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# Study on regional linkage: the cases of six city-provinces in Southeast of Vietnam

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**ABSTRACT**
Regional linkage is an indispensable requirement of a market economy with established criterion, that creating growth poles in a national economy. The objective of this paper is to study the correlation between six city-provinces in the Southeast of Vietnam and the productivity and GDP of logistics transport (LTI GDP) in Ho Chi Minh (HCM), Vietnam. The methodology is Cronbach's Alpha, Correlation Pearson and Multivariate regression by series time data. The highlight findings are while HCM urban residents has the same direction impact on Logistics transport (LT) freight productivity calculated on labour (LP1), TN province female population has opposite direction impact on it. About (LP2) LT passenger productivity calculated on labour that while TN province female population has same direction impact on (LP2), BV urban residents has opposite direction impact on it. Regarding to (CP1) LT freight productivity calculated on capital that while BP province population density has same direction impact on CP1, TN province female population has opposite direction impact on it. About (CP2) LT passenger productivity calculated on capital, while BP rural residents has same direction impact on CP2, TN province population density has opposite direction impact on CP2. And finally, (LTI GDP) logistics transport industry gross domestic product that while TN province population density has same direction impact on LTI GDP, HC, BD, BV urban residents have opposite direction impact on LTI GDP

**KEYWORDS**
regional linkage; logistics transport productivity; southeast Ho Chi Minh Vietnam

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## (1) INTRODUCTION

Regional linkages include key criterion of population, population density, population gender and gender distribution by urban and rural areas. Accordingly, on the basis of division of labour with comparative advantages, investment, in order to improve the efficiency of regional and national development. In the current context in any economics, it is necessary to have strategy of social-economic for each region to serve as a basis for areas to develop their own socio - economic development strategies, promote national economy. Regional and inter-regional relationship needs to be given adequate attention, however localities almost independently run social - economic activities within their respective localities. Regional policies have not been given due attention, so the development linkages between localities as well as nation still face many obstacles. Such these cooperation and linkage between localities should be considered as a national strategy.

David Ricardo advocates the development of trade based on comparative advantage. Based on comparative advantages in labour and natural resources to create large economic centres. David Ricardo also believes that these economic centres will be the locomotive for national economic development [1]. The analysis of development resources, commercial capacity and showing comparative advantages in shaping regional development is necessary in planning regional development.

The linkages will be formed in each region with the different advantages of the localities that will create the division of labour. It will form development centres. The interdependence of sectors in the development of trade and production promotes regional linkages to develop. To be able to promote regional development in terms of both economic scale and development space, it is not only that we should analyze the interdependence relationships of business groups, but also the problems of concentration of production space need to be analyzed. The advantage of economic scall increases the region's competitiveness and at the same time increases the development spreading. Economic and industrial concentration form cities, and there will be an interaction between the urban growth pole and its pervasive adjoining regions [2]. The spatial organization of the region with production and trade links in a center with an abundance of resources is emphasized, including highly skilled human resources. Therefore, there is constant growth and change leading to a spillover effect attracting development in the periphery. The periphery has more workers at a lower level and development depends on the center [3]. Awkward linkage effects arising from the input supply needs of a newly established industry. While the forward linkage effect arises from using the output of that industry as the input of other industries to follow. The linkage effect is seen as the impulses that creates new investments through the movement of input output relationships. Regional links create consumer links, production links [4].

The Southeast region of Vietnam consists of six city - provinces which are Ho Chi Minh (HCM/HC), Binh Phuoc (BP), Tay Ninh (TN), Binh Duong (BD), Dong Nai (DN) and Ba Ria - Vung Tau (BV) where it is the most important geographic position in economy of Vietnam country. With a large population, leading the Vietnam country in export, attracting foreign direct investment. Therefore, study on regional linkage is really necessary to meet the strategic needs of national economic development.

The objective of this paper is to assess the relations between six city-provinces in the Southeast of Vietnam and the productivity and LTI GDP in HCM, Vietnam by analyzing Cronbach's Alpha, Correlation Pearson and Multivariate regression.

This paper has nine main sections which are section 1 is introduction, section 2 is literature review, methodology will be presented in section 3, section 4 will be introduction of the Southeast City - provinces of Vietnam, section 5 is introduced about logistics transportation, source data is in section 6, study results will be presented in section 7, section 8 is for discussion and finally conclusion will be written in section 9

## (2) LITERATURE REVIEW

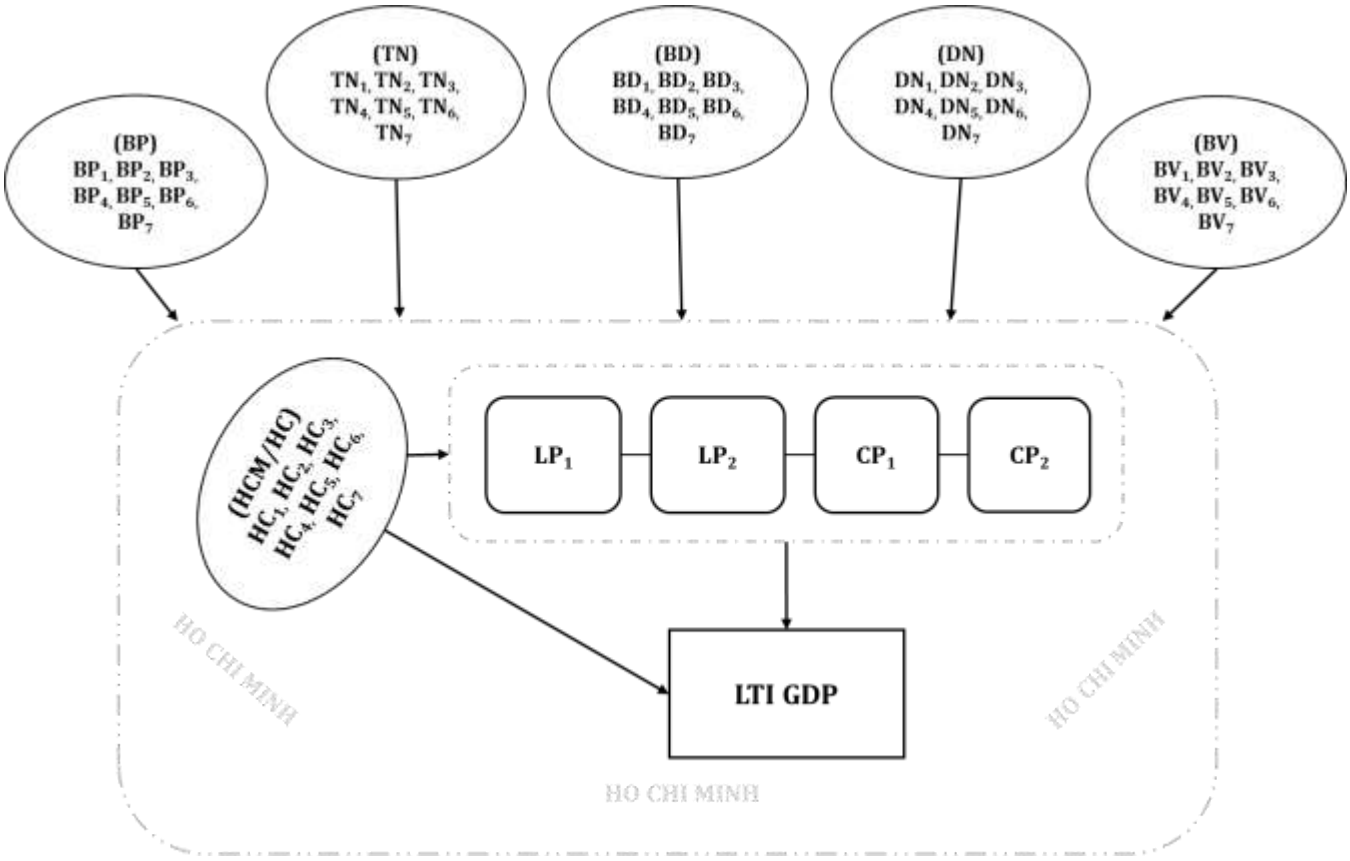
Regional linkage creates significant differences in the spillover effects of different types of policies in different urban areas. The core cities' policy spillover often reduces the changing characteristics of the real estate market generally [5]. The regional linkages that has intermediate inputs and capital goods can promote inter-regional collaborative innovations, and there is positively intermediating relationship between the linkages of capital goods and the inter-regional collaborative innovations. The regional linkage is also related to capital goods, network capital, and collaborative innovation is stronger when the regional pairs have higher Similarity of the economic development level [6]. Regional and spatial linkages give policies and regional endowments that includes human capital, transportation infrastructure, and enterprise ownership, are crucial in explaining these heterogeneities in regional technology spillover [7]. The main economic relations of regional linkgare such as interregional commodity flows, labour flows and capital flows that reveals the important effect that comes from the regional differences and linkages. The specifications of the regional differences and key linkages have significant influences on policy analysis [8]. Regional linkage for high quality win-win mining linkages in the Chilean mining regions is very weak something that strongly constrains their possibility of achieving sustainable forms economic development [9]. Study on regional linkage in China in China, especially in the Beijing-Tianjin-Hebei (Jing-Jin-Ji) urban agglomeration reveals that the contribution of scale effect, intensity effect and structure effect was about 40%, 40% and 20% for the NTE from Hebei province to Beijing, respectively [10]. Co-movement of asset prices or cross-correlation in market returns among these markets, especially in global event is proven by empirical studies that regional economic integration, regional markets linked with a common currency emerge with the development of globalization [11]. Geospatial attributes and regional economic association in China influence to economic, social, and technological factors exhibit significant differences in different cities, and all of these factors present regional spreading effect [12].

The strength of economic integration in regional link between town and hinterland and to estimate the magnitude spillover which is shown to be dependent on regional linkage differences in the local economy [13]. By the regional linkage belonging to twelve countries of the former EU15 during 1995–2002, the relationship between economic growth, knowledge and human capital endowments which are most effective factors enhancing the growth of GDP per capital [14]. A well-organized network between regional link can achieve an effective healthcare [15]. In China, industrial linkages that not only promote growth of industrial products, but also creates CO2 emissions at the regional level have been less concerned, Minerals in the East Coast exports a large amount of CO2 emissions to Construction [16]. Silk Road is one of form of regional linkage between Central Asian countries and China. In the field of trade, Central Asia's ex- changes with other Asian countries have been growing steadily since the 1990s [17]. There are changes in economic regional interlinkages in Europe which is a significant surge in regional synchronisation, Ile de France, Inner London and Lombardia are most interrelated with the rest of Europe, sectoral composition explains regional synchronisation in Europe and sectoral composition has important implications for aggregate economic fluctuations [18]. Regional linkage between Asia and Latin America since 1990 indicates that the significance of the causality varies considerably over time and it tends to strengthen particularly at the time of major financial crises, and there is inter-regional asymmetry in the causality and persistence of shocks on market linkages [19]. Market linkages in the region between China, and Japan is a dominant driver East Asian equity markets and crises are conducive to increased cross-border linkages [20].

## (3) METHODOLOGY

### (3.1) Study framework

simulating the regional linkage through the relations between forty-two independent variables and five dependent variables.



### (3.2) Variables of study model

### (3.2.1) Independent variables

**TABLE 1:** Describing and naming independent variables

| Independent Variables / City /Province name | City/Province Area ($km^2$) | City/Province population (Person/km) | City/Province population density (People) | City/Province male population (Thousand People) | City/Province female population (Thousand People) | Urban residents (Thousand People) | Rural residents (Thousand People) |
|---|---|---|---|---|---|---|---|
| Binh Phuoc | $BP_1$ | $BP_2$ | $BP_3$ | $BP_4$ | $BP_5$ | $BP_6$ | $BP_7$ |
| Tay Ninh | $TN_1$ | $TN_2$ | $TN_3$ | $TN_4$ | $TN_5$ | $TN_6$ | $TN_7$ |
| Binh Duong | $BD_1$ | $BD_2$ | $BD_3$ | $BD_4$ | $BD_5$ | $BD_6$ | $BD_7$ |
| Dong Nai | $DN_1$ | $DN_2$ | $DN_3$ | $DN_4$ | $DN_5$ | $DN_6$ | $DN_7$ |
| Ba ria Vung tau | $BV_1$ | $BV_2$ | $BV_3$ | $BV_4$ | $BV_5$ | $BV_6$ | $BV_7$ |
| Ho Chi Minh | $HC_1$ | $HC_2$ | $HC_3$ | $HC_4$ | $HC_5$ | $HC_6$ | $HC_7$ |

***Source:*** studied by author

### (3.2.2) Dependent variables

$LP_1$ is freight productivity of logistics transport industry (LT) which calclated on labour

$$LP_1 = \frac{\text{Total volume freight of LT which have been carried}}{\text{Total labour of LT}}$$

$LP_2$ is passenger productivity of LT which calclated on labour

$$LP_2 = \frac{\text{Total number of passenger of LT who have been transported}}{\text{Total labour of LT}}$$

$CP_1$ is freight productivity of LT which calclated on capital

$$CP_1 = \frac{\text{Total volume freight of LT which have been carried}}{\text{Total capital of LT}}$$

$CP_2$ is passenger productivity of LT which calclated on capital

$$CP_2 = \frac{\text{Total number of passenger of LT who have been transported}}{\text{Total capital of LT}}$$

LTI GDP is Logistics Transport Industry Gross Domestic Product
GDP is gross domestic product based the calculation method of Vietnam [21] which is calculated by formula below.
GDP on demannd = C + G + I + E - M
C: final household consumption
G: government final consumption
I: investment (aggregate accumulation)
(E-M): the difference between goods export and services export
GDP on supply = total value added at base price + tax

### (3.3) Cronbach's Alpha

Cronbach's Alpha is to assess the reliability between forty-two independent variables consists of $BP_1$, $BP_2$, $BP_3$, $BP_4$, $BP_5$, $BP_6$, $BP_7$ of Binh Phuoc province, $TN_1$, $TN_2$, $TN_3$, $TN_4$, $TN_5$, $TN_6$, $TN_7$ of Tay Ninh province, $BD_1$, $BD_2$, $BD_3$, $BD_4$, $BD_5$, $BD_6$, $BD_7$ of Binh Duong province, $DN_1$, $DN_2$, $DN_3$, $DN_4$, $DN_5$, $DN_6$, $DN_7$ of Dong Nai province, $BV_1$, $BV_2$, $BV_3$, $BV_4$, $BV_5$, $BV_6$, $BV_7$ of Ba Ria Vung Tau province and $HC_1$, $HC_2$, $HC_3$, $HC_4$, $HC_5$, $HC_6$, $HC_7$ of Ho Chi Minh city

Cronbach's Alpha (CAL), (Lee Cronbach, 1951)

(1) $$CAL = \frac{n}{n-1}\left(1-\frac{\sum_{i=1}^{n} a_i^2}{a_v^2}\right)$$

As Equation (1) states:
Where,
n is number of observed variables
v is observed variables
$a_v^2 = \sum_{i=1}^{n} a_i^2 + \sum_{i=1}^{n} \sum_{w \neq i}^{n} a_{iw}$
w is in [1, 42] and w ≠ i

### (3.4) Pearson Correlation (PC)

PC is used to check up how strong and which direction of the relations between six independent variables ABP, ATN, ABD, ADN, ABV, AHC and one dependent variable ADPV.
A PC coefficient (PCC) has significance in [0,1]

(2) $$PCC = \frac{n(\sum ABP.ATN.ABD.ADN.ABR.AHC.ADPV) - (\sum ABP)(\sum ATN)(\sum ABD)(\sum ADN)(\sum ABV)\ \sum AHC)\ \sum ADPV)}{\sqrt{[n\sum ABP^2 - (\sum ABP)^2]\,[\sum ATN^2 - (\sum ATN)^2][\sum ABD^2 - (\sum ABD)^2][\sum ADN^2 - (\sum ADN)^2][\sum ABV^2 - (\sum ABV)^2][\sum AHC^2 - (\sum AHC)^2][\sum ADPV^2 - (\sum ADPV)^2]}}$$

As Equation (2) states:
Where,
n is number of observed variables, in this paper n = 7 including ABP, ATN, ABD, ADN, ABV, AHC, ADPV
ABP = Average [$BP_1$, $BP_2$, $BP_3$, $BP_4$, $BP_5$, $BP_6$, $BP_7$]
ATN = Average [$TN_1$, $TN_2$, $TN_3$, $TN_4$, $TN_5$, $TN_6$, $TN_7$]
ABD = Average [$BD_1$, $BD_2$, $BD_3$, $BD_4$, $BD_5$, $BD_6$, $BD_7$]
ADN = Average [$DN_1$, $DN_2$, $DN_3$, $DN_4$, $DN_5$, $DN_6$, $DN_7$]
ABV = Average [$BV_1$, $BV_2$, $BV_3$, $BV_4$, $BV_5$, $BV_6$, $BV_7$]
AHC = Average [$HC_1$, $HC_2$, $HC_3$, $HC_4$, $HC_5$, $HC_6$, $HC_7$]
ADPV = Average [$LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP]

### (3.5) Multivariate regression

(3) $LP_1 = a_0 + a_1BP_{[1,7]} + a_2TN_{[1,7]} + a_3BD_{[1,7]} + a_4DN_{[1,7]} + a_5BV_{[1,7]} + a_6HC_{[1,7]} + i$
(4) $LP_2 = a_0 + a_1BP_{[1,7]} + a_2TN_{[1,7]} + a_3BD_{[1,7]} + a_4DN_{[1,7]} + a_5BV_{[1,7]} + a_6HC_{[1,7]} + i$
(5) $CP_1 = a_0 + a_1BP_{[1,7]} + a_2TN_{[1,7]} + a_3BD_{[1,7]} + a_4DN_{[1,7]} + a_5BV_{[1,7]} + a_6HC_{[1,7]} + i$
(6) $CP_2 = a_0 + a_1BP_{[1,7]} + a_2TN_{[1,7]} + a_3BD_{[1,7]} + a_4DN_{[1,7]} + a_5BV_{[1,7]} + a_6HC_{[1,7]} + i$
(7) $GDP = a_0 + a_1BP_{[1,7]} + a_2TN_{[1,7]} + a_3BD_{[1,7]} + a_4DN_{[1,7]} + a_5BV_{[1,7]} + a_6HC_{[1,7]} + i$

As Equation (3), (4), (5), (6), (7) state:
Where,
$a_0$ is the intersection between the vertical-axis and regression lines of models (3), (4), (5), (6), (7), respectively
i is other factors beyond BP, TN, ABD, ND, BV, HC that this paper does not have analysis
[1,7] is mean that there are seven factors BP, TN, BD, DN, BV, HC, each factor has seven independent variables 1, 2, 3, 4, 5, 6, 7, respectively. Seven independent variables which are described one by one clearly in section (3.2.1. dependent variables).

As stated by Keshab Bhattarai (2015, p. 55) and Jeffrey M. Wooldridge (2020, p. 126):
Where,
Coefficients Beta:
$a_o + a_1 + a_2 + a_3 + a_4 + a_5 + a_6 = 0$, to show that regression models (3), (4), (5), (6), (7) have not been built suitably to the input data and they do not have statistics significance.
$a_o + a_1 + a_2 + a_3 + a_4 + a_5 + a_6 \neq 0$ is to show that regression models (3), (4), (5), (6), (7) have been built suitably to the input data and they have statistics significance.
$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 > 0$ is to mean that BP, TN, BD, ND, BV, HC have same direction impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP, respectively and separately.
$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 = 0$ is to mean that BP, TN, BD, ND, BV, HC do not have impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP, respectively and separately.
$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 < 0$ is to mean that BP, TN, BD, ND, BV, HC have opposite direction impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP, respectively and separately.
How strong is impact BP, TN, BD, ND, BV, HC on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP is based on their coefficients

**(3.6) Hypothesis:** $H_1$, $H_2$, $H_3$, $H_4$, $H_5$, $H_6$
$H_1$ is $BP_1$, $BP_2$, $BP_3$, $BP_4$, $BP_5$, $BP_6$, $BP_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP
$H_2$ is $TN_1$, $TN_2$, $TN_3$, $TN_4$, $TN_5$, $TN_6$, $TN_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP
$H_3$ is $BD_1$, $BD_2$, $BD_3$, $BD_4$, $BD_5$, $BD_6$, $BD_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP
$H_4$ is $DN_1$, $DN_2$, $DN_3$, $DN_4$, $DN_5$, $DN_6$, $DN_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP
$H_5$ is $BV_1$, $BV_2$, $BV_3$, $BV_4$, $BV_5$, $BV_6$, $BV_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP
$H_6$ is $HC_1$, $HC_2$, $HC_3$, $HC_4$, $HC_5$, $HC_6$, $HC_7$ impact on $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP

## (4) INTRODUCTION OF THE SOUTHEAST CITY - PROVINCES INCLUDES HO CHI MINH, BINH PHUOC, TAY NINH, BINH DUONG, DONG NAI AND BA RIA VUNG TAU OF VIETNAM. [22], [23], [24], [25], [26], [27]

With the policy of creating economic development triangles to promote driving force for economic domestic regions and national economy of Vietnam, three economic triangles were established which are the North, the Central and the South in Vietnam. Due to the requirements of regional development and especially because of the dynamic development of the provinces located next to the economic triangles leads to the development triangles have been expanded in geographical space which includes economic region linkages of the five Southeast provinces including Ho Chi Minh, Binh Phuoc, Tay Ninh, Binh Duong, Dong Nai and Ba ria Vung tau

### (4.1) Transportation

**(4.1.1) Roadway:** Although the road network is constantly being upgraded, it does not meet the development requirements, traffic congestion hinders the development of the Region. In order to solve this situation, a number of major traffic projects are being implemented with designed map is Ho Chi Minh City - Trung Luong Expressway that in the future will be connected to Can Tho, Ring roads Number 1, 2, 3, East - West Avenues, Thu Thiem Tunnel, Expressway Ho Chi Minh City - Long Thanh - Dau Day, Trans-Asia Road, Phu My bridge, Bien Hoa - Vung Tau Expressway.

**(4.1.2) Railway:** Currently there is only North-South Railway runs through this area. How to meet the transportation needs, a number of railway projects are being planned consists of High-speed railway Ho Chi Minh City - Vung Tau, Metro lines from Ben Thanh to Mien Tay and Bien Hoa bus stations which are being surveyed by big companies from Germany, France, Russia and Japan.

**(4.1.3) Airway:** Tan Son Nhat International Airport is an important trade gateway of the region with a capacity of about 15 million passengers per year by the end of 2006. This is the largest airport in Vietnam, accounting for 2/3 of international visitors to Vietnam by air. By 2010, Long Thanh International Airport with a designed capacity of 80-100 million passengers per year and 5 million tons of cargo per year that will be the leading airport of the Economic Region.

**(4.1.4) Port:** The Saigon port group currently has the highest volume of customs clearance in the Vietnam. Due to the need for urban development, the ports in the inner city will be relocated to the downstream of Dong Nai River and Thi Vai River. In the future, Thi Vai port in Ba Ria Vung Tau will be the main seaport of the region along with Cat Lai and Hiep Phuoc container ports as one of the leading deep-water seaports in the Vietnam country.

### (4.2) Industrial area

The key economic region of the Southeast provinces of Vietnam is where to concentrate a large number of industrial parks and attracts many largest foreign investment projects of the nation. There are Hi-Tech Park, two export processing zones which are Tan Thuan and Linh Trung, Quang Trung Software Park and more than ten of other attractive industrial parks like Bien Hoa, Nhon Trach, Loteco, Amata-Dong Nai, Song Than, Vietnam - Singapore, Viet Huong, Nam Tan Uyen, My Phuoc, Dong An-Binh Duong, Tan Tao, Vinh Loc, Tan Binh - Ho Chi Minh City. The most important industries of the region including Petroleum, leather, textiles, electronics, mechanics, chemicals, fertilizers, steel rolling. There are also a number of industrial parks are located in Long An province, My Tho - Tien Giang named My Tho Industrial Park (79.14 hectare), Tan Huong Industrial Park (197 hectare), Long Giang Industrial Park (600 hectare), Oil Service Industrial Park Gas (1,000 hectare), Trung An cluster (17 hectare), Tan My Chanh cluster (23.57 hectare), and currently it is preparing to build Nam Tan Phuoc Industrial Park (1,000 hectare).

### (4.3) Energy Centre

Phu My Power Centre and Ba Ria and Hiep Phuoc Power Plants which have a total power capacity of over 30% of total electricity capacity of the whole Vietnam country. Nam Con Son and Bach Ho gas projects and the East - West gas pipeline project that connecting the East and the Southwest provides energy for this region in the near future. Together with Nhon Trach Power Centre (2,600 MW), this region is still an important energy centre of the Vietnam country

### (4.4) Services and commercials

Import and export activities is the busiest region of Vietnam. The region's total export turnover accounted for about 2/3 of total export turnover in 2005 of Vietnam country. This is also the place where supermarkets and large trade centres of major retail groups in the world are concentrated.

### (4.5) Urbanized area

In the near future, with rapid urbanization, this region will be a large - scale metropolitan area in Southeast Asia and the whole world. Currently, there is implementing a number of large urban area projects which are Binh Duong general industrial urban area with a 4,000 hectare-scale, urban areas in Northeast Cu Chi and Long An (4,000 hectare), Phu My Hung urban area is 600 hectare and especially Thu Thiem new commercial urban area (700 hectare). In the future, there will build a number of new cities that are Nhon Trach, Binh Duong, Long Thanh, Phu My, Hau Nghia, Can Giuoc

## (5) LOGISTICS TRANSPORTATION

Transport logistics is one of the most important sectors of the economy, its share is increasing every year, which is determined by the process of globalization. In the European Union, the transport and storage sector that employs about 11 million people, accounting for more than 5% of total employment and almost 5% of GDP [28]. Transport logistics is an important part of logistics and supply chain organizations in order to reduce costs and improve services [29]. The fact is that transportation costs contribute significantly to total logistics costs, building both efficient delivery networks and intermodal transport is critical to reducing logistics costs [30].

Logistics transports consists of (1) logistics road transport, (2) logistics rail transport, (3) logistics marine transport, (4) logistics inland waterway transport, (5) logistics air transport. (1) [30] argues that “Transport is vital to the sustainability of many businesses and greatly affects the economies of many countries. According to [31] that the transport sector plays an important role in socio-economic development in developing countries.

(2) The rail transit system provides a set of available trains connecting departure and arrival stations to a group of people according to their journey and a rail transport company's train schedule. The rail transport system represents a network of trains and its nodes [32].

Today, rail transport is the most used, efficient and cheaper than other modes of transport in the supply chain [33]. (3) Marine transport accounts for more than 80% of global trade by economies and communities around the world every year. Ocean shipping is the most efficient and cost-effective mode of international transportation for most goods, providing a reliable, low-cost global means of transportation that facilitates trade and help create prosperity among nations and peoples [34]. Ocean shipping accounts for a very large part of the total world transport. Ocean shipping is mainly used to transport goods, liquid fuels, all kinds of products and people, ocean tankers, cargo ships and barges that require huge amounts of energy to transport. operation and is usually powered by diesel or residual fuel [35]. (4) Inland waterway transport is also the most energy-efficient means of transport, inland waterway transport using diesel engines per kilometer is about 100 tons/km, which is lower than other modes of transport such as railway or road [36]. The competitive power of inland waterway transport can also be enhanced in non-traditional ways [37]. And (5) Air transportation has changed people's lives in every aspect and helped people experience different cultures and create new relationships all over the world, Air transportation not only provides services passenger service but also provides freight services between countries across continents. Air-logistics is an extraordinary phenomenon that has become even more critical not only to the success of airlines but to every consumer and business leader worldwide [38]. Since the early 1900s, goods transported by air have evolved into an important component of world trade as today's global consumer society. Although air freight accounts for about 3% of the real-world tonnage, the value of goods is more than 35%, which has made it an extremely important business [38].

## (6) DATA SOURCE

Data is time series data between 2011 and 2020 is from General statistics department of Vietnam.

## (7) STUDY RESULTS

### (7.1) Cronbach's Alpha analysis

**TABLE 2:** Analysis result of Reliability Statistics of Cronbach's Alpha.

| Reliability Statistics before item deleted | | | Reliability Statistics after item deleted | | |
|---|---|---|---|---|---|
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .946 | .974 | 42 | .956 | .999 | 30 |

***Source:*** study result by author

Table 2 is to show analysis result of the Reliability Statistics before items were deleted that has Cronbach's Alpha is 0.946, it is mean $0 < 0.946 < 1$. in other words, Coefficient of Cronbach's Alpha is between [0, 1].

Reliability Statistics after items were deleted that has Cronbach's Alpha is 0.956, it is mean $0 < 0.956 < 1$ which means that Coefficient of Cronbach's Alpha is between [0, 1].

According to Lee Cronbach (1951) to define that the collected input data has high Reliability Statistics with Cronbach's Alpha is of 0.946 before items deleted and 0.956 after items deleted.

**TABLE 3:** Item-Total Statistics

| No. | Independent variables | Item-Total Statistics Before items deleted | | | | Item-Total Statistics after items deleted | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| 1 | HC2 | 71135.58 | 10603867.197 | .996 | .948 | 42506.5560 | 9999304.021 | .996 | .960 |
| 2 | HC3 | 75425.35 | 12397664.431 | .997 | .940 | 46796.3250 | 11742751.294 | .997 | .951 |
| 3 | HC4 | 75331.22 | 12578278.759 | .998 | .940 | 46702.1900 | 11918067.614 | .998 | .951 |
| 4 | HC5 | 75076.81 | 12696471.217 | .998 | .940 | 46447.7780 | 12033082.637 | .998 | .951 |
| 5 | HC6 | 72612.13 | 12112188.210 | .997 | .941 | 43983.0990 | 11464326.207 | .997 | .951 |
| 6 | HC7 | 77795.88 | 13175143.849 | .979 | .941 | 49166.8500 | 12499406.776 | .979 | .952 |
| 7 | BP2 | 78455.21 | 14331375.765 | .999 | .945 | 49826.1860 | 13625908.185 | .999 | .956 |
| 8 | BP3 | 79268.59 | 14578279.817 | .999 | .947 | 50639.5620 | 13866663.682 | .999 | .957 |
| 9 | BP4 | 78924.59 | 14482814.685 | .997 | .946 | 50295.5570 | 13773562.204 | .997 | .956 |
| 10 | BP5 | 78934.86 | 14470712.575 | .997 | .946 | 50305.8290 | 13761761.703 | .997 | .956 |
| 11 | BP6 | 79204.29 | 14403463.413 | .996 | .946 | 50575.2580 | 13696203.275 | .995 | .956 |
| 12 | BP7 | 78655.18 | 14550423.633 | .980 | .946 | 50026.1500 | 13839474.603 | .980 | .957 |
| 13 | TN2 | 78285.70 | 14377787.094 | .977 | .946 | 49656.6760 | 13671287.179 | .977 | .956 |
| 14 | TN3 | 79129.21 | 14560159.574 | .975 | .946 | 50500.1860 | 13849021.296 | .975 | .957 |
| 15 | TN4 | 78840.25 | 14500563.062 | .996 | .946 | 50211.2240 | 13790897.571 | .996 | .957 |
| 16 | TN5 | 78837.99 | 14512552.100 | .995 | .946 | 50208.9650 | 13802591.505 | .994 | .957 |
| 17 | BD2 | 77378.90 | 12448761.174 | .979 | .941 | 48749.8760 | 11792857.850 | .979 | .951 |
| 18 | BD3 | 78654.16 | 13791818.065 | .981 | .943 | 50025.1280 | 13100268.154 | .981 | .953 |
| 19 | BD4 | 78355.20 | 13413237.498 | .999 | .942 | 49726.1750 | 12730840.443 | .999 | .952 |
| 20 | BD5 | 78342.93 | 13652850.992 | .998 | .942 | 49713.9060 | 12964342.721 | .998 | .953 |
| 21 | BD6 | 77816.04 | 12037844.599 | .982 | .941 | 49187.0070 | 11386773.902 | .984 | .952 |
| 22 | DN2 | 76483.63 | 13279960.583 | .988 | .941 | 47854.6060 | 12600946.334 | .988 | .952 |
| 23 | DN3 | 78910.20 | 14375197.906 | .988 | .945 | 50281.1740 | 13668575.779 | .989 | .956 |
| 24 | DN4 | 77947.80 | 13904806.972 | .998 | .943 | 49318.7730 | 13209934.848 | .998 | .954 |
| 25 | DN5 | 77948.54 | 14034125.216 | .992 | .944 | 49319.5160 | 13336048.228 | .992 | .954 |
| 26 | BV2 | 78320.90 | 14250805.053 | .996 | .945 | 49691.8760 | 13547396.083 | .996 | .955 |
| 27 | BV3 | 78859.76 | 14424294.569 | .996 | .946 | 50230.7270 | 13716526.979 | .996 | .956 |
| 28 | BV4 | 78852.61 | 14469051.831 | .980 | .946 | 50223.5860 | 13760115.417 | .980 | .956 |
| 29 | BV5 | 78853.68 | 14460040.837 | .992 | .946 | 50224.6550 | 13751301.027 | .992 | .956 |
| 30 | BV6 | 78794.07 | 14251623.944 | .984 | .945 | 50165.0380 | 13548134.604 | .984 | .955 |

***Source:*** study result by author

Table 3 shows Cronbach's Alpha analysis results before and after total twelve items were deleted. There are thirty items have Corrected Item-Total Correlation are all > 0.974 (Cronbach's Alpha Based on Standardized Items = 0.974). According to Nunnally, J. (1978) that variables have Corrected item -Total correction >= 0.3 is to mean they are qualified; table 2 presents total thirty independent variables which all have Corrected item -Total correction are between 0.975 and 0.999. Comparing in Cronbach's Alpha Based on Standardized Items is 0.974 in table 1; whereby there are twelve independents variable consists of are $HC_1$, $BP_1$, $TN_1$, $TN_6$, $TN_7$, $BD_1$, $BD_7$, $DN_1$, $DN_6$, $DN_7$, $BR_1$, $BR_7$ which are all < 0.974 will be presented in table 3 that Item-Total Statistics after items have been deleted that they have Cronbach's Alpha if Item Deleted are between 0.951 and 0.960 which all > 0.974

**TABLE 4:** Item-Total Statistics: Deleting corrected Item-Total Correlation

| Independent variables | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| $HC_1$ | 77328.51 | 14737276.829 | -.853 | .947 |
| $BP_1$ | 72532.85 | 14601467.959 | .856 | .947 |
| $TN_1$ | 75368.60 | 14605107.653 | .469 | .947 |
| $TN_6$ | 79190.85 | 14300324.486 | .701 | .945 |
| $TN_7$ | 78487.40 | 14717989.255 | -.286 | .947 |
| $BD_1$ | 76712.46 | 14618831.404 | .792 | .947 |
| $BD_7$ | 78882.08 | 15122350.936 | -.770 | .950 |
| $DN_1$ | 73521.57 | 14769748.939 | -.853 | .948 |
| $DN_6$ | 78373.26 | 13379846.295 | .858 | .942 |
| $DN_7$ | 77523.09 | 14592302.035 | .019 | .947 |
| $BV_1$ | 77421.75 | 14648816.579 | -.849 | .947 |
| $BV_7$ | 78912.24 | 14679183.157 | -.780 | .947 |

***Source:*** study result by author

Table 4 presents twelve items are $HC_1$, $BP_1$, $TN_1$, $TN_6$, $TN_7$, $BD_1$, $BD_7$, $DN_1$, $DN_6$, $DN_7$, $BR_1$, $BR_7$ which have Corrected Item-Total Correlation < 0.974 (Cronbach's Alpha Based on Standardized Items = 0.974).

### (7.2) Pearson Correlation

**TABLE 5:** Result of Pearson correlation analysis

| | | ADPV | AHC | ABP | ATN | ABD | ADN | ABV |
|---|---|---|---|---|---|---|---|---|
| **ADPV** | Pearson Correlation | 1 | .988** | .990** | .979** | .976** | .988** | .989** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 | .000 | .000 |
| **AHC** | Pearson Correlation | .988** | 1 | .999** | .995** | .996** | .993** | .999** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 | .000 | .000 |
| **ABP** | Pearson Correlation | .990** | .999** | 1 | .989** | .991** | .998** | .999** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 | .000 | .000 |
| **ATN** | Pearson Correlation | .979** | .995** | .989** | 1 | .995** | .978** | .992** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 | .000 | .000 |
| **ABD** | Pearson Correlation | .976** | .996** | .991** | .995** | 1 | .984** | .992** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | | .000 | .000 |
| **ADN** | Pearson Correlation | .988** | .993** | .998** | .978** | .984** | 1 | .996** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | | .000 |
| **ABV** | Pearson Correlation | .989** | .999** | .999** | .992** | .992** | .996** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | |

**. Correlation is significant at the 0.01 level (2-tailed).

***Source:*** study result by author

Table 5 shows Pearson correlation result of six independent variables that represents six city-provinces which are Ho Chi Minh (AHC), Binh Phuoc (ABP), Tay Ninh (ATN), Binh Duong (ABD), Dong Nai (AND), Ba ria Vung Tau (ABV) and one dependent variable is named ADPV that represents five dependent variables are $LP_1$, $LP_2$, $CP_1$, $CP_2$, GDP by calculating an average value of thirty independent variables after removed twelve independent variables are $HC_1$, $BP_1$, $TN_1$, $TN_6$, $TN_7$, $BD_1$, $BD_7$, $DN_1$, $DN_6$, $DN_7$, $BR_1$, $BR_7$ which have Corrected Item-Total Correlation < 0.974 shown in Table 3.

Statistical significance of all six independent variables consists of AHC, ABP, ATN, ABD, ADN, ABV and one dependent variable ADPV are all = .000 < 0.05 is to mean the input data and the model was built has statistical significance.

Pearson Correlation of all six independent variables consists of AHC, ABP, ATN, ABD, ADN, ABV and one dependent variable ADPV are between 0.976 and 0.999 which are all > 0. In other words, Correlation is significant at the 0.01 level (2-tailed), which is to mean that one specific variable has the positive direction correlation with other variables.

### (7.3) Regression analysis results

**TABLE 6:** Reliability and ANOVA of regression models

| | **Reliability** | | | | **ANOVA (Analysis of Variance)** |
|---|---|---|---|---|---|
| | **R** | **R Square** | **Adjusted R Square** | **Durbin-Watson** | **Sig.** |
| **Model (3)** | 1.000 | 1.000 | . | 2.365 | .000 |
| **Model (4)** | 1.000 | 1.000 | . | 2.005 | .000 |
| **Model (5)** | 1.000 | 1.000 | . | 3.022 | .000 |
| **Model (6)** | 1.000 | 1.000 | . | 1.814 | .000 |
| **Model (7)** | 1.000 | 1.000 | . | 2.298 | .000 |

***Source:*** study result by author

Reliability: five models (3), (4), (5), (6), (7) have R = 1.000, R Square = 1.000 which mean that five models have been built perfectly suitably to the input data and they have statistics significance

According to Durbin and Watson (1950, 1951) that coefficient of Durbin-Watson is in [1,3]. Table 6 shows Durbin and Watson coefficients of model (3) is 2.365, model (4) is 2.005, model (5) is 3.022, model (6) is 1.814 and model (7) is 2.298, all of them are in [1,3] which is mean that there is no autocorrelation

As stated by (Ronald Fisher, 1918, 1921, 1925) and (Jerzy Neyman, 1923); whereby Anova of five models (3), (4), (5), (6), (7) have Sig = .000 < 0.05 (5%) is to mean that the models were built has statistical significance

**TABLE 7:** Coefficients of independent variables

| Independent Variables | Coefficients Beta | Standardized Coefficients Beta (SCB) | | | | | Sig. | VIF |
|---|---|---|---|---|---|---|---|---|
| | | Model: (3) | Model: (4) | Model: (5) | Model: (6) | Model: (7) | Models: (3), (4), (5), (6), (7) | Models: (3), (4), (5), (6), (7) |
| $HC_6$ | $a_{6(6)}$ | 3.903 | -2.421 | -7.348 | -22.006 | -.956 | .000 | 1118.245 |
| $BP_3$ | $a_{1(3)}$ | .849 | 2.633 | 5.335 | 9.244 | -2.034 | .000 | 778.252 |
| $BP_7$ | $a_{1(7)}$ | .793 | -2.431 | 3.996 | 1.446 | -.692 | .000 | 138.964 |
| $TN_3$ | $a_{2(3)}$ | .906 | -2.620 | 2.085 | -.444 | .305 | .000 | 163.891 |
| $TN_5$ | $a_{2(5)}$ | -6.432 | 5.072 | -6.212 | 6.943 | .679 | .000 | 1263.958 |
| $BD_6$ | $a_{3(6)}$ | -1.380 | .023 | -1.648 | -.277 | -.071 | .000 | 68.536 |
| $DN_2$ | $a_{4(2)}$ | -1.351 | 5.193 | 1.021 | 13.511 | 3.322 | .000 | 3178.492 |
| $BV_3$ | $a_{5(3)}$ | -3.081 | 3.172 | -1.014 | 7.478 | 1.803 | .000 | 331.535 |
| $BV_6$ | $a_{5(6)}$ | 6.758 | -7.945 | 4.520 | -15.692 | -1.354 | .000 | 1100.684 |

***Source:*** study result by author

Table 7 is presented coefficients of independent variables is to show how many independent variables of total thirty independent variables impact on five dependent variables and it also gives information to know which direction they impact and how strong they impact on five dependent variables

Five model (3), (4), (5), (6), (7) are same that there is total nine independent variables HC6, BP3, BP7, TN3, TN5, BD6, DN2, BV3, BV6 impact on five dependent variables LP1, LP2, CP1, CP2, GDP.

Model (3):
Independent variables have same direction impact on LP1 which are HC6, BP3, BP7, TN3 and BV6, their SCB are a6(6) = 3.903, a1(3) =.849, a1(7) =.793, a2(3) =.906, a5(6) = 6.758, respectively. BV6 has the strongest impact on LP1 at SCB a6(6) is 6.758, the second strongest impact on LP1 is HC6 has SCB a6(6) is 3.903. Variable BP7 has the weakest impact on LP1 at SCB a1(7) =.793

Independent variables have opposite direction impact on LP1 are TN5, BD6, DN2, BV3, their SCB are a2(5) = -6.432, a3(6) = -1.380, a4(2) = -1.351, a5(3) = -3.081, respectively. BV3 has the strongest impact on LP1 at SCB a2(5) = -6.432, Variable DN2 has the weakest impact on LP1 at SCB a4(2) = -1.351

Model (4):
Independent variables have same direction impact on LP2 are BP3 has SCB a1(3) = 2.633, TN5 has SCB a2(5) = 5.072, BD6 has SCB a3(6) = .023, DN2 has SCB a4(2) = 5.193, BV3 has SCB a5(3) = 3.172. DN2 has the strongest impact on LP2 at SCB a4(2) = 5.193, the second strongest impact on LP2 is TN5 with SCB a2(5) = 5.072. Variable BD6 has the weakest impact on LP2 at its SCB a3(6) = .023

Independent variables have opposite direction impact on LP2 are HC6 has SCB a6(6) = -2.421, BP7 has SCB a1(7) = -2.431, TN3 has SCB a2(3) = -2.620, BV6 has SCB a5(6) = -7.945. Variable BV6 has the strongest opposite direction impact on LP2 at SCB a2(5) = -7.945, variable TN3 has the second strongest opposite direction impact on LP2 at SCB a2(3) = -2.620. The weakest opposite direction impact on LP2 is HC6 with SCB a6(6) = -2.421

Model (5):
Independent variables have same direction impact on CP1 which are BP3, BP7, TN3, DN2, BV6.Their SCB are a1(3) = 5.335, a1(7) = 3.996, a2(3) = 2.085, a4(2) = 1.021, a5(6) = 4.520, respectively. BP3 has the strongest impact on CP1 at SCB a1(3) = 5.335, the second strongest impact on CP1 is DN2 with SCB a5(6) = 4.520. Variable TN3 has the weakest impact on LP2 at its SCB a4(2) = 1.021

Independent variables have opposite direction impact on CP1 are HC6 with a6(6) = -7.348, TN5 with a2(5) = -6.212, BD6 with a3(6) = -1.648, BV3 with a5(3) = -1.014. HC6 has the strongest impact on CP1 at SCB a6(6) = -7.348, variable BV3 has the weakest impact on CP1 at SCB a5(3) = -1.014

Model (6):
Independent variables have same direction impact on CP2 which are BP3 (a1(3) = 9.244), BP7 (a1(7) = 1.446), TN5 (a2(5) = 6.943), DN2 (a4(2) = 13.511), BV3 (a5(3) = 7.478). DN2 has the strongest impact on CP2 at SCB a4(2) = 13.511, the second strongest impact on CP2 is BP3 with SCB a1(3) = 9.244, variable BP7 has the weakest impact on CP2 at its SCB a1(7) = 1.446

Independent variables have opposite direction impact on CP2 which are HC6 (a6(6) = -22.006), TN3 (a2(3) = -0.444), BD6 (a3(6) = -0.277), BV6 (a5(6) = -15.692. Variable HC6 has the strongest impact on CP2 at its SCB a6(6) = -22.006, variable BD6 has the weakest impact on CP2 at its SCB a3(6) = -0.277

Model (7):
Independent variables have same direction impact on LTI GDP which are TN3, TN5, DN2, BV3. The SCB of them are a2(3) = .305, a2(5) = .679, a4(2) = 3.322, a5(3) = 1.803, respectively. Variable DN2 has the strongest impact on LTI GDP at SCB a4(2) = 3.322, the second strongest impact on LTI GDP is BV3 with SCB a5(3) = 1.803, variable TN3 has the weakest impact on LTI GDP at SCB a2(3) = .305

Independent variables have opposite direction impact on LTI GDP which are HC6, BP3, BP7, BD6, BV6. The SCB of them are a6(6) = -.956, a1(3) = -2.034, a1(7) = -.692, a3(6) = -.071, a5(6) = -1.354, respectively. Variable BP3 has the strongest impact on LTI GDP at SCB a1(3) = -2.034, variable BV6 has the second strongest impact on GDP at SCB a5(6) = -1.354, variable BD6 has the weakest impact on LTI GDP at SCB a3(6) = -.071

Sig. of five models (3), (4), (5), (6), (7) are .000 < 5% is to mean that all five regression models have been built suitably to input data and they have high statistical significances.

VIF of five models (3), (4), (5), (6), (7) are HC6 = 1118.245, BP3 = 778.252, BP7 = 138.964, TN3 = 163.891, TN5 = 1263.958, BD6 = 68.536, DN2 = 3178.492, BV3 = 331.535, BV6 = 1100.684, all of them are at high value coefficients which is to mean that there is Multicollinearity between independent variables

## (8) DISCUSSION

Based on study results at section 7 is to show that total nine independent variables HC6, BP3, BP7, TN3, TN5, BD6, DN2, BV3, BV6 impact on five dependent variables LP1, LP2, CP1, CP2, GDP, respectively and separately. Significant Test of all five models are .000 < 5% is to mean that all five regression models have been built suitably to input data and they have high statistical significances. VIF of all nine independent variables are at high value coefficients which is to mean that there is multicollinearity between independent variables.

Model (3) has five independent variables have same direction impact on LP1 which are HC6, BP3, BP7, TN3 and BV6. Variable BV6 has the strongest impact, the second strongest impact is HC6, and variable BP7 has the weakest impact on LP1. Total four independent variables have opposite direction impact on LP1 that are TN5, BD6, DN2, BV3. Variable BV3 has the strongest impact, variable DN2 has the weakest impact on LP1.

Model (4) has five independent variables which have same direction impact on LP2 which are BP3, TN5, BD6, DN2, BV3. Variable DN2 has the strongest impact, the second strongest impact is TN5 and BD6 has the weakest impact on LP2. There is total four independent variables have opposite direction impact on LP2 which are HC6, BP7, TN3, BV6. Variable BV6 has the strongest opposite direction impact, TN3 has the second strongest opposite direction impact, and HC6 is the weakest opposite direction impact on LP2.

Model (5) has five independent variables have same direction impact on CP1 which are BP3, BP7, TN3, DN2, BV6. Variable BP3 has the strongest impact, the second strongest impact is DN2 and TN3 has the weakest impact on LP2. Total three independent variables have opposite direction impact on CP1 which are HC6, TN5, BV3. Variable HC6 has the strongest impact, variable BV3 has the weakest impact on CP1

Model (6) has five independent variables have same direction impact on CP2 which are BP3, BP7, TN5, DN2, BV3. Variable DN2 has the strongest impact, the second strongest impact is BP3 and BP7 has the weakest impact on CP2. Total four independent variables have opposite direction impact on CP2 which are HC6, TN3, BD6, BV6 . Variable HC6 has the strongest impact, BD6 has the weakest impact on CP2

Model (7) has four independent variables have same direction impact on LTI GDP which are TN3, TN5, DN2, BV3. Variable DN2 has the strongest impact, the second strongest impact is BV3 and TN3 has the weakest impact on LTI GDP. Total five independent variables have opposite direction impact on LTI GDP which are HC6, BP3, BP7, BD6, BV6. Variable BP3 has the strongest impact, BV6 has the second strongest impact and BD6 has the weakest impact on LTI GDP.

## (9) CONCLUSION

According to study results in section 7 and discussion in section 8, There is total nine independent variables impact on five dependent variables, respectively and separately. All five models have been built suitably to input data and they have high statistical significances. There is multicollinearity between independent variables.

There is total five independent variables have same direction impact on (LP1) LT freight productivity calculated on labour which are (HC6) HCM urban residents, (BP3) BP province population density, (BP7) BP rural residents, (TN3) TN province population density, (BV6) BV urban residents. In which, BV6 has the strongest impact, the second strongest impact is HC6 and BP7 has the weakest impact on LP1. There is total four independent variables have opposite direction impact on LP1 includes TN5, BD6, DN2 and BV3. In which, BV3 has the strongest impact and DN2 has the weakest impact on LP1.

In terms of (LP2) LT passenger productivity calculated on labour, there is total five independent variables have same direction impact on LP2, consists of (BP3) BP province population density, (TN5) TN province female population, (BD6) BD urban residents, (DN2) DN province population and (BV3) BV province population density. In which, DN2 has the strongest impact, the second strongest impact is TN5 and BD6 has the weakest impact on LP2. There is total four independent variables have opposite direction impact on LP2 includes HC6, BP7, TN3 and, BV6. In which, BV6 has the strongest impact, TN3 has the second strongest impact, and HC6 is the weakest impact on LP2.

Regarding to (CP1) LT freight productivity calculated on capital that there is total five independent variables have same direction impact on CP1, consists of (BP3) BP province population density, (BP7) BP rural residents, (TN3) TN province population density, (DN2) DN province population and (BV6) BV urban residents. In which, BP3 has the strongest impact, the second strongest impact is DN2 and TN3 has the weakest impact on CP1. There is total three independent variables have opposite direction impact on CP1 which are HC6, TN5 and BV3. In which, HC6 has the strongest impact and BV3 has the weakest impact on CP1.

About (CP2) LT passenger productivity calculated on capital, there is total five independent variables have same direction impact on CP2, includes (BP3) BP province population density, (BP7) BP rural residents, (TN5) TN province female population, (DN2) DN province population and (BV3) BV province population density.

In which, DN2 has the strongest impact, the second strongest impact is BP3 and BP7 is the weakest impact on CP2. There is total four independent variables have opposite direction impact on CP2 which are HC6, TN3, BD6 and BV6. In which, HC6 has the strongest impact and BD6 is the weakest impact on CP2

And finally, about (LTI GDP) logistics transport industry gross domestic product that there is total four independent variables have same direction impact on LTI GDP, consists of (TN3) TN province population density, (TN5) TN province female population, (DN2) DN province population and (BV3) BV province population density. In which, DN2 has the strongest impact, the second strongest impact is BV3 and TN3 is the weakest impact on LTI GDP. There is total five independent variables have opposite direction impact on LTI GDP which are HC6, BP3, BP7, BD6 and BV6. In which, BP3 has the strongest impact, BV6 has the second strongest impact and BD6 is the weakest impact on LTI GDP.

**Limitations**

Firstly, series data is between 2011 and 2020 which is thought as a short period. Hence, it may the reason that make it could not be able to be analyzed Exploratory Factor Analysis (EFA).

Secondly, in terms of Pearson Correlation that the author had to analyze by calculating the average value of thirty independent variables into six independent variables and calculating five dependent variables into one dependent variable.

## (10) DECLARATION OF COMPETING INTEREST

I declare that I have no significant competing interests including financial or non-financial, professional, or personal interests interfering with the full and objective presentation of the work described in this manuscript.

I have described my financial or non-financial interests in the space below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## (13) AUTHOR CONTRIBUTIONS

There is only author Vu Thi Kim Hanh have done the whole this article

## (14) DATA AVAILABILITY STATEMENT

The data is time series data which has been collected and extracted by manual method by the author Vu Thi Kim Hanh, data is between 2011 and 2020 is from General statistics department of Vietnam.

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