SCITECH
RESEARCH ORGANISATION

Volume 14, Issue 2
February 13, 2020

Journal of Research in Business, Economics and Management
www.scitecresearch.com

THE PHILIPPINE MANGO GLOBAL COMPETITIVENESS

Michael F. Centino[1], Mary Caroline N. Castañ̃o[2], Jenny Beb F. Ebo[3]
[1]The Graduate School, University of Santo Tomas and College of Accountancy and Business Administration, San Carlos College, mike_cents23@yahoo.com
[2]The Graduate School, University of Santo Tomas, marycaroline.castano@gmail.com
[3]Cavite State University, jennybeb_ebo@cvsu.edu.ph

Abstract

The competitive edge of the Philippines in the global market has been recorded in the trading history. Its contribution to the economy is notable; however trading is limited to fresh mangoes. Likewise, the continuous decrease of area planted to mangoes contributed to its bounded participation in global value chain. Meanwhile, some countries in Southeast Asia emerged in the industry and further threatened the entrance of Philippine mango in the foreign market. This situation will be altered by strengthening the country's global competitiveness, gross domestic product and implementing policies on remoteness of the country as the result of integrating gravity model using the fixed effect panel regression.

Keywords: Global Competitiveness; Global Value Chain; Gravity Model; Philippine Mango; and Panel Regression

1. INTRODUCTION

The term "Global value chain" (GVCs) is often expressed as one of the features that shape the current swing of globalization however little is known on how to efficiently integrate it in the chain. The current situation of developing countries like the Philippines motivates these countries to search for efficient and effective ways to integrate "GVC" in the global economy. With barriers such as limited resources and policy challenges, developing countries are less competitive and can be left behind by neighboring developed countries if they will not improve their respective social and economic outcomes.

Trade statistics shows that mango as an agricultural crop also follows the integration in global value chain, for the past ten years mango trade shows an increasing trend from US$696 million in 2005 to US$2 billion in 2015 (UN Comtrade, 2016). This is also evident to its position regarded as the top five of the most cultivated fruits in the world. Yet in some countries, studies shows that trade is limited since majority of the produce is still locally consumed (FAO, 2016).

In the Philippines, mango contributed to the achievement of the development goal of the country. Globally, the country had participated in the mango global market chain with an increasing exports of fresh and dried mangoes which is is $US 67.9 million or 2.6 percent share of the global market (UN Comtrade, 2018). The country has exported mangoes to Hong Kong (China), Japan, Singapore, Switzerland, UK and the USA. The increase in mango exports can also be attributed to the low tariff in exports, which allows Philippine mangoes to enter duty-free markets, as provided by the World Trade Organization and Japan. Likewise, locally, mangoes served as a major source of income to an estimate of 2.5 million farmers, ranked third after bananas and pineapples in terms of quantity and value of production, thus, providing major a source of income to an estimate of 2.5 million farmers (PCARRD DOST, 2017).

With the Philippines strengths in mango production, the country is regarded as one of the leading producers and exporters of dried mangoes, with 85percent of its total processed products was exported. . However, the country's

participation in fresh mango export is often limited which is largely due to limited farm size. According to the Bureau of Agricultural Statistics Report (2016), the average area of farm planted with mangoes is 1.34 ha. There are also other constraints that hinder the Philippines' potential to improve its ranking. One of these problems is the inability to meet strict Sanitary and Phytosanitary (SPS) terms in markets. Similarly, productivity difficulties were experienced by the Philippine mango including erratic annual production and quality yields because of environmental aspects, pest and diseases and the high costs of inputs by the Philippine mango industry (PCARRD-DOST, 2011). Moreover, the industry also faced lack in technological development in order to survive environmental hazards, inadequate irrigation equipment, the lack of fertilization management and equipment and abuse in the use of pesticide (Briones et al., 2013; Buguis, 2014; Hambloch, 2015). Lastly, other significant challenges including lack of financial resources and infrastructure are considered as threat.

Meanwhile, other significant mango exporters including Mexico, Peru, Brazil, India and Thailand emerged in the industry. These countries threatened the status of the country in the global trade. Mexico and Peru have placed considerable focus on developing and upgrading farming techniques and many of their farms are certified by and followed the standards set by GAPs. Concurrently, other countries like India have allocated additional budget for Research and Development to solved problems of low productivity and seasonality (R&D) like India.

Hence, the development of a model for the Philippine Global Value Chain is necessary to possibly upgrade the global value chain participation status of the country and to be able to compete internationally. These new opportunities for the country will upgrade their integration in global trade and expand their exports. Historically, developing countries are contained in exporting unprocessed raw materials with the traditional thought of intricateness in the process in integrating in the chain. Today because of the various opportunities, many countries are opened to exporting manufactured goods.

2. LITERATURE REVIEW

2.1 Definition of Global Value Chain

According to the WTO (2011), the term "value chain" illustrates all of the activities that firms and workers do to produce goods or provide service from its conception to its end use and so on. This includes activities such as the design, production, marketing, distribution and support to the final consumer. All these activities was them organized with the so-called global value chains (GVCs), wherein the different stages in production process are located across different countries (OECD,2019). Melle et.al (2007) describes "value chain" that includes all activities needed to produce a product from "conception", thorough "production", "transformations", and "delivery" to final consumers and also needs to incorporate the proper final disposal after usage. It includes process and also players from suppliers of inputs to producers and processors to exporters and buyers engaged in the activities required to produce a product for its end use.

Various researchers used the concept in different fields. One of the well-known business books author by Porter(1985) introduced the concept in constructing corporate strategy. According to him, for the firm to be globally competitive, it is necessary to focus on the entire system of activities like that of the chain in which activities must be organized collectively. While Kimura and Ando (2005) suggested that the value within the system which is the product of the firm's effort was also the factor of the value within the system which is the product of the firm's effort was also the factor of the value distribution system that influence the firms selection. The vertical participation of "GVC" relies on the hierarchical pattern that has an absolute and unidirectional control of the main company over its subsidiaries.

2.2 Measuring Global Value Chain

While there are various studies conducted on analysing the global value chain, complexity of the measurements used has created difficulties on apprehending trade and creating policies. Traditional measurements used gross value of the exchange between partner countries and do not include producer's contribution in understanding global value chains of commodities. Other literature used value-added of trade data. Chen et.al (2004) introduced the idea of integrating gross exports into the value added context. With the limitation of the conventional approach, some studies used "input-output" tables. Hummels et. al (2001) for instance introduced the concept of vertical specialization and usesd input-output tables to measure the intermediate inputs used to produce an exported good. Another study conducted by Daudin et.al (2006) constructed a multi-country input-output table from 70 countries to compute for the domestic value-added of exports. This also includes indices of vertical specialization and regionalization. Moreover, Bems and Johnson (2012) proposed the concept of "value-added" real effective exchange rate. These indicators were used to clear the external imbalances and use to evaluate the magnitude of prices. Moreover, Koopman et.al (2016) introduced the decomposition method of gross exports into various sources of value added. The method breaks down the gross export into local value added absorbed abroad, local value added first exported then returned back home, foreign value-added and pure double-counted terms.

There were also various approach used in the analysis of the global value chain integration. Some studies used qualitative approach like case analysis. In the study conducted by Sarah Mutonyi and Karin Beukel (2015) they explained in the study that "price fairness", "price reliability", and "relative price" are scope of price contentment that influence producers' trust in the buyer. The study found out that trust is an important mediator factor which affects producer loyalty and price satisfaction. Kusnandar (2012) utilized case study method and the application of the triple helix model and causal loop diagram. The results of the study revealed that institutional innovation provides support to the farmers thereby reducing risk. It further opens the chance for the farmers to be included in the supply chain of the "export market". Developing a scheme of information to determine the operation of the multi stakeholder participation in the supply chain and the improvement of policy simulator as a matter of upgrading the triple helix policy of Indonesia.

However very limited studies used quantitative approach, the study of Muntonyi et.al (2016) which utilized the SEM model revealed that trust is important factor that influence producer's loyalty. Relative price, reliability and price fairness are the identified scope that establish producer's loyalty and trust in the supply chain. These findings are in relation to latest studies about trust and its role. Since the player's perception involved in the chain changes overtime, it is recommended to rely on a design which is longitudinal. However, the model has established a low disparity in producer loyalty and trust with only 45 percent, therefore other factors needs to be addressed in this study. In China, Wang et. al (2017), utilized the Structural Equations Modelling in analysing the sustainable food supply chain management practices. Results suggest that "supply chain management practices" positively affects the environmental and social performance that leads to improvement of financial performance. Food safety insurance is in turn affected by sustainable performance. However, the model did not consider effect of other variables such as "moderator" and "control" . They recommended that new variables into the mechanism of SSCM practices. Enterprises of different sizes are significantly different in SSCM and that its impact to sustainable performance may differ. SSCM included the internal and external management and its relationship was not included in the study.

With the limitations of SEM specifically as applied in first-hand information, gravity model might be a necessary tool that will bridge the gaps in information. The "**Gravity model"** that predicts the bilateral trade flows based on the economic sizes and distance between two units. Since global value chain deals with trade this model is applicable to use. Trade volumes depend on an entire network structure of trade connections (Baldwin and Taglioni, 2011). The intermediate goods trade between two countries " increases in the size and productivity of a third country and declines in each of the two countries trade costs to it ". They call this relation "gravity" of a third country which finally contradicts the common theoretical literature of the final goods trade where third country "gravity", or in traditional terms, lower multilateral resistance, decreases bilateral trade (Anderson and van Wincoop, 2003).

The gravity model, in its standard form, is derived from a consumer expenditure system in which the price term is eliminated using the general equilibrium structure of the theoretical model. In Anderson and van Wincoop (2003), the demand for the products of i by entity j , derived by maximizing the CES utility function of the consumer j , is as follows: where Pi, is the supply price of i , tij the iceberg trade costs and Pj the consumer price index in j . The aggregate exports of i to all partners j are equal to the total output of i:

$$x_{ij} = \left(\frac{\beta_i p_i t_{ij}}{P_j}\right)^{1-\sigma} Y_j \qquad (1)$$

$$Y_i = \sum_j x_{ij} \qquad (2)$$

The above market clearance condition is then used to eliminate the relative price term (Pi) in expenditure equation (1). The equilibrium prices are then**:**

$$(\beta_i p_i)^{1-\sigma} = \frac{Y_i}{\sum_j (t_{ij}/P_j)^{1-\sigma} Y_j} \qquad (3)$$

Hence, trade from i to j in equilibrium is:

$$x_{ij} = \frac{Y_i}{\Omega_i}\left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} Y_j \qquad (4)$$

$$\Omega_i = \sum_j (t_{ij}/P_j)^{1-\sigma} Y_j \qquad (5)$$

The above model relies on the assumption that the products exported from i to j are produced solely in i . In empirical gravity literature Xij , is measured as the gross exports of i to j , while Yi is measured on a value-added basis by the GDP of entity i . However, under vertical specialization, the origin of the value-added and the exporter of the goods are no longer the same and the volume of aggregate gross exports is much higher than the amount of domestic value-added due to the import content of exports or, in other words, intermediate goods imported and re-exported after being processed.

2.3 Determinants of Global Value Chain

Various studies pointed out different factors that contributed to the increasing integration to the global chain, these depends heavily on the economic and geographical status of each countries. In Asia for instance, food distribution systems relied on changes in urbanization, consumer preference and eating habits, infrastructure development and competition. This integration in the supply chains and networks provided chance for making added value. Moreover, branding lead to high consumer confidence and satisfaction in the buying of good and services. Likewise, chains helped in facing challenges by creating partnership, input provider, marketers and customer within the networks of chain (Chen and da Silva, 2005).

Geography was also found out to be one of the determining factors of Global Value Chain. The center of production hubs in terms of trade includes the United States, Asia which includes China, Japan and Republic of Korea and one in Europe, Germany. According to Diakantoni (2017) on his study based on the UN Comtrade database, China is on the boundary and tends to trade with the "hub" that is nearest in geographic distance. Since African countries are far from the existing hubs, trade becomes difficult in these countries. Many developing countries are also far from the existing hubs that affects their integration in the chain.

Moreover, flexibility and speed were factors that also contributed to the degree of integration. Shorter lead time, fast response to market change, and the demand-driven orientation greatly contributed to the manufacturing supply chain strategy. However, the degree of integration within the chain needs improvement because the functional level of the supply chains is not the desired level. There is a lack of values and integration on the vertical and horizontal members of the manufacturing industries, which hinder the best value chain. Working in "Silos culture" leads to lack of customer focus and top management commitments (Lemenge & Tripathi, 2011).

3. METHODOLOGY

The study used both descriptive and causality research design. The descriptive part described the situation of the Philippines in the mango global value chain integration. The influences of the identified variables were formulated using the gravity model and measured using panel regression analysis. Two models were formulated to test the causal relationship of the identified explanatory variables and the dependent variables using the concept of gravity model using GDP as the traditional gravity variables in the equations. The functional models were:

(1) $\ln Ex_{rc} = \beta_0 + \beta_1 \ln D_{rc} + \beta_2 \ln GDP_r + \beta_3 \ln R_{rc} + \beta_4 LL_r + \beta_5 GGI_{rc} + \varepsilon$

(2) $\ln V_{rc} = \beta_0 + \beta_1 \ln D_{rc} + \beta_2 \ln GDP_r + \beta_3 \ln R_{rc} + \beta_4 LL_r + \beta_5 GGI_{rc} + \varepsilon$

Where the dependent and explanatory variables are given as:

$\ln D_{rc}$ = natural logarithm of the bilateral distance

$\ln GDP_r$ = is the "natural logarithm" of the Gross Domestic Product of the regions

R_{rc} = remoteness of the region from the rest of the world. This is measured by Head (2003).

$R_{rc} = 1/\Sigma (GDP_m / D_{rm})$; GDP of importer country and Distance of region to importer country

LL_r = "dummy variable" whose value is one when region r is landlocked.

GGI_{rc} = global competitiveness index of the region to the rest of the world

Dependent variables

Ex_{rc} = gross exports from mango exporter region r to destination country c

V_{rc} = "value added" produced and exported from mango exporter region r to destination country c

The null hypothesis tested were:

Ho₁: Bilateral Variables (distance and contiguity) have no significant effect to the Philippines mango global value chain.

Ho₂: Unilateral Variables (idiosyncratic characteristics) have no significant effect to the Philippines mango global value chain.

Ho₃: Exporter and Importer characteristics have no significant effect to the Philippines mango global value chain.

Pangasinan in Luzon, Western and Central Visayas, Davao and Cotabato are the leading exporters of mango in the Philippines. These provinces come from four regions of the country namely, Region 1, 6, 7 and 11 and was chosen as the regions that are assumed to be involved in the mango global value chain. Secondary data were used to represent, bilateral distance, exports, gross domestic product, and production of mango. For some variables that are not quantifiable in nature such as remoteness and landlocked, values were derived using different formula (Table 1). Cross Section data across the four mango producing regions and 11 leading importers of mango in the latest two years data with a total of 88 observations were used in the study. The data were gathered from the agencies Philippine Statistical Authority and UN Comtrade.

Table 1. Trade variables and computational formula

Trade Variables	Definition/Computational Formula
$\ln D_{rc}$	Natural Logarithm of the Bilateral Distance
$Cont_{rc}$	Dummy variable as control for common borders between regions and partner country
LL_r	Dummy variable whose value is one when region r is landlocked.
LL_C	Dummy variable whose value is one when country c is landlocked.
R_{rc}	Remoteness of the region from the rest of the world. This is measured by Head (2003) : $R_{rc} = 1/\Sigma (GDP_m / D_{rm})$; GDP of importer country and Distance of region to importer country

Since the type of data set has cross sections, we utilize the "cross section" regression model. According to Gujarati (2011), by integrating "time series" of "cross sectional observations", the so called "panel data" gives more informative data, more variability, less co-linearity among variables, more degrees of freedom and more efficiency". Since time observations is the same across the 4 regions and 11 leading importer of mangoes countries, the set of data is called as "balance panel". Furthermore, the data are also called as "short panel" because the number of cross-sectional *N* or leading importer of mangos countries (11) is greater than the number of time period *T* (2). To produce robust estimates of the model, three panel data modeling were addressed in this research namely: "Pooled OLS Regression", "Fixed Effect Model" or "Least Square Dummy Variable" and "Random Effect Model". Likewise, we use the panel regression unit root test that is the the "IM, Pesaran and Shin" (IPS) test and Hausman to test the robustness of the models.

4. RESULTS AND DISCUSSION

4.1 The Philippine mangoes in the (GVC) global value chain

Since 1980, the country notably participated in the mango global market with increasing exports in the 1990s. By 2017, the Philippines ranked fourth in exports of fresh and dried mangoes which is $US 67.9 million or 10.08 percent share of the Asia's export of mango (UN Comtrade, 2018). The country has exported mangoes to Hong Kong (China), Japan, Singapore, Switzerland, UK and the USA. The increase in mango exports can also be attributed to the low tariff in exports, which allows Philippine mangoes to enter duty-free markets, as provided by the World Trade Organization and Japan. Figure 1 below shows the leading exporters of fresh and dried mango by value in Asia, 2017.

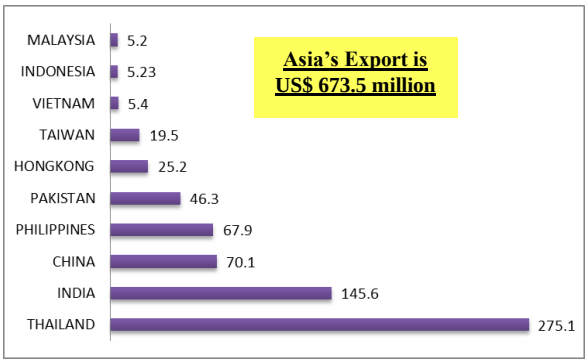
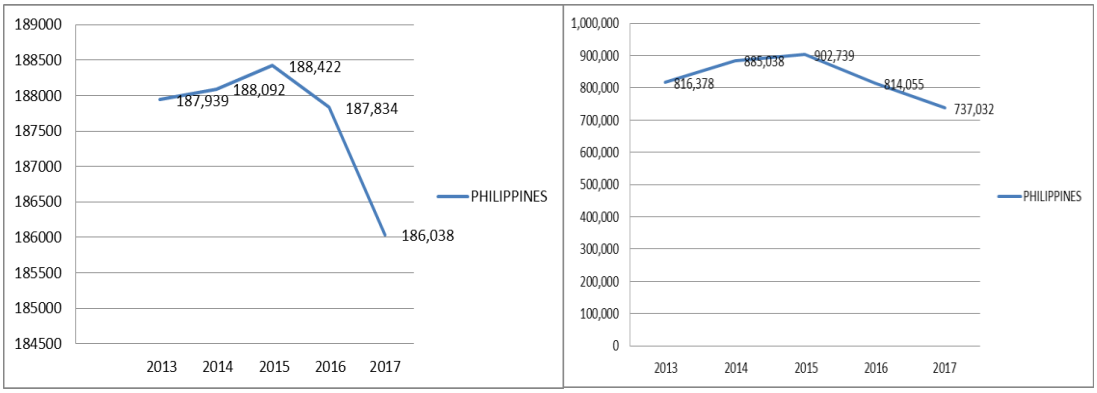


Figure1: Leading Exporters of Fresh and Dried Mango by Value in Asia, 2017

However, the current situation of mango in the farming industry posts problem in terms of the area planted and volume of production. As shown in Figure 2, the land area planted with mangoes decreases at an average of 0.20% within the period of five years with an average farm size of 1.34 hectares. Correspondingly, volume of production decreases at an average of 1.78% in five years.



Decreases at an average of 1.78% in five years

Decreases at an average of 0.20% in five years with an average farm size of 1.34 hectares

Figure 2 : Land Area Planted with Mango (in Hectares) and Volume of Production (in Metric tons), Philippines, 2013-2017

With the decrease of its volume of production, the share of mango to total exports declined, exhibiting a drastic fall (Figure 3). This explains the decreasing competitiveness of the Philippine mangoes in the world.

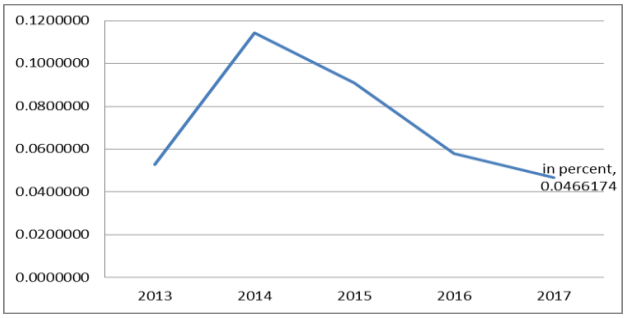


Figure 3: Percentage Share of Mango to Total Philippine Export, in FOB value Million pesos (at constant) prices, 2013-2017

The country's participation in the global value chain was limited in the production and processing stage of the chain.Thereby limiting its integration (Figure 4). This situation limits its participation in the trade of fresh and processed forms. . Majority of processed mango in dried, airtight and juice goes to US and puree goes to Hong Kong (Figure 5).

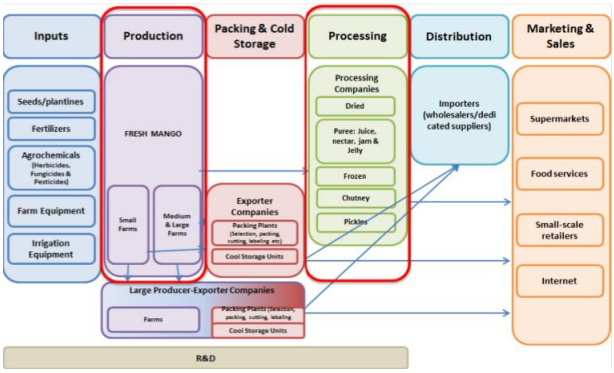


Figure 4. Philippine Participation in the Mango Global Value Chain

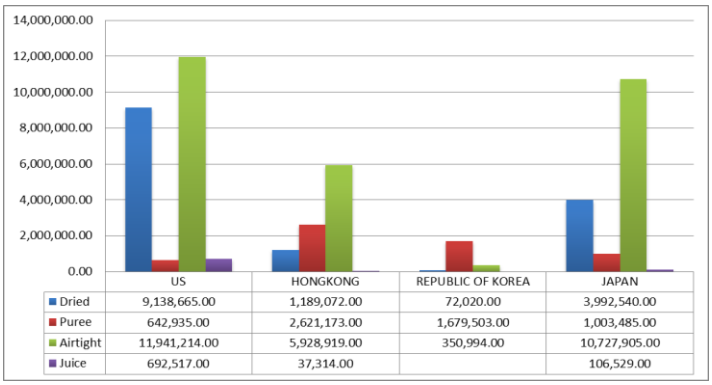


Figure 5. Processed Mango Exports Value in US$ Millions, FOB, 2013-2017, By Type, By Export Destination Philippines

4.2 Integrating gravity model approach in the (GVC) global value chain analysis

Since the data are panel, estimation of the causal relationship uses common pooled regression, fixed effect model and random effect model. Initially, the panel unit root testing was performed to test if the variables taken collectively were stationary. The obtained annual data of the gross exports, gross value-added, gross domestic product and global competitiveness were first plotted at levels and were observed for the trending patterns that they exhibit. All the data series demonstrated fluctuating trends which characterized non-stationary variables at levels. However, plotting at first difference, all the variables were found to be stationary. Table 2 shows that using the Im, Pesaran and Shin (IPS) test, at level the variables were all non-stationary as shown in the probabilities which exceeded the 5% level of significance. However, after differencing it exhibited a stationary or stochastic trend, therefore at this point the variables were integrated of the same order therefore regression was performed on the variables at that form.

Table 2. Summary of Panel Unit Root Test Using the Im, Peasaran and Shin

Variables	At Level	Probability	At 1st Difference	Probability
Gross exports	-12.23328	0.1144	-15.95813	0.0000
Gross Value Added	-2.34248	0.3511	-2.03284	0.0210
Gross Domestic Product	-14.4948	0.4200	-14.6272	0.0000
Global competitiveness	-0.84331	0.2938	-2.29454	0.0109

The common pooled regression assumed that the regressors are non-stochastic or if stochastic, are uncorrelated with the error term. It is also presumed that the error term satisfies the usual classical assumptions (Gujarati, 2011). On the other hand, the fixed effect model was estimated to cross-check the heterogeneity that may exist among all the observation. This model allows each cross section to have its individual intercept value. The term fixed effect is caused by the fact that while the intercept may differ across countries/regions, the intercept does not vary over time that is it time invariant. This process is done by introducing differential intercept dummies. To account for the lack of representation and knowledge on the dummy variables; Random effect model (REM) suggested the expression of the said ignorance through the disturbance term, subject to a stochastic random error component. The individual differences of each country were being reflected in the error term.

Table 3 shows the panel regression estimation done for the first functional model. The first functional model was: ln $Ex_{r\,c} = \beta_0 + \beta_1 \ln D_{r\,c} + \beta_2 \ln GDP_r + \beta_3 \ln R_{r\,c} + \beta_4 LL_r + \beta_5 GGI_{r\,c} + \varepsilon$: where: $Ex_{r\,c}$ represents the gross exports from mango exporter region r to destination country c; ln $D_{r\,c}$ is the natural logarithm of the bilateral distance; ln GDP_r is the "natural logarithm of the Gross Domestic Product of the regions; $R_{r\,c\,is}$ the remoteness of the region from the rest of the world. This is measured by Head (2003); $\boldsymbol{R_{r\,c} = 1/\Sigma\,(GDP_m / D_{r\,m})}$***; GDP of importer country and Distance of region to importer country;*** $LL_{r\,is}$ the dummy variable" whose value is one when region r is landlocked; and $GGI_{r\,c\,is}$ the global competitiveness index of the region to the rest of the world.

Table 3. Panel Data Regression Result for Functional Model 1

Variables	Panel Data Regression			
	Common Pooled	Fixed Effect	Random Effects	Hausman Test
Constant	13.956	25.671	30.227	
lnDrc	-0.9875	-0.048*	0.00765	
Prob	*0.089*	*0.0478*	*0.0934*	
lnGDPr	2.824**	1.440**	0.724**	
Prob	*0.0021*	*0.007*	*0.005***	
Rrc	6.496*	6.697*	7.390*	
Prob	*0.045*	*0.0329*	*0.00287*	
Llr	-0.162*	-0.157*	-0.843*	
Prob	*0.0421*	*0.0467*	*0.0238*	
GGIrc	1.045**	1.087**	1.820**	
Prob	*0.0042*	*0.005*	*0.00298*	
R-squared	0.85	0.76	0.72	
Chi-square				**3.989**
Prob				***0.762***

The result shows that bilateral distance using the common pooled and random effects has no significant effect to the gross exports. However, using the fixed effect panel regression estimation it exhibited a negative significant effect on the gross exports using five percent level of significance. The other explanatory variables such as gross domestic product, remoteness, landlocked and global competitiveness have exhibited significant effect on the gross export using all the estimation method. The result reveals that bilateral distance drives down the gross exports. Remoteness, GDP and global competitiveness has a positive sign while landlocked has a negative sign.

As for the second functional model, that is: $\ln V_{rc} = \beta_0 + \beta_1 \ln D_{rc} + \beta_2 \ln GDP_r + \beta_3 \ln R_{rc} + \beta_4 LL_r + \beta_5 GGI_{rc} + \varepsilon$; where: V_{rc} is the "value added" produced and exported from mango exporter region r to destination country c; $\ln D_{rc}$ is the natural logarithm of the bilateral distance; $\ln GDP_r$ is the "natural logarithm" of the Gross Domestic Product of the regions; R_r is the remoteness of the region from the rest of the world. This is measured by Head (2003);$R_{rc} = 1/\Sigma (GDP_m / D_{rm})$; ***GDP of importer country and Distance of region to importer country;*** LL_r is the "dummy variable" whose value is one when region r is landlocked and GGI_{rc} is the global competitiveness index of the region to the rest of the world. Table 4 shows the estimation results:

Table 4. Panel Data Regression Result for Functional Model 2

Variables	Panel Data Regression			
	Common Pooled	Fixed Effect	Random Effects	Hausman Test
Constant	12.956	34.671	32.976	
lnDrc	-0.935	-0.041*	0.00685	
Prob	*0.079*	*0.0488*	*0.0834*	
lnGDPr	2.924**	1.570**	0.890**	
Prob	*0.0012*	*0.009*	*0.005*	
Rrc	6.196*	6.997*	2.290*	
Prob	*0.025*	*0.0369*	*0.00187*	
Llr	-0.142*	-0.127*	-0.743*	
Prob	*0.0321*	*0.0267*	*0.0338*	
GGIrc	1.035**	1.039**	1.027**	
Prob	*0.0022*	*0.003*	*0.0005*	
R-squared	0.82	0.74	0.67	
Chi-square				**3.92**
Prob				***0.823***

The resulting estimation shows bilateral distance still has significant negative effect to gross value added. The distance variable that is represented by bilateral distance drives down both the gross exports of mango and gross value- added. This means that final goods and intermediate goods that is either fresh or processed mango was negatively affected by the distance of the Philippines to its exporting countries (Hong Kong (China), Japan, Singapore, Switzerland, UK and the USA). This negative effect means the nearness or farness of the regions of the country to its exporting countries. In contrast, gross domestic product increases the country's integration in terms of mango chain to the world as depicted by increase on its gross exports and gross value-added. Remoteness has a

positive effect as expected similar to gross value- added and gross exports. The result is the same with the global competitiveness that each country has. Conversely, landlocked has negative effect in the mango global value chain. Hence, in forecasting the Philippine mango global chain integration, bilateral distance, gross domestic product, remoteness, landlocked and global competitiveness must be considered. Policies direted toward these factors must be considered.

Hausman Test was then used to determine the robustness of the model to be use for policy formulation. The null hypothesis of the Hausman test is that FEM and REM do not differ substantially. The result of the Hausman test strongly accepts the REM model for the p- value of the estimated chi-square statistic as high. However, it did not indicate a significant difference and did not necessarily follow that random effect estimates are free from bias and are more preferred than fixed effect estimates.

The results of the panel regression suggest that the Fixed Effect Model is the appropriate model for policy formulation. Thus, the resulted mango global value chain models are: $Ex_{r\,c} = 25.671 - 0.048\ D_{r\,c} + 1.440\ GDP_r + 6.697R_{r\,c} - 0.157\ LL_r + 1.087\ GGI_{r\,c}$ and $V_{r\,c} = 34.671 - 0.041\ D_{r\,c} + 1.570\ GDP_r + 6.997R_{r\,c} - 0.127\ LL_r + 1.039\ GGI_{r\,c}$ .The first functional model implies that an increase by 1 percent each would tend to increase growth in gross exports 1.44% (Gross Domestic Product), 6.697% (Remoteness) and 1.087 % (Global Competitiveness). On the contrary, an increase by 1 percent of landlocked and bilateral distance will decrease gross exports by 0.157 and 0.048 percent respectively.

Additionally, the second model reflects the same effect with the gross value-added but in different levels. Landlocked and remoteness brings down gross value added by 0.127 and 0.041 percent. Gross domestic product, remoteness and global competitiveness positively affect gross value-added by 1.570%, 6.997% and 1.039% respectively.

Both functional models that explains Philippine global value chain integration is affected by the determinants, bilateral distance, gross domestic product, remoteness, landlocked and global competitiveness which suggests that all of the identified explanatory variables has significant effect to the country's global value chain integration. Therefore, for the country to increase its integration, policy directing towards these variables must be directed. The results indicated that gravity model proves its significance not only in trading but also to its integration to the mango chain.

5. CONCLUSION

The Philippines' participation in mango global value chain is limited to its exports of fresh and processed mango and was threatened by the decreasing pattern of its volume of production. Using the gravity model approach, it was found out that bilateral distance and landlocked drives down the country's integration. Conversely, the country's gross domestic product, remoteness and global competitiveness increases its integration to the world.

The concerned authorities must take necessary action to help the mango farmers. As the results reveals, the Philippines participation is limited only in the production and processing stage of the chain. To integrate deeply, the country may invest to research and development and machineries to be able to compete globally. They may also tap the available manpower and skills to integrate in distribution, marketing and sales. Investment in education and trainings might be the key factors necessary for the upgrade of the country's status in global trading. Since bilateral distance and landlocked was found to have a significant negative influence to trade, there is a need to strengthened the country's mode of transporting mangoes giving consideration to flexible and timely delivery of mangoes to the world.

Acknowledgements

This work was supported by the Commission on Higher Education of the Philippines under grant number 2016b-010771.

References

[1] Bems, R., & Johnson, R.(2012). Value-Added Exchange Rates. *NBER,Cambridge, MA.*

[2] Briones, R. M., Turingan P.S & Rakotoarisoa, M.A.(2013). Market Structure and Distribution of Benefits from Agricultural Exports : The Case of the Philippine Mango Industry Food and Agriculture Organization of the United Nations.

[3] Chen, K.(2016). Innovations in Financing of Agri-Food Value Chains in China and India: Lessons and Policies for Inclusive Financing.

[4] Chen and da Silva (2005). Changes in Food Retailing in Asia Implications of Supermarket Procurement Practices for Farmers and Traditional Marketing Systems; FAO, Rome.

[5] Chen, X., L. Cheng, K.C. Fung, and L. Lau. (2004). The Estimation of Domestic Value-Added and Employment Induced by Exports: An Application to Chinese Exports to the United Tates. In China and Asia: Economic and Financial Interactions, edited by Y.W. Cheung and K.Y. Wong. New York: Routledge.

[6] Daudin, G.,C Rifflart and D. Schweisguth.(2006). Who Produces for Whom in the World Economy"? Document de travail No. 2009-18 Observatoire Francai des Conjonctures Economiques, Paris.

[7] Diakantoni, A., H. Escaith, M. Roberts and T. Verbeet.(2017). Accumulating Trade Costs and Competitiveness in Global Value Chains. World Trade Organization (WTO) Working Paper Economic Research and Statistics Division (ERSD) 20017-2, WTO, Geneva.

[8] Gujarati, D. (2011). *Econometrics by Example*. United States of America: Mcmillan Publisher Limited.

[9] Guilhoto, J. Siroen, J.M & Yucer, A., (2015). The Gravity Model, Global Value Chain and the Brazilian States. *Documents de Travail UMR DIAL*.

[10] Head, K. (2003). *Gravity for Beginners*. Mimeo University of british Coulumbia Vancouver, B.C.

[11] Hummels, D.,J.Ishii, and K.M. Yi.(2001). The Nature and Growrh of Verical Specialization in World Trade. *Journal of International Economics 54 (1):75-96.*

[12] Koopman, R., Z. Wang and S. Wei and K.Zhu. (2016). Tracing Value-Added and Double Counting in Gross Export: Reply to the Comment by Bart Los, Marcel Timmer and Caaitzen J. de Vries. Draft Manuscript.

[13] Kusnandar, T. (2014). Effectiveness of a "whole chain" approach in linking farmers to market: A case of Pakistan mango market. UMK Procedia 1 (2014) 57 – 62

[14] Lemenge, F., & Tripathi, S.K. (2011). Critical Issues in Realising Best-Value through Strategically Aligned Supply Chains: A Study of Selected Manufacturing Companies in Tanzania. *Management Convergence Vol.1 No.2, 32-44.*

[15] Mutonyi S. & Beukel. K. (2016). Price Satisfaction and Producer Loyalty: The Role Of Mediators In Business To Business Relationships In Kenyan Mango Supply Chain. *British Food Journal (2016), Vol. 118 Issue: 5, pp.1067-1084 https://doi.org/10.1108/BFJ-09-2015-0319.*

[16] Porter, M.E. (1985). Competitive Advantage, Creating and Sustaining Superior Perfromance. New York: Free Press.

[17] PSA. (2007-2014). Firm-Level Trade Data. Manila: Philippines Statistics Authority (PSA)

[18] UNComtrade. (2016). World Mango Exports by All Reporters and Partners, 2005-2015. Retrieved October 22,2018, from United Nations Statistics Division.

[19] Wang,J., Huili,Y. & Goh, M. (2017) Empirical study of sustainable food supply chain management practices in China. *British Food Journal (2017), https://doi.org/10.1108/BFJ-09-2017-0525.*

[20] WTO (World Trade Organization) and IDE-JETRO (Institute of Developing Economies-Japan External Trade Organization) 2011. Trade Patterns and Global Value Chains in East Asia: From trade in Goods to Trade in Tasks. Geneva: WTO.