The Implications of E-Commerce on Labor Productivity in the Philippines

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Abstract — *The relationship between Labor Productivity and independent variables, Technology, and Electronic Commerce was examined in this study. Since the start of E-Commerce in the Philippines, it has been known to have positive effects on economy-wide establishments that contribute to the growth of the Philippine economy. Furthermore, it served as an opportunity for undergraduates to pursue jobs and improve the employment capacity of the Philippines. Its dynamic capabilities allow Filipino consumers to browse websites with easier and faster access than the primitive way of purchasing in the commerce industry. After using cross-sectional data and Pearson Correlation Coefficient, this study proved that E-Commerce and Technology have an implication on Labor Productivity.*

Keywords — *labor productivity, e-commerce, technology, employment.*

I. INTRODUCTION

Electronic Commerce or referred to as E-Commerce in the early 1920s, was defined as any transaction done through rail transportation and telephone service. In the twentieth century, E-Commerce evolved into industries such as rail transport and telephone service. At present, the marketplace for E-Commerce is defined as a virtual platform for buyers to purchase goods and services from the internet (Plant, 2000). Business and the growth of an economy are linked with technological advancements. According to Jorgenson (2011), productivity in labor is critical when it comes to an economy's success. Furthermore, to boost productivity, certain policies should be made, such as investment in human capital and technology. With this, there will be more accessible access to information and may lead to boosting economic growth and competitiveness.

Ramos (2020) indicated that the Philippines is lagging behind in Labor Productivity rate as compared to other ASEAN countries. The labor framework in the Philippines is said to not complement higher productivity in the workforce. The government must intervene and implement policies that are ideal in motivating workers, such as incentives, application of technology, and increased wages & compensation. Moreover, Mandel (2017) stated that the expansion of E-Commerce created more job opportunities. About 44.1 million people aged 15 and up are currently employed out of a population of 70.9 million in the 2018 Philippine Labor Force Survey.

E-Commerce is estimated to drive the GDP growth of the Philippines to 5.5% by the end of 2021 (DTI, 2020). The economic contribution of E-Commerce is to rise to P1.2 trillion as compared to the year 2020's P599 billion. Moreover, the impact of E-Commerce is said to take up 5.5% of the Philippines' GDP. This is an increase compared to the year 2020's 3.4%, based on The Philippines E-Commerce Road Map findings.

E-Commerce in the Philippines is said to increase Labor Productivity in the long run (Patinglinghug, 2019). To observe Electronic Commerce and Sectoral Spending on Technology and its connection with the productivity of labor, the researchers used the Cobb-Douglas Production Function as a theoretical basis for the study. The theory focuses on production output and its relationship with the factors of production. It estimates the change of production caused by the innovation of technology (McKenzie, 2020).

The function for Cobb-Douglas Production Function is as follows: $Q = A, L^{\alpha} K^{\beta}$, where: Q = production rate; L = labor input; K = capital/equipment input; A = technology; α and β are the output elasticity

of labor and capital respectively. This function calculates the changes in the output of the production after adjustments in the input. Moreover, it depicts whether there are deficiencies or productivity after the calculation process, allowing the representation of a more complex result.

The purpose of this study is to identify the implications of E-Commerce Revenue and Sectoral Spending on Technology on Labor Productivity. This research should be able to answer the following questions: What sectors in the Philippines heavily influence the relationship between E-Commerce Revenue and Labor Productivity? and What sectors in the Philippines rely on technology to increase and decrease Labor Productivity?

The researchers will be using Coefficient Correlation analysis as a quantitative method of research in analyzing the relationship of each variable in this study. Furthermore, the objectives of this research paper are to determine the relationship between E-Commerce Revenue and Labor Productivity of the Philippines by gathering data per sector and examining the relationship between Sectoral Spending on Technology and Labor Productivity in selected sectors in the Philippines.

In this Study, E-Commerce Revenue refers to profits generated from selling and providing goods & services through an online platform. Electronic Commerce revenue is measured by Sales from Ecommerce, which is available in the Annual Survey of Philippine Business and Industry. Moreover, Labor Productivity is the measurement of economic performance through the calculation of the number of hourly labor and the number of goods and services produced in Electronic Commerce.

II.   LITERATURE REVIEW

2.1   Models of E-Commerce based on the parties involved

The B2B model is the transaction between one business to another. It is a process in the supply chain when a business would purchase raw materials that will be used in manufacturing. Whereas B2C refers to the traditional retail model wherein a business sells directly to its consumers. In relation to E-Commerce, transactions are conducted through an online setting. The involved businesses, for example, Shopinas, follow a traditional model of retail but sell their goods and services through an online website. On the other hand, the C2C model allows customers to trade, buy, and sell with one another through an online platform. In exchange, the website would give them a percentage of commission for every sale they make. In essence, the sellers are also the consumers. Platforms such as Shopee, OLX, and Lazada are examples of C2C. Businesses earn revenue through charging commissions and advertisements (PCC, 2020).

2.2   Labor Productivity in the Philippines

Labor Productivity is the reflection of an organization or country's ability to generate higher income or added value (Sauiain, 2017). It maintains the competitiveness of a nation in the global market (Auzina-Emsina, 2014). The World Bank (2018) stated that for the Philippines' GDP to reach its target 6.5 annual growth rate, it must increase total factor productivity (Felipe, 2018). TFP growth requires that the growth rate of total output should be lower than the growth rate of total input (Kathuria et al., 2013). Moreover, Arshad (2015) suggested that the government must limit the arrival of low-skilled workers in the country. The study continued that labor supply may result in a decline in productivity. Productivity in labor is greater in countries that hone economic development (Korkmaz, 2017). Moreover, the production level that is set for each country can only be attained if countries use their economic resources efficiently. Once achieved, production factors such as capital and labor are said to increase.

Labor Productivity and Real Wage are variables that are essential in the long run of an economy. When real wages are increased, employees are more motivated. Therefore, Labor Productivity increases (Klein, 2012). Sen (2006) stated that factories that invest in ergonomics, generate an attractive Return on Investment that will help them reach their goals. More productive firms tend to pay workers higher wages thus there is a rise in quality of labor, capital inputs, and investment in the education of workers (Bagger, 2014) & (Fox, 2011) especially in the sectors of commerce and agriculture (Katovich, 2018). Moreover, with the increase of workers with a higher level of educational attainment, there will be a rise in new products and services, thus increasing productivity (Taylor et al., 2016). Tabari and Reza (2012) consider technology and education as important factors

influencing Labor Productivity. Although Canals (2018) indicated that if there is a lack of support in capital investments and Total Factor Productivity then there will be an economic slowdown even with the implementation of high-speed technology. This especially occurs in developing countries, such as the Philippines.

2.3   E-Commerce in relation to productivity

E-Commerce refers to the method of doing business over the Internet. It has the potential to change the way individuals do business in the past (Shahjee, 2016). As stated by Tao Kong (2015), E-Commerce accounts for a significant portion of the digital economy. Furthermore, advancements in E-Commerce strengthen the link between good management and customer retention. It also has an impact on large industries like communications, finance, and retail trade, as well as education, health, and government (Farooq, et al., 2019). Xue, Wang, and Li (2019) also claimed that the E-Commerce service industry will play a critical role in promoting national economic growth, increasing employment, reorganizing the industrial structure, and increasing resource utilization efficiency. However, although E-Commerce adoption is becoming progressively important in the digital economy, its effects on the functioning dynamics of traditional industrial clusters have not yet been explored (Wang, Zhang, & Song, 2019).

Pantelimon (2020) and Anvari et al. (2016), indicated that Electronic Commerce and the gross domestic product of a country display a positive relationship to an economy despite the closure of brick-and-mortar stores. It is due to higher sales volume because prices tend to be lower and there is a wider variety of goods and services available in online shops thus it can increase GDP (Cardona et al., 2015). Moreover, E-Commerce is said to have a stronger enhancing development effect on a country as compared to research and development expenditures. Government officials are highly recommended to give importance to economic planning concerns of E-Commerce to further improve the health of the economy (Narouzi, 2016). However, today's E-Commerce typically necessitates advanced ICT infrastructures to function (Falk & Hagsten, 2015).

According to Khan (2016), the online platform has been proven to deliver opportunities to develop countries and establish a more solid foothold in the global trading system. As indicated by Nibedita et al. (2015), countries like the USA, UK, China, Japan, and India use E-Commerce platforms such as online stores to raise their country's GDP. Furthermore, China and the USA have the highest GDP in terms of E-Commerce usage of online retails, virtual markets, stores, and e-cash sales, as well as marketing. However, Zohuri (2020) stated that businesses should understand the status of an economy before transferring to E-Commerce to avoid economic downfalls.

2.4   Technology in Labor Productivity

Relich (2017) found that the number of ICT specialists can be used to measure Labor Productivity as well as human capital. Moreover, Acemoglu and Restrepo (2019) claimed that new technologies increase productivity as the task content of production enhances the labor demand as well. Battisti, Del Gatto, and Parmeter (2018) indicated that the overall increase in Labor Productivity contributes to the capital accumulation of a country. Industries such as Manufacturing, Research and Development, and Trade are sectors that are impacted by advances in technology (Apergis, 2008 & Oh, 2011). Singh (2008) and Mandel (2017) stated that internet technology has a positive effect on businesses and the labor market was the variable used in determining its impact on macroeconomic growth. The study continued stating that new technology, especially the internet and E-Commerce, and other significant changes such as continued increases in workforce educational attainment, shifts in jobs to service industries, increased employment opportunities for women, and the formation of online trade unions.

Alani (2012) argued that with the involvement of technological progress, labor and capital productivity seem to decline and this has caused the reduction of excess demand. The reason behind this is that, with the rise of technology, there is an exhaustion of output that creates excess capacity or workers have the tendency to prefer leisure over work since it is relatively easier with the help of technology. Furthermore, Tianyao (2018) agreed that technology has an indirect relationship in some industries, such as in farming. The study showed more cultivation can be done with manpower rather than advancements in technology. Even with the investments in new technologies, it may not drive-up Labor Productivity due to the lack of Total Factor Productivity (Canlas, 2018). This is evident in developing countries such as in the Philippines and Vietnam. The advance adaptation

of Information Technology in the United States causes a slow growth of productivity in terms of acquiring new measurements. Moreover, the technology adaptation is believed to be so rapid that the output quality is difficult to measure (NASEM, 2017). Therefore, technology's effects are dependent on the external environment's volatility and competition, and it can improve or limit employee flexibility and decision-making and self-organization options.

2.5 Labor Productivity in E-Commerce

Due to the emergence of Electronic Commerce, the global economic outlook has changed completely over the past decade (Wen, 2015). Moreover, it is indicated that the effect of E- Commerce on productivity increases as it connects different boundaries of markets (Barsauskas, 2008). Bernasak (2001) and Lui et al. (2013) claimed that E-Commerce is essential in boosting global confidence, furthermore, the gross domestic product of a country. Qureshi et al. (2006) suggested that the government must intervene and encourage firms to engage in E-Commerce activities and invest in new technologies, especially for developing countries. E-Commerce is considered a type of knowledge capital in operating a firm, thus the latter and research & development have a strong productivity-enhancing effect on businesses. There are fewer inefficiencies in the production of goods as the software for ecommerce is designed to improve the Labor Productivity rate in a country (Relich, 2017). In addition, company productivity may be improved through enriching an Enterprise Resource Planning [ERP] software that is readily available. Although the advancement of technology may not lead to a competitive advantage, Nurmillasko (2009) stated that firms recognize the importance of standardized data exchange which is important in B2B E-Commerce and trading.

Kaur et al. (2017) said that E-Commerce allows businesses to expand their market and target consumers. It is a less costly alternative that makes processing and production more efficient for its convenient application in purchasing raw materials needed for production (Jameel, 2017). The researchers continued to raise Labor Productivity, by increasing revenue with little to no additional cost and increasing the number of materials needed in production to contribute to the overall output of a firm. In addition, a large contribution to growth in productivity is B2B transactions.

With the rise of Electronic Commerce, there has been significant improvement in efficiency, productivity, and development (Arendt, 2018). However, online firms are not as profitable compared to retail firms (Yang et al., 2017). The research proved that there is a low profitability rate for E-Commerce businesses due to input congestion, which leads to diseconomies of scale. Additionally, even with the rise of business productivity, the wages of employees do not seem to increase (Mandel, 2017). Romero (2010) mentioned that sales may not be improving significantly because of a lack of access to the internet for households. It is a barrier to the purchasing power of a household.

2.6 Synthesis

Labor Productivity is a country's ability to produce goods and services and generate higher income. Moreover, productivity in labor is relatively greater in countries that hone economic development. Established in the discussion above, Technological Advancements are said to raise Labor Productivity, only if it is supported by Total Factor Productivity. If not, then there is a chance of an inverse relationship. However, it is said that Electronic Commerce and Labor Productivity display a positive relationship because it has the ability to connect different boundaries of markets. Furthermore, internet technology has a positive effect on businesses moreover the macroeconomic growth of a country.
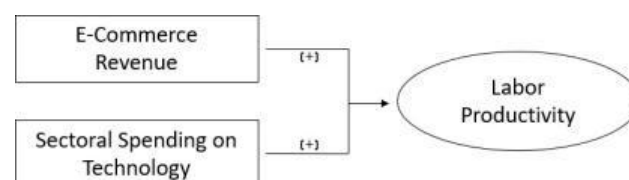
2.7 Simulacrum

Figure 1. Labor Productivity as the dependent variable. E-Commerce Revenue and Sectoral Spending on Technology as the independent variables.

2.8   Hypothesis

H1: Electronic Commerce Revenue does not have an association with Labor Productivity in the Philippines.
HA: Electronic Commerce Revenue has an association with Labor Productivity in the Philippines.

H2: The Sectoral Spending on Technology does not have an association with Labor Productivity in the Philippines.
HA: The Sectoral Spending on Technology has an association with Labor Productivity in the Philippines.

III.   METHOD

3.1   Research Design

   To satisfy the hypotheses and validate the study, the researchers used a quantitative method of research. The main characteristic of quantitative research is that it relies on data to observe or measure a certain population (Allen, 2017). Therefore, the researchers would want to observe how E-Commerce revenue and sectoral spending on technology gives implications to Labor Productivity. It is an advantage since it seeks precise measurements and analysis (Miles & Huberman, 1994) through numerical data.

   The quantitative approach followed in this study was quasi-experimental research. The cause-and-effect equation are analyzed between the independent variables and its implication on the dependent variable. Moreover, the dependent variable is under the influence of changes that imply in the independent variables which in the case of the study, the Labor Productivity.

3.2   Data and Sources Specification

   The implications of E-Commerce revenue and technology to Labor Productivity are measured using cross-sectional data from the Philippines and is acquired in the designated statistical data provider from Philippine Statistics Authority (PSA), the Annual Survey of Philippine Business and Industry (ASPBI). This covers the years 2014 - 2017 to configure reliability. Gretl is the cross-platform software that is used to determine implications from economy wide establishments specifically:

   •   Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles - It is any type of goods and rendered services, it is considered the final steps in the distribution of goods. This sector includes: retail sale of goods in specialized stores, retail sale of household equipment in specialized stores, retail sale in non-specialized stores, retail sale of food, beverages, and tobacco, sale, maintenance, & repair of motorcycles and related parts, retail sale of automotive fuel, and retail sale of information and communication equipment. This section shall cover the years 2014, 2015, 2016, and 2017 of data that was sourced online.

   •   Accommodation and Food Service Activities - All restaurants, fast food chains, cafeterias, refreshment stands, kiosks and counters, dining cars, and other restaurant and mobile food services fall into this category. This section will contain data from the years 2014, 2015, 2016, and 2017 that were gathered online.

   •   Transportation and Storage Sector - Included in this industry are passenger and freight transportation, rail, pipeline operations, road operations, parking facilities, transportation equipment rental, and cargo handling. This section will include data collected online in the years 2014, 2015, and 2017.

- Manufacturing Sector - Manufacturing is defined as any significant alteration, renovation, or reconstruction of commodities. The physical or chemical transformation of materials, substances, or components into new products falls under this category. Agriculture, forestry, fishing, mining, and quarrying, as well as other manufacturing activities, provide the raw materials. This section will contain online data from the years 2014, 2016, and 2017.
- Education Sector - This sector covers all sorts of private and public education, whether full-time or part-time or intensive, day or evening, at any level or for any career, given through institutions. This industry will cover data from the years 2014, 2015, 2016, and 2017 that were obtained through Internet sources.

- Arts, Entertainment and Recreation Sector - Customers' cultural and entertainment interests are met through the operation of facilities and provision of services in this class. This comprises the creation and marketing of live performances, events, or exhibits aimed at the public, as well as participation in them, and the provision of artistic, creative, or technical talents for the creation of artistic products and live performances. This sector will use data from the years 2014, 2015, 2016, and 2017 that were gathered from online sources.

- Financial and Insurance Activities - Financial services activities such as insurance, reinsurance, pension funds, and activities that support financial services are included in this category. The data online covered the years, 2014, 2015, 2016, and 2017 that was used to quantify tests.

- Real Estate Activities - Under this class included lessors, agents, brokers in the following: selling or buying real estate, renting real estate, and providing other estate services. The data used to quantify the tests was gathered online for the years 2016, and 2017.

3.3 Econometric Tool and Model

To illustrate the relationship between Electronic Commerce and spending of technology in certain industries in the Philippines to its implications on Labor Productivity. Coefficient Correlation is used as the econometric model and Nonparametric statistics is the econometric tool. This test determines the degree of similarity between 2 variables (Taylor, 1990). Moreover, it is a test that measures the strength of linear association between two variables and the direction of the relationship, if it exists (Abdi, 2007). The formula below shall

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

r = correlation coefficient

x_i = values of the x-variable in a sample

$\bar{x}$ = mean of the values of the x-variable

y_i = values of the y-variable in a sample

$\bar{y}$ = mean of the values of the y-variable

signify this claim:

Lamorte (2016) specified that the model is used to estimate the connection between the independent variables to the dependent variable. It is to note that coefficient correlation cannot describe the cause-and-effect relationship of the two variables involved. Moreover, it can accurately describe the curvilinear relationship (SAS Institute, 2021).

IV.   RESULT AND DISCUSSION

To determine the relationship between two variables – (1) E-Commerce revenue and Labor Productivity and (2) Labor Productivity and spending on technology, Coefficient Correlation is used. Coefficient Correlation is a test that measures the strength of linear association between two variables and the direction of the relationship if it exists. The measure of strength or the value of the correlation coefficient ranges

between -1 to 1. A value of -1 or +1 implies a perfect degree of linear relationship between the two variables. The closer the absolute value of the correlation coefficient is to 1, the stronger the linear relationship is. Meanwhile, as the value goes towards 0, it implies a weaker association (Berg, 2021). See the table below for the level of strength per range of the coefficient:

Correlation Coefficient (Absolute Value)	Level of association
0.7 - 0.9	Strong
0.4 – 0.7	Moderate
0.1 -0.4	Weak

Moreover, the sign of the correlation coefficient indicates the direction of the relationship between the variables. A "+" sign means a positive relationship which means that as one variable increases, the other value also increases, while a "-" sign means a negative relationship or when one variable increases, the other decreases, and vice versa (Akoglu, 2018). In this study, the Coefficient Correlation will be computed for each sector to determine if there's a relationship between (1) E-Commerce Revenue and Labor Productivity and (2) Labor Productivity and Spending on Technology. If the result of the test would be at least 0.7 but not greater than, 1 then this would imply that there is a strong linear association between the two variables and the value of the correlation coefficient will dictate the strength and direction of the relationship. Moreover, if the result of the test would be at least 0.4 but less than 0.7 then it is a moderate relationship. If the test results range from 0.1 to 0.4 then it would imply a weak relationship. Below are the summary of results and interpretation per correlation test per sector.

SECTOR 1 - Wholesale and Retail Trade

Variable	IV1	DV
IV1	1	
DV	-0.771169868	1

Variable	IV2	DV
IV2	1	
DV	-0.931889838	1

SECTOR 2 - Accommodation and Food Service Activities

Variable	IV1	DV
IV1	1	
DV	-0.791033748	1

Variable	IV2	DV
IV2	1	
DV	-0.387220793	1

SECTOR 3 - Transportation and Storage Sector

Variable	IV1	DV
IV1	1	
DV	0.394046864	1

Variable	IV2	DV
IV2	1	
DV	-0.646703849	1

SECTOR 4 - Manufacturing Sector

Variable	IV1	DV
IV1	1	
DV	0.998585548	1

Variable	IV2	DV
IV2	1	
DV	0.243784677	1

SECTOR 5 - Educational Sector

Variable	IV1	DV
IV1	1	
DV	0.519798741	1

Variable	IV2	DV
IV2	1	
DV	-0.930809205	1

SECTOR 6 - Arts, Entertainment, and Recreation Sector

Variable	IV1	DV
IV1	1	
DV	-0.515762765	1

Variable	IV2	DV
IV2	1	
DV	0.44559879	1

SECTOR 7 – Business Process Management

Variable	IV1	DV
IV1	1	
DV	-0.808519418	1

Variable	IV2	DV
IV2	1	
DV	0.188141948	1

Sector 1, Wholesale and Retail Trade: Under the Wholesale and Retail Trade Sector, it can be concluded that Labor Productivity and independent variables: Ecommerce Revenue and Sectoral Spending on technology have a strong negative association. Furthermore, the correlation coefficient for Labor Productivity and Ecommerce Revenue is -0.771 while Labor Productivity and Sectoral Spending for technology is -0.931 respectively. As stated by Ingene (1982), a reason for this is the imbalance between spending on marketing activities and labor productivity. Moreover, in retail, productivity is dependent on the geographical location therefore, even with the increase in technology expenditure, productivity will not flourish if the place is not technologically savvy. The same scenario goes for Electronic Commerce revenue and its relationship with Labor Productivity.

Sector 2, Accommodation and Food Service Activities: Under the sector Accommodation and Food Service Activities, Labor Productivity shows a strong positive relationship with Revenue in Electronic Commerce and a weak positive relationship with Sectoral Spending in Technology. The correlation coefficient for the former is -0.791 and for the latter is -0.3872. Labor Productivity increases as more bookings are confirmed although Serafica (2020) stated that there are discrepancies with booking online such as conflicts in third-party outlets and issues in rate parity. Moreover, because of these incidents, revenue from electronic commerce is said to decrease. An increase in the investments in technology may lead to a decrease in labor productivity in the Philippines due to certain scenarios wherein employees are not media literate therefore cannot cater to the preferred choices of customers (Hua., et al., 2014).

Sector 3, Transportation and Storage Sector: Under the Transportation and Storage Sector, Labor Productivity has a weak and positive relationship with Electronic Commerce revenue. The correlation coefficient is 0.394. It is seen to increase in this sector because transportation is deemed essential when purchasing goods from an online market, thus driving up productivity and revenue (Mandel, 2017). However, Labor Productivity has a moderate negative association with Technology, as its correlation coefficient is -0.647. A reason is due to the imbalance of investments in total factor productivity and transportation.

Sector 4, Manufacturing Sector: Under the sector Manufacturing Sector, Labor Productivity shows a strong positive relationship with Revenue in Electronic Commerce and a low positive relationship with Sectoral Spending in Technology. Furthermore, the correlation coefficient for Labor Productivity and Ecommerce

Revenue is 0.999 while Labor Productivity and Sectoral Spending for technology is 0.244 respectively. Elirch (2005) stated that the need for adaptation of new technologies and software is necessary for the manufacturing sector due to projects that require certain softwares to analyze figures that are needed when bidding for new projects and the maintenance of existing ones, thus increasing productivity in labor as well. Moreover, SME's involved in e-selling have a positive relationship with labor productivity, which increases revenue. It has the power to raise productivity to 0.484 percent (Ahemd, 2013).

Sector 5, Educational Sector: Under the Educational Sector, Labor Productivity and Ecommerce revenue shop a moderate relationship, with a coefficient correlation of 0.5197. It has been known that since 2013, E-Commerce has had a fair contribution to the productivity of the labor sector as stated by Singh (2008) and Mandel (2017). However, there is a strong negative relationship between Labor Productivity and Spending on technology. The correlation coefficient is -0.931.

Sector 6, Arts, Entertainment, and Recreation: Under the Arts, Entertainment, and Recreation Sector, there is a moderate negative relationship between Labor Productivity and Ecommerce Revenue, with a correlation coefficient of -0.516. Labor Productivity and Sectoral Spending on Technology has a correlation coefficient of 0.446, which depicts a moderate positive relationship. The arts, entertainment, and recreation in the Philippines do not require a massive usage of technology, especially during the years 2013-2017. Therefore, there may be a change in technology in the following years.

Sector 7, Business Process Management: Under the Business Process Management Sector, Labor Productivity and Ecommerce Revenue depict a strong negative relationship. The correlation coefficient is -0.809. Moreover, Labor Productivity and Sectoral Spending in Technology show a weak positive relationship, with a coefficient correlation of 0.188. Jameel and Kaur et al. (2017) stated that E-Commerce allows less cost in the business processing and production.

V.   CONCLUSION AND RECOMMENDATION

The aim of this research is to determine and examine the relationship between the independent variables, E-Commerce Revenue and Sectoral Spending on Technology, and the dependent variable, Labor Productivity. Using secondary data from the Annual Survey of Philippine Business and Industry (ASPBI), the researchers concluded that electronic commerce displays a positive relationship with labor productivity based on the Manufacturing sector of the Philippines, for it has the strongest and highest association among the given sectors discussed. However, for sectoral spending in technology, there is seen to have a negative relationship and a strong association as well. This was concluded by determining the sector with the highest association rate, which is Wholesale and Retail Trade. The strength of their relationship was seen after performing Pearson Correlation Coefficient, which was the statistical method used in the study.

Electronic Commerce Revenue and Labor Productivity heavily influences the movement of one another and depicts a positive relationship. This was established by determining the sector with the strongest correlation, which is Sector 4, Manufacturing Sector. Due to the limitation of the study, the researchers could not determine the cause-and-effect relationship between the 2 said variables, although Sigh and Mandel (2017) indicated that labor productivity rose with the emergence of ecommerce due to the investments in physical and human capital. The researchers confirmed that technological advancements in the Philippines have a negative association with Labor Productivity, given that Wholesale and Retail Trade has the strongest association. As previously stated, the study lacks sufficient support to determine the cause-and- effect relationship of the two variables. However, Canlas (2018) indicated that even with the increase in new technology, if there are no investments in Total Factor Productivity, labor productivity will have a negative relationship. Hence, the Philippines has been bringing in technology from foreign investors yet remains to be one of the weakest systems of education in the world. Moreover, Filipinos have the tendency to study abroad, therefore, work in that country after graduation, and this leads to a brain drain effect within the Philippine economy.

Based on the correlation table presented, Labor Productivity and Revenue in Electronic Commerce of the Manufacturing Sector display the strongest positive relationship among the sectors presented. Hence, in line with the guidelines of the Philippine Economic Zone Authority (PEZA) which aims to generate higher income in the provinces outside Metro Manila, Philippines by the usage of technology. Moreover, businesses that fall under this sector must qualify under PEZA accreditation for it grants incentives extended assistance to

businesses. The agency is tasked to facilitate the business operations of investors that are in the manufacturing and service industries.

The Wholesale and Retail Trade Sector garnered the strongest negative relationship among the sectors that were discussed. Furthermore, the Educational Sector depicts a strong negative relationship as well. It is recommended by the researchers that establishments within this sector should undergo research and training in relation to Republic Act No. 8792, known as the Electronic Acts of the Philippines. The objective of this republic act is to simplify and facilitate the domestic and foreign exchange of transactions and communication through an electronic medium. In addition, electronic related activities help promote the authenticity and reliability of technology.

The researchers recognized that the mentioned sectors in this study correlate with the idea of the Cobb-Douglas Theory, which states that to create linear homogeneous production, the inputs must correlate with the needs of the output. This research supports the theory because value creation is a priority in order to achieve productivity in the labor market as proven in this study.

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