THE IMPACT OF ROAD CONSTRUCTION SECTOR ON HOUSEHOLD INCOME INTRA AND INTER-REGION OF WEST-EAST INDONESIA

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ABSTRAK

Perbedaan perkembangan antardaerah menyebabkan terjadinya kesenjangan kesejahteraan dan kemajuan daerah, antara lain Kawasan Barat Indonesia (KBI) dan Kawasan Timur Indonesia (KTI) dan daerah perkotaan dan daerah pedesaan. Tujuan studi ini menganalisis jalur struktural sektor pembangunan infrastruktur jalan terhadap perubahan distribusi pendapatan rumah tangga baik intra maupun inter regional KBI dan KTI. Model yang digunakan adalah model Sistem Neraca Sosial Ekonomi (SNSE) Antar Wilayah atau Interregional Social Accounting Matrix (IRSAM) KBI-KTI dengan basis data tahun 2005. Untuk kepentingan penelitian sektor bangunan di-disaggregasi menjadi sektor bangunan jalan (termasuk jembatan) dan sektor bangunan lainnya. Sedangkan institusi rumah tangga, di-disaggregasi berdasarkan klasifikasi pendapatan rumahtangga menurut World Bank yaitu : golongan rendah, golongan menengah, dan golongan atas. Analisis data dilakukan secara deskriptif dan kuantitatif. Untuk melihat keterkaitan antara sektor pembangunan infrastruktur jalan dengan sektor-sektor produksi lainnya di KBI dan KTI dianalisis dengan analisis jalur struktural atau structural path analysis yang menunjukkan efek multiplier yang dipancarkan paling kuat melalui faktor-faktor produksi tenaga kerja dan modal sebelum sampai ke rumah tangga.

Kata kunci : *sektor bangunan jalan, pendapatan rumah tangga, analisa jalur struktural, kawasan barat Indonesia, kawasan timur Indonesia, sistem neraca sosial ekonomi antar wilayah*

ABSTRACT

The differences in interregional development have caused gaps in regions' advancements and prosperity, such as in the case of Western Indonesia (WI) and Eastern Indonesia (EI) and between urban and rural areas. The objective of this study is to analyze the structural path of road infrastructure construction sector on household income distribution change in both Intra and Inter West-East Region of Indonesia. The model used is Interregional Social Accounting Matrix West and East Region of Indonesia (IRSAM WEI). Within the model framework, construction sector is disaggregated into construction of road infrastructure sector (including bridge) and other construction sector. Meanwhile, the urban and rural household income is disaggregated into low, medium and high income. The Structural Path Analysis (SPA) shows that the strongest multiplier effect comes from production factor of worker and capital before reaching households.

Keywords : *road construction sector, household income, Structural Path Analysis, Western region of Indonesia, Eastern region of Indonesia, Interregional Social Accounting Matrix*

INTRODUCTION

The differences in interregional development have caused gaps in regions' advancements and prosperity, such in the case between Western Indonesia (WI) and Eastern Indonesia (EI) and between urban and rural areas (Kuncoro, 2002).

The issues of interregional gaps are still relevant and intriguing up to now, due to the fact that these problems in interregional economic gaps remain unsatisfactorily unsolved. Various solution alternatives have been offered, several policies and operational measures have been taken; yet, none of them succeeded. These measures to overcome the disparity in regional development include the distribution of the development of transport infrastructures, including the development of road infrastructures (Sjafrizal, 2008; Tjahjati, 2009). Empiric study related to interregional in Indonesia has been done by many parties, applies model Interregional Social Accounting Matrix e.g., Alim (2006) analyses cause of the widening of economic gap between Jawa and Sumatra during the economic development, Hadi (2001) studies about income disparity between West Region of Indonesia (WI) and East Region of Indonesia (EI), Achjar, et al. (2003) investigates dependency character of interregional by using Interregional Block Structural Path Analysis method and Rahman and Utama (2003) analyses the impact of fiscal decentralization Indonesia. But, none of the above studies analyze the impact of road construction sector. In the context of this research, the issue to be discussed related to economic interactions between WI and EI is the extent to which the role of road construction sector holds in increasing household income. The purpose of this research is to measure and analyze the role and/or structural path of road construction sector in the change of household income in WI and EI.

LITERATURE REVIEW

The Role of Road Infrastructures

Road infrastructure in Indonesia plays a vital role in national transportation, serving around 92% of passenger transportation and 90% of goods transportation at the existing infrastructure.

So far, the total value in infrastructure asset capitalization of National Roads only exceeded two hundred trillion rupiah. Road holds a very strategic role in reducing transportation expense. If the construction of road infrastructure continues, roads will become one factor that gives positive influence on economic growth, which will improve regional economic competitiveness in national economy, and improve national competitiveness towards international economy (Direktorat Jenderal Bina Marga, 2009).

Construction of road infrastructure creates business opportunity and accommodates labor force, as well as gives a potential multiplier effect to local and sectoral economy. The micro linkage between road development and industrial and services sectors itself and the potential employment opportunities are illustrated by *Khazanah Nasional (2006*) as in Figure 1 and Figure 2 as follows:

Justification for the Use and Construction of Interregional Social Accounting Matrix (IRSAM) Model

In line with the theoretical framework used, the IRSAM model is capable of taking the snapshot of the whole economic projections, for either endogenous or exogenous, and either intraregional or interregional. Moreover, the model makes it possible to analyze the interregional correlation between WI and EI in a single matrix (Hadi, 2001; Alim, 2006).

Model SAM is extension from model I-O, where this model makes a picture economics at one certain time. Excellence of SAM model compare to I-O model is that SAM model can show the flow of income distribution and income redistribution and also consumption between household classifications in economics (Sadoulet and de Janvry, 1995). The IRSAM model is constructed using the database of the year 2005. This model was compiled by initially compiling WI-EI Interregional Input-Output (IRIO), followed by compiling IRSAM WEI. For the purpose of this research, the construction sector is disaggregated into road construction sector (including bridge) and other constructions sector, while the urban and rural household income are disaggregated based on World Bank classification into low, middle and high income.

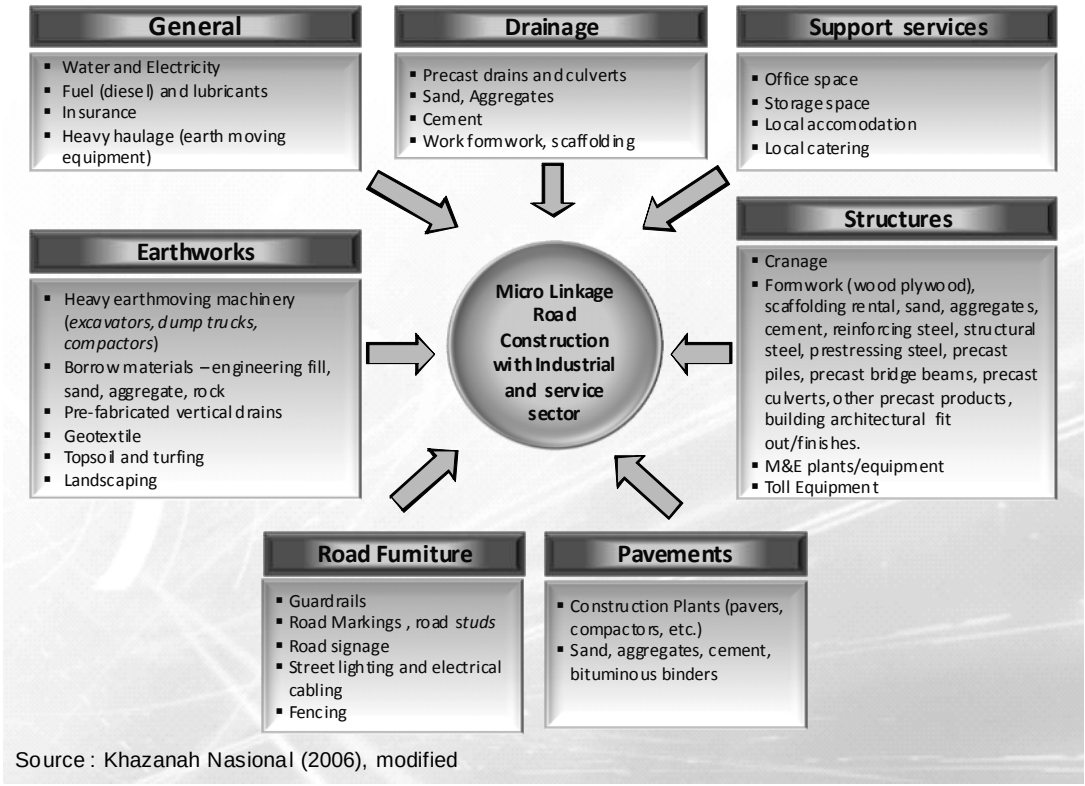


Figure 1. Micro Linkage Road Construction with Industrial and service sector

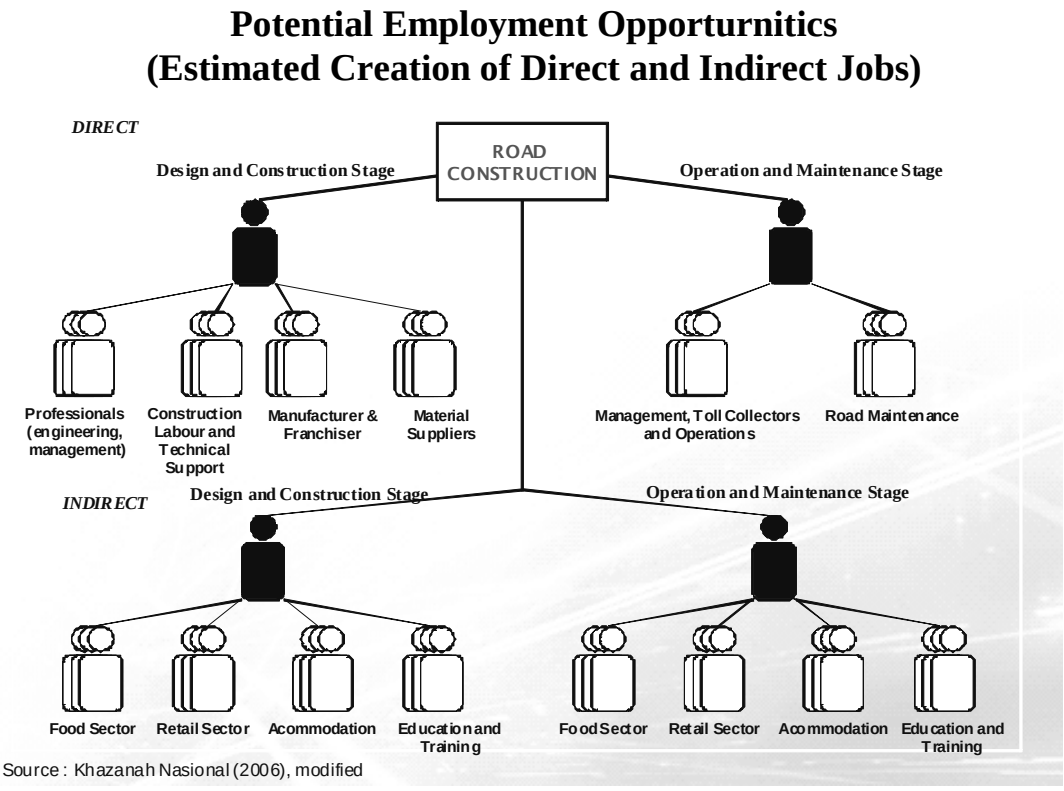


Figure 2. Potential Employment Opportunities

The compilation of I-O Interregional table of the year 2005 is basically done based on two main foundations, namely I-O regional tables of 30 provinces in the year 2005 and interregional trade flow matrices. From the data available, the provinces' I-O tables were compiled based on years (BPS, 2000). In order to alter these years into the year 2005, the data for some of the provinces are updated using the RAS method (Jackson and Murray, 2002 ; Fofana, et. al., 2002). The interregional trade flow matrices of several sectors (commodities) are explored using the data of the flow of goods based on ports in Indonesia, and the other sectors are estimated using Gravity Model.

Basically, transactions in the IRIO table are transactions between economic sectors and between regions, while the transactions in the IRSAM table are transactions of four key balances. These four key balances are production factor balance, institutional balance, production sector balance and other balance. Data used to compile IRSAM is secondary data obtained from Badan Pusat Statistik (BPS, 2007; BPS, 2008) which covers Sensus Sosial Ekonomi Nasional (Susenas) applied to construct household balance sheet, Survey Angkatan Kerja Nasional (Sakernas) to compile labour matrix, The Government Financial Statements to compile Government balance sheet, data Survei Khusus Badan Usaha as compilation basis of Private Enterprises balance sheet and Balance of Payment (Bank Indonesia) as compilation basis of Foreign balance sheet. The IRSAM matrix construction is 136 x136.

HYPOTHESIS

Based on the mentioned above hence this study hypothesis is as follows:

1. Road construction sector has big role in creating output, added value, opportunity of job and in pushing increases of other sectors income and increases household income.
2. Road construction sector through policy strategy of supply push will be able to affect to improve income distribution and reduce level of poverty.

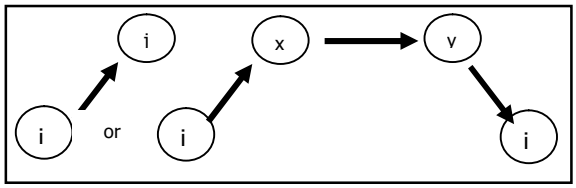
METHODOLOGY

Structural Path Analysis

In order to meet the purposes of the research, data are analyzed descriptively and quantitatively. The correlation between road infrastructure sector and other production sectors in WI and EI is determined by quantitatively analyzing the data using SPA.The use of SPA is intended to clarify the correlation between roads and bridges infrastructure construction sector and household sector.

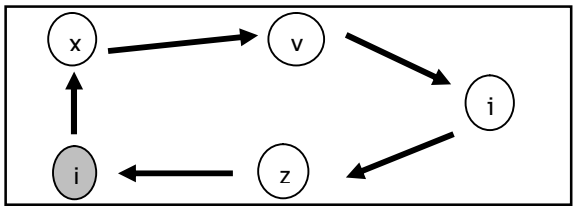
The SPA method is able to show the effects of transmission from one sector to another in an image continuously. In the SPA, each element in SAM multiplier can be decomposed into direct, total, and global effects. This means that SPA is essentially a method performed to identify a whole network of paths connecting the effects of one sector on another sector in a social economic system. The effect of one sector on another sector may go through an elementary path or circuit (Prihawantoro, 2002). According to Defourney and Thorbecke (1988) in Daryanto (2001), a conventional decomposition method is incapable of decomposing the multiplier into its component transactions, or of identifying transactions by including a correlation in sequences. Conventional multiplier decomposition can only decompose the effects within and between endogenous projections alone.

Influencing from a sector to the other sector can pass elementary path or circuit (Prihawantoro, 2002), called as elementary path if the path through a sector at the most once. Taking Example sector *i* to influence sector *j*. Influence from *i* to *j* can happen directly, also can happen through other sectors, say *x* and *y*. If in path *i* to *j* *i*, *x*, *y*, and *j* only be passed by once, hence thing like this conceived of elementary path, the example as shown in figure 3.



Source : Prihawantoro (2002)

Figure 3. Elementary Path in Path Analysis



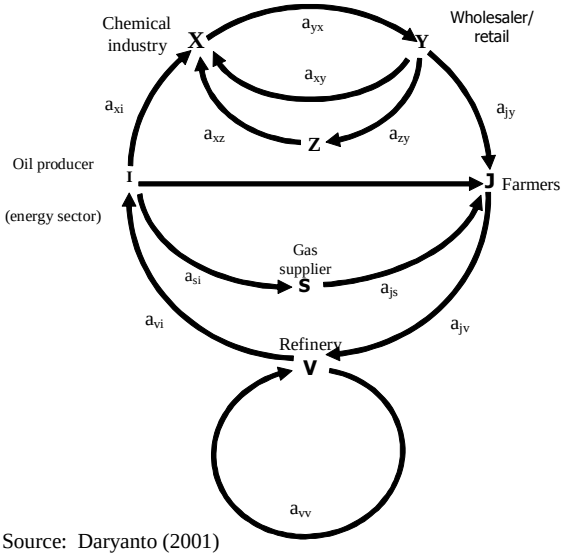
Source : Prihawantoro (2002)

Figure 4. Circuit in Path Analysis

Sometimes a sector, after influencing other, in the end will return again influences itself sector. As an example, sector influence *i* to *j* simply inchoate. If *j* influences *z*, and *z* influences *i*, hence line from *i* to *x* to *y* to *j* to *z* and back to *i* called as circuit. In this line every sector passed by only once, except *i*. Sector *i* passed twice, namely in the early of line and by the end of line, as indicated in Figure 4

The influence, is size expressing level of disbursement impact of a sector to other sector, and hence depicts is tightly the relation of among both the sectors. Magnitude used tightly to measure the relationship, depends on approach applied, namely approach of average or marginal approach. Therefore, it can be applied magnitude *aij* or *cij*.

In methodologies SPA there are three important elements to be studied, namely direct influence line (direct influence), total influence (total influence), and global influence (global of influence) (Daryanto, 2001; Prihawantoro, 2002). We will discuss all of the three influences based on Figure 5.



Source: Daryanto (2001)

Figure 5. Example of the Possible Linkages between Two Sectors

Direct Influence

Direct influence from *i* to *j* ($ID_{i \to j}$) shows alteration of earnings or produce of *j* because of alteration of one unit *i*, during earnings or produce other point (except to of bottom line passed by from *i* to *j*) doesn't experience alteration. With average approach, direct influence ($ID_{i \to j}$) from *i* to *j* is:

$$ID (i \to j) = a_{ij} \quad \text{..... (1)}$$

Figure 4 presents example about SPA for case two sectors, this bottom line measured along the length of line *ij*. This means farmer (sector *j*) seen directly buys fuel from fuel producer (sector *i*). Because line passed by for once, this means elementary line from *i* to j has length one. Every disbursement trend of average (average expenditure propensity), *aij*, can be interpreted as strength from transmission influence from sector *i* to sector *j*.

Matrix A_n in modeling SAM can be said a direct influence matrix, what determined analogical (1) above. Direct influence can also be measured with elementary path having length more than one. Like the one presented in Figure 4, we see farmer (sector *i*) buys fuel from trader (sector *s*) where trader buys the fuel from producer (sector *j*). It is seen there are two bows, means elementary path from this direct influence has length equal to two. This interrelationship can be formulated as follows:

$$ID(i , sj) = a_{si}\, a_{js} \quad \text{..... (2)}$$

Total Influence

Total influence from *i* to *j* is alteration brought from i to j either through elementary path or circuit connecting it. Total influence *(IT)* is multiplication between direct influences *(ID)* and path multiplier *(Mp)*, which can be formulated as follow :

$$IT (i \to j) = ID (i \to j)\, Mp \quad \text{.....(3)}$$

$$IT (i \to j) = a_{xi}\, a_{yx}\, a_{jy} [1 - a_{yx} (a_{xy} + a_{zy}\, a_{xz})]^{-1} \quad \text{..... (4)}$$

Where:

$$Mp = [1 - a_{yx} + (a_{xy} + a_{zy}\, a_{xz})]^{-1} \text{..... (5)}$$

In Figure 5, IT is explained along the length of three bow lines, that is $i \to x \to y \to j$.

Therefore, IT has three elementary paths. In this case can be explained that the farmer buys input drugs from whole seller service sector or retailer *(y)* where they obtain it from agriculture drugs industrial sector *(x)*. Then to produce drugs, industrial sector also requires input from fuel producer *(j)*. Referring to the transaction line we see existence of reciprocal influence either directly or also indirectly. For this case reciprocal influence directly can be seen at line *x* to *y*, what indicates that drugs trader (y) directly buys it (the merchandise from industrial sector *(x)*. While reciprocal influence indirectly looked to be at *z* line to *y* and *x* to *z*, what indicates that trader service sector *(y)* can buy output from peripatetic company in research and development firm where this company obtains the input from chemical industry *(x)*.

Global Influence

Global influence from *i* to *j* measures overall of influence at earnings or produce of *j* which is caused by one alteration units *i*. Global influence *(IG)* equal to total influence *(IT)* along the length of bottom line interacting at point of *i* and point *j*. This global influence can be derived from the following formula.

$$IG_{(i\to j)} = m_{aji} = \sum_{p=1}^{n} IT_{(i\to j)} = \sum ID_{(i\to j)} Mp \quad ....(6)$$

Where:

IG $(i \to j)$ = global influence from column to i in SAM to line j,

$m_{aj}i$ = element to (j , i) at matrix multiplier Ma

IT $(i \to j)$ = total influence from i to j

ID $(i \to j)$ = influence directly from i to j , and

Mp = multiplier along the length of line p.

In Figure 5 origin point *i* and destination point *j* have the same three elementary paths. For example (*i* , *x* , *y* , *j*) , (*i* , *s* , *j*) dan (*i* , *v* , *j*), assume that for three paths, each path named 1, 2 and 3, hence we can derive global influence from the trajectory as follows.

$$\begin{aligned} IG\ (i \to j) &= IT\ (i,x,\ y,\ j) + IT\ (i,\ s\ ,\ j\ ) + IT\ (i,\ v,\ j) \\ &= IT\ (i \to j)_1 + IT\ (i \to j)_2 + IT\ (i \to j)_3 \\ &= ID\ (i \to j)_1\ M_1 + a_{si}\ a_{js} + (\ a_{vi}\ a_{jv}\ )\ (\ I - a_{vv}\ )^{-1} \\ &= ID\ (i \to j)_1\ M_1 + ID\ (i \to j)_2 + ID\ (i \to j)_3\ M_3 \quad .....(7) \end{aligned}$$

Finally, it can be said that SPA has proved as a peripheral capable to identify important interrelationships in a complicated SAM model. Main difficulty in using approach of this SPA is when we wish to calculate elementary path in a real big number, the calculation becomes more complicated.

In order to analyze the structural paths of all those economic sectors, software called Matrix Accounts Transformation System (MATS) version 1.0.5 is used.

RESULTS AND ANALYSIS

The structural path analysis describing the flow of income to households as an impact of stimulus fund injected into a development sector can be used as a reference to observe the extent to which road and bridge infrastructure sectors plays a role in increasing household income. This path analysis makes it possible to trace where the effects of the stimulus fund for road and bridge infrastructure sectors are transmitted, therefore making it possible to determine which household groups benefit the most out of roads and bridges development.

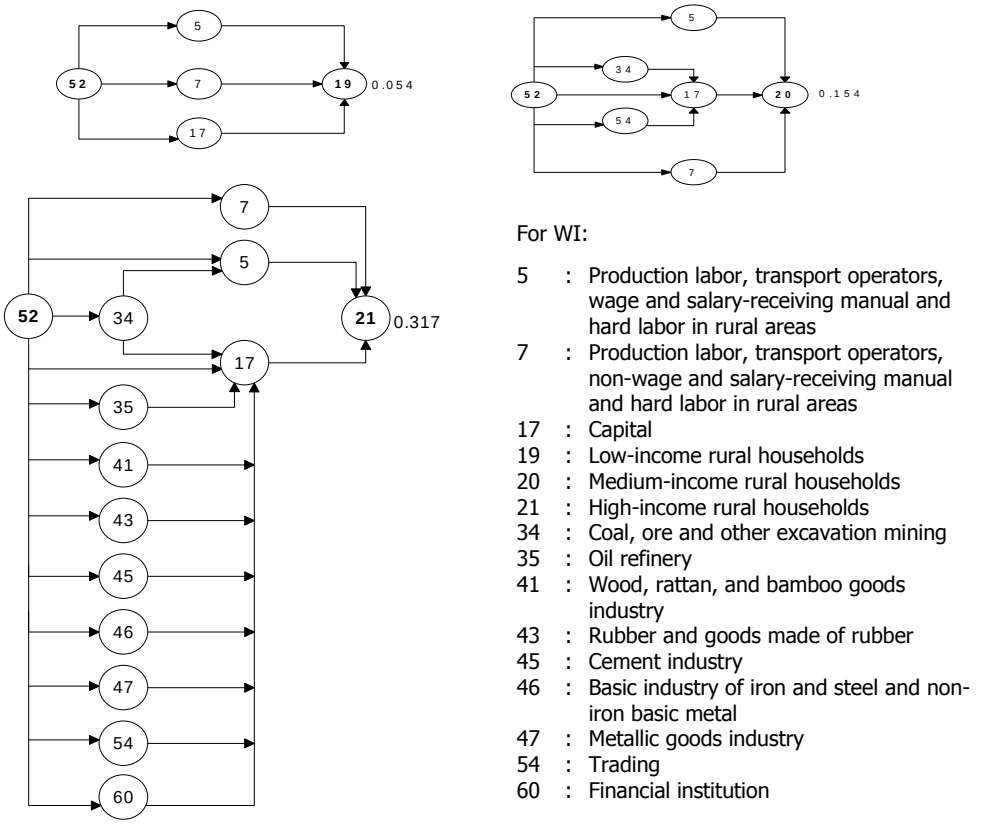
It has been established in the current structural path analysis that the amount of direct effect observed and analyzed shall be 0.001 or 0.1%. Any direct effect below this coefficient value will not be traced. The a very small coefficient value is intended to further specify where the income effects of road infrastructure sector stimulus fund are transmitted to households. This is described more clearly in Table 1, Figure 6, 7, 8, Table 2, Figure 9, 10 and 11 respectively.

Table 1. Structural Path Analysis of Western Indonesia Road and bridge infrastructure sectors towards Households

Path	Global Effect	Direct Effect	Path Mult	Total Effect	% of Global	Cum %
52, 5, 19	**0.054**	**0.008**	**1.131**	**0.009**	**16**	**16**
52, 7, 19		0.001	1.12	0.002	2.8	18.8
52, 17, 19		0.004	1.692	0.007	12.3	31
52, 5, 20	**0.154**	**0.018**	**1.223**	**0.022**	**14.3**	**14.3**
52, 7, 20		0.003	1.214	0.004	2.7	17
52, 17, 20		0.012	1.746	0.022	14	31.1
52, 34, 17, 20		0.002	1.773	0.003	1.8	32.9
52, 54, 17, 20		0.001	1.891	0.002	1.3	34.2
52, 5, 21	0.317	0.037	1.339	0.05	15.6	15.6
52, 7, 21		0.006	1.334	0.008	2.6	18.2
52, 17, 21		**0.03**	**1.78**	**0.053**	**16.6**	**34.8**
52, 34, 5, 21		0.001	1.362	0.002	0.6	35.5
52, 34, 17, 21		0.004	1.808	0.007	2.1	37.6
52, 35, 17, 21		0.002	1.802	0.004	1.2	38.8
52, 41, 17, 21		0.002	2.313	0.004	1.4	40.2
52, 43, 17, 21		0.001	2.217	0.003	0.8	41.1
52, 45, 17, 21		0.002	1.84	0.004	1.3	42.4
52, 46, 17, 21		0.002	2.215	0.005	1.6	44
52, 47, 17, 21		0.001	2.52	0.003	1	45
52, 54, 17, 21		0.003	1.916	0.005	1.5	46.5
52, 60, 17, 21		0.002	2.013	0.004	1.2	47.8
52, 6, 22	**0.077**	**0.007**	**1.17**	**0.009**	**11.4**	**11.4**
52, 8, 22		0.001	1.134	0.002	2	13.4
52, 10, 22		0.002	1.2	0.002	3.1	16.5
52, 14, 22		0.002	1.154	0.003	3.4	19.8
52, 17, 22		0.004	1.708	0.006	8.1	27.9
52, 6, 23	0.234	0.017	1.301	0.023	9.7	9.7
52, 8, 23		0.003	1.271	0.004	1.9	11.5
52, 10, 23		0.005	1.325	0.006	2.7	14.2
52, 14, 23		0.005	1.289	0.007	2.8	17
52, 16, 23		0.001	1.262	0.002	0.6	17.7
52, 17, 23		**0.016**	**1.794**	**0.029**	**12.4**	**30.1**
52, 34, 6, 23		0.001	1.324	0.001	0.6	30.7
52, 34, 17, 23		0.002	1.823	0.004	1.6	32.3
52, 35, 17, 23		0.001	1.816	0.002	0.9	33.2
52, 41, 17, 23		0.001	2.331	0.002	1.1	34.3
52, 45, 17, 23		0.001	1.854	0.002	1	35.2
52, 46, 17, 23		0.001	2.233	0.003	1.2	36.4
52, 54, 17, 23		0.001	1.936	0.003	1.2	37.6
52, 60, 10, 23		0.001	1.519	0.002	0.9	38.5
52, 60, 17, 23		0.001	2.021	0.002	0.9	39.4
52, 6, 24	0.517	0.036	1.452	0.052	10.1	10.1
52, 8, 24		0.006	1.433	0.009	1.7	11.8
52, 10, 24		0.009	1.465	0.014	2.6	14.5
52, 14, 24		0.011	1.44	0.016	3	17.5
52, 16, 24		0.002	1.426	0.003	0.6	18.1
52, 17, 24		**0.044**	**1.842**	**0.082**	**15.9**	**33.9**

Table 1. Structural Path Analysis of Western Indonesia Road and bridge infrastructure sectors towards Households (Continued)

Path	Global Effect	Direct Effect	Path Mult	Total Effect	% of Global	Cum %
52, 17, 26, 24		0.001	2.311	0.002	0.5	34.4
52, 34, 6, 24		0.002	1.476	0.003	0.7	35.1
52, 34, 10, 24		0.001	1.489	0.002	0.3	35.3
52, 34, 17, 24		0.006	1.87	0.01	2	37.4
52, 35, 17, 24		0.003	1.863	0.006	1.2	38.5
52, 41, 6, 24		0.001	1.891	0.002	0.4	38.9
52, 41, 17, 24		0.003	2.393	0.007	1.3	40.3
52, 43, 17, 24		0.002	2.292	0.004	0.8	41.1
52, 45, 6, 24		0.002	1.501	0.002	0.5	41.6
52, 45, 17, 24		0.003	1.903	0.007	1.3	42.8
52, 46, 6, 24		0.002	1.809	0.003	0.5	43.3
52, 46, 17, 24		0.003	2.291	0.008	1.5	44.8
52, 47, 6, 24		0.001	2.057	0.002	0.4	45.2
52, 47, 17, 24		0.002	2.606	0.005	1	46.2
52, 54, 12, 24		0.001	1.635	0.002	0.4	46.6
52, 54, 17, 24		0.004	1.966	0.008	1.5	48.1
52, 56, 17, 24		0.001	1.892	0.002	0.4	48.5
52, 59, 17, 24		0.001	1.965	0.003	0.5	49.1
52, 60, 10, 24		0.003	1.668	0.004	0.9	49.9
52, 60, 17, 24		0.003	2.07	0.006	1.2	51.1
52, 62, 17, 24		0.001	1.996	0.002	0.4	51.5
52, 99, 71, 89	0.037	0.001	1.18	0.001	3.8	3.8



For WI:

5 : Production labor, transport operators, wage and salary-receiving manual and hard labor in rural areas
7 : Production labor, transport operators, non-wage and salary-receiving manual and hard labor in rural areas
17 : Capital
19 : Low-income rural households
20 : Medium-income rural households
21 : High-income rural households
34 : Coal, ore and other excavation mining
35 : Oil refinery
41 : Wood, rattan, and bamboo goods industry
43 : Rubber and goods made of rubber
45 : Cement industry
46 : Basic industry of iron and steel and non-iron basic metal
47 : Metallic goods industry
54 : Trading
60 : Financial institution

Figure 6. Diagram of Structural Paths of WI's Road and bridge infrastructure sectors towards Rural Households

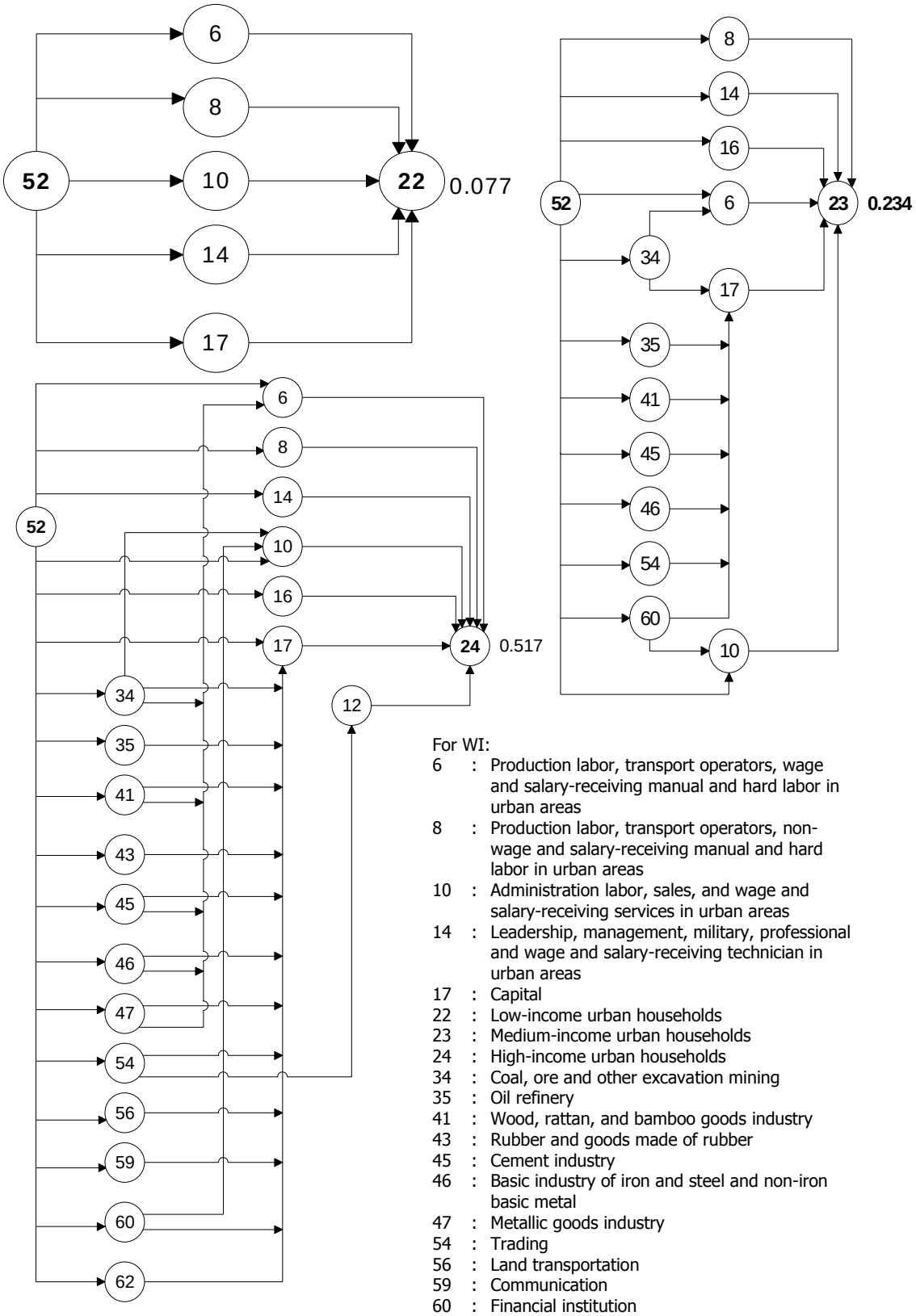


Figure 7. Diagram of Structural Paths of WI's Road and bridge infrastructure sectors towards Urban Households

DISCUSSION

In Figure 6, low-income rural households (19) will experience the income increase effect from the injection of stimulus fund into road and bridge infrastructure sectors (52) as much as the global effect, which is 0.054 rupiah. This global effect is transmitted through capital and labor production factor paths, in which the largest global percentage of 16% is through road and bridge infrastructure sectors income path (52) to wage-receiving labor production factor (5) and ends at low-income rural households (19), note Table 1. In other words, the structural path (52) to (5) and to (19) is the path most strongly describing the multiplier effect of road and bridge infrastructure sectors on low-income rural households.

Middle-income rural households (50) appear to be gaining greater effects compared to low-income rural households. From every injection of 1 rupiah of stimulus fund into road and bridge infrastructure sectors, this household group gains a global effect of 0.154 rupiah, in which the highest global percentage is through road and bridge infrastructure income path (52) to wage-receiving labor production factor (5) and middle-income rural households (20), with the global percentage revealed through this path of 14.3%. The income paths generated in middle-income rural household group vary and involve considerable production activities, two of which successfully recorded through SPA diagram are mining sector (34) and trading sector (54). In this regard, there is a correlation in the flow of income between road and bridge infrastructure sectors and the mining and trading sectors.

For rural areas, high-income households (21) are the household group gaining the most global effect of the stimulus fund injection into road and bridge infrastructure sectors, with the amount of 0.317. The flow of income generated varies and involves a significant number of paths, especially from other economic sectors before arriving at production factors and households. However, out of so many paths generated by the SPA, the greatest global percentage comes from road and bridge infrastructure sectors path (52) to capital production factor (17) and to high-income rural households (21). The global percentage in this path is 16.6%.

Still in WI, the structural path analyzed at this juncture is urban households, also divided into low-income, medium-income, and high-income groups. As in rural areas, low-income urban households (22) also gain the lowest multiplier effect of road and bridge infrastructure sectors. In Table 1 and Figure 7, these households only gain a global effect of 0.077, with structural paths involving more of capital and labor production factors alone, in which the path with the highest global percentage is the path from road and bridge infrastructure sectors (52) to labor production factor, transport operators, manual and hard labor (6), and ends at low-income urban household (22). The global percentage for this path is 11.4%.

The next point to discuss is the structural path to medium-income urban households, gaining a global effect of 0.234%, with the dominant path from road and bridge infrastructure sectors (52) to capital production factor (17) and ends at medium-income urban households (23); this path has a global effect percentage of 12.4%.

The last household income structural path to discuss in WI is the path to high-income urban households. This group gains the highest global effect among all households, either urban or rural, of 0.517, with the dominant path from road and bridge infrastructure sectors (52) to capital production factor (17) and to high-income urban households (24) of 15.9%.

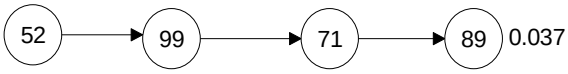


Figure 8. Diagram of Structural Paths of WI's Road and bridge infrastructure sectors towards High-Income Urban Households in EI

In Figure 8, the multiplier effect generated by road and bridge infrastructure sectors to high-income urban households results in a considerable number of structural paths. Almost all the other production factors and activities are involved in these structural paths. One of the paths through production activities strongly describing the global effect of road and bridge infrastructure sectors to high-income urban households is the mining production sector (34). The global percentage through this sector is 2%. This is followed by the iron and steel

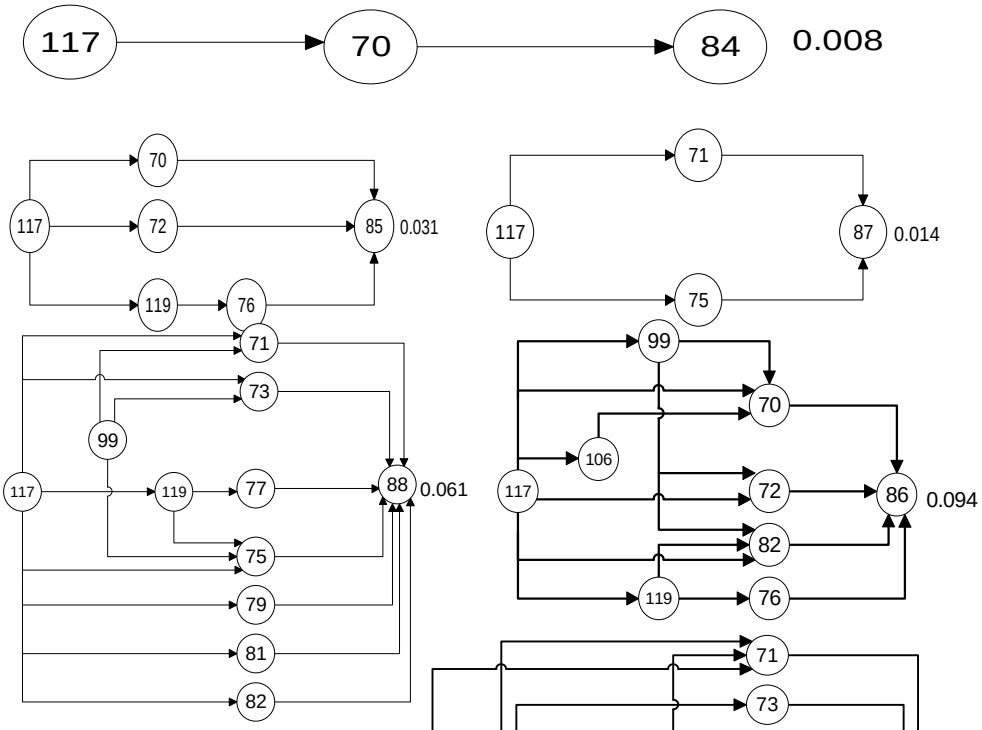
basic industry and non-iron basic metals sector of 1.5%, and the trading sector of 1.5%.

In addition to the structural paths describing intraregional effects, the structural path of interregional global effects is also presented in this discussion. Based on the data processing by SPA, it has been identified that there is only one path describing a spillover effect from the road and bridge infrastructure sectors in WI to households in EI. This path is from road and bridge infrastructure sectors (52) to mining sector in EI (99) to urban wage and salary-receiving labor production factors in EI (71) and ends at high-income urban households in EI (89), with a global effect of 0.037, and a global percentage of 3.8%. A more detailed description can be seen in Figure 4.

After a discussion on structural paths of road and bridge infrastructure sectors in WI, the next point to discuss is the roads and bridge infrastructure sectors in EI. A more complete description can be seen on Table 2 and Figure 9.

Table 2. Structural Path Analysis of EI's Road and bridge infrastructure sectors towards Households

Path	Global Effect	Direct Effect	Path Mult	Total Effect	% of Global	Cum %
117, 70, 84	**0.008**	**0.002**	**1.014**	**0.002**	**28.3**	**28.3**
117, 70, 85	**0.031**	**0.008**	**1.035**	**0.008**	**26.6**	**26.6**
117, 72, 85		0.003	1.034	0.003	8.4	35
117, 119, 76, 85		0.001	1.093	0.001	3.7	38.7
117, 70, 86	**0.094**	**0.035**	**1.0311**	**0.037**	**38.8**	**38.8**
117, 72, 86		0.005	1.031	0.005	5.3	44.1
117, 82, 86		0.006	1.048	0.006	6.7	50.8
117, 99, 70, 86		0.004	1.11	0.004	4.6	55.4
117, 99, 72, 86		0.002	1.11	0.002	2.2	57.6
117, 99, 82, 86		0.002	1.128	0.002	2.6	60.2
117, 106, 70, 86		0.001	1.435	0.002	2	62.2
117, 119, 76, 86		0.002	1.09	0.002	2.6	64.9
117, 119, 82, 86		0.002	1.106	0.002	2.6	67.4
117, 71, 87	**0.014**	**0.003**	**1.02**	**0.003**	**19.7**	**19.7**
117, 75, 87		0.001	1.02	0.001	7.8	27.5
117, 71, 88	**0.061**	**0.01**	**1.056**	**0.011**	**17.7**	**17.7**
117, 73, 88		0.003	1.054	0.004	5.8	23.6
117, 75, 88		0.005	1.056	0.005	8.5	32.1
117, 79, 88		0.005	1.055	0.005	8.5	40.6
117, 81, 88		0.001	1.053	0.001	2	42.6
117, 82, 88		0.002	1.074	0.002	3.5	46.1
117, 99, 71, 88		0.002	1.137	0.002	3.1	49.2
117, 99, 73, 88		0.001	1.134	0.001	2	51.2
117, 99, 75, 88		0.001	1.137	0.002	2.5	53.7
117, 119, 75, 88		0.001	1.116	0.001	2.3	56
117, 119, 77, 88		0.002	1.114	0.002	3.9	60
117, 71, 89	0.17	0.046	1.045	0.048	28	28
117, 73, 89		0.006	1.045	0.007	4	32
117, 75, 89		0.009	1.046	0.01	5.7	37.7
117, 79, 89		0.012	1.045	0.012	7.2	45
117, 81, 89		0.002	1.044	0.002	1.3	46.3
117, 82, 89		0.01	1.06	0.011	6.3	52.6
117, 99, 71, 89		0.007	1.125	0.008	4.9	57.5
117, 99, 73, 89		0.002	1.124	0.002	1.3	58.9
117, 99, 75, 89		0.003	1.126	0.003	1.7	60.6
117, 99, 79, 89		0.002	1.124	0.002	1	61.6
117, 99, 82, 89		0.004	1.14	0.004	2.5	64.1
117, 106, 71, 89		0.002	1.454	0.003	1.8	65.9
117, 106, 82, 89		0.001	1.472	0.002	0.9	66.8
117, 119, 75, 89		0.002	1.105	0.003	1.6	68.4
117, 119, 77, 89		0.005	1.103	0.005	3	71.4
117, 119, 82, 89		0.004	1.117	0.004	2.4	73.8
117, 35, 17, 24	0.125	0.001	1.786	0.003	2.1	2.1



For EI:

70 : Production labor, transport operators, wage and salary-receiving manual and hard labor in rural areas
71 : Production labor, transport operators, wage and salary-receiving manual and hard labor in urban areas
72 : Production labor, transport operators, non-wage and salary-receiving manual and hard labor in rural areas
73 : Production labor, transport operators, non-wage and salary-receiving manual and hard labor in urban areas
75 : Administration labor, sales, and wage and salary-receiving services in urban areas
76 : Administration labor, sales, and non-wage and salary-receiving services in rural areas
77 : Administration labor, sales, and non-wage and salary-receiving services in urban areas
81 : Leadership, management, military, professional and non-wage and salary-receiving technician in urban areas
82 : Capital
84 : Low-income rural households
85 : Medium-income rural households
86 : High-income rural households
87 : Low-income urban households
88 : Medium-income urban households
89 : High-income urban households
99 : Coal, ore and other excavation mining
106 : Wood, rattan, and bamboo goods industry
117 : Road and bridge infrastructure sectors
119 : Trading

Figure 9. Diagram of Structural Paths of EI's Road and bridge infrastructure sectors towards Urban Households

Unlike the case in WI, the road and bridge infrastructure sectors in EI yields very low global income effect on either urban or rural households. Low-income rural households only gain a global effect of 0.008, transmitted through the structural path from road and bridge infrastructure sectors (117) to production labor, transport operators, wage and salary-receiving manual and hard labor in rural areas (70) and to low-income rural households (84), with a global percentage of 28.3%, which means that this path can describe the effect of road and bridge infrastructure sectors on the increase in the income of low-income rural households by 28.3%. A more detailed description can be seen on Table 2 and Figure 9. Medium-income rural households gain a global effect of 0.031, with the structural path gaining the greatest global percentage from road and bridge infrastructure sectors (117) to production labor, transport operators, wage and salary-receiving manual and hard labor in rural areas (70) and to medium-income rural households (85). This very path, gaining the greatest global percentage of 38.8%, is also transmitted to high-income rural households. The only difference is that this group of households gains the highest global effect in the rural areas with 0.094.

The same phenomenon can also be seen on the structural path of road and bridge infrastructure sectors to urban households. All paths with the largest global percentage go through production labor, transport operators, wage and salary-receiving manual and hard labor in urban areas (71), transmitted to either low-income (87), medium-income (88), or high-income (89) urban households. Despite the fact that some of the paths detected by SPA also go through some production activities such as mining sector, sector of goods made of wood, rattan, and bamboo, and trading sector, the structural paths more strongly describing the correlation between road and bridge infrastructure sectors and urban households are the short paths going merely through production labor, transport operators, wage and salary-receiving manual and hard labor in urban areas (71) production factors.

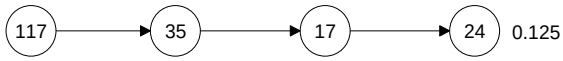


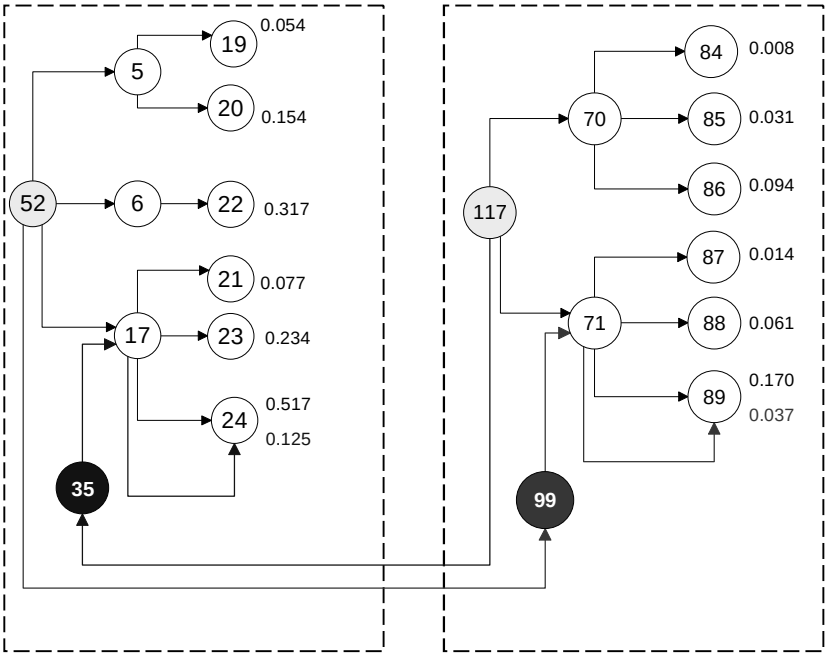
Figure 10. Diagram of Structural Paths of WI's Road and bridge infrastructure sectors towards High-Income Urban Households in EI

Figure 10 shows the structural path diagram of the spillover effect from road and bridge infrastructure sectors in EI to households in WI. The SPA model developed can only take a snapshot of one path inflicting a direct effect greater than or equal to 0.001, coming from road and bridge infrastructure sectors in EI (117) to WI's oil refinery sector (35) then to WI's capital production factor (17) and ends at high-income urban households in WI (24), with transmitted interregional global effect of 0.125, and a global percentage of 2.1%.

Based on the structural paths with the highest global percentages above, it is possible to draw a diagram of paths most dominantly describing the effects of stimulus fund in road and bridge infrastructure sectors on households as described in Figure 11.

According to Figure 11, it is clear that if observed intra-regionally, the global effects of road and bridge infrastructure sectors in either WI or EI on households are more strongly transmitted through production factors structural paths without involving other production sector activities. Generally, production factors included in structural paths in EI are production labor, transport operators, manual and hard labor receiving or non-receiving wages and salaries (70 and 71). In WI, in addition to labor (5 and 6), production factors involved include capitals (17).

Another path interesting to discuss here is the structural path describing an interregional or spillover effect. In the case of either EI or WI, before the global effect of road and bridge infrastructure sectors is received by households, especially high-income urban households, it initially goes through production activities of other sectors. For WI, the spillover effect transmitted to EI's high-income urban households (89) must first go through coal, ore mining and other excavation sector (99).



(A). Western Indonesia Area (B). Eastern Indonesia Area

Figure 11. Structural Path of the Effects of Stimulus Fund in Road and bridge infrastructure sectors towards Households based on Paths with the Highest Global Percentage.

For EI, on the other hand, the spillover effect is transmitted through WI's oil refinery sector (35) before going through WI's capital production factor (17) and then to WI's urban households.

CONCLUSION AND SUGGESTION

Conclusion

Development policies in road and bridge infrastructures are potentials to increase household incomes. The multiplier effects of these policies, as described by the SPA, are transmitted most strongly through labor and capital production factors before reaching households. The SPA shows the flow of stimulus fund through road construction sector and its effect in increasing household income and which household classification gains the most benefit of the road construction.

Urban household and rural household intraregional of WI and EI illustrate the same result; the high income households both for urban and rural gain the highest benefit of stimulus fund through road construction sector, continued by the medium income households and lastly low income household. High income urban households gain the highest global effect among household income group (0.517 rupiah) and the lowest is the rural household low income (0.054 rupiah).

Inter-regionally, the spillover effect of road construction sector from WI to household in EI and EI to household in WI shows that the spillover from EI to WI household (global effect of interregional transmitted 0125, and global percentage equal to 2.1%) is higher than from WI to EI household (global effect of interregional 0037, and global percentage equal to 3.8%).

Suggestion

The low income group should be supported by road construction sector policies, which take into consideration both intraregional and interregional effects on household income. Therefore, the disparity of income between household groups, urban and rural intraregional of WI and EI and interregional of WI and EI will not become wider than the existing condition.

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