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DAFTAR ISI

ROAD NETWORK PERFORMANCE AND ECONOMIC PARAMETERS USING CITY/MUNICIPAL DATA IN SULAWESI PROVINCE

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ABSTRACT

Road transport is an important sector of economic activity, especially in developing countries, where it plays an essential role in marketing agricultural products and providing access to health, education, and agricultural inputs and extension services. Many questions still exist related with transportation infrastructure performance's impact and how further policy must be defined according to current condition, especially in city/municipal levels. This fact shows that there is a need to analyze the relation between transportation's infrastructures with economic measurements. This paper has an objective to study the relationship between road networks with economic parameters. The result can be used to figure more clearly its impact to economic growth. Further benefit is that it can be used as a base to allocate further funding allocation. Several models has been build, tested using statistical analysis, and reported in this paper. The model to predict amount of money spend to finance road sector is presented by models with DBM (different between APBD and fund needed for maintenance) as independent variable, which population and road length variable as independent variables. Analysis cannot build a good model to relate DAK (special allocation fund) with the road index.

Keywords: road network, economic parameters, road index, model, city/municipal.

INTRODUCTION

Road transport is an important sector of economic activity, especially in developing countries, where it plays an essential role in marketing agricultural products and providing access to health, education, and agricultural inputs and extension services. The impact of road transportation in developed regions is also significant. An efficient road system gives a country a competitive edge in moving goods economically. Conversely, lack of accessibility or poor road conditions are barriers to agriculture, industry and trade, and may hinder the entire development effort. Nevertheless, the contributions of transport to national development may be difficult to quantify in economic terms (Queiroz and Gautam, 1992). The World Bank's Long-Term Perspective Study emphasizes that although better market incentives (especially related to prices and inputs) to farmers remain important factors in agriculture, the effects of these would be blunted if the physical barriers and economic costs of transporting goods to and from markets remain high (The World Bank, 1990 in Queiroz and Gautam, 1992).

Rural areas with low standards of living are characteristically those with inadequate methods of moving people and goods, probably because of deficient access between villages and markets, schools, medical, economic, administrative and social services which affect the day to day lives of rural people (Riverson and Carapetis, 1991 in Queiroz and Gautam, 1992).

Transport investment would help open up new areas for agricultural production, create new markets for goods and link in isolated areas with the main towns and cities. Essentially, this is the development argument that has been applied more recently to countries passing through the development stage (Banister & Berechman, 2000). At one levels the traditionally held view that there is a strong link between transport infrastructure growth and economic growth does seems to be supported, particularly if national statistics on trends over the last fifty years are used. However, this aggregate view simplifies the more interesting political and economic arguments for investment, the regional variations, and the actions of individual firms and people in their own decisions (Banister & Berechman, 2000).

Indonesia, as a developing country, really needs many things to support economic growth, and one of them is transportation infrastructure. Indonesian's transportation infrastructures in current condition have been analyzed many times in varied ways. Unfortunately, many questions still exist related to its impact and how further policy must be defined according to current condition, especially in city/municipal levels. This fact shows that there is a need to analyze transportation's infrastructure relation with various economic measurements. The benefits from the analyses result, in national, provincial, or city/municipal levels, are to know the current condition (performance), impact to community and environment, strength and weakness from current condition, and developing further policy for the future.

This paper has an objective to study the relationship between land transportation infrastructures, especially road network, with economic parameters. The result can be used to figure more clearly its impact to economic growth. Further benefit is that it can be used as a base to allocate further funding allocation. It is known very well about limited government fund for transportation sector. The analysis will be focused on Sulawesi islands and city/municipal data will be used, since the provincial level has been studied in Joewono (2004) and Santosa and Joewono (2005)

DATA DESCRIPTION

Sulawesi is one of the big islands in Indonesia and consists of several provinces, while recently there was an expansion in number of provinces. The general data about Sulawesi is shown in Table 1 and the number of population is shown in Figure 1. Table 2 shows the economic parameter of Sulawesi. Figure 2 presents the total road length for each province in Sulawasi with its stagnancy condition. There was almost no increasing road length in Sulawesi, except there was small increase in Center Sulawesi in 2000 to 2001 and in North Sulawesi from 1999 to 2000. Road length decreased in 2000 to 2001 for South Sulawesi. Other than the length, the stagnancy condition also happened in the road condition. Proportion of road in stable condition was in range 50 to 70%, as shown in Figure 3.

Table 1 Sulawesi's General Data in 2002

Province	Capital	Area (km^2)	Number of City/Municipal
North Sulawesi	Menado	15.272	8
Center Sulawesi	Palu	61.550	9
South Sulawesi	Ujung Pandang	62.362	28
South East Sulawesi	Kendari	38.140	7

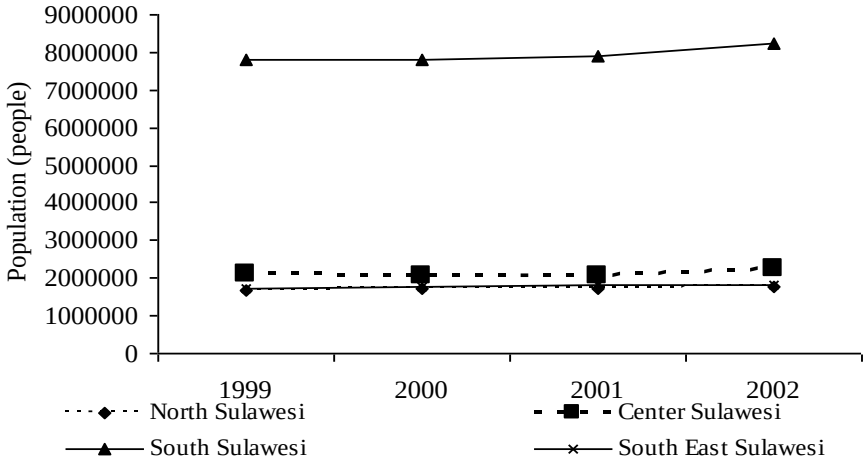

Figure 1 Number of Populations in Sulawesi from 1999 to 2002

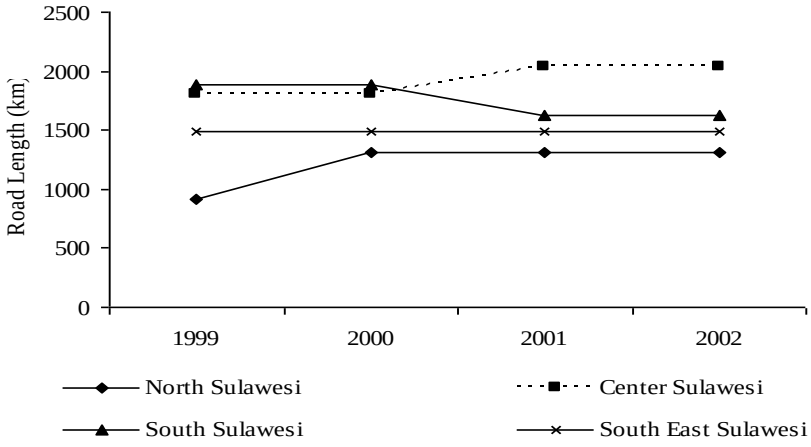

Figure 2 Road Lengths in Sulawesi

Table 2 Fiscal Index and DAK in Sulawesi in year 2003

Province	DAK (Specific Allocation Fund)* (in year 2003) (10^9 Rupiah)	Fiscal Index (in year 2002)
North Sulawesi	6,70	0,21
Center Sulawesi	7,20	0,13
South Sulawesi	3,40	0,53
South East Sulawesi	7,90	0,12

*DAK = Dana Alokasi Khusus

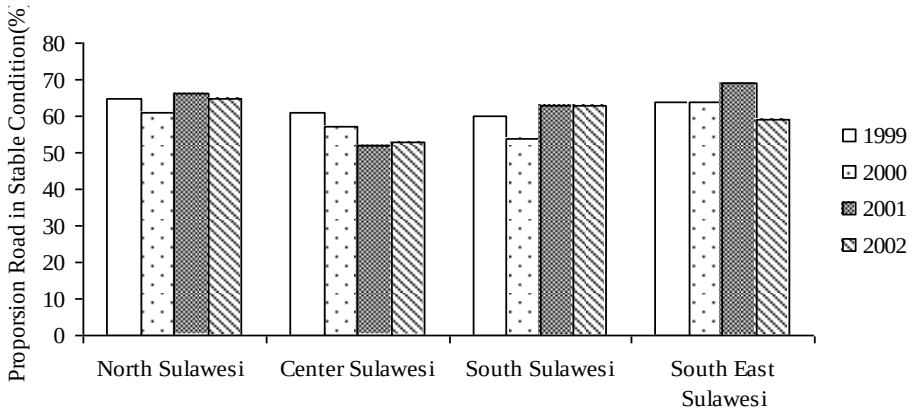

Figure 3 Proportion of Road in Stable Condition in Sulawesi Islands

Road network in Indonesia is divided into national, provincial (first level), and city/municipal (second level), based on who owns, operates, and maintains. The national road length in Sulawesi can be seen in Figure 4 and its proportion of national road length in stable condition is presented in Figure 5. In Sulawesi, national road length was almost not change, except there was a decreasing of length in North Sulawesi in 2001 to 2002. The interesting thing can be observed in the proportion of national road length with stable condition from 1999 to 2002 was that there was an increasing proportion.

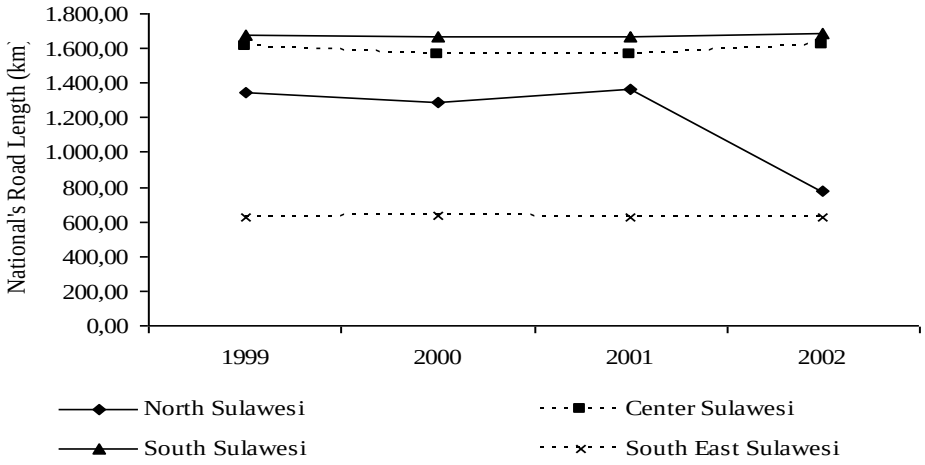

Figure 4 National Road Length in Sulawesi Island

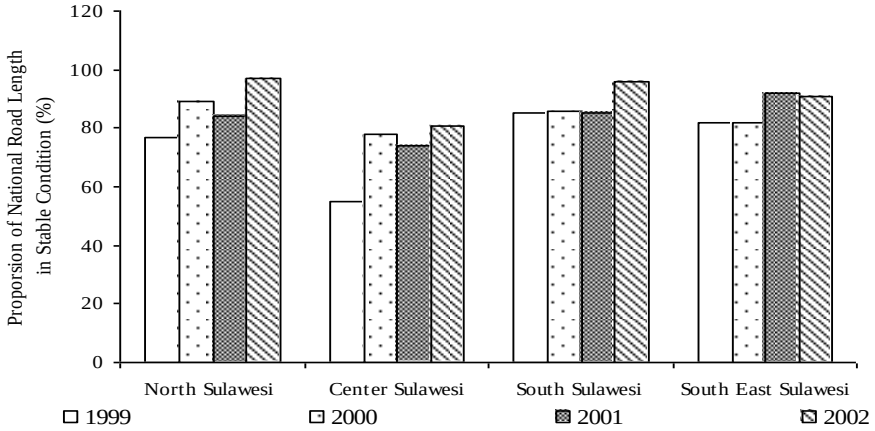

Figure 5 Proportion of National's Road Length in Stable Condition in Sulawesi Island

The financial aspect related with road network is the local budget for road sector. The local budget for road sector is shown in Figure 6. The figure shows a decreasing trend from 1999 to 2001, and very small increase from 2001 to 2002. The opposite condition happens in national budget for road sector, which increases drastically in the year 2001 to 2002 for all provinces in Sulawesi, as shown in Figure 7.

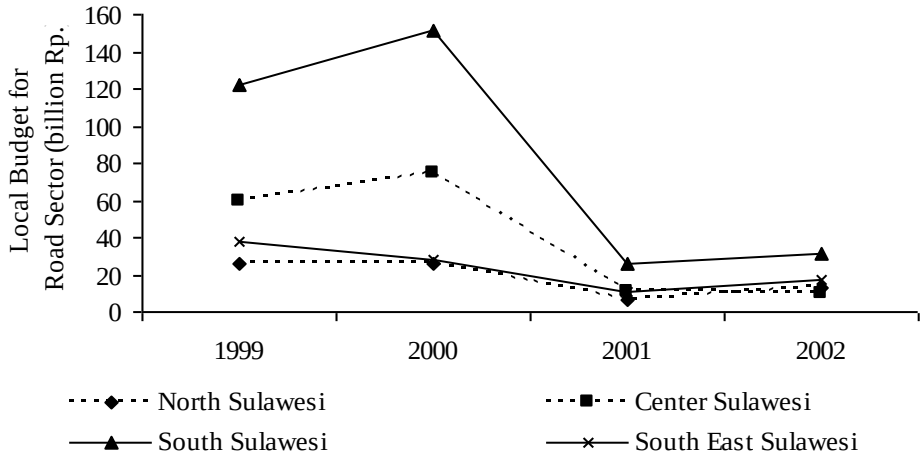

Figure 6 Local Budgets for Road Sector in Sulawesi Island

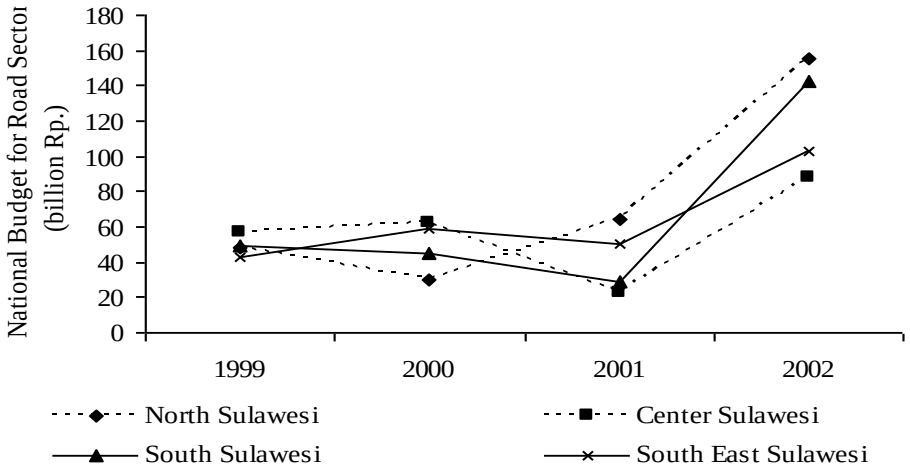

Figure 7 National Budgets for Road Sector in Sulawesi Island

The study about road network and economic parameters can not be separated from number of vehicle and economic measurements of community. The number of vehicle has weak positive trend, almost unmoved. South Sulawesi has the highest number of vehicle, while South East Sulawesi has the lowest number. South Sulawesi again has the highest Gross Regional Domestic Product (GRDP) from 1999 to 2002 compared with others three provinces in Sulawesi. South East Sulawesi has the lowest GRDP, in line with the smallest number of vehicle. The South Sulawesi's GRDP is more than two times compare with the others three provinces. As has been explained in Joewono (2004) and Santosa and Joewono (2005), the value of road indexes in Sulawesi is summarized in Table 3. Table 3 contains road indexes with same weight and different weight, which has no significant different between same or different weight (Joewono, 2004).

Table 3 Road Indexes in Sulawesi Island (DirJen. Pengembangan Prasarana Wilayah, 2004)

Province	Index with Same Weight				Index with Different Weight			
	1999	2000	2001	2002	1999	2000	2001	2002
North Sulawesi	0,216	0,255	0,258	0,254	0,220	0,257	0,260	0,254
Center Sulawesi	0,232	0,219	0,226	0,224	0,230	0,218	0,227	0,227
South Sulawesi	0,267	0,247	0,237	0,238	0,270	0,248	0,234	0,236
South East Sulawesi	0,285	0,279	0,280	0,284	0,280	0,277	0,279	0,283

Road network condition can not be separated from the availability of allocated fund for road handling. It is important to figure the economic measurement from the community resided around the road. The economic measurement in this evaluation is GRDP (gross regional domestic product). The correlation value between national budget for road sector and GRDP in Sulawesi is presented in Table 4. There is negative correlation in North Sulawesi and Center Sulawesi, between national budgets for road sector and GRDP, while in South Sulawesi and South East Sulawesi have positive correlation.

Table 4 Correlation between National Budget for Road Sector and GRDP

Province	North Sulawesi	Center Sulawesi	South Sulawesi	South East Sulawesi
Correlation	-0.58	-0.13	0.66	0.81

ROAD NETWORK PERFORMANCE AND ECONOMIC PARAMETERS

Joewono (2004) and Santosa & Joewono (2005) have analyzed the road network performance in provincial levels, while analyzing city/municipal data will be reported in this paper. Different analysis is needed to study the effect of road investment in city/municipal area, because the community actually lived in city/municipal area, so the greatest impact of road networks will be experienced by city/municipal communities. Further benefit from analysis in city/municipal level is for using in budget allocation. It is needed a system to distribute limited resources to many city/municipal in Indonesia, so the relation between road network and economic parameters is needed to show the amount and urgency of budget allocation for each city/municipal.

The study about the relationship between road networks with economic parameters is conducted by building a model with economic parameters as independent variables. The result is shown in Table 5, 6, 7, and 8, which the independent variables are fiscal index (FI), APBD (local budget for road sector), DBM (different between APBD and the needed fund for maintenance), and DAK (special allocation fund), respectively. The selected model is reported after conducting elimination process to not significance variables, as shown in Table 5 to 8. In the model about road network and economic parameters as discussed here, there is a difficulty to know the true model to begin with, while there is a possibility of errors of measurement. In this context, it is possible there is an error, which classified as model mis-specification errors.

Table 5 shows the model with fiscal index (FI) as independent variables. According to the decision of Ministry of Finance (Kep.Men.Keu. RI No. 505 / KMK.02 / 2004 and No. 548/KMK.07/2003), the calculation of Netto Fiscal Index for one region is based on the ratio between regional's fiscal ability with whole region's fiscal ability multiplied by number of region. The regional's fiscal ability is based on the difference of Regional Income (Real Regional Income/Pendapatan Asli Daerah), Balance Fund (Dana Perimbangan), Regional Credit (Pinjaman Daerah), and others income, which not includes rest of budget (SAL/Sisa Anggaran Lebih) and Regional Labour Spending (Belanja Pegawai Negeri Sipil Daerah /fiskal netto). One region can be classified as have a low fiscal ability, if their Netto Fiscal Index is less than one.

There are several models, with fiscal index as the dependent variables, as shown in Table 5. According to F-statistic, Model 6 in Table 5 is not good enough, since it have p-value higher than 0.05. Model 2 and 4 try to relate fiscal index with total road length and road length in stable condition, which the R^2 is low enough while the variable is suitable in the model. Model 2 and 4 is better than Model 6 with Road Index as a variable to predict fiscal index. Model 19 looks as the best model to predict Fiscal Index with population, road length, and DBM (different between APBD and fund needed for maintenance) as independent variables. The disadvantage of Model 19 is the sign for DBM which is positive, while it is sound not real. Model 8 and 10 almost provide same statistical measurements result, which looks better model than Model 12 with lower R^2.

Table 6 presents two selected models to predict local budget for road sector (APBN) after eliminated from long list of modeling result. The two models in Table 6 have small R^2 and R^2 (adj.), but Model 6 has smaller value than Model 17. In term of F-statistic result, Model 17 is better than Model 6. The disadvantage to choose Model 17 is there is variable

with high t-statistic. It is hard to choose a representative model in predicting local budget for road sector.

The model to predict amount of money spend to finance road sector is presented in Table 7, which shows models to predict DBM (different between APBD and fund needed for maintenance). Model 7 in Table 8 clearly shows as the best model, which has high R^2, R^2 (adj.), F-statistic, and consists of variables with very low p-value. It can be concluded the best model to predict DBM is presented by Model 7 in Table 7, which is build by population and road length variables. Table 8 shows model to relate DAK (special allocation fund) with the road index. The model has very low R^2 and R^2 (adj.), even the model is still good enough as shown by F-statistic (low p-value). It can be concluded that the models is not good enough.

CONCLUSIONS

The interaction between road network performance and economic parameters can be developed in various ways, including various levels. In this paper two levels analyses has been presented, namely provincial levels and city/municipal levels. The difference between those two is in the data used. The analysis using city/municipal data is needed to study the effect of road investment in city/municipal area, because the community actually positioned in city/municipal area, so the greatest impact of road networks will be experienced by city/municipal communities. Further benefit from analysis in city/municipal level is for budget allocation. It is needed a system to distribute limited resources to many city/municipal in Indonesia, so the relation between road network and economic parameters is needed to show the amount and urgency of budget allocation for each city/municipal.

There are two models to predict fiscal index using city/municipal data, one with total road length as dependent variable and the other with road length in stable condition as dependent variable, which almost provide same statistical measurements result. The analysis shows that it is hard to choose a representative model in predicting local budget for road sector using city/municipal data. The model to predict amount of money spend to finance road sector is presented by models with DBM (different between APBD and fund needed for maintenance) as independent variable. The model clearly shows as the best model, which has high R^2, R^2 (adj.), F-statistic, and consists of variables with very low p-value. The model to predict DBM is build by population and road length variables. Analysis cannot build a good model to relate DAK (special allocation fund) with the road index.

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Table 5 FI = f(x_1, x_2, … x_n)

Model	Constant	POP	RL	DAK	RSL	RI	DBM	F	S	R^2	R^2 (adj)
1	0.27763 (5.54) [0.000]	0.00000055 (3.96) [0.000]						15.66 [0.000]	0.1476	28.6%	26.8%
2	0.30041 (7.11) [0.000]		0.00018924 (4.29) [0.000]					18.43 [0.000]	0.1440	32.1%	30.3%
3	0.37414 (8.05) [0.000]			0.00002771 (2.07) [0.046]				4.27 [0.046]	0.1659	9.9%	7.6%
4	0.31138 (7.58) [0.000]				0.00035080 (4.17) [0.000]			17.35 [0.000]	0.1453	30.8%	29.0%
6	0.39803 (10.27) [0.000]					2.347 (1.95) [0.059]		3.79 [0.059]	0.1668	8.8%	6.5%
7	0.37364 (9.24) [0.000]						-0.00000252 (-2.54) [0.015]	6.47 [0.015]	0.1618	14.2%	12.0%
8	0.22886 (4.68) [0.000]	0.00000036 (2.50) [0.017]	0.00013580 (2.92) [0.006]					13.59 [0.000]	0.1351	41.7%	38.6%
10	0.23098 (4.75) [0.000)	0.00000037 (2.67) [0.011]			0.00025257 (2.92) [0.006]			13.60 [0.000]	0.1351	41.7%	38.7%
12	0.23496 (4.44) [0.000]	0.00000053 (3.95) [0.000]				2.053 (1.99) [0.054]		10.40 [0.000]	0.1423	35.4%	32.0%
19	0.13971 (3.22) [0.003]	0.00000065 (5.00) [0.000]	0.00042932 (5.93) [0.000]				0.00000763 (4.73) [0.000]	21.62 [0.000]	0.1081	63.7%	60.7%

Note: coefficient, (…) = t-value; […] = p-value; FI = fiscal index; POP = population (people); RL = road length (km); RSL = road length in stable condition (km); RI = road index; DAK = special fund allocation; DBM = different between APBD and fund needed for maintenance.

Table 6 APBD = f(x_1, x_2, … x_n)

Model	Constant	POP	RL	RI	DBM	F	S	R^2	R^2 (adj)
6	13316 (8.52) [0.000]			-108592 (-2.23) [0.031]		4.99 [0.031]	6725	11.3%	9.1%
17	7256 (2.98) [0.005]	0.013182 (1.81) [0.078]	13.613 (3.35) [0.002]		0.37089 (4.10) [0.000]	5.67 [0.003]	6069	31.5%	25.9%

Note: coefficient; (…) = t-value; […] = p-value; APBD = local budget for road sector; POP = population (people); RL = road length (km); RI = road index; DBM = different between APBD and fund needed for maintenance.

Table 7 DBM = f(x_1, x_2, … x_n)

Model	Constant	POP	RL	DAK	F	S	R^2	R^2 (adj)
4	-17714 (-2.60) [0.013]			-4.911 (-2.50) [0.017]	6.26 [0.017]	24272	13.8%	11.6%
7	11689 (2.97) [0.005]	-0.03825 (-3.33) [0.002]	-38.486 (-10.27) [0.000]		93.63 [0.000]	10879	83.1%	82.2%

Note: coefficient; (…) = t-value; […] = p-value; POP = population (people); RL = road length (km); DAK = special fund allocation; DBM = different between APBD and fund needed for maintenance.

Table 8 DAK = f(x_1, x_2, … x_n)

Model	Constant	RI	F	S	R^2	R^2 (adj)
1	2152.6 (4.98) [0.000]	30470 (2.26) [0.029]	5.13 [0.029]	1861	11.6%	9.3%

Note: coefficient; (…) = t-value; […] = p-value; DAK = special fund allocation; RI = road index.

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