

Broader Economic Benefits of Transportation Infrastructure Investment (Individual Project) of Production Sector Based on Cost Reduction of Freight Transportation

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Abstract: The linkage between transportation sectors and economic growth has been widely researched in the past 25 years. Most research confirm that the improvement of transportation performance through transportation investment can reduce logistic cost of the production sectors and thus reducing their marginal cost. Consequently, the increase of the output in the production sectors is expected to develop the regional economy. The purpose of this study was to estimate the broader economic benefits of the new infrastructure investment of Cipularang Toll road to the region connected to the toll road (Bandung city). Specifically, this study mapped out the direct benefits received by the production sector (key sectors) in relation to the associated decrease of freight transportation costs. Using the input-output simulation model, the regional GDP increases 1.2% after the operation of Cipularang Toll road. This increase was estimated due to the lower inter-regional freight transportation costs.

Keywords: Infrastructure investment, production sector, economic growth

1. INTRODUCTION

New investment of road infrastructure will provide potential economic benefits to a region, and improvement of the road infrastructure performance is believed to be one way to increase the economic growth of that region. The role of transport is to facilitate the movement of goods, than road infrastructure improvements such as additional road capacity will reduce travel time and transportation cost. Efficient transportation is crucial to the efficiency of industrial supply chains which has a major impact on improving productivity, distribution of goods and competition in the production sector. Therefore, transportation sector cannot be separated from the regional economy. At its most basic level, transportation must be able to provide benefits by providing access to people and serving as a logistic function (Taking Raw Materials; manufacture to consumer).

In order to estimate the total economic implications of road infrastructure investments, the estimates of the microeconomics analysis, the project effects in direct user or toll revenue compare to total cost of project, however, do not represent a full economic analysis. Changes in freight transportation costs and productivity affecting an industry at the project level have broader economic repercussions (greater operating scale and accessibility economies) for the locality or region (Glen W 1998).

These macroeconomic models argue that there are externalities to investments in infrastructure which are not captured in microeconomic analysis. The utility of such a result is open to question in view of two serious drawbacks of this macroeconomic modelling stream: first, the sharp differences and conflicts among these models on the magnitudes and direction of economic impacts of infrastructure, and second, these macroeconomic models offer little clue to the mechanisms linking transport improvements and the broader economy (T.R. Lakshmanan, 2008).

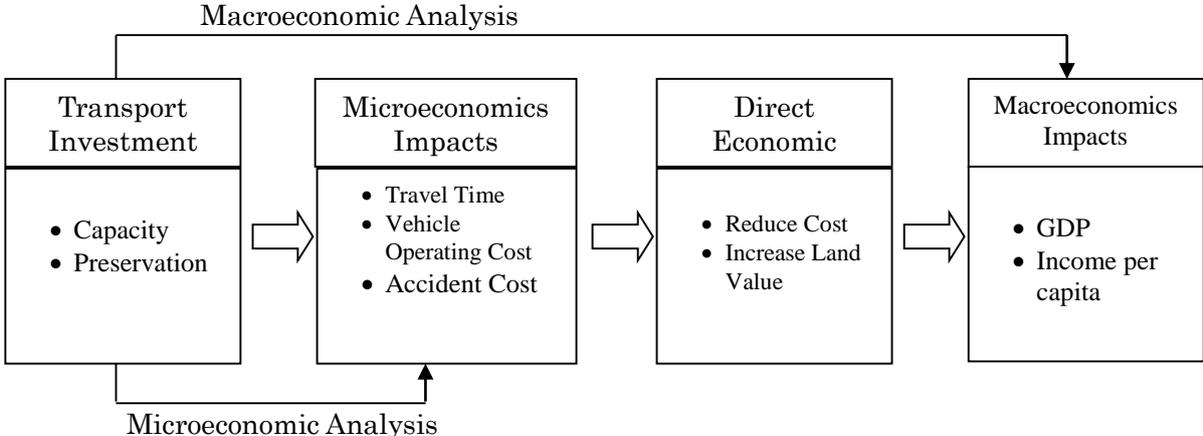


Figure 1 Economic Impacts of Transportation Investment
Source: Florida Department of Transportation

From Figure 1 above, the estimated difference of an investment in transportation infrastructure can be observed. This figure also highlights the individual performance indicators used in microeconomics and macroeconomics analyses. Microeconomic analysis is more bottom-up and focus on direct users. The value of the benefits in microanalysis is obtained by quantifying the direct benefits that users receive -such as the saving of vehicle operating costs or the value of time and road user safety- and converting them into a monetary unit (\$). On the other hand, macroeconomic analysis is more top-down. Using econometric approach (time series, cross-sectional data), analysts obtain the effect of road infrastructure investments on local economic growth. A macroanalysis on the benefits of transportation investment is important as a justification for a value that is spent on transportation infrastructure sector (infrastructure expenditure) and its benefits for the region (district, province, country).

From a regional economic point of view, the benefits of transportation infrastructure investment, among others, are: opening a production area, creating a new market, opening up an isolated area and connecting it to the nearest city. Yet, the benefits might not necessarily be the same for each region, whether it is a city or a newly developed area; a developed country or developing country.

The economic benefits of the investment of Cipularang toll road (as an individual project) will give a significant impact on production sector especially the transportation sector for the province of West Java, and micro analysis results in the feasibility study of Cipularang toll road (use numbers of users passing through

as toll revenue) indicates that it is economically and financially viable. However, the value of the benefits has not shown the economic impact to the production sector of the district/city connected with the toll road.

Therefore, this research aims to: (1) estimate the broader economic benefits of new toll road infrastructure investments (as an individual project) to the production sector (key sectors) of the regions connected to Cipularang toll road (Bandung Region), especially in terms of cost reduction of freight transportation, and (2) assess the influence of these key sectors on other economic sectors in the Bandung Region, where the value of the investment is not suitable to be included as part of the value invested by Bandung region and that's not captured in microeconomics analysis that only focus to the direct user.

2. LITERATURE REVIEW

2.1 Linkage between Transport Infrastructure Investments towards Production Sector

Economic income (GDP) is one of the factors that drive the economic growth of a region. Besides, the economic development of an area will also be reflected in infrastructure performance. In turn, good infrastructure will support economic activity in the region. More specifically, the increase in transportation infrastructure will affect economic sectors, with the assumption that this increase would serve to encourage the production sector activity, and also can be a stimulus for economic growth in a region or as a fulfilment of the level of need (demand) of the region's economic growth itself (infrastructure may follow growth as well). There are several aspects of the productivity of economic sectors that could be affected by transportation infrastructure investment. Overall, productivity can be defined as the ratio of output per unit from input number of factors (including labour, capital, and technology). Productivity level can be affected by many factors, such as the levels of capital, the amount of labour, technology, and quality of supporting infrastructure.

In addition to its logistical function (e.g., taking raw materials), transportation also functions when viewed from the side in addition to the logistics of taking raw materials also plays a role in distributing goods from the production sector. The role of transportation in the production sector also affect the cost of production of goods. As such, high transportation costs will lead to higher production costs and may affect the sale value of the production and purchasing power of consumers. Lubis et al (2005) describe the conditions that occur in Indonesia today, in which they argue that the pattern of inter-city freight transportation (domestic) is still dominated by land transportation (+90%). This land-dominant freight transportation becomes one of the causes of the high cost of logistic cost in Indonesia, in addition to geographical factors and external costs (The Asia Foundation and LPEM - UI, 2008). Compared to other Asian countries, logistics cost in Indonesia is much higher than that of other nations in the region. Reaching up to 25 % of the Gross Domestic Product (GDP), this cost causes the production sectors to become inefficient and less competitive (World Bank, 2013).

The debate on the contribution of transportation in improving the region's economic growth is not new. Economists have done many research in this regard, where the focus of research in general is to assess the benefits derived from a value of investment in transportation to the economy of an area within a certain time frame (time series). Auscher (1988) for example conducted a study on the influence of capital and government spending on the public sector towards the level of productivity (aggregate productivity). This study found that the decline in

the growth rate of investment in the public sector during the period of the 1970s and 1980s in the United States of America was a major factor in the decline in the productivity of the private sector.

Rephan (1993) in his study on the connection between transportation infrastructure investment and economic growth argued that the benefits of investment was more pronounced in less industrialized areas, compared to the less developed ones. In addition, without the transportation infrastructure, the economic development will be hampered, but it is very difficult to determine how much influence derived from the transportation infrastructure to economic growth.

Table 1. Impact of of Transportation Infrastructure Investment on Economic Growth
(macroeconomy analysis)

Study		Type of Model	Location	Effect of transportation investment	Elasticity
Auscher	1991	Production Growth Model	United state	Total transport capital effect on growth	0,166
				Transit capital effect on growth	0,384
				highway capital effect on growth	0,231
Seitz	1993	Leontif Cost Function	Germany (highway data)	Change ini average private cost	0,05
Garcia-Mila and McGuire	1992	Production Function	United state (48 contiguous data)	Elasticity of GSP with respect to highway capital	0,04
Munnel	1990	Production Function	United state (48 contiguous data)	Elasticity of GSP with respect to highway capital	0.06
McGuire	1992	Production Function	United state (48 contiguous data)	Elasticity of output with respect to highway capital	0,121-0,37
Deno	1988	Profit function model	United state	Elasticity of output with respect to highway capital	0,31
Haughwout	1996	Equilibrium model	United state	Elasticity of output with respect to highway capital	0,08

Source: Banister , David and J. Berechman

Table 1 shows several results of macroeconomic studies in estimating the effects on productivity of public capital in general, and of transportation infrastructure in particular.. In order to understand this disparate results, the mechanisms that generate the economic impacts need to be uncovered (especially in an individual project).

This discussion continues to receive wider attention among researchers (such as from OECD Countries). Glen Weisbrod (1998) mentions investment in road infrastructure has been known to promote development and economic growth on local, regional and even national levels. This research analyses the economic impacts of an individual project on a wider economy, specifically by conducting an aggregate macroeconomic analysis. Therefore, it is necessary to develop a model of economic assessment of potential economic impacts (or wider benefits) of an individual transportation infrastructure project. The same approach was also taken by Andreas Kopp (2002) who conducted a research on the impact of road investment on the increased productivity of 13 European countries. By using the Structure of National Accounts (National Social Accounting Matrix) method, Kopp showed level of investment from the transport sector shows positive results. The results also suggest that the approach needs to be developed that can connect macroeconomic analysis on a regional scale at the project level (an individual project).

The common approach in analyzing the economic benefits in transportation infrastructure investment (an individual project) is done micro-economically. Commonly, the scope of microeconomic analysis is limited to the individual projects reviewed and exclude the

infrastructure investments of the production sector/economy of a region. Some believe this approach to be less objective; therefore it is necessary to develop another model that can analyze the benefits of transportation investment to the economic growth of a region (direct benefit impact on production sectors).

According to Banister and Berechman (2000), the investment in the field of transportation is believed to help open up new areas for the production sectors, create a new market for goods, and open access to isolated areas with major cities.

To understand the relevance of the measurement of infrastructure to the production sector, the study focuses its analysis on: (1) how an investment in an individual road infrastructure project can increase the output of each of the key sectors of the region connected with the road infrastructure, and (2) how much reduction of the cost of transporting goods towards the marginal cost of the production sector. The increase in the production sector will affect other production sectors, which in this study will be analyzed using Input-Output Analysis method.

2.2 Brief Review Of I - O Analysis On Transportation infrastructure Investment

The I-O model could be a good research methodology to explore the influence of one sector on the other production's sectors. However, there have been few studies that use the I-O model directly for analyzing the transportation industry. Input-Output (I-O) Table is a statistical description that describes the transaction between the production sectors as a whole in a given year (shows the connection between sectors). Presentation of the Input-Output tables is in the form of a matrix, where each row shows how the output of a sector achieving the intermediate demand and final demand. To get a brief picture of how an I-O tables are arranged, the example presented in Table 2. And for the examples It will describe how the I-O table for the economic system which consists of three production sectors.

Table 2. Input – Output Table (3 Production Sector)

		Output Allocation		Intermediate demand			Final Demand	Total Output
				Production's Sector				
Input			1	2	3			
Structure Intermediate Input	Production's Sector	1	X ₁₁	X ₁₂	X ₁₃	F ₁	X ₁	
		2	X ₂₁	X ₂₂	X ₂₃	F ₂	X ₂	
		3	X ₃₁	X ₃₂	X ₃₃	F ₃	X ₃	
Primary Input			V ₁	V ₂	V ₃			
Total Input			X ₁	X ₂	X ₃			

From table 2, it can be seen that the I-O tables consists of 3 quadrants, each associated with intermediate demand, final demand, and primary inputs. The I-O model is a linear, intersectoral model that shows the relationships among the productive sectors of a given economic system. The basic balance equations of the I-O model consisting of N industry sectors can be expressed as:

$$\sum_{j=1}^n x_{ij} + F_i = X_i - M_i \quad (1)$$

where:

- x_{ij} = the amount of output in sector i used as input in sector j
- F_i = Final demand towards output sector i

X_i = total output of sector i
 M_i = total output i imported

and for the total input of a sector can be formed equation;

$$\sum_{j=1}^n x_{ij} + V_j = X_j \quad (2)$$

where:

x_{ij} = the amount of output in sector i used as input in sector j
 V_j = primary input (adding value) in sector j
 X_j = total input of sector j

The use of input-output model serves as a basis for planning and macro-economic analysis, especially with regard to the production sector, the analysis of impacts, and the connections between sectors and economic projections (GDP). However, there is a slight difference between this study and other studies that use traditional I-O analysis. In this study, the value invested in transportation infrastructure is not used as a “shock” to the I-O table. Due to the new highway infrastructure is considered, this study treats the investment value as a result of forces outside the model, which resulted in changes in the freight transportation cost in the model.



Figure 1. Illustrate of New Toll Project and Bandung Region

From Figure 1 above, it can be seen that the construction of the toll road is located outside the territory of Bandung region (city), but provides new connectivity to the city.

3. RESEARCH METHODOLOGY

3.1 General Framework

The framework of this research is the development of a model that can estimate the economic benefits of an individual road infrastructure investment to the production sector in terms of reduction of freight transportation cost. There is a connection between road infrastructure investments (individual project) that provides the benefits of a reduction of the cost of transportation of goods that can have a positive impact on the production sector. Macro-economically this will increase the region's economic performance.

The research methodology is structured as a series of flow chart that shows the relationship between road infrastructure investment on the production sector, as well as the

added value generated as a result of economic improvement in the measured region Gross Domestic Product (GDP). Illustration of the work frame of the research can be seen in the Figure 2 below.

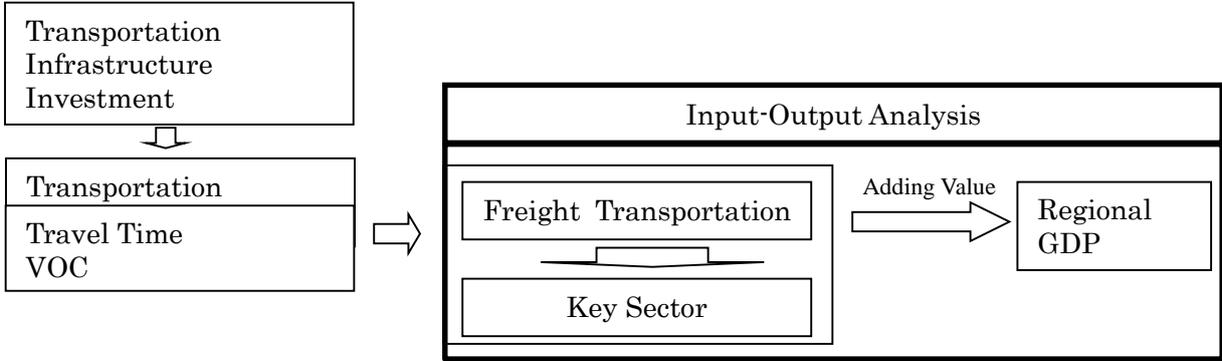


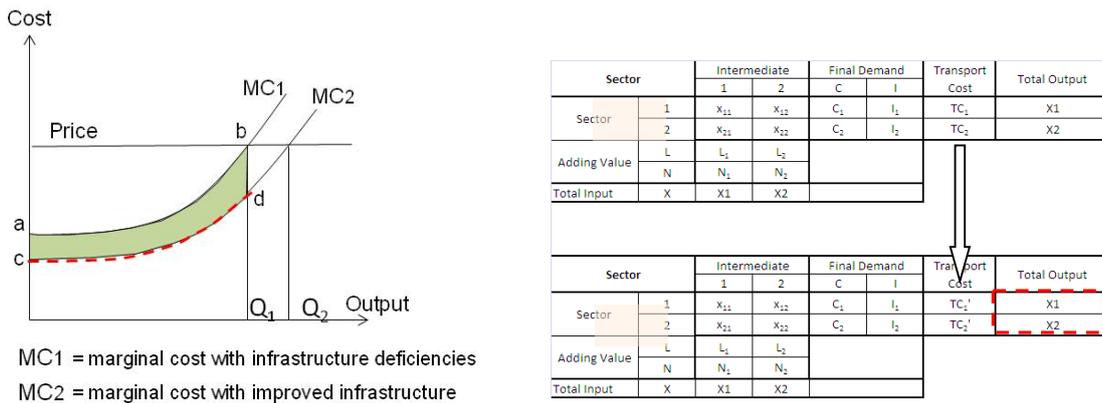
Figure 2. General Framework Of Research Methodology

The Input-Output Analysis is done by correcting the freight transportation’s cost from key sector. Next its multiplier effect on other production sectors can be calculated.

However, this research is limited and only considering:

- a. The potential economy benefit will analyze using input output model (base on I-O table on 2008) according to Cipularang toll road was operating since 2006.
- b. The estimation of reduce cost of freight transportation assumed as profit for key sectors (reduce the marginal cost of production).
- c. The model developed is limited to freight transportation function, which consists of the movement of production to market (distribution of production)
- d. Transportation reviewed is the transportation in terms of domestic flow and movement between districts/cities, which will be reviewed production sector associated with the movement patterns (aggregation of sectors that exist in the I-O tables).
- e. In the model developed , the production capacity is influenced by other factors such as labor, other materials as inputs of production factors are assumed to be exogenous variables in the analysis process as well as the effect on the market price of the commodity production sector is considered as an exogenous variable too in this study.
- f. Generalized cost is a combination of transportation costs and travel time costs . The calculation of these costs is the total cost of transport of goods incurred by each production sector of the place of origin to final destination. Changes in transportation costs are used as an indicator of the success of the performance improvement of the transport sector related to the improvement of the level of mobility and accessibility
- g. In this research, the analysis conducted is using I-O tables, based on the price buyers

Due to the provision of new transport infrastructure investment (Cipularang Toll road), is assumed to reduce the marginal cost of key sectors. This reduction is assumed as an additional value operating surplus of the key sectors. Explanation of these savings will be described by Figure 3 as follows.



Gambar 3. The Contribution of an Infrastructure investment towards The Reduction on Production Cost (marginal cost)
 Source: T.R. Lakshmanan (2008)

From the picture above, it can be seen that the impact of the performance improvement of transport infrastructure, where there is a reduction on the marginal cost (MC1 be MC2) with a fixed amount of production and the same price, then the input-output analysis it is assumed to add the profit (surplus).

3.2 Inter-Industry Linkage Analysis

The I-O model could be a good research methodology to explore the influence of one sector on the other sectors. This model can be used as a tool to help the decisions maker in planning of a region development. In the I-O models, it is figured which sector is becoming a key sector in the economic structure of the region. A sector can be said to be a key sector is a sector that is spread in various economic activities so as to move the production sector as a whole.

I-O models can be used to see what sectors are biased into key sectors in a region. These sectors can be identified with the event (Daryanto, Arif and Yundy H, 2013) :

1. Backward linkages and forward linkages are relatively high
2. High Level of the sector's output
3. Demand driven relatively high
4. Creating jobs is high

To figure out about the key sectors of the economy, the region should measure backward linkage (demand-driven) and forwards linkage (supply-driven). The backward linkage effect is represented as the power of dispersion (POD), which is the average of n elements in column j divided by the average of all n^2 elements in the Leontief inverse matrix. Similarly, the forward linkage effect is expressed as the sensitivity of dispersion (SOD), which is the average of n elements in row i divided by the average of all n^2 elements in the Leontief inverse matrix. The concept of forward linkage shows the result of a particular sector of the sectors that provide the input for the sector directly per unit increase in total demand, with the following equation:

$$BL_i = \frac{\sum_{j=1}^n X_{ij}}{X_i} = \sum_{j=1}^n a_{ij} \quad (3)$$

$$FL_i = \frac{\sum_{j=1}^n X_{ij}}{X_i} = \sum_{j=1}^n b_{ij} \quad (4)$$

Where:

- BL = backward linkage
- FL = forward linkage
- X_{ij} = the amount of output in sector i used to sector j
- X_i = total output in sector i
- a_{ij} = coeff matrix
- b_{ij} = coeff matrix

The analysis of the economy impact of using the I-O model is done by using a multiplier matrix. This matrix is obtained from the IO table by turning the input coefficient matrix. The basic equation used is:

$$X = AX + F \quad (5)$$

where:

- A = matrix of coeff input
- X = vector output
- F = Final demand matrix

$$X - (I-A)^{-1} = F \quad (6)$$

where:

- (I-A) = Leontif matrix
- $(I-A)^{-1}$ = Leontif inverse matrix (multiplier matrix)

Analysis of the multiplier effect actually shows the total value of output produced by the economy to meet the change of one unit of final demand in one sector. Data needs to perform analysis of this model can be seen in the following table (Tim Lynch, 2000):

Table 3 Data Needs for Regional Input-Output Model

Category Production Sector	The output must be classified from each production sector
Year	The output timing must be determined in order to identify the economic consequences time period and to adjust the output of the reviewed year which is used in the estimation.
Location	The location needs to be specified so that the multiplier analysis can be done according to the area reviewed which has been estimated to perceive the benefits of the road infrastructure investments

There are 4 regions connected with Cipularang Toll way, but in this study, the scope of region chosen in this research is Bandung City and Table I-O is used as the basis for the analysis of the production sector of the city is Input Output Table of Bandung City 2008 (last Updated).

4. RESULT

4.1 Input-Output Table Of Bandung Region

Each of the production sector in the regional's economy will have an input-output structure difference. The following Table 4 shows the structure of the IO Bandung on the price buyers in 2008, with 9 sector classification.

Table 4. I-O table based on Buyer's Price in 2008 (million rupiah)

SEKTOR	INTERMEDIATE DEMAND										TOTAL	FINAL DEMAND	M+T	OUTPUT
	1	2	3	4	5	6	7	8	9	10	180	309	509	600
1 AGRICULTURE, FORESTRY & FISHERY	89,779	-	1,272,779	-	-	4,419,861	-	-	180,460	-	5,962,879	3,158,931	5,565,436	370,314
2 MINING	-	-	10,992	-	590,475	25,260	-	-	-	-	626,727	3,200	378,331	-
3 PROCESSING INDUSTRY	98,041	-	16,048,544	959,199	4,280,212	33,473,016	4,043,415	662,952	1,390,915	-	60,936,294	65,357,433	57,121,461	36,220,570
4 ELECTRICITY, GAS AND WATER	5,287	-	680,286	277,655	102,650	774,673	209,423	169,609	170,804	-	2,390,387	1,254,191	-	2,853,265
5 CONSTRUCTION	5,620	-	13,852	-	112,597	553,327	32,032	67,113	3,523	-	788,064	7,079,799	-	7,867,863
6 TRADE	-	-	100,107	1,150	46,302	178,116	145,717	80,571	90,818	-	642,781	6,326,297	(60,753,115)	66,437,251
7 TRANSPORTATION AND COMMUNICATION	13,930	-	1,669,292	110,850	39,875	1,125,722	3,280,542	211,498	146,870	-	6,598,579	7,844,803	(2,312,113)	15,305,280
8 FINANCE, RENTAL & SERVICE COMPANY	1,623	-	532,414	116,830	20,098	400,216	356,207	1,374,821	76,246	-	2,878,455	4,134,814	-	6,552,178
9 SERVICES	-	-	232,529	14,269	1,651	1,256,418	139,089	116,273	1,427,188	-	3,187,417	5,871,668	-	9,059,085
10 OTHERS	-	-	-	-	-	-	7,264	-	-	-	7,264	-	-	-
190 TOTAL OF INTERMEDIATE DEMAND	214,280	-	20,560,795	1,479,953	5,173,860	42,206,609	8,213,689	2,682,837	3,486,824	-	84,018,847	101,031,136	-	144,665,806

Source: BPS Bandung City

From the table above, it is seen that the city of Bandung needs the input between +58.18% of total cost and + 41.82% used for the primer input to produce one unit of goods and services.

Total demand in the year of 2008 is Rp. 184 917 420 million, while the total of provision from the Bandung region which is the production output is Rp. 144 665 609 million. This would indicate that there is still needs to import for the production sector, to fulfill the total demand. Based on the particular table, it is discovered that the ratio of margin and transportation cost is Rp. 63 065 228 million or about + 43% of the total output.

4.2 Inter-Industry Linkage Effect

Analysis of the leading sectors (key sectors) performed after the obtained analytical linkages between sectors in the input output analysis. Total impact of changes in final demand for a sector of the economy-wide output is further used to determine how far the level of linkages between sectors of production, can be seen from two sides, namely backward linkages and forward linkages.

Table 5. Forward Linkage, Backward Linkage, and Share to GDP

SECTOR		Backward Linkage	Forward Linkage	Share to GDP (%)
1	Agriculture, Forestry & Fishery	1.083	0.485	0.3
2	Mining	0.440	0.516	0.0
3	Processing Industry	1.143	0.610	25.0
4	Electricity, Gas & Water	1.024	1.249	2.0
5	Construction	1.199	0.989	5.4
6	Trade	1.393	2.916	45.9
7	Transportation % Communication	1.191	1.289	10.6
8	Finance, Rental & service company	0.834	0.614	4.5
9	Services	0.952	0.541	6.3

Source: I-O Bandung's City, BPS - Statistics Indonesia 2008

Based on table 5 above, it can be seen that the key sector in the city of Bandung is the trade and industrial sector. Regarding to the movements of goods between cities/region using Cipularang toll road, therefore simulated as a key sector in this research is the industrial sector with a forward linkage value 1.05 and backward linkage 0.52 and share to GDP 25.8%.

4.3 Broader Economic Impact of Reduce Freight Transportation

It can simply be formulated that industrial sector output multiplier is the total value of production output due to a change of 1 unit of final demand from the industrial sector (due to a reduction in freight transport costs).

The results will describe how the effects of an exogenous change (in this study reduced freight transportation costs) to the industrial sector output (as direct impact) and other production sectors (as indirect impact). The results will describe how the effects of an exogenous change (in this study reduced freight transportation costs) to the industrial sector output (as direct impact) and other production sectors (as indirect impact).

Before the analysis, it is necessary to make the technology coefficient, this coefficient is calculated as follows:

$$a_{ij} = \frac{z_{ij}}{X_j} \quad (7)$$

Where:

- a_{ij} : input-output coefficient
- z_{ij} : intermediate demand for sector j from sector i
- X_j : Total input sector j

If there are n sectors in the production sector, then there will be n² coefficients. All coefficients can be expressed in a matrix (matrix A), in the form of:

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \quad (8)$$

An additional output from the production sector means that require additional input from itself, and from other production sectors. Additional input from each production sector

will create a new additional output for all sectors. An analysis of the total output can be calculated as follows (round-by-round effect analysis).

$$\text{Direct effect} \quad \Delta Y_1 = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Indirect effect

$$\begin{bmatrix} a_{11} & a_{1n} \\ a_{n1} & a_{nn} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_3 \\ x_4 \end{bmatrix} \quad \Delta Y_2 = \begin{bmatrix} x_3 \\ x_4 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{in} \\ a_{n1} & a_{nn} \end{bmatrix} \begin{bmatrix} x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} x_5 \\ x_6 \end{bmatrix} \quad \Delta Y_n = \begin{bmatrix} x_n \\ x_{n+1} \end{bmatrix}$$

$$\text{Total output sector 1} = x_1 + x_3 + \dots + x_n$$

$$\text{Total output sector 2} = x_2 + x_4 + \dots + x_{n+1}$$

Reduction of freight transportation cost due to the operation of Cipularang toll road, assumed 10% of the existing transportation costs. Due to changes in the total demand, the total output of Bandung (GDP) overall increase of Rp. 723.949 million (8x iteration change in output).

Direct changes felt by the industrial sector output is as big as the value of goods transportation cost savings which is Rp. 571 214.6 million. On the other hand, indirect changes felt by another production sector is Rp. 152 735 million.

5. CONCLUSION

There is little difference in the estimate using microeconomic analysis with the model developed in this study. In microeconomic analysis, the value of economic benefits in the estimation only based on the direct users of the toll road, but with this model try to see the benefits that can be obtained by the production sector (key sectors) due to the operation of the toll road as a multiplier effect or direct economic benefit.

Based on Bandung region's Input Output table, the total primary input of Bandung's region is the largest for the trade sector (+ 46 % of the total GDP of Bandung) and the Industrial sector (+ 30% of the total GDP of Bandung). This reflects that these sectors provide the largest share of the total economy of the Bandung region/city.

Based on the results in the linkage analysis, the trade sector has the largest backward linkage and forward linkage value and with largest shares on GDP of Bandung. Therefore, the trade sector becomes the key sector of the economic system in Bandung. However, in the analysis of the economic potential that can be gained from the construction of Cipularang toll road, it is more appropriate, for the industrial sectors to have the greatest impact compared to other sectors (based on the reduction of transportation cost) related to the movement of goods between cities. Therefore, it is the industrial sector that simulates the final demand changes (total output) which is 10% of the total reduction in cost of transporting goods.

The results towards the output changes performed based on the direct impact received by the industrial sector and the indirect impact received by another production sector in Bandung is + 1.2 of the GDP total.

For further research, there should be an analysis of the percentage of freight from the total cost of production (marginal cost). It is also necessary to collect relevant data on how large the output of industry sectors that use the toll road infrastructure is.

This study has implications for the stakeholders involved in the development of Indonesian transportation infrastructure, by highlighting the broader economic benefits received by the regions (especially key sector) in which the transportation project investment occurs.

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