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Analysis on the Impact of Transportation on Labor Productivity in Metropolitan Business Hubs in the Philippines.

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A B S T R A C T

The transportation industry plays a significant role in society by facilitating the production of goods and services for firms and individuals. Furthermore, it enables communication, transactions, trade, connections, and the movement of people from one destination to another. In the Philippines, Metro Manila, Metro Cebu, and Metro Davao stand as megacities and the most bustling areas, making it undeniable that transportation significantly impacts the labor productivity of workers in these three Metropolitan Areas. This paper examines the relationship between exogenous variables—such as available mass transportation, wages, and congestion—and the performance of workers. Through the application of Ordinary Least Squares (OLS) panel data regression analysis and diagnostic tests, this study aims to determine whether these exogenous variables positively or negatively affect labor productivity. Considering that millions of employees commute to and from the country's commercial districts, transportation unquestionably influences their daily lives and efficiency at work. Consequently, this study sought to uncover the inherent costs associated with each mode of transportation, constrained by congestion, and its impact on labor productivity.

Keywords: Congestion, Labor productivity, Transportation, Wage

1. Introduction

Early political economists such as Adam Smith, David Ricardo, and Karl Marx recognized land, labor, and capital as components of production. The present concept of components of production is mostly based on a neoclassical economic viewpoint. It combines previous approaches to economic theory, such as socialism's idea of labor as a component of production, into a single definition. The work exerted by an individual to bring a product or service to market is referred to as labor. It can, once again, take numerous forms. (Investopedia, n.d.). Labor is defined as the human effort required to produce commodities and services. People who work or want to work are regarded to be part of the labor force accessible to the economy (The University of Minnesota, n.d). Labor, in this context, refers to any form of physical or mental exertion. An economy can create and consume more commodities and services with the same amount of effort. Individuals (workers and customers) value productivity. Increases in labor productivity, which simply implies how effectively we do things, drive long-term economic growth. In other words, how well does a country employ its labor and other resources. Labor productivity is the number of products produced by each employee per unit of time worked.

The Metropolitan Hubs in the Philippines, mainly Manila, Cebu, and Davao are one of the busiest districts in the world. From its tourist spots to business, it continues to attract many people in its day to day operations. In an article published by the Philippine News Agency (2019) under the supervision of the News and Information Bureau (NIB) of the Presidential Communications Office (PCO), it discussed that the Philippines was ranked 8th in the most favorite visited country in the world, individuals traveling in the country majority are work or for leisure. In this sense we can see that the country has a substantial body of work on the value of transportation connection in an economy.

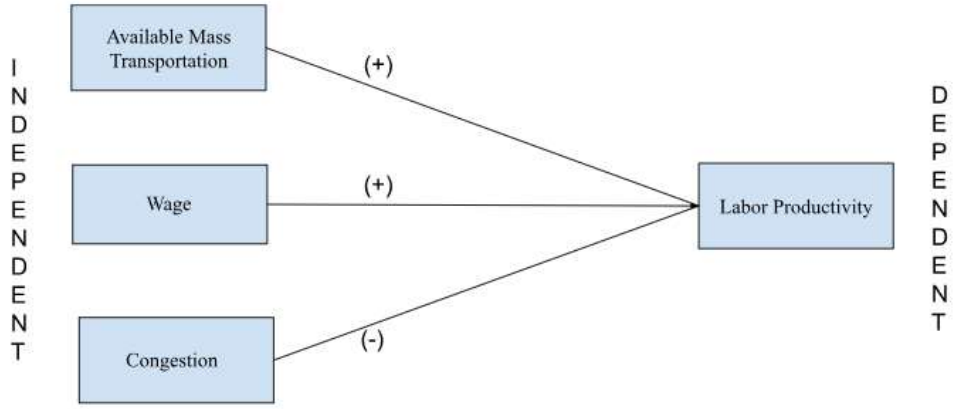
Existing research suggests that efficient modes of transportations promote local economic growth; according to Minten & Kyle (1999), transportation connection promotes local economy efficiency because improved mobility and lower material operation cost allow the domestic economy to effectively deploy their resources to much more profitable uses. Although previous research has mostly focused on the impact of road and rail infrastructure construction, according to Francisco & Tanaka (2019) it does give a general picture of how greater transportation accessibility benefits local economies.

While in the Philippine setting particularly in the nation's Metropolitan Hubs, there is a worrisome mobility problem. From lengthy lines to unpleasant traffic congestion, there is no doubt that improvements should be planned efficiently. With several studies taking place, such as the Tomtom traffic Index, GoShorty, and even the Asian Development Bank (ADB), it was found to be that the Metropolitan Hubs are one of the most congested cities in the world, and even earning the top spot on the 278 Developing Asian Countries. In addition, It was found that Metro Manila was placed 58th among the Urban Mobility Readiness study of the Oliver Wyman Forum and University of California Berkeley, out of the 60 countries that participated.

It is a fact that millions of employees travel in and out of the country's commercial district, with transportation also playing a role. In the day-to-day life of an employee, efficient transportation is a must. Transportation does have an effect on one's labor productivity. In the study conducted by Rich (n.d.) he discussed that transportation provides a number of benefits and heralded innovations that enhance the productivity in the movement of passengers.

As noted in Xu & Feng's (2022) study on how transportation influences company productivity, there were various outcomes indicating that good transportation and infrastructures had a favorable effect on economic growth studies. Majority of research has demonstrated the value of transportation systems to emerging countries. Certain studies, for example, have demonstrated the importance of transport in encouraging economic growth in Asia and South America (Straub & Terada-Hagiwara, 2011; Giordano et al., 2012). Ghani et al. (2014) discovered that improving transportation infrastructure increased resource allocation efficiency and encouraged industrial growth in India through the natural experimentation of India's Gold Quaternion Project for expressway rebuilding and upgrade. Therefore, based on the Filipino context, it is one of the factors we must examine while assessing our productivity. Moreover, the goal of this study is to determine the underlying cost of each Mode of Mass transportation bound by congestion, and its effect on Labor Productivity.

1.2. Conceptual Framework



1.3 Statement of objectives

The purpose of this research was to better understand the numerous costs and roots brought by the difficulties faced by the transportation sector and its effect on labor and the firm's productivity. Furthermore, the researchers aimed to uncover the underlying relationships of exogenous variables with labor productivity. The objectives of this study were:

To identify the effects of available mass transportation to labor productivity

To identify the effects of wage to labor productivity.

To identify the effects of congestion on labor productivity.

1.4 Statement of objectives

Hypothesis1

Ho: Available mass transportation has no significant impact on Labor Productivity

Ha: Available mass transportation has a significant impact on Labor Productivity

Hypothesis2

Ho: Wage has no significant impact on Labor Productivity

Ha: Wage has a significant impact on Labor Productivity

Hypothesis3

Ho: Congestion has no significant impact on Labor Productivity

Ha: Congestion has a significant impact on Labor Productivity

1.5 Scope and Limitations

The focus of this paper was on analyzing the relationship of the exogenous variables, Transportation, Wage, and Congestion to labor productivity in the Metropolitan Hub in the Philippines, which is Metro Manila (Luzon), Metro Cebu (Visayas), Davao Region (Mindanao). The paper was not limited to discussing only commuters or workers' transportation; it aslso covered the transportation mobility, influence of wage, and negative effects of road congestion. The researchers will be using the 2021 Philippine Statistical Yearbook and labor productivity statistics from 1991 to 2018, transportation mobility data, consumption on transportation of employees, and previous to current state of transportation in Metropolitan Hub in the Philippines related to road congestion.

1.6 Significance of the Study

This study analyzed the significance of transportation and its implications in Metropolitan Hubs's labor productivity. The researchers used studies from various countries and adjusted them to the Philippine setting, assuming the results could potentially be applied in the Philippines. The aim of the study is to determine the relations between transportation, its internal and external causes and costs caused by congestion, and how these are related to the workers' performance. Transportation is critical to worker productivity in many industries, notably logistics, and manufacturing. Efficient transportation infrastructure and services may boost productivity, lower transportation costs, and boost the competitiveness of these industries and sectors.

1.7 Definition of Terms

1. Digital Transportation - A mode of transportation where a phone application is utilized.
2. Conventional Transportation - A traditional mode of transportation which includes trains, traditional PUVs like Jeepney, Bus, Trains etc.
3. Wage - Something that is received oftentimes monetary to compensate for the work done by an employee.
4. Logistics - an industry whereby transportation of goods and resources is done.
5. Congestion - a situation in which something is too crowded or blocked.
6. Mobility - The ability to use transportation to get from one area to another in order to satisfy daily needs (Eltis, 2019)

2. Review of Related Literature

2.1. Section 1

Labor Productivity

Pugel (2020) in his book International Economics defines labor productivity as the number of units of output that a worker can produce in an hour. It is computed by dividing the number of output to the number of hours worked. International Labour Organization (ILO) Sziraczki (2015), highlighted the importance of labor productivity. According to the study, a highly productive economy means that the country can produce more goods or services with the same or less amount of resources. Furthermore, labor productivity affects everyone. For businesses an increased productivity brings higher profit and opportunity. For workers, increased productivity can translate to higher wages and better working conditions, and in the longer term, increased productivity is key to job creation. For the government, increased productivity results in higher tax revenues. Moreover, the aging population and economic integration needs to be taken into account.

A study conducted by the United States Bureau of Labor Statistics (2017), Bureau of Labor Statistics (BLS) used labor productivity to measure transportation productivity trends. BLS indicates that labor productivity changed over time for selected transportation sectors from 1990 to 2004. It demonstrates how labor productivity changes when influenced by external factors. From 1990 to 2004, air transportation had the highest worker productivity growth at 160.5 percent. It is due to traditional carriers implementing aggressive labor-saving strategies as well as significant output increases among low-cost carriers. The second-largest gain in worker productivity was seen in the rail transportation industry, at 116.3 percent. It is the outcome of labor-saving technologies that automate operational and administrative activities. Although worker productivity in transit transportation has fallen to 3.0 percent as a result of the total labor hours required to produce that is greater than the output.

Transportation has an impact on worker productivity as well. Gibson & Rozelle (2003) measured road density in Papua New Guinea by tracking the progression of coast-to-inland highway penetration. The headcount index fell by 5.3% as a result of the less than 3-hour decrease in access time criteria. Additionally, according to Donaldson (2009), the expansion of railroads in colonial India allowed areas to trade at reduced prices and increased economic exchanges with bigger overall impacts. Wage, like the transportation sector, has a significant impact on worker productivity. A fair and effective salary, according to Bağlıtaş (2021), is critical for businesses, industries, and the economy. Likewise, unfair income compensation causes workers to lose motivation, which leads to lower production. Lastly this paper will also tackle the influence of congestion to labor productivity. According to David & Gregory (2009), congestion reduces worker productivity by reducing the number of hours workers could have spent working due to the longer hours spent on the road.

2.1. Section 2

Transportation to Labor Productivity

Transportation connects the production variables in a complicated web of interactions among producers and consumers. The result is typically a more efficient labor distribution through the use of comparative abundance of natural resources, as well as the ability to achieve economies of scale and scope (Rodrigue & Notteboom, n.d.). The efficiency of delivery and human mobility thereby boosts the efficiency of space, capital, and labor. Economic growth is becoming more related to transportation advances, specifically infrastructure, but also to management expertise, which is critical in logistics. As a result, while transportation requires a lot of infrastructure, it also requires a lot of soft assets, such as labor, management, and information systems. To maximize advantages while minimizing costs and annoyance, decisions must be taken regarding how to use and run transportation networks. Kalasova et al. (2019) further discussed that transportation ranks among the most important components in the growth of every community. Transport is not an end in itself, but rather a tool of economic growth and a method of establishing social and regional integration. One of the indications of a prosperous society as well as the economic health of human behavior is the rising desire for mobility. The growth of society is inextricably linked to the development of transportation in all of its forms. Transportation has a detrimental influence on the environment in two ways: the creation of transportation infrastructure and the environmental impact of traffic. One of the most serious violators of environmental sustainability is road transport, which generates negative externalities for labor productivity and even the environment.

According to Francisco & Tanaka (2019) it does give a general picture of how greater transportation accessibility benefits local economies. The most noticeable consequence is lower transportation costs and more mobility, which leads to increased market activity. For example, Limao & Venables (2001) discovered larger trade volumes with decreased transit costs. Catalbas (2012), logistics is a major economic industry, and its significance is growing as globalization progresses. The industry is vital to global economic growth, and most other industries rely on efficient logistics. To be competitive, national economies rely on effective logistics management, may it be for the products or the people. Effective transportation provides enhanced mobility, time and cost-savings that lead to broader economic growth, and furthermore increases in disposable family income, corporate productivity, and market access (Weisbrod, 2009). Although it has a positive impact, we should also consider the long term effects that would lead to a negative effect, Weisbrod (2009) further discussed that an effective investment on transportation should be considered with its long term effects, there is a guarantee that costs and productivity might change due to depreciation.

The Philippines' urban transportation system is predominantly road-based, consisting of public utility jeepneys, buses, taxis, tricycles, and pedicabs. In Metro Manila, jeepneys and buses dominate road-based public transportation, with buses serving 805 routes and jeepneys serving 785 routes. Taxis, tricycles, and pedicabs provide express services, however, the latter two are only available in small towns (Asian Development Bank, 2012).

Figure 1 depicts the mode distribution and composition of trips taken by public transportation in Metro Manila in 2014. According to Fig. 1. The majority of journeys were generated by public transportation, specifically public utility jeepneys.

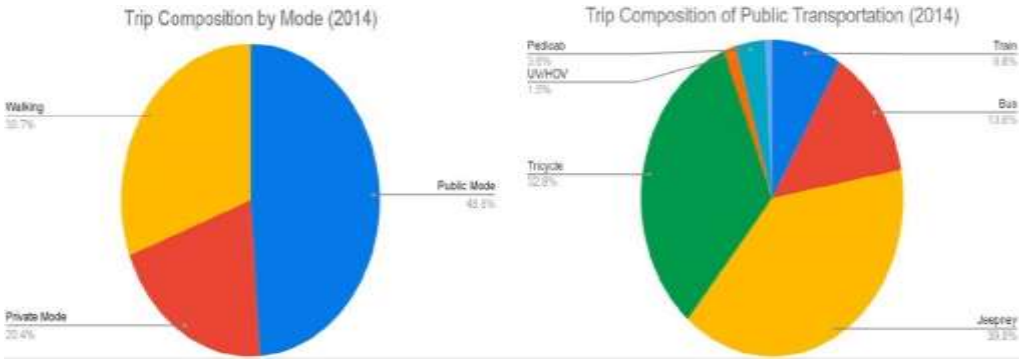


Fig. 1. Trip composition by mode (left) and trip composition of public transportation (right) Source: JICA & DOTC, 2015.

Metro Manila has a higher percentage share of public transportation than Jakarta, which has a 27% modal share (Prayudyanto & Thohir, 2017), and Kuala Lumpur, which has a 20% modal share (NKRA-UPT, as reported in Endut et al., 2015). However, it has fewer journeys created by private automobiles than Jakarta, which has 73% of trips generated by personal vehicles (Prayudyanto & Thohir, 2017). In the day-to-day life of an employee, transportation is a must. Transportation does have an effect on one's labor productivity. In the study conducted by Rich (n.d.) he discussed that transportation provides a number of benefits and heralded innovations that enhance the productivity in the movement of passengers. As noted in Xu & Feng's (2022) study on how transportation influences company productivity in China, there were various studies that indicated that good transportation and infrastructures had a favorable effect on economic growth studies (Aschauer, 1989; Duranton & Turner, 2011; Donaldson, 2018; Zhang, 2012). The majority of research has demonstrated the value of transportation systems to emerging countries. Certain studies, for example, have demonstrated the importance of transport in encouraging economic growth in Asia and South America (Straub & Terada-Hagiwara, 2011; Giordano et al., 2012). Ghani et al. (2014) discovered that improving transportation infrastructure increased resource allocation efficiency and encouraged industrial growth in India through the natural experimentation of India's Gold Quaternion Project for expressway rebuilding and upgrade. Therefore, based on the Filipino context, it is one of the factors we must examine while assessing our productivity.

Wage to Labor Productivity

One of the best drivers of employee motivation is pay. According to Saleh (2022), workers who are fairly rewarded are more likely to do well, but those who are unfairly treated are less likely to perform well. The study conducted by Bağlıtaş (2021) found that wage inequality lowers labor productivity, which is similar to Saleh. The productivity of the workers is decreased by 0.16% for every 1% increase in pay disparity. During the recession in the United States, household income and purchasing power declined, which had a little impact on labor input and labor productivity. However in European countries although employment does not change, labor productivity had a significant decrease Ohanian (2010). Contradicting Bağlıtaş , according to ILO (2016) minimum wage helps reduce wage dispersion but also increases labor productivity by promoting productivity gains into higher wages. This is because of the theory, efficiency wage.

Akerlof (1982) introduced the efficiency-wage theory, which discusses how a minimum wage encourages workers to perform at their best by comparing individual firms' pay levels. Ehrenberg & Smith (2009) argued that a firm having a slightly higher pay level than the minimum wage, compared to other individual firms, attracts more experienced and motivated workers and also more committed and productive employees. Owens & Kagel (2010) also found that the minimum wage and workers' performance have positive relationships if firms have executed a well-designed minimum wage that can result in slightly higher wages than the minimum wage at other firms and where employers can have the same or slightly higher average costs. However, it is believed that the efficiency-wage theory is only effective for firms that closely monitor employees' performance. Coviello, Deserranno, & Persico (2022) found that the relationship between the minimum wage and labor productivity becomes negative when workers' performance is not strictly monitored. In relation to this, firms frequently opted to pay fixed wages to employees when performance was not strictly monitored (Lazear, 1986). In contrast, Fehr & Gachter (2000) argued that in most cases, firms offer higher pay than minimum wages, and employees in return perform with their best effort than what they are paid for. This is the theory of the gift-exchange model, where it explains the relationship between workers' effort and wages provided by firms. To conclude, the influence of wages on labor productivity varies. In relation to transportation, according to Nicolas, Palmiano, & Villar (n.d.), workers' choice of transportation is affected by income level. It is found that low-income earners prefer to use public transportation, such as jeepneys, while middle income earners prefer to use standard buses, and lastly, high-income earners prefer private transportation, such as private cars and taxis.

Additionally, Rodirgue and Notteboomn (n.d), Hossain and Johnson (2018), and Francisco and Helble (2017) discovered that transportation is linked to producer, consumer, and distribution costs at the microeconomic level (the importance of transportation for specific parts of the economy). Thus, the significance of various transportation operations and infrastructure may be determined for each sector of the economy. Higher-income levels are often connected with a larger percentage of transportation consumption costs. Rodirgue and Notteboomn (n.d.) propagate claiming that transportation accounts for 10% to 15% of family expenses on average. In comparison, it contributes to around 4% of the expenses of each unit of production in manufacturing, however, this proportion varies substantially between sub-sectors.

On the contrary, Adamopoulos (2011), transportation costs can impair productivity within industries and skew resource allocation across locations and industries, resulting in low aggregate production per worker. He investigates the impact of disparities in transportation costs across nations and concludes that improving transportation productivity will benefit impoverished countries more than wealthy ones. However, he contends that lowering transportation costs alone, or in conjunction with other improvements, has only a minimal impact on resource allocation and wellbeing.

Congestion to Labor Productivity

Ogunsanya (1984) defined congestion as a scenario that develops when several cars are attempting to utilize the same route at one time across geographical and temporal dimensions. According to historic articles, there has always been traffic congestion. In ancient Rome, the Caesars observed that the passing of goods carts on narrow city streets so clogged them that they became impassable and hazardous for people (Downs, 2004). When highways are visibly clogged with automobiles, trucks, and buses, congestion is quite simple to spot, people crowded the sidewalks. Somiyuwa et al. (2015) concluded in his study that congestion negatively affects the flow of people and freight in most metropolitan places, both in perception and actuality, and is closely related to our history of highly developed mobility and accessibility (Downs, 2004).

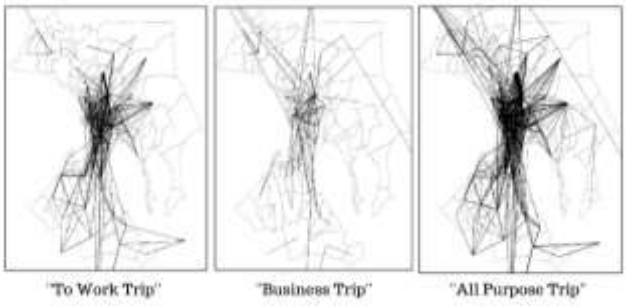
Everyone detests congestion problems, yet despite efforts to alleviate it, it just gets worse. This contradicts the theoretical tenet that all issues eventually find a resolution. In huge, developing metropolises across the world, increasing road congestion is an unavoidable condition. Peak-hour congestion is a natural byproduct of the way modern societies function and the citizens' strong motivations to achieve their goals, which ultimately overburden daily transportation infrastructure (David & Gregory, 2010). Too many people want to move about at the same time every day, which is the reason for increased traffic.

This is reliant on the economic and educational systems operating well, which calls for individuals to commute to work, attend school, and do errands at the same time in order to connect with one another. Due to the fragile position it has in the national economy and its crucial function in society, the situation becomes more devastating and unchangeable. It is important to note that this happens in every business district but it depends on how the planning works. In fact, it has developed into a cancer that is spreading its fangs throughout the world's biggest cities. Productivity is defined in the context of economics as the ratio of total business output to the weighted average cost of business inputs. Business output is measured in terms of dollars of sales, and business inputs are the costs associated with acquiring labor, machinery, supplies, mass transit, and other services.

Congestion delays can reduce productivity in three ways: by increasing the costs of existing delivery operations, limiting or reducing business sales due to a reduction in efficient marketing size, and rising unit costs due to the loss of opportunities for economies of scale and scope in production and delivery

processes Evers (1988), McCann (1993), Ciccone and Hall (1996), and Weisbrod, Vary, & Treyz (2001). The disruption of a city's road network has a great range of effects, from minor inconveniences to significant loss of access to basic commodities and services (Isla & Tekmono, 2016). According to Hensher and Puckett (2005), company expenses and productivity clearly show that firms suffer costs connected with moving goods and people that go beyond the immediate personal value of driver time and direct operating cost.

According to a survey conducted in the United Kingdom, traffic congestion was identified as the most important factor likely to impact spending and administration (Fernie, and Marchant, 2000). A significant number of transportation financial issues focus on the time portion of driving expenses (Small & Verhoef, 2007). According to the United Nations, (2011), increased road traffic congestion creates stress and exhaustion among people, which has a substantial influence on employee health and performance. According to Oni (1992), traffic congestion causes workers to fail to realize time management in their job, which affects their work development at institutions. Congestion, according to the co-location hypothesis, just stimulates employer-employee residential co-location (Crane & Chatman, 2003; Gordon et al., 1989; Levinson & Kumar, 1994).



(Figure 1) Source: One New Ph (2020)

(Figure 2) Source: Japan International Cooperation Agency (JICA) & Department of Transportation and Communications (DOTC). (2015). Transportation Demand Characteristics Based on MUCEP Person Trip Survey

Figure 1 & 2 shows the route maps of the metropolitan area wherein Makati, Pasig, and Quezon City have big enterprise agglomerations that draw a lot of "to work" and "business" journeys Japan International Cooperatin Agency (JICA) & Department of Transportation and Communications (DOTC) 2015. In addition it was also found that with the average 200,000 trips per day, there was indeed a negative correlation between Congestion and Labor Productivity.

Empirical research on job-housing imbalance (Cervero, 2007; Cervero & Wu,2009; Schwanen et al., 2004) showed substantial commuting burdens, whereas theoretical urban economic economic models imply congestion-induced urban economic waste and inefficiency (Arnott, 2007; Anas & Xu, 1999; Fujita & Thisse, 2002; Weisbrod, Vary, & Treyz, 2001), most prominently by lowering agglomeration benefits (Graham, 2007). Furthermore, research indicates industry-variant sensitivity to the potential impact of congestion, with service sectors being the least sensitive and manufacturing industries being the most susceptible, indicating that sector mix is crucial. Commuting has unavoidable repercussions for employees. The monetary expenses of transportation stand out as one of the most important aspects when determining where to look for work, whether to change employment or resign, and analyzing the compensation provided to job hopefuls (Kmruzaman et al, 2019). Aside from losing valuable time, it may result in stress and decreased productivity. Time lost during everyday journeys should be addressed in addition to monetary expenditures.

2.3 Section 3

Synthesis

The studies of Quintana et al, (2022) and Somuyiwa (2015) served as the foundation for assessing changes in labor productivity behavior when impacted by external influences. Labor productivity is defined as the number of units of output produced by a worker in an hour. It is calculated by dividing the

total number of output by the total number of hours worked. The recommended factors such as (1) Mode of Transportation (Conventional & Digital) and (2) Wages are projected to have a positive relationship to Labor Productivity based on the numerous evaluated journals. Moreover, (3) congestion has a negative relationship with labor productivity. As a result, the previously mentioned independent variables are external influences that can affect the quantity of units of output that a worker can create.

3. Research Method

3.1. Research Design

The researchers utilized a quantitative approach to determine the link between the study's exogenous and endogenous variables. The researchers were able to analyze the strength of the association between explanatory and outcome variables by using Ordinary Least Squares (OLS) panel data regression analysis. Along with OLS, the researchers also used diagnostic tests including Unit Root, Autocorrelation, Normality of Residuals, Specification Error, Multicollinearity, Heteroskedasticity, and Stability as econometric measurements.

3.2 Study Site

The area of the study is in the Philippines' National Capital Region (NCR) also known as Metropolitan Manila (Metro Manila), and the two other Metropolitan Hubs, Cebu and Davao City. The researchers considered the population density relating to the inclusion of the three Metropolitan Hubs. The researchers will be using a panel data regression.

3.3 Data Collection Procedure

This study was done by gathering secondary data. Mode of Transportation (Conventional and Digital Transportation), are all collected from Philippine Statistics Authority. The following would be the variables and their respective measurements: (1) Transportation was measured by Number of Motor Vehicles Registered by Type of Vehicle (2) Wages was measured by Family Income and Expenditure in Metro Manila, Cebu and Davao (3) Congestion was measured by the travel time delays (4) Labor Productivity was measured by the Labor Productivity Data. To match the data and variables Propensity Score Matching will be utilized wherein Quasi-experimentation wherein the study methodology entails using statistical methods to establish a simulated control group by matching each treated individual with a similar untreated individual based on similar qualities. The researcher may assess the impact of an intervention by performing these comparisons.

3.4 Data Analysis

3.4.1 Data Analysis

Labor Productivity

This paper examines how transportation, along with other exogenous factors, affects workers' labor productivity (LP) in the three Metropolitan Hubs, Manila, Cebu and Davao. Labor productivity (LP) was calculated by dividing the total number of outputs by the total number of hours worked by workers (Pugel, 2020). Labor productivity (LP) is defined by Gupta (n.d.) as a measurement to quantify workers' efficiency; thus, this paper used LP to measure workers' efficiency, which is represented by the equation below:

$$\boldsymbol{LP = \frac{O}{HW}}$$

Where:

LP = Labor Productivity

O = Output

HW = Hours Worked

Econometric Model

$$\boldsymbol{LP_{ct} = \beta_0 + \beta_1 MT_{ct} + \beta_2 W_{ct} + \beta_3 CG_{ct} + \varepsilon}$$

Where:

LP = Labor Productivity

MT= Mode of Transportation (Conventional and Digital Transportation)

W = Wage

CG = Congestion

c = City (What City)

t = Time

3.5 Research Method

3.5.1. Test for Unit Root

The Augmented Dickey-Fuller (ADF) test is used to test the existence of stationary variables. Stationary variables are detected in a time series of data when a null hypothesis cannot be rejected and therefore a unit root exists (Menegaki, 2021). The test is run by adding lagged variables to the dependent variables (Chong et al., 2021). The ADF is a crucial test to do in the regression to avoid erroneous findings (Lean et al., 2014)

3.5.2. Test for Autocorrelation

Autocorrelation occurs when an observation in an equation is influenced by a previous or potential observation in time. For instance, first-order autocorrelation emerges when a time series observation is compared to its preceding one. This phenomenon has been extensively studied and identified in commodities and pricing (Clements, 2010). While the Durbin-Watson statistic is calculated for lag 1, Durbin-Watson is computed for h delays. Consequently, the Durbin-Watson test fails to capture any autocorrelation beyond lag 1 (Mahan et al., 2015). To mitigate some limitations of the Durbin-Watson d autocorrelation test, analysts Breusch and Godfrey developed a comprehensive autocorrelation test that accommodates (1) non-stochastic regressors, such as lagged values of the regress and; (2) higher-order autoregressive patterns like AR(1), AR(2), and so on; and (3) simple or higher-order moving averages of white noise error terms (Gujarati, 2004).

3.5.3. Test for Normality of Residuals

The Jarque – Bera (JB) test is used to identify if residuals are normally distributed through Ordinary Least squares (OLS). If the p-value exceeds the predetermined significance level, the null hypothesis that residuals are normally distributed cannot be rejected; if the p-value is less than the established significance level, the alternative hypothesis that residuals are not normally distributed is accepted. This test is used to measure the skewness and kurtosis of OLS residuals (Gujarati, 2004).

3.5.4. Test for Specification Error

Ramsey's RESET, or regression for specification error, will be used to evaluate linear regression models if there are existing specification errors such as incorrect functional form, redundant and omitted variables (Gujarati, 2004). Ramsey's RESET, according to Choji & Datong (2016), is more accurate at all sample sizes in identifying a non-zero disturbance mean.

3.5.5. Test for Multicollinearity

Multicollinearity occurs when two or more variables have a nearly perfect or exact linear connection with each other, which is common when using OLS regression. One of the goals of regression is to discover how well the independent variable predicts the outcome. To determine the presence of multicollinearity, the Variance Inflation Factor (VIF) will be utilized. Additionally, if the predictors are associated, the variance of a predicted regression coefficient may be determined. If no variables are connected, all VIFs would be 1. (Calicdan et al., 2020). This issue skews the degrees of significance of independent variables and inflates standard errors. It has no effect on the model's fit, but it can reduce the accuracy of each of the independent variables (Clements, 2010).

3.5.6. Test for Heteroskedasticity

The Breusch-Pagan test was developed to determine if the estimated variance of residuals from regression is affected by the independent variable values (Calicdan et al., 2020). Heteroskedasticity exists if the variance of the error component is constant for all observations, which is an assumption of the Ordinary Least Squares (OLS) method (Salvatore & Reagle, 2002).

The White - Heteroskedasticity test was performed to determine if the variances of the regression residuals were uneven. White's generic test of heteroskedasticity does not rely on the normalcy assumption and is significantly easier to apply (Gujarati, 2004).

3.5.7. Test for Stability

Gujarati (2004) states that the Chow Breakpoint Test is used to identify structural changes that may be brought on by differences in the intercept, the slope coefficient, or both. The F-test is used in the model to find the optimal variance between the two regressions: single regression or two regressions. If the estimated f- ratio exceeds the critical value, the null hypothesis of no structural break at the specified observation is rejected. Otherwise, the null hypothesis is accepted when the f-ratio is less than the critical value (Calicdan et al., 2020)

4. Results and Discussion

4.1 Presentation of Results

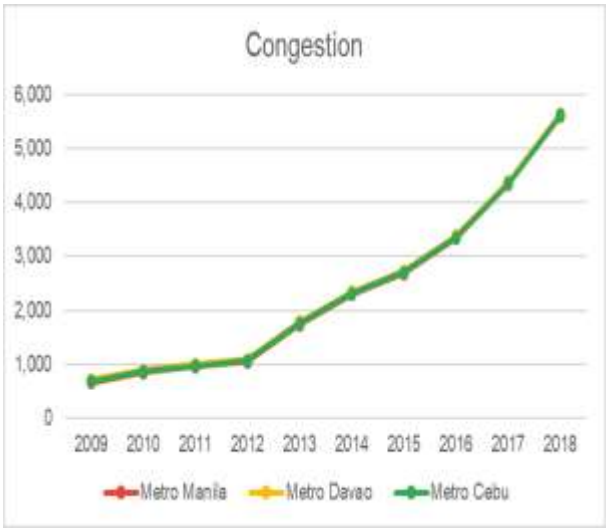
4.1.1 Research objectives

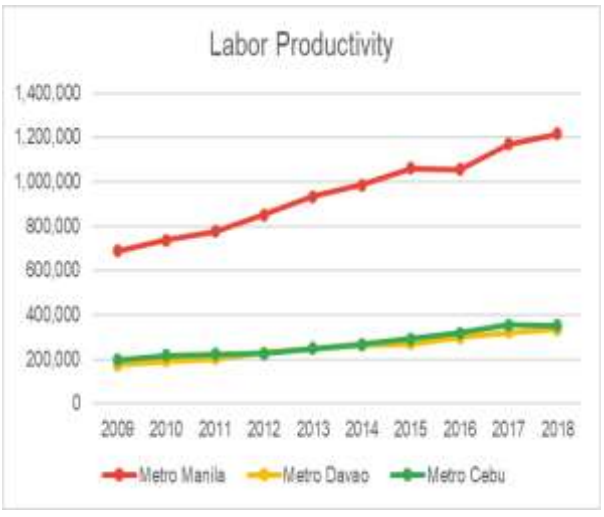
The objective of this study is to assess the impact of exogenous variables—mass transportation, wage, and congestion—on the endogenous variable of labor productivity. The study utilizes data from the Philippines Statistics Authority (PSA) and Euromonitor, analyzing data from 2009 to 2018 across three metropolitan hubs in the Philippines: Metro Manila, Metro Davao, and Metro Cebu. The analysis was conducted using the econometric model below.

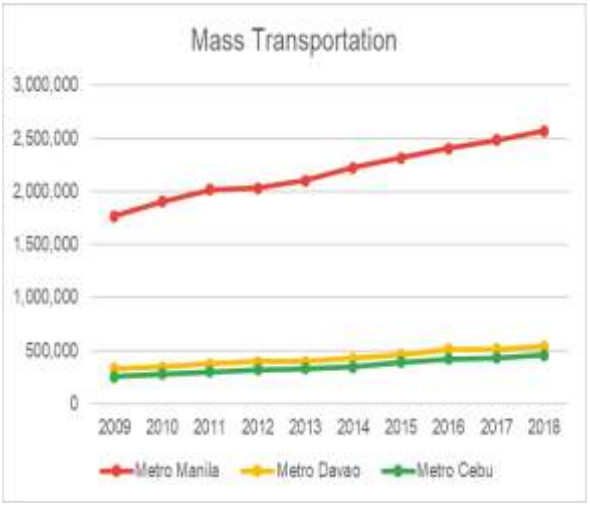
$$LP_{ct} = \beta_0 + \beta_1 MT_{ct} + \beta_2 W_{ct} + \beta_3 CG_{ct} + \varepsilon$$

4.1.2 Descriptive results

The graphs presented below show the historical trends of exogenous variables and the endogenous variable used in this study from 2009 to 2018. It illustrates that labor productivity and mass transportation in Metro Manila, located in the National Capital Region (NCR) of the Philippines, exhibit higher trends in labor productivity and mass transportation. Metro Davao and Metro Cebu display almost identical trends. As for the wages, all the metros show stagnant movement from 2009 to 2011 and an increase in 2012. In 2012, Metro Cebu wage exhibited a higher trend among the three metros. Congestion, on the other hand, shows a continuous increase for the three metros.







4.1.3 Numerical Results

Model 7: OLS, using observations 2009-2018 (T = 30)

Dependent variable: l_LP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	5.68289	1.70731	3.329	0.0028	***
D_1	0.476008	0.290962	1.636	0.1149	
D_2	−0.152160	0.0340590	−4.468	0.0002	***
D_3	−0.0025690	0.0045902	−2.052	0.0003	***
l_MT	0.432098	0.160060	2.700	<0.0001	***
l_W	−0.0197212	0.0272575	−0.7235	0.4764	
l_CG	0.193610	0.0330080	5.866	0.0003	***

Mean dependent var	12.88376	S.D. dependent var	0.651749
Sum squared resid	0.027679	S.E. of regression	0.033960
R-squared	0.997753	Adjusted R-squared	0.997285
F(5, 24)	2131.416	P-value(F)	5.99e-31
Log-likelihood	62.25589	Akaike criterion	−112.5118
Schwarz criterion	−104.1046	Hannan-Quinn	−109.8222
rho	0.253872	Durbin-Watson	1.467630

Figure 4.1.3 illustrates the outcomes of a multiple regression analysis detailing the variables influencing Labor Productivity during the period spanning 2009 to 2018, encompassing 30 observations. The comprehensive significance (P-value(F)) of the regression demonstrates statistical significance, recording a p-value of 5.60e-22, which falls below the 0.01% threshold of significance. Both the variables Mode of Transportation (MT) and Congestion (CG) exhibit statistical significance at the 0.1% significance level. Conversely, the variable Wage (W) shows statistical insignificance. Considering the specified significance level and the p-values associated with Mode of Transportation and Congestion, it is evident that these statistical variables hold significant weight. This substantiates the alternative hypothesis, indicating that Mode of Transportation and Congestion bear a substantial influence on Labor Productivity.

Based on the statistical results of the OLS regression, the econometric model equation was specified as:

$$LP= 5.68289 + 0.476008\ (D1) - 0.152160\ (D2) - 0.0025690\ (D3) + 0.744312\ (MT) - 0.0689042\ (W) + 0.139000\ (CG) + \varepsilon$$

The analysis posits that under the condition where all independent variables hold at zero, the labor productivity measures 2.43936. A discernible enhancement of 0.744312 in labor productivity is anticipated with each unit improvement in the mode of transportation. Conversely, an increase in wage by a single unit is linked to a decrement of −0.0689042 in labor productivity. Additionally, an increase of one unit in mobility within congestion is associated with a rise of 0.139000 in labor productivity

Table 4.1.3

Diagnostic Tests

Indicated below is the summarized result of the diagnostic tests:

DIAGNOSTIC TESTS[1]	**RESULT**
Unit Root (Augmented Dickey-Fuller)	LP (P-value: 0.017): The p-value of 0.017 suggests sufficient evidence to infer that the variable LP is likely to be stationary. This implies a consistent behavior over time without a unit root. MT (P-value: 0.400): With a p-value of 0.400, there is substantial evidence to regard the variable MT as stationary. This value indicates there is no presence of a unit root and suggests it is stationary. W (P-value: 0.004): The p-value of 0.004 indicates strong evidence that the variable W is likely to be stationary, as it opposes the hypothesis of a unit root. This implies a stable pattern over time. CG (P-value: 5.311e-87): The extremely low p-value (5.311e-87) strongly supports rejecting the null hypothesis of a unit root for the variable CG. Hence, it is highly likely to be stationary and exhibits consistent behavior over time.
Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)	The p-value of f-stat (0.159) is greater than 0.05 level of significance.
Normality Of Residuals (Jarque-Bera)	The p-value of f-stat (0.689) is greater than 0.05 level of significance.
Specification Error (Ramsey's RESET)	The p-value of f-stat (0.82) is greater than 0.05 level of significance.
Multicollinearity (Variance Inflation Factors)	All 3 independent variables are less than 10 VIF: ● (MT = 0.980), W = 0.3754), (CG = 0.2903)
Heteroskedasticity 1. Breusch-Pagan-Godfrey 2. White	1. The p-value of f-stat (0.405) is greater than 0.05 level of significance. 2. The p-value of f-stat (0.083) is greater than 0.05 level of significance.
Stability (Chow Breakpoint)	The p-value of f-stat (0.66) is greater than 0.05 level of significance.

(The significance of all diagnostic tests denotes the absence of deficiencies within the regression model, affirming its reliability and adequacy in analysis)

1.Unit Root Test

The outcomes from the Augmented Dickey-Fuller (ADF) test indicate that variables LP and W likely showcase stationary behavior, implying consistent patterns over time. However, variable MT may not exhibit stationarity, suggesting a potential lack of consistency. Meanwhile, variable CG shows strong indications of being stationary.

2.Autocorrelation Test

Autocorrelation or Durbin Watson test aims to identify similarities between variables. The test result indicates that the f-stat's p-value exceeds the 0.05 significance level, suggesting the absence of autocorrelation.

3. Normality of Residuals Test

[1]

The Jarque-Bera (JB) Test of Normality, a large-sample test relying on Ordinary Least Squares (OLS) residuals, suggests a f-stat p-value greater than 0.05. Hence, the null hypothesis is accepted, concluding that the residuals conform to a normal distribution.

4. Specification Error Test

The Ramsey's RESET tests various specification errors, such as incorrect functional form or omitted variables. The obtained f-stat p-value surpasses the 0.05 significance level, ruling out misspecification error and accepting the null hypothesis.

5.Multicollinearity Test

The Multicollinearity test checks for linear relationships among independent variables. Results reveal Variance Inflation Factors (VIF) well below 10 for each independent variable, thus accepting the null hypothesis that serious multicollinearity issues are absent.

6.Heteroskedasticity Test

Breusch-Pagan-Godfrey and White Heteroskedasticity Tests determine variance dependency and unequal regression residuals. Both tests indicate f-stat p-values exceeding 0.05, suggesting the absence of significant heteroskedasticity.

7. Stability Test

The Chow Breakpoint Test evaluates the regression model's stability across years. The obtained f-stat's p-value surpasses 0.05, accepting the null hypothesis, indicating the absence of a structural breakpoint.

4.2 Hypothesis Testing and Discussion of Results

4.2.1 Hypothesis Testing

Hypothesis1

Ho: Available mass transportation has no significant impact on Labor Productivity

Ha: Available mass transportation has a significant impact on Labor Productivity

Conclusion: Accept Null Hypothesis

Hypothesis2

Ho: Wage has no significant impact on Labor Productivity

Ha: Wage has a significant impact on Labor Productivity

Conclusion: Accept Alternative Hypothesis

Hypothesis3

Ho: Congestion has no significant impact on Labor Productivity

Ha: Congestion has a significant impact on Labor Productivity

Conclusion: Accept Alternative Hypothesis

4.2.2 Discussion of Results

1. Mode of Transportation has a positive relationship with Labor Productivity. As outlined in Chapter 2, as per Francisco & Tanaka (2019), there exists a comprehensive overview illustrating the positive impact of enhanced transportation accessibility on local economies. A prominent consequence is the reduction in transportation expenses and heightened mobility, subsequently resulting in augmented market activity. Additionally, Catalbas (2012) highlighted logistics as a significant economic sector, with its importance growing amidst the progression of globalization. Furthermore, findings from Weisbrod's study (2009) underscore the pivotal role of efficient transportation in advancing mobility, economizing time and costs, thereby fostering broader economic expansion. Additionally, it contributes to increased disposable income for families, improved corporate productivity, and expanded market reach.

2. Wage has a negative relationship on Labor Productivity; however it is statistically insignificant. As emphasized in Adamopoulos' (2011) research, transportation expenses have the potential to diminish productivity within industries and disrupt the allocation of resources among locations and sectors, consequently leading to reduced overall output per worker. Adamopoulos examines how discrepancies in transportation costs among nations influence outcomes and concludes that enhancing transportation efficiency would be particularly advantageous for underprivileged nations rather than affluent ones. Nonetheless, he argues that solely reducing transportation expenses or combining such efforts with other enhancements yields only marginal effects on resource distribution and welfare.

3. Congestion has a positive relationship with Labor Productivity, which means that the data on Mobility highlighted relates to the studies of Evers (1988), McCann (1993), Ciccone and Hall (1996), and Weisbrod, Vary, & Treyz (2001) which underscore the correlation between congestion and Labor Productivity. These authors have collectively highlighted how congestion-induced delays can erode productivity through three key channels: inflating costs in existing delivery operations, constraining business sales due to reduced market reach, and escalating unit expenses by missing opportunities for economies of scale and scope in production and delivery processes. Additionally, the United Nations (2011) notes that heightened road traffic congestion significantly contributes to stress and fatigue among individuals, impacting employee health and performance substantially. Oni (1992) further argues that traffic congestion disrupts effective time management for workers, impeding their professional growth within organizations. Moreover, congestion aligns with the co-location hypothesis, fostering the residential co-location of employers and employees as discussed in the results of the the studies of Crane & Chatman (2003), and Gordon et al. (1989)

4. The impact on labor productivity between Metro Cebu and Metro Davao stands out significantly compared to Manila, as evidenced by their competitive positions in the Philippines' metropolitan landscape. Metro Cebu, renowned as a hub for infrastructural advancements, thriving trade, and convenient access to neighboring islands, undoubtedly fosters a conducive environment for enhancing labor productivity. In 2021, Cebu held the title of the richest province in the Philippines. It continued to maintain its position among the top ten wealthiest provinces after that year. Conversely, Davao, holding the distinction of being the 4th most competitive city in the Philippines, sustains a vibrant economic landscape and implements sustainable modernization strategies. These factors collectively contribute to the positive effects observed on labor productivity in these regions.

5. In contrast, Manila's influence on labor productivity remains inconsequential due to prevalent issues such as traffic congestion and its densely populated metropolitan setting. Despite continuous efforts towards rehabilitation and sustainable modernization initiatives, the city grapples with adverse effects on labor productivity. The persistent challenges of congestion persistently impede the achievement of its productivity goals, rendering Manila continually clogged and struggling to meet its objectives despite ongoing improvement endeavors. Despite Manila's status as the capital of the Philippines, labor productivity influences its functioning. The region's heavily congested roads cause delays in work, impacting employees' performance and service delivery, thereby affecting the overall labor productivity of the area. This doesn't just impact individual employees but also has repercussions on the region's economic performance as a whole.

6. From 2015 onwards, it was found that both Metro Cebu and Metro Davao have witnessed the successful implementation of various transformative transportation infrastructure projects. Notable among these endeavors in Cebu is the Cebu Bus Rapid Transit (BRT) system, a pioneering mass transit project aimed at easing traffic congestion and enhancing commuter accessibility within the city. Additionally, the ongoing construction of the Cebu-Cordova Link Expressway, a vital bridge connecting Cebu City to Mactan Island, signifies a substantial leap in enhancing inter-city connectivity and promoting economic growth.

7. Similarly, in Metro Davao, initiatives such as the Davao City Bypass Construction Project, which involves the development of a network of highways to divert heavy traffic away from the city center, stands as a testament to the region's sustainable commitment to modernizing its transportation infrastructure. Furthermore, the ongoing expansion and improvements to the Davao International Airport play a pivotal role in fostering regional connectivity, bolstering tourism, and facilitating economic development and productivity.

8. Contrastingly, the transportation infrastructure landscape in Metro Manila has been marred by persistent delays and setbacks in various projects. Notable among these stagnating initiatives is the long-overdue Metro Manila Subway Project, which has faced numerous challenges, including land acquisition issues and bureaucratic hurdles, leading to substantial delays beyond the scheduled completion dates. The stark contrast between the proactive advancements in Cebu and Davao infrastructure projects and the prolonged stagnation in Metro Manila underscores the need for a comprehensive reevaluation of administrative procedures and policy frameworks governing infrastructure development.

5. Results and Discussion

5.1 Summary, Conclusion, and Policy Implication

5.1 Summary

This paper focuses on determining the impact of transportation on labor productivity in the Metropolitan Hubs in the Philippines, specifically Metro Manila, Metro Cebu, and Metro Davao. The selection of these metros is based on their competitiveness, determined by population density, with Metro Manila, Metro Davao, and Metro Cebu ranking among the top 10 most competitive cities in the Philippines. The research delves into the relationships between exogenous variables and the endogenous variable. Mass transportation and congestion demonstrated significance in the panel data regression test. However, congestion exhibited a negative effect on the endogenous variable, Labor Productivity, while mass transportation displayed a positive effect on it. On the other hand, wage showed insignificance in the panel data regression test, indicating no correlation with Labor Productivity. The researchers drew inferences from 30 observations using panel data regression, gathering data from the Philippine Statistics Authority (PSA) and Euromonitor.

5.2. Conclusion

5.2.1 Available Mass Transportation to Labor Productivity

Enhanced labor distribution efficiency often results from leveraging the comparative abundance of natural resources, coupled with the realization of economies of scale and scope. This optimization in resource utilization amplifies the effectiveness of delivery systems and human mobility, thereby bolstering the efficient use of space, capital, and labor.

The correlation between transportation advancements, particularly infrastructure, and economic growth is increasingly evident. Management proficiency in logistics plays a pivotal role in this relationship. Analysis based on Ordinary Least Squares (OLS) regression suggests a positive association between Mass Transportation and Labor Productivity. In essence, efficient transportation systems, in both capacity and effectiveness, empower increased productivity among laborers, optimizing operational output for companies.

This shows that enhanced transportation accessibility positively impacts local economies and notably, reduced transportation expenses and heightened mobility, fostering expanded market activities. Moreover, amplified trade volumes due to decreased transit costs as well as it only proves that logistics as a substantial economic sector, particularly in the context of globalization. Efficient logistics management is indispensable for the global economic framework, as most industries rely heavily on it. National economies strive for competitiveness, necessitating effective logistics management, whether for goods or people.

Efficient transportation systems offer increased mobility, along with time and cost savings, which in turn fuel broader economic growth. This growth manifests in augmented disposable family income, elevated corporate productivity, and widened market access.

5.2.2 Wage to Labor Productivity

Building upon the noteworthy discovery of the indirect relationship between wages and labor productivity, the inclination for individuals to work less when faced with higher wages echoes the premises of the backward bending theory. This economic theory contends that as wages initially increase, individuals are incentivized to work more due to the higher returns per hour. However, beyond a certain point, the theory proposed a reversal in behavior, where further wage increases lead to a diminishing desire to work more hours.

This principle aligns seamlessly with the observations unveiled in the study. As wages rise, individuals might opt for increased leisure time, choosing to work fewer hours despite the potential for higher earnings. Consequently, this phenomenon has significant implications for labor productivity. While higher wages are conventionally assumed to motivate individuals to work harder, the reality reflected in the research suggests a more nuanced relationship. Beyond a certain threshold, higher wages might paradoxically result in decreased labor input, thereby impacting overall productivity

Moreover, these insights pose critical considerations for policymakers and stakeholders. Understanding the intricate dynamics between wages, work incentives, and productivity is crucial in designing effective labor policies and economic strategies. Striking a balance between offering fair wages to incentivize work and preventing a reduction in productivity due to increased leisure choices is a delicate task that requires a nuanced approach.

Therefore, Adamopoulos's study not only reinforces the relevance of the backward bending theory in explaining certain behaviors in the labor market but also emphasizes the importance of evaluating wage policies in a holistic manner, considering their potential implications on overall productivity and work incentives within the economy. This understanding is instrumental in crafting policies that foster sustainable economic growth while ensuring the well-being of the workforce.

5.2.3 Congestion to Labor Productivity

The panel data analysis reveals that congestion significantly and adversely affects labor productivity. From 2009 to 2018, congestion consistently escalated across the three metros, supporting the acceptance of the alternative hypothesis that underscores congestion's substantial impact on labor productivity. Congestion is an unavoidable issue in the Philippines, particularly when standard working schedules synchronize across various corporations. This synchronization leads to slower travel times, resulting in employee lateness and delayed work outcomes. This factor significantly influences labor productivity in these metros. The time that could have been utilized for productive work is wasted while stuck in traffic, highlighting the opportunity cost of commuting to work. Congestion triggers a chain reaction, impacting not just employee performance but also overall company performance. Employees, as integral stakeholders, experiencing decreased performance will consequently lower sales and the company's overall performance.

5.3. Policy Implication

This research endeavor is essential to understanding the complex relationships that exist between labor, transportation, and economic stability—especially in the context of Philippine metropolitan hubs. By examining the intricacies of transportation networks and their influence on many sectors, this research provides an all-encompassing comprehension of the interconnectedness that influences economic efficiency. Improved transportation systems can also enhance and boost competitiveness among the three metros or even throughout the entire Philippines. Enhanced transportation creates more opportunities for a broader range of products or services. It clarifies how an efficient transportation system not only makes it easier for products and services to move

around, but also how important it is for proficient employees to have access to firms located across these centers. Furthermore, in addition to its direct economic consequences, this study highlights the wider societal repercussions of transportation issues in these Metropolitan Hubs. The report emphasizes how congestion and inefficient transportation systems not only impede economic development but also fuel social problems including worker stress from long commutes, environmental damage, and unequal access to job opportunities. Policymakers, stakeholders, and business leaders must comprehend these complex effects in order to put into practice comprehensive plans that improve the general well-being of the communities dependent on these hubs in addition to addressing economic issues.

To sum it up, this research makes a substantial contribution to the current discussion on the complex interplay of labor, transportation, and economic stability in the Philippine Metropolitan Hubs. This study offers important insights that can direct the development of policies and interventions aimed at fostering a more effective and inclusive transportation infrastructure, thereby fostering sustained economic growth and societal well-being. It does this by illuminating the complex effects of transportation challenges and their broader implications.

Current initiatives, policies, and programs of the government that our study can support include: (1) Senate Bill No. 1121, also known as the proposed PTSB Act (National Transportation Safety Board Act), underscores the State's commitment to preventing accidents and safeguarding lives and property within the transportation sector. The bill aims to promote safety in the transportation of individuals, goods, and commodities by conducting independent accident investigations. It also emphasizes the need for continual and impartial evaluations of operating practices and regulations within government agencies responsible for implementing transportation laws. Furthermore, the bill seeks to establish and enforce safety improvement standards for adherence and implementation by these agencies and relevant private sectors.

(2) The LRT-1 Cavite Extension Project signifies a substantial expansion initiative set to increase the total count of LRT-1 stations from 20 to 28. Encompassing major metropolitan areas such as Quezon City, Caloocan, Manila, Pasay, Paranaque, and extending all the way to Bacoor, Cavite, this project will elongate the existing railway system by 11 kilometers. Expected to cater to an estimated 800,000 daily passengers, this extension initiative is also projected to stimulate and bolster commercial development in the areas surrounding the new rail stations. Commuters stand to benefit from a more efficient and modern integrated transportation system, as travel time from Pasay City to Cavite is anticipated to significantly decrease from an hour and a half to just twenty-five to thirty minutes.

(3) The North-South Commuter Railway Extension (PNR North 2 South Commuter Project) and the Metro Manila Subway Project Phase 1 initially garnered considerable attention for their scope and impact. The subway project secured funding from the Japan International Cooperation Agency (JICA), while the rail projects received financial support from both the Asian Development Bank (ADB) and JICA. For projects funded by JICA, U.S. companies are not eligible to be listed as the principal contractors; however, opportunities for subcontracting and supply exist for potential involvement.

(4) The extension initiative for the Light Rail Transit Line 1 (LRT-1), the primary metro line in the Manila LRT system, stretches from Congressional Ave. in Quezon City to Baclaran in Paranaque city. This extension project aims to lengthen the railway line's reach from Baclaran to Bacoor city, Cavite. In addition to easing traffic congestion in the Paranaque-Las Pinas-Cavite corridor, the expansion endeavor intends to stimulate economic growth within the areas surrounding the newly established rail stations. Initially accommodating 500,000 individuals, the extension initiative anticipates an increase in capacity to serve up to 800,000 commuters.

(5) The National Transport Policy (NTP), resulting from a comprehensive study and extensive consultations, stands as a blueprint designed to fulfill the Transport Vision's aspirations. This vision envisions a national transport system that is "safe, secure, reliable, efficient, integrated, intermodal, affordable, cost-effective, environmentally sustainable, and people-oriented," aiming to enhance the overall quality of life for citizens. This policy represents a collective effort toward fostering a transportation landscape that prioritizes safety, reliability, efficiency, integration, affordability, cost-effectiveness, environmental sustainability, and a strong focus on meeting the needs and well-being of the people it serves.

(6) In consideration of future research and studies, the researchers recommend to delve deeper into the multifaceted variables encompassing transportation infrastructure and its direct correlation with labor productivity. Expanding the scope of these studies to encompass a comparative analysis among countries, particularly within the ASEAN region, would significantly contribute to a more comprehensive understanding of the intricate dynamics between transportation systems and workforce efficiency. This expanded research approach holds the potential to yield invaluable insights into optimizing transportation networks and enhancing productivity on a regional scale, thereby fostering sustainable economic growth and development, and even improvement on the transportation sector of the Philippines.

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