherein changes in this value is observed and compared to the changes in the value

of the independent variables within the same period of time.

Philippines is composed of many regions and each region has its own GVA and specialized sectors. Philippines has seventeen regions but this study has excluded the Autonomous Region is Muslim Mindanao (ARMM) due to lack of data. The regions covered as population in this study are:

1. National Capital Region (NCR)
2. Ilocos Region (Region I)
3. Cordillera Administrative Region (CAR)
4. Cagayan Valley (Region II)
5. Central Luzon (Region III)
6. CALABARZON (Region IV-A)
7. MIMAROPA (Region IV-B)
8. Bicol Region (Region V)
9. Western Visayas (Region VI)
10. Central Visayas (Region VII)
11. Eastern Visayas (Region VIII)
12. Zamboanga Peninsula (Region IX)
13. Northern Mindanao (Region X)
14. Davao Region (Region XI)
15. SOCCSKSARGEN (Region XII)
16. Caraga Region (Region XIII)

With sixteen regions as the population covering six years (2011-2016) of data, this study has a total of ninety-six (96) observations.

3.3. Data Collection

For ease and reliability, this study used secondary data provided by the government agencies in the Philippines that handle specific sectors and departments. Data on GVA, inflation rate, IRA, and labor population are taken from the Philippine Statistical Authority (PSA). The number of Higher Education Institutions (HEIs) data are provided by the Commission on Higher Education (CHED). The Agricultural Training Institute (ATI) of the Department of Agriculture (DA) provided the data on the number of trainings. Since the trainings are provided by the agriculture agency and there were no available training data for other sectors, the independent variable training is just used for the GVA agriculture model. The data on concrete bridges and paved roads are requested from the Department of Public Works and Highways (DPWH) whereas the data on Gross Registered Tonnage (GRT) was taken from the Philippine Ports Authority (PPA).

3.4. Data Analysis

The first data analysis done was descriptive statistics that provides brief and summarized description of the panel data with 96 observations. Two measures were included in this study's descriptive statistics: measures of central tendency and measures of variation. Measures of central tendency such as the mean indicate where the center or most typical value of a data set lies. Measures of variation or measures of spread describe the difference quantitatively that indicates the amount of variation or spread in data set. The maximum and minimum values of the variables are shown to present the

contrasts taking into account the largest and smallest observations. Another measure of variation is the standard deviation that takes into account all observations. It is a measure of variation where the mean is used as the measure of the center. It measures variation by indicating how far, on average, the observations are from the mean. For a data set with a large amount of variations, the observations will, on average, be far from the mean, so the standard deviation will be large. For a data set with a small amount of variation, the observations will, on average, be close to the mean, so the standard variation will be small (Weiss, 2012).

Multiple Regression Analysis was used as a statistical tool to examine how multiple independent variables are related to the dependent variable and if there is a statistically significant relationship between them (Higgins, 2005).

Since this study wants to analyze the impacts of the variables that vary over time, Fixed Effects (FE) Model was utilized. FE Model explores the relationship between predictor and outcome variables within an entity, or in this case the region. Each region has its own individual characteristics that may or may not influence the predictor variables (for example, being in Region III may have some effect on the inflation rate). The rationale behind the assumption of the correlation between the region's error term and predictor variables is that we assume that something within the individual may impact or bias the predictor or outcome variables and we need to control for this (Torres-Reyna, 2007). FE Model removes the effect of the time-

invariant characteristics so the researcher can assess the net effect of the predictors on the outcome variable. The equation for the fixed effects model is:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}$$

Where:

α_i (i=1…n) = unknown intercept for each variable (*n* region-specific intercepts)

Y_{it} = the dependent variable (Gross Value Added); *i* = region and *t* = time

X_{it} = represents one independent variable

B_1 = coefficient for the independent variable

U_{it} = error term

For this study, we create the following model to find out the determinants of GVA of five major sectors:

$$GVA\_Agri_{it} = \beta_1 InflationRate_{it} + \beta_2 HEIs_{it} + \beta_3 Trainings_{it} + \beta_4 NumberBridges_{it} + \beta_5 LengthBridges_{it} + \beta_6 PavedRoad_{it} + \beta_7 Tonnage_{it} + \beta_8 Revenue_{it} + \beta_9 Labor_{it}$$

Where:

GVA_Agri_{it} is the dependent variable or the Gross Value Added of the agriculture sector of the regions ***i*** and years ***t***

β_1 is the coefficient of independent variable Inflation Rate of the regions ***i*** and years ***t***

β_2 is the coefficient of independent variable Higher Education Institutions (HEIs) of the regions ***i*** and years ***t***

β_3 is the coefficient of independent variable Trainings of the regions ***i*** and years ***t***

β_4 is the coefficient of independent variable Number of Concrete Bridges of the regions ***i*** and years ***t***

β_5 is the coefficient of independent variable Length of Concrete Bridges of the regions ***i*** and years ***t***

β_6 is the coefficient of independent variable Length of Paved Road of the regions ***i*** and years ***t***

β_7 is the coefficient of independent variable Gross Registered Tonnage (GRT) of the regions ***i*** and years ***t***

β_8 is the coefficient of independent variable Internal Revenue Allotment (IRA) of the regions ***i*** and years ***t***

β_9 is the coefficient of independent variable Labor Force Population of the regions ***i*** and years ***t***

The aim of this study is not just to determine the factors affecting the Gross Value Added of the Agriculture but also of four other major export sectors such as construction, manufacturing, mining, and other services. Below are the regression models for other sectors with different dependent variables but the same set of independent variables:

For the construction sector:

$$GVA\_Cons_{it} = \beta_1 InflationRate_{it} + \beta_2 HEIs_{it} + \beta_3 Trainings_{it} + \beta_4 NumberBridges_{it} + \beta_5 LengthBridges_{it} + \beta_6 PavedRoad_{it} + \beta_7 Tonnage_{it} + \beta_8 Revenue_{it} + \beta_9 Labor_{it}$$

For the manufacturing sector:

$$GVA\_Manu_{it} = \beta_1 InflationRate_{it} + \beta_2 HEIs_{it} + \beta_3 Trainings_{it} + \beta_4 NumberBridges_{it} + \beta_5 LengthBridges_{it} + \beta_6 PavedRoad_{it} + \beta_7 Tonnage_{it} + \beta_8 Revenue_{it} + \beta_9 Labor_{it}$$

For the mining sector:

$$GVA\_Mine_{it} = \beta_1 InflationRate_{it} + \beta_2 HEIs_{it} + \beta_3 Trainings_{it} + \beta_4 NumberBridges_{it} + \beta_5 LengthBridges_{it} + \beta_6 PavedRoad_{it} + \beta_7 Tonnage_{it} + \beta_8 Revenue_{it} + \beta_9 Labor_{it}$$

For the other services sector:

$$GVA\_Serv_{it} = \beta_1 InflationRate_{it} + \beta_2 HEIs_{it} + \beta_3 Trainings_{it} + \beta_4 NumberBridges_{it} + \beta_5 LengthBridges_{it} + \beta_6 PavedRoad_{it} + \beta_7 Tonnage_{it} + \beta_8 Revenue_{it} + \beta_9 Labor_{it}$$

STATA software was used to run the models. Stata is a complete, integrated software package that provides data science needs such as data manipulation, visualization, statistics, and reproducible reporting (StataCorp LLC, 1996).

Chapter 4. Results and Discussion

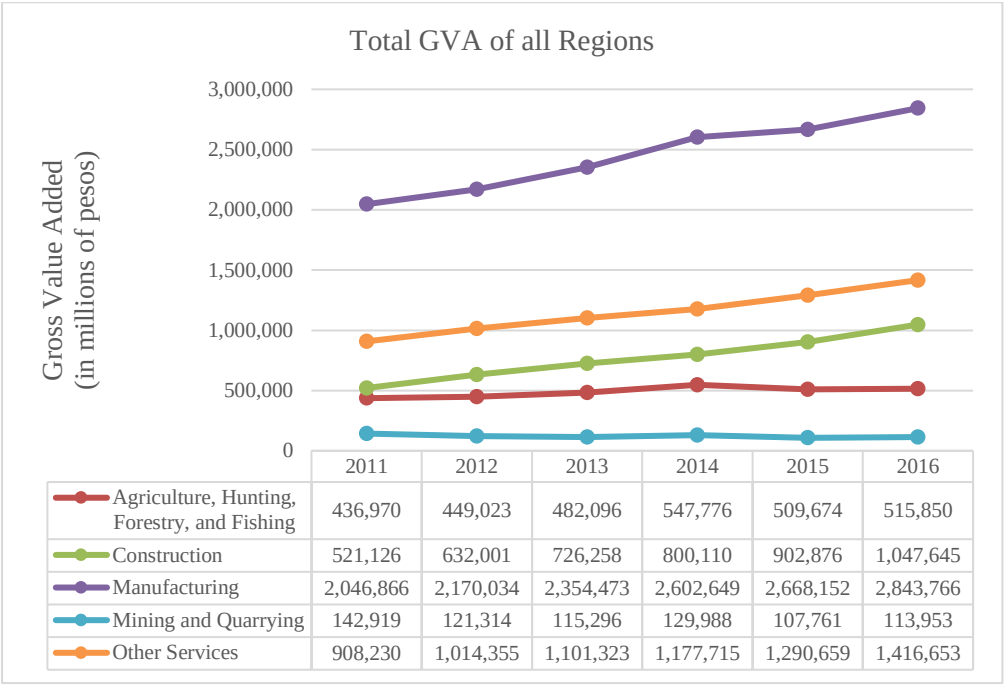
Incorporating all the data and method mentioned in the previous chapters, this chapter provides the result and analysis of the study.

4.1. Descriptive Statistics

Figure 1 below shows the total Gross Value Added (GVA) of all regions on different sectors within the period of 2011-2016. It can be observed that the sector with the highest GVA for the last six years is the manufacturing sector. With a very huge gap, it is followed by the other services sector, then construction, agriculture, and mining.

Noticeable in this figure is that from 2014 to 2015, there was a decline in the GVA of the agriculture and mining sectors. Although they got better in year 2016, they still were not able to go back to the same amount they had in 2014.

Figure 2. Gross Value Added of All Sectors (2011-2016)



	2011	2012	2013	2014	2015	2016
Agriculture, Hunting, Forestry, and Fishing	436,970	449,023	482,096	547,776	509,674	515,850
Construction	521,126	632,001	726,258	800,110	902,876	1,047,645
Manufacturing	2,046,866	2,170,034	2,354,473	2,602,649	2,668,152	2,843,766
Mining and Quarrying	142,919	121,314	115,296	129,988	107,761	113,953
Other Services	908,230	1,014,355	1,101,323	1,177,715	1,290,659	1,416,653

In table 1 below, descriptive statistics for the dependent and independent variables is shown. The researcher utilized five dependent variables but incorporated into five separate regression models. All variables have 96 observations due to 16 regions as population covering 6 years of data (2011-2016). On average, the Gross Value Added (GVA) of Agriculture for 16 regions and 6 years is 79 million pesos and standard deviation is 43 million pesos. Roughly speaking, the GVA of the individual regions fall, on average, 43 million pesos from their mean GVA of 79 million pesos.

This huge variation in the GVA of Agriculture data can be explained by the fact that different regions in the Philippines have their own specialized sectors wherein some have abundance in agriculture products and some do

not. Within the last six years, one region has only 7.7 million pesos GVA for Agriculture, which is the minimum among the 96 observations while the maximum is at 206 million pesos GVA.

For the construction sector, mean GVA is at 48 million pesos while standard deviation is at 42 million pesos. Compared to the Agriculture sector, construction sector has a smaller deviation that means that the 16 regions in the Philippines have almost the same level of productivity for construction materials.

Gross Value Added of the manufacturing sector is the highest among the five major export sectors of the Philippines. Its standard deviation of 251 million pesos is higher on average compared to its mean of 153 million pesos. However, it also worth noting that the minimum and maximum GVA of construction are very extreme in nature wherein the minimum is very small and the maximum is very high compared to other sectors. The very huge gap between the minimum and maximum gives us the idea that there are regions in the Philippines which really specializes in exporting manufacturing materials. There are also regions that are very poor with it.

Mining and quarrying sector in the Philippines is among the smallest producer because of its products which are limited in nature, raw, and not reproduced. Zero GVA in the minimum shows that there is a region in the Philippines that does not produce any mining goods at all. The said region was NCR or the National Capital Region where the main capital city of Manila is situated.

Although zero in mining, NCR Region or Manila is the greatest contributor in the services sector. Mean value of the services sector is 72 million pesos while standard deviation is 127 million. The same with the manufacturing sector, GVA of the regions, rise on average, in terms of services.

Looking at the independent variables, mean inflation rate for 16 regions in the last six years was 3.2% and standard deviation was 1.5%. There was a point in time when one region experienced zero inflation rate based on the minimum value and one region experienced high inflation as high as 7%.

The average number of Higher Education Institutions (HEIs) is 143. Based on the standard deviation, the number of HEIs in the whole Philippines fall 86 from their mean number of 143. The least number of HEIs is 54 and highest is 354. Since we are talking about institutions, this gap is huge. However, it also depends on the size of the region in terms of geographical size, income size, and population size.

On average, the Department of Agriculture provided 128 trainings for 16 regions and in 6 six years. Just this figure alone tells us that the agency gave little trainings although it has already been proven in many studies that trainings and human development are very important factors of productivity, regardless of the industry or sector.

For the number and length of concrete bridges, one region has only 174 in number and 5,980 kilometers while at maximum, one region has 767 number of concrete bridges and 31,605 kilometers long. The gap is very huge.

Although we can say that it also depends on the size of the region, the danger of having this information is that infrastructure development might be concentrated in selected regions. Every region has its own specialized sector and if the government focuses only on some regions, some sectors might also be affected and will have lesser productivity in the long run.

As mentioned before, Gross Registered Tonnage (GRT) is the volume of all enclosed spaces of a ship. It is the measure of the internal volume of space within a vessel expressed in terms of 100 cubic feet a ton. In this study, it represents the capacity of the ships that dock in the ports in different regions. Having zero tonnage or GRT in one region might mean the products in that region are being transported to other regions just to be delivered and exported. Roughly speaking, it will be costlier to producers to have a low shipping capacity in their region and might consequently discourage them to produce more.

Table 10. Descriptive Statistics of Variables

Variable	No. of observations	Mean	Standard Deviation	Min	Max
(GVA in millions of pesos)					
Agriculture	96	79,223	43,284	7,769	207,130
Construction	96	48,229	42,395	8,932	177,264
Manufacturing	96	152,979	250,844	2,349	1,034,902
Mining	96	7,617	9,958	0	48,009
Services	96	71,968	127,156	12,015	656,503

Inflation Rate (%)	96	3.2	1.5	0	7
HEIs	96	143	86	54	354
Trainings	96	128	37	51	255
No. of Bridges	96	414	163	174	767
Length of Bridges (km)	96	17,505	7,133	5,980	31,605
Length of Paved Road (km)	96	1,672	485	978	2,803
Tonnage	96	2.04e+07	1.33e+07	0	5.69e+07
Revenue (million pesos)	96	5,601	3,203	2,494	19,094
Labor Force	96	3,881	2,245	1,121	9,539

The revenue variable in the table represents the local government fund given to the regions to spend for developmental projects. On average, the national government has disbursed 5,601 million pesos of Internal Revenue Allocation (IRA) for sixteen regions in six years. Based on standard deviation, the IRA given to the regions fall short by 3,203 million to its mean. At the minimum, one region has received only 2,494 million pesos and one region has received a maximum of 19,094 million pesos IRA. Considering the different sizes of the regions, the gap is not that huge and can be considered as just and fair.

4.2. Multiple Regression Result

4.2.1. Determinants of the GVA of Agriculture, Hunting, Forestry, and Fishing

Table 2 below presents the result of the multiple regression analysis for the dependent variable GVA of Agriculture, Hunting, Forestry, and

Fishing. At 0.01 significance level, Internal Revenue Allotment (IRA) is the most significant variable and has a positive relationship to the dependent variable. Since the unit of measurement the researcher used in IRA is million pesos, the interpretation would be: for every one million pesos increase in the Internal Revenue Allotment provided to the region, there will be an increase in the GVA of Agriculture by 0.35 million pesos. This result is consistent with the theory that government support, by funding development projects, will improve the quality of living in the locality and encourage productivity in the businesses.

Another significant variable is the inflation rate at p-value less than 0.05. It also has a positive relationship with the GVA wherein one unit of increase in the inflation rate will result to 0.01 million pesos increase in the GVA of Agriculture. Theory states that increase in inflation rate will negatively affect productivity because of high commodity prices. However in this case, inflation rate is a positive variable for the GVA of Agriculture. This phenomena can be justified with the fact that outputs produced by the Agriculture sector are mostly raw and basic types of commodities. Hence if there is inflation rate hike, it is the sector which can benefit more because it is an opportunity for the Agriculture firms to justifiably increase their product price or output value.

With p-value of 0.01, labor force population is the third predictor variable that resulted to be significant. One unit if increase in the labor force population increases the GVA by 0.19 million pesos. Labor force population

is the total population of people age 15 years old and above. This result is consistent with the theory that labor force abundance or availability helps the industries to produce more.

The rest of the variables did not come out as significant but most of them have positive relationship with the Agriculture GVA. One of them is trainings wherein increase in the number of trainings provided by the Department of Agriculture results to positive increase in GVA. As observed before in the descriptive statistics, the number of trainings given to the different regions of the Philippines is very low. That is probably the reason why it has come out as not significant in the regression model.

Another noteworthy result is the value for HEIs or Higher Education Institutions. Results say that increase in the number of HEIs decreases the amount of GVA in Agriculture. Although theory says that education is an important component of productivity, regression model says otherwise. This is mainly because HEIs in the Philippines usually offer courses that are popular and related to high-paying jobs such as medicine, law, business administration, nursing, etc. Graduates of HEIs do not commonly work or invest to Agriculture firms as it is deemed low-paying career in the Philippines. Therefore, if there are more HEIs built in the region, the lesser chance of number of people working for the Agriculture sector and produce goods.

Table 11. Multiple Regression Result for GVA_Agriculture

Dependent Variable: GVA_Agriculture	Fixed Effects Coefficient	Robust Std. Error	P>|t|
Inflation Rate	0.0110**	.0048965	0.041
Higher Education Institutions	-0.169	.2476554	0.505
Trainings	0.00612	.0398937	0.880
No. of Concrete Bridges	0.0625	.1275467	0.631
Length of Concrete Bridges	-0.119	.1780548	0.513
Length of Paved Road	0.0401	.0810975	0.628
Gross Registered Tonnage	0.0175	.0173298	0.330
Internal Revenue Allotment	0.348***	.0711505	0.000
Labor Force Population	0.193**	.0657118	0.010
constant	7.506589	1.860805	0.001

4.2.2. Determinants of the GVA of Construction Sector

Table 3 below illustrates the result of regression analysis for GVA in Construction sector. The same with results for GVA in Agriculture, the most significant predictor variable is the Internal Revenue Allotment (IRA) with p-value 0.000. For every one million pesos increase in the amount of IRA provided to a region, there will be 1.4 million pesos increase in the amount of Gross Value Added in the construction sector.

At 0.01 significance level, variable inflation rate is also one of the factors that affect the GVA in construction sector. They have negative relationship wherein for every one unit increase in the inflation rate in a

region corresponds to 0.03 million pesos decrease in the construction GVA. This result is logical and consistent with the theory because most of the outputs in the construction sector are processed and require raw materials from the local market. Increase of price in the basic commodities is expected to negatively affect the production of processed goods.

A little bit less significant compared to the first two, Gross Registered Tonnage (GRT) came out as a significant variable for GVA in construction. As explained in the previous chapter, GRT represents the shipping capacity of the ports close to the regions. Result of the regression says it has an inverse relationship with the GVA wherein one unit of increase in GRT consequently results to decrease in the Gross Value Added in construction sector by 0.07 million pesos. This result is inconsistent with the theory that higher shipping capacity or better transport infrastructure means higher productivity. However, since the shipping capacity data is not exclusive to exports only, we can assume that it is also used for imports. Foreign trade statistics in 2016 reported that one of the top five commodities imported by the Philippines is iron and steel amounting to $3.321 billion (Philippine Statistics Authority, 2017). This means that the Philippine industry of construction materials is being threatened with huge imports. This can also explain why higher gross registered tonnage decreases GVA of regional construction sector.

Table 12. Multiple Regression Result for GVA_Construction

Dependent Variable: GVA_Construction	Fixed Effects Coefficient	Robust Std. Error	P>|t|
Inflation Rate	-0.0252***	.0071841	0.003
Higher Education Institutions	-0.0466	.249488	0.854
No. of Concrete Bridges	0.586	.4979012	0.257
Length of Concrete Bridges	-0.617	.0372703	0.335
Length of Paved Road	0.309	.3379373	0.375
Gross Registered Tonnage	-0.0734*	.0372703	0.068
Internal Revenue Allotment	1.423***	.2100522	0.000
Labor Force Population	-0.121	.143289	0.413
constant	1.043	4.017476	0.799

4.2.3. Determinants of the GVA of Manufacturing Sector

Table 4 below illustrates the result of the regression model where the dependent variable is the Gross Value Added (GVA) of the Manufacturing sector. The panel data is comprised of sixteen regions in the Philippines in the last six years (2011-2016). In this model, three variables have resulted as significant factors affecting GVA of manufacturing, namely: 1) Internal Revenue Allotment (IRA), 2) Labor Force Population, and 3) Higher Education Institutions (HEIs).

IRA is significant at 0.01 significance level with p-value 0.000. Its coefficient tells us that for every one million pesos increases in the funds

provided by the national government to the regions will correspond to 0.67 million pesos increase in the productivity or GVA of manufacturing sector.

The second variable that came out as significant is the labor force population with significance level of 0.01. Since the unit of measurement used in this variable is thousands, interpretation of the coefficient would be: for every one thousand working-age people added to a region will consequently result to an increase of 0.53 million pesos in the Gross Value Added of the manufacturing sector. This result is consistent with our labor force theory especially in this sector that requires more manpower to export finished goods.

At 0.1 significance level, Higher Education Institutions (HEIs) variable came out to be an important factor that affects the GVA of manufacturing. For every one additional HEI built in a region corresponds to increase in the manufacturing GVA by 0.66 million pesos. In the Philippines, the most common courses offered by HEIs are medical-related and business-related such as degree in business administration and accounting. These courses can actually help produce individuals who are knowledgeable with doing business therefore assets to the manufacturing sector.

Although not significant, there are some variable results worth discussing. The coefficient of inflation rate was not that high but it has negative relationship with the GVA. It would make sense because increase in the prices of commodities will in reality negatively affect the production of processed goods for exports.

Number of concrete bridges and length of paved road surprisingly resulted to negative coefficients. It means that one additional bridge and one additional kilometer of paved road in a region will result to decrease in the Gross Value Added of manufacturing sector. Such result is inconsistent with the theory that increase in infrastructure development should also increase productivity of the industries. However, it is also important to remember that benefits from building infrastructure units usually take a long time to realize. Especially in the case of the Philippines, common complains of the people are the slow and inefficient implementation of government projects. Sometimes road projects are swarmed with corruption scandals due to overpricing of materials and use of substandard materials. Cases like these will affect the quantity and quality of the infrastructure projects and the people and the businesses will directly and indirectly suffer some losses.

Table 13. Multiple Regression Result for GVA_Manufacturing

Dependent Variable: GVA_Manufacturing	**Fixed Effects Coefficient**	**Robust Std. Error**	**P>|t|**
Inflation Rate	-0.00343	.0096868	0.728
Higher Education Institutions	0.660*	.3665519	0.092
No. of Concrete Bridges	-0.112	.2274736	0.631
Length of Concrete Bridges	0.186	.2818076	0.519
Length of Paved Road	-0.0920	.1362007	0.510
Gross Registered Tonnage	-0.00936	.0140629	0.516
Internal Revenue Allotment	0.677***	.0806985	0.000

Labor Force Population	0.527***	.0783877	0.000
constant	-2.754	2.448082	0.278

4.2.4. Determinants of the GVA of Mining and Quarrying Sector

Table 5 below shows the result of running a regression model with the GVA of mining and quarrying as dependent variable. Totally different from the previously-discussed sectors, none of the identified predictor variables turned to be significant in estimating the GVA of mining and quarrying. Although most have positive coefficients, none of their corresponding p-values are significant at any significance level.

Among all the sectors considered in this study, the mining sector is actually very unique in nature. Mining industries are very dependent on the characteristic of the geographical area where they operate. The minerals they mine are limited and can deplete once totally exhausted. It is not the same with agriculture where they can grow plants and raise animals nor like manufacturing and construction sectors where industries can just collect materials and process them into processed goods for exports.

As any of the predictor variables did not come out as significant, researchers who are interested in understanding the mining sector should conduct a separate special investigation using variables that are not common. In depth understanding of the mining sector is necessary because of its unique set of needs and factors that affect its productivity or Gross Value Added.

Table 14. Multiple Regression Result for GVA_Mining

Dependent Variable: GVA_Mining	Fixed Effects Coefficient	Robust Std. Error	P>|t|
Inflation Rate	0.0232	.0350973	0.520
Higher Education Institutions	0.446	1.443711	0.762
No. of Concrete Bridges	-1.128	1.300753	0.400
Length of Concrete Bridges	0.994	1.391229	0.487
Length of Paved Road	-0.425	.4492572	0.361
Gross Registered Tonnage	0.00772	.1047158	0.942
Internal Revenue Allotment	0.239	.5112087	0.648
Labor Force Population	0.113	.2773686	0.690
constant	3.354	12.92127	0.799

4.2.5. Determinants of the GVA of Other Services Sector

Table 5 below illustrates the regression result for the Gross Value Added (GVA) of Other Services. Other services include services related to medical field, insurance, travel, business processing outsourcing like call canters, and others. Five out of eight predictor variables resulted as significant.

At 0.01 significance level, the variable Internal Revenue Allotment (IRA) or the fund provided to the regions for development projects is very significant and has a positive correlation with Gross Value Added of other services. One million pesos increase in IRA provided will result to 0.77 million pesos increase in the GVA of other services. As government tries to

develop the communities by making them beautiful and improving public utilities, more investors and workers will be attracted and sell their services.

Inflation rate also resulted as an important factor with significance level at 0.01. However, it has a negative coefficient wherein one percent increase in the inflation rate will correspond to decrease in GVA of services by 0.02 million pesos. This result is consistent with our theory and is logical in the sense that the main input for service sector is manpower hence increase in commodity prices will decrease the productivity of the service sector.

Surprising result in this model is the Gross Registered Tonnage (GRT) wherein the variable is very significant at 0.01 level. It also has an inverse relationship with the services GVA wherein one unit increase in GRT will result to a decrease of 0.02 million pesos in GVA. GRT is related to shipping of goods or merchandise in the ports. Services on the other hand do not deliver physical products. Service sector firms usually just have offices or workplaces located within the country and deliver their services in person or through communication if the customers are oversees. Therefore, we can see that there is no direct involvement between the services sector and shipping capacity represented by the GRT variable. The result cannot however be ignored as there might have been an important reason that requires in-depth research about the two variables' relationship.

Another unexplainable result is the negative significance of the length of concrete bridges. At 0.1 level of significance, every one kilometer increase of building concrete bridges will correspond to a decrease of

services GVA by 0.17 million pesos. It has been discussed in the previous part of this paper that infrastructure takes a long time to build and benefit the businesses and can understandably not be as significant in this type of regression model. However in this case, it came out as significant but the negative coefficient is not supported by the theory. Further examination on the related literatures and other methods of analysis should be done in order to clarify such result.

The last significant factor in this regression model is the number of Higher Education Institutions (HEIs) with p-value of 0.051. It has a positive correlation hence for every one higher education institution built, there will be an increase in the GVA of other services by 0.29 million pesos. This result is consistent with the theory and at the same expected because service sector is mainly about manpower. Higher manpower education will clearly produce higher value for the service sector.

Labor force population variable came out as insignificant even though it is expected otherwise since this sector is about labor. But we can also assume that the number of available labor does not instantly translate to higher value of output of the service sector. Part of the working-age population is unemployed hence cannot actually contribute to GVA. Some types of jobs might also not as valuable and do not produce much value. In that sense, studying the factors affecting the service sector should not just use quantity of available labor but the quality.

Table 15. Multiple Regression Result for GVA_Services

Dependent Variable: GVA_Services	Fixed Effects Coefficient	Robust Std. Error	P>|t|
Inflation Rate	-0.0154***	.0041338	0.002
Higher Education Institutions	0.287*	.135786	0.051
No. of Concrete Bridges	0.119	.0810825	0.162
Length of Concrete Bridges	-0.167*	.0839488	0.065
Length of Paved Road	0.0878	.060032	0.164
Gross Registered Tonnage	-0.0207***	.0069285	0.009
Internal Revenue Allotment	0.770***	.0529873	0.000
Labor Force Population	0.0603	.0541542	0.283
constant	2.839***	.5738481	0.000

4.2.6. Determinants of the GVA of all Sectors Combined

Table 7 below illustrates the results of multiple regression analysis using the GVA of all sectors- agriculture, construction, manufacturing, mining, and other sectors, as the dependent variable. Only two independent variables resulted as significant factors which are both significant at 0.01 level. Which means that IRA or Internal Revenue Allotment and labor force population affect the productivity of all sectors. One million pesos increase in the IRA constitutes to 0.65 million pesos increase in the GVA of all sectors. Also, per one thousand people added to the labor force population constitutes to 0.22 million pesos increase in the GVA of all sectors.

Table 16. Multiple Regression Result for GVA_All Sectors

Dependent Variable: GVA_All Sectors	Fixed Effects Coefficient	P>|t|
Inflation Rate	-0.00312	0.585
Higher Education Institutions	0.0919	0.638
No. of Concrete Bridges	0.0195	0.920
Length of Concrete Bridges	-0.0280	0.907
Length of Paved Road	-0.0158	0.259
Gross Registered Tonnage	-0.0158	0.219
Internal Revenue Allotment	0.646***	0.000
Labor Force Population	0.223***	0.004
constant	5.836***	0.000

4.2.7. Summary of Significant Variables

This study ran five different regression models using five different dependent variables but sharing the same set of independent variables. The dependent variables are the Gross Value Added (GVA) of five major export sectors in the Philippines. Out of the identified independent variables, some came out as significant factors affecting the sectors and some are not significant. Table 7 below provides the snapshot of the relationship between different variables. It can be observed in the table that the variable Internal Revenue Allotment (IRA) is significant to all sectors except mining and quarrying. The significance level is also very high and the coefficients are all positive. Increasing the amount of IRA will positively affect four sectors significantly.

The second most significant variable based on the summary table is the inflation rate. Although it is significant to three sectors, increase on this variable affects the sectors in different directions. Inflation rate affects the sector agriculture, hunting, forestry, and fishing positively because of its nature of producing raw, commodity products. On the other hand, inflation rate variable negatively affects construction and other services sectors commodity goods are their input to produce processed goods and various services.

Availability of labor force in the region affects two sectors: 1) agriculture, hunting, forestry, and fishing; and 2) manufacturing. Both sectors require high number of labor but not necessarily of high quality hence the significance.

Tonnage or shipping capacity affects both construction and other services sectors negatively. Interpretation on this result is vague and not backed by theory. There is also a possibility that the variable is not a suitable representation of infrastructure quality in the Philippines or shipping capacity of ports. Further understanding on this variable is needed in order to thoroughly explain its relationship to the dependent variables where it resulted as significant.

Number of Higher Education Institutions (HEIs) is significant variable to two sectors: 1) manufacturing; and 2) other services. These results are logical in the sense that these sectors actually require high-skilled labors or graduates of higher education institutions. However, the levels of

significance are low which might be explained by the fact that producing graduates with good knowledge and skills takes a long time thus the impact is not direct and high.

The researcher has included four independent variables related to infrastructure because of the many theories proving that high infrastructure correlates with high productivity and export capacity. But the results of this study state otherwise when almost all of the infrastructure-related variables did not come out as significant to all sectors.

Table 17. Summary of Results of Regression

	Dependent Variables (Sectors)					
Independent Variables	Agriculture, Hunting, Forestry, and Fishing	Construction	Manufacturing	Other Services	Mining and Quarrying	All Sectors
Internal Revenue Allotment	***(+)	*** (+)	*** (+)	*** (+)		***(+)
Inflation rate	** (+)	*** (-)		*** (-)		
Labor force population	** (+)		*** (+)			***(+)
Tonnage		* (-)		*** (-)		
HEIs			* (+)	* (+)		
Bridge (length)				* (+)		
Bridge (number)						
Paved road						
Training						

4.2.8. Summary of Model Fit

According to Weiss (2012), R-squared is the coefficient of determination that explains the proportion of variation in the observed values of the response variable explained by the regression. Its values always lie between 0 and 1. A value of r-squared near 0 suggests that the regression equation is not very useful for making predictions. In the case of using the Fixed Effects Model, which is used in this study, R-squared explains how much of the variance within the panel units does the model account for.

For the model we used in determining the factors affecting the GVA in Agriculture, only 43% of the variance in the panel units is explained in the model. If we use the 70% rule of thumb, we can state that the independent variables incorporated in this study are not quite useful in predicting the GVA of Agriculture.

However for the GVA in construction, the model can explain 81% of the variance in the response variable. This means that the model or the independent variables used are a good fit in predicting the values on GVA in construction.

The model for the manufacturing GVA can explain 67% of the variation in its response variable. It almost reached the 70% mark so to some extent we can say that the model is somehow a good fit in understanding the variation in the GVA of manufacturing.

The model with the lowest R-squared, which is very close to zero, is the model for GVA in mining and quarrying. Only 5% in the variation in the

response variable can be explained by the regression model. Therefore we can assume that the independent variables may not be suitable in predicting the changes in the GVA of mining and quarrying sector.

The regression model used in predicting the GVA for other services can explain the changes in the response variable by 92%. This is very high and almost perfect model fit.

Table 18. Summary Results of Model Fit

Sector	R-Squared	F-Statistic	Prob > F
Agriculture, Hunting, Forestry, and Fishing	0.43	15.44	0.0000
Construction	0.81	33.17	0.0000
Manufacturing	0.67	31.75	0.0000
Mining and Quarrying	0.05	0.54	0.8058
Other Services	0.92	169.02	0.0000
All Sectors	0.76	62.61	0.0000

Table 8 above also showed results for F-statistic and Prob > F. F-statistic is the mean square model divided by the mean square residual. On the other hand, Prob > F is the p-value associated with the F-statistic used in testing the null hypothesis that all the model coefficients are 0 (Bruin, 2006).

For the regression model used in predicting the GVA in mining and quarrying, Prob > F resulted to 0.8058. We can conclude in this case that there is a problem in the model because STATA is only 19% confident that all the coefficients in the model excluding the constant are zero (Vijayamohanan, 2016).

However, the result for the rest of the regression models of the other sectors posted a 0.0000 Prob > F or a confidence level of 99.99%. Hence we strongly reject the null hypothesis and conclude that the models are highly significant.

Chapter 5. Summary and Conclusions

Trade is very important in the development of a country. The world's measurement of a country's development is based on its Gross Domestic Product (GDP). One of the components in calculating GDP is net exports (exports minus imports). Philippines, one of the members of ASEAN aiming for a regional economic development, is weak in terms of trade. Philippines' net exports are negative for many years due to higher imports than exports. Philippines is very abundant in terms of natural resources and manpower. It also experienced great economic status in the past and has been predicted to be the next tiger economy in Asia. With continuous trade deficits, the country will also continue borrowing money from the international market which in the future will put the country in a worse situation.

Many factors could have affected the weakening trade performance of the Philippines but this study would like to focus in the export side. The objective of this thesis is to determine the factors affecting the export value of the Philippines contributed by its sixteen regions from the last six years (2011-2016).

Gross Value Added (GVA) was used to represent the export performance of each region wherein it is calculated by the value of output less the value of intermediate consumption. Five major export sectors are considered in this study which are: 1) Agriculture, Hunting, Forestry, and Fishing; 2) Construction; 3) Manufacturing; 4) Mining and Quarrying; and

5) Other Services. Each of the GVA of the sectors are used as dependent variables and encoded as panel data representing sixteen regions in six years.

Based on theories from existing related literatures, nine independent variables are used to create a regression model. These independent variables are: 1) Inflation rate; 2) Internal Revenue Allotment (IRA); 3) Number of Higher Education Institutions (HEIs); 4) Number of concrete bridges; 5) Length of concrete bridges; 6) Length of paved road; 7) Gross Registered Tonnage; 8) Trainings; and 9) Working-age population.

Data for the dependent and independent variables are gathered from secondary sources. The sources are all government agencies in the Philippines wherein some data are published in their official websites and some provided the data through e-mail.

Fixed Effects Model was utilized since the study wants to analyze the impacts of the variables that vary over time and explore the relationship between predictor and outcome variables for the different regions. The software program STATA was used to regress the models.

Results of the regression analysis showed that the determinants of the GVA in Agriculture are inflation rate, IRA, and labor force population. It means that in order to improve the productivity or GVA of the Agriculture sector, the government should focus on inflation rate, fund allotment to the regions, and maximize the labor force availability in the region.

For the construction sector, the government should lower the inflation rate and increase the IRA of the regions to increase its GVA.

Slightly different from the construction sector, the government should work on increasing the number of Higher Education Institutions (HEIs), IRA, and labor force population to increase the GVA of the manufacturing sector.

No significant independent variable has resulted for the mining and quarrying sector. Meaning, the independent variables considered in this study or the model of regression is not suitable in predicting the changes in the GVA of the mining and quarrying sector.

The sector of other services includes medical services, business processing outsourcing services or call centers, and many more. Based on the result of this study, GVA on this sector is significantly affected by the changes in inflation rate, HEIs, number of concrete bridges, gross registered tonnage and IRA.

Test on model fit suggests that all regression models are significant in predicting the GVA of the sectors except that of mining and quarrying (four models out of five are significant).

Different sectors have different factors that can affect its productivity. Changes on those significant factors affect the sectors in different magnitudes. These results provide a valuable information to the government about which things should they work on. There are regions which specialize in specific sectors and the government can focus on those regions to increase their productivity in the specific sectors through explicit policies and projects.

Philippines has been performing weakly in terms of export. The country is very abundant with resources. It needs to continually study on which factors it needs to focus in terms of budget, efforts, and innovation. With the right information and direction, the Philippines will eventually catch up to its ASEAN neighbors.

Chapter 6. Recommendations for Future Research

The study has been too broad as it encompasses a lot of sectors and limited independent variables. Although this research has provided initial insight on the factors that can affect the different sectors in the Philippines, it is recommended that future research should tackle more on specific industries to narrow down the possible factors that can affect them significantly.

Results of this study raised unexplainable figures about the Gross Registered Tonnage (GRT) as one of the independent variables. It is recommended therefore to delve into whether a different variable should represent the shipping capacity of ports or if there are other technical issues as to why it is a significant factor in determining the GVA of other services sector.

Bibliography

(n.d.). Retrieved from Philippine Ports Authority: http://www.ppa.com.ph/sites/default/files/Definition%20of%20Terms.pdf

(1996). Retrieved from StataCorp LLC: https://www.stata.com/why-use-stata/

(2013, February 5). Retrieved from Rappler.Com: https://www.rappler.com/business/21120-philippines-a-rising-tiger-world-bank

Acemoglu, D. (2007, November 26). Introduction to Modern Economic Growth. 37.

Andersson, R., Quigley, J. M., & Wilhelmsson, M. (2009). Urbanization, Productivity, and Innovation: Evidence from Investment in Higher Education. *Journal of Urban Economics* , 2-15.

Babbie, E. (2013). *The Practice of Social Research.* Singapore: Wadsworth, Cengage Learning.

Benhabib, J., & Spiegel, M. M. (1994). The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data. *Journal of Monetary Economics* , 143-173.

Bruin, J. (2006). *Regression Analysis | STATA Annotated Output.* Retrieved from Institute for Digital Research and Education: https://stats.idre.ucla.edu/stata/output/regression-analysis-2/

Building Trade Capacity. (n.d.). Retrieved from World Trade Organization: https://www.wto.org/english/tratop_e/devel_e/build_tr_capa_e.htm

Canare, T. (2016, August 29). The Relationship Between IRA and Local Government Expenditures: Evidence ffrom a Cross-section of Philippine Cities. *Philippine Political Science Journal* , 167-189.

Canivel, R. S. (2017, November 13). *PH Lags Behind Neighbors in Trade Performance*. Retrieved from Inquirer.Net: https://business.inquirer.net/240667/ph-lags-behind-neighbors-trade-performance

Choi, N. (2016). Determinants of Value Added in Exports and their Implications. *Korea Institute for International Economic Policy: World Economy Update* .

Cloete, N., Bailey, T., & Maassen, P. (2011). *Universities and Economic Development in Africa: Pact, Academic Core and Coordination.* Wynberg: African Minds for the Centre for HIgher Education Transformation (CHET).

Foreign Trade Statistics of the Philippines: 2016. (2017, July 10). Retrieved from Philippine Statistics Authority: https://psa.gov.ph/content/foreign-trade-statistics-philippines-2016

Frank, I. (1968). The Role of Trade in Economic Development. *International Organization , 22* (1), 44-71.

Glejser, H. (1965). Inflation, Productivity, and Relative Prices--A Statistical Study. *The Review of Economics and Statistics* , 76-80.

Glossary of Statistical Terms. (2001, September 25). Retrieved from OECD.Org: https://stats.oecd.org/glossary/detail.asp?ID=1184

Higgins, J. (2005). *The Radical Statistician.*

Highlights of the Philippine Export and Import Statistics: December 2017. (2018, February 9). Retrieved from Philippine Statistics Authority: https://psa.gov.ph/content/highlights-philippine-export-and-import-statistics-december-2017

Inflation Rate. (2007, June 15). Retrieved from United Nations: http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/econ_development/inflation_rate.pdf

Leamer, E. E. (1995). *The Heckscher-Ohlin Model in Theory and Practice.* Princeton: International Finance Section, Department of Economics, Princeton University.

Manzella, J. (1999, January 1). *The Impact of Trade Agreements*. Retrieved from The Manzella Report: http://www.manzellareport.com/index.php/trade-finance/401-the-impact-of-trade-agreements

Nayak, G. (2017, July 31). *What Are GVA and GDP in Growth Calculation?* Retrieved from The Economic Times: https://economictimes.indiatimes.com/markets/stocks/news/the-debate-over-the-use-of-gva-and-gdp/articleshow/58905721.cms

Prais, S. J. (1995). *Productivity, Education, and Training: An International Perspective.* Cambridge: Cambridge University Press.

Reading and Using STATA Output. (n.d.). Retrieved from http://web.mit.edu/course/17/17.846/OldFiles/www/Readout.html

Seth, A., & Ganguly, K. (2017). Digital Technologies Transforming Indian Agriculture. *The Global Innovation Index 2017* , 105-111.

Stupak, J. M. (2017). Economic Impact of Infrastructure Investment. *Congressional Research Service* , 1-19.

Torres-Reyna, O. (2007, December). Panel Data Analysis Fixed and Random Effects using Stata. Retrieved from https://www.princeton.edu/~otorres/Panel101.pdf

Trade Profile: ASEAN Pulls the Threads Together. (2017, November 20). Retrieved from Stratfor Worldview: https://worldview.stratfor.com/article/trade-profile-asean-pulls-threads-together

Vijayamohanan, P. N. (2016). *Munich Persona RePEc Archive.* Retrieved from https://mpra.ub.uni-muenchen.de/76869/1/MPRA_paper_76869.pdf

Weiss, N. A. (2012). *Introductory Statistics* (9th ed.). Boston: Pearson Education, Inc.

국문초록

필리핀 주요 수출 부문의 총부가가치를 결정하는 요인에 관한 연구

Kirbie Mae Pacinabao
서울대학교 행정대학원
글로벌행정전공

필리핀은 지리적으로 인접한 아세안 국가들 중 수출이 저조한 편에 속한다. 2006년부터 2013년까지 수출액증가율을 살펴보면 매해 평균적으로 4.6%의 증가율을 보이는데, 이는 베트남 17.9%, 인도네시아 9%, 태국 9.2% 증가율(Canivel, 2017)에 비해 뒤쳐지는 수치이다. 국내총생산은 국내에서 창출되는 부가가치의 총합으로 산출되는데, 부가가치란 최종생산물에서 중간생산물의 가치를 제한 가치이며 이를 통해 각 개별 생산자, 산업 또는 부문이 국내총생산에 얼마나 기여했는지를 측정할 수 있다. 본 논문은 필리핀의 5개 주요 수출 부문에서 수출 성과를 결정하는 요인을 분석하기 위해 2011년부터

2016년까지 16개 지역의 패널 데이터를 조사하였다. 연구 결과, 지역개발사업을 위해 지방에 교부된 재원인 Internal Revenue Allotment(IRA)는 0.01의 유의수준에서 5개 중 4개의 수출 부문과 양의 상관관계를 보였다. 또 경제활동인구도 모든 수출 부문에서 중요한 결정요인으로 나타났다. 결론적으로 필리핀 정부는 수출 부문의 생산성을 높이기 위해서 지방교부금인 IRA를 효율적으로 운용하고 경제활동인구를 늘리는 데 집중해야할 것이다.

주제어: 총부가가치(GVA), 고정효과 모형, 수출, 필리핀, 지방교부금(Internal Revenue Allotment, IRA)

학 번: 2017-28249