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The effect of infrastructure on economic growth in Indonesia

Tunjung Hapsari
Department of Economics and Development Studies/Faculty of Economics and Business/Uin Syarif Hidayatullah Jakarta, Indonesia

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ABSTRACT

Infrastructure development of infrastructure in Indonesia has been going on for quite a long time and the investment incurred is very big. But still quite a lot of problems experienced by our country in particular regarding the weak planning, insufficient quantity, poor quality, and so forth. The problems discussed in this study is whether the factors of production are represented by the infrastructure (roads, electricity, telephone, and water) have a significant influence and contribution to the output variables are represented by per capita income for the government to set policy direction in the development of infrastructure in Indonesia. The data used are panel data with the period from 2004 to 2009 for 26 provinces in Indonesia. To find the results of the BLUE (Best Linear Unbiased Estimator), the test for a panel like the Chow Test and Hausman Test so that got fixed effect panel data model for the complete data with characteristics as above. Then do the test assumptions such as Classical multicollinearity, Heteroskidastity, and autocorrelation. The end result is the four independent variables above, which have two variables that have a significant effect on economic growth of the road, electricity and two more variables which have no significant effect of telephone and water.

Corresponding Author:

Tunjung Hapsari,
Department of Economics and Development Studies/Faculty of Economics and Business,
Uin Syarif Hidayatullah Jakarta,
Jl. Ir H. Juanda No. 95, Ciputat, Kec. Ciputat Tim., South Tangerang City, Banten 15412, Indonesia.
Email: hapsari90@gmail.com

1. INTRODUCTION

The infrastructure reform program carried out by the government by agreeing on an ADB loan package of US $ 428 million in 2006 is one of the programs aimed at advancing infrastructure development in Indonesia. This program was carried out partly because of the government's seriousness and confidence in achieving high economic growth through infrastructure development.

Based on the history of economic development in Indonesia, infrastructure is positioned as a vital sector in the process of achieving high economic growth. To achieve this process requires hard work so that infrastructure development always increases every year. Table 1 below explains the development of GRDP, roads, electricity, telephone and water in Indonesia in the 2004-2009 period.

Table 1. Development of GRDP (million/capita), roads (km/capita), electricity (Watt/capita), telephone (SST/capita) and water ($M3$/capita) in Indonesia in the period 2004 – 2009

Year	GRDP (Million/Capital)	Road (Km/Capital)	Electricity (Watt/Capital)	Telephone (SST/Capital)	Water (M^3 /$Kapita$)
2004	6.97	0.000783	150.4	0.0780	0.0075
2005	7,36	0.000105	156.0	0.0796	0.0099

2006	7,77	0.000774	162.3	0.0806	0.0159
2007	8,26	0.000820	170.5	0.0812	0.0092
2008	8.34	0.000128	176.7	0.0791	0.0101
2009	9,27	0.000732	180.4	0.0843	0.0109

Based on table 1. it can be seen that GRDP in Indonesia always increases every year, in 2004 GRDP reached 6.97 million/capita, and in 2009 GRDP reached 9.27 million/capita. This is due to the sharp rise in national income every year. Due to an increase in income every year it can help plan the implementation of a timely development program, help formulate government policies and compare the state of the economy from time to time between regions/provinces.

GRDP acts as a measure of the level of gross income within a province. GRDP affects the economy by redistributing gross income and wealth and increasing output levels. GRDP which is always decreasing causes uncertainty for development in the region and people's welfare. Development in the region will decrease if GRDP always decreases every year. Not only that, economic activity will also decline and result in a decline in national income as well as increasing unemployment and an increasingly high level of poverty. The high level of poverty will have an impact on increasing the crime rate in an area.

Research on the effect of infrastructure on economic growth has been carried out a lot, but this research is still important to do because economic growth (GRDP) needs to be considered given its very broad impact on the economy in a country, especially GRDP which always decreases every year and results in people's welfare, namely development. an area for goods and services resulting from a decrease in real income. GRDP must be increased immediately so that regional development and community welfare can be achieved.

Economists believe that the debate is that the best way to catch up on economic backwardness is to increase the rate of economic growth (gross domestic product growth) as high as possible so that it can exceed the rate of population growth. In this way the per capita income figure will increase so that automatically there will also be an increase in people's prosperity. Therefore the main target in economic development is more emphasized on efforts to achieve high levels of economic growth.

The lag of an area in development is influenced by many things. One of them is the low attractiveness of an area which causes a low level of economic activity. An area that does not have resources (both human and natural) and the lack of incentives offered (infrastructure, hardware and software, security and so on) can cause an area to lag behind in development (Azis, 1994: 65). To catch up with other regions, there are several alternative development areas. The alternative can be in the form of investment that is directly directed at the productive sector or investment in the social-overhead sector such as the construction of roads, health facilities, education and other infrastructure infrastructure.

In many developing countries, investment in infrastructure is a preferred choice and accounts for a very large portion of total government spending. This shows the big role of the government in the procurement of infrastructure, especially in the transportation, communication and energy sectors. Meanwhile, other public expenditures in the health and education sectors, although they tend to be neglected, have a high level of productivity because they have both direct and indirect impacts in the form of increasing the productive capacity of human resources.

Infrastructure can also be consumed directly or indirectly, for example by reducing the time and effort needed to get clean water, go to work, sell goods to the market and so on. Good infrastructure can also increase productivity and reduce production costs. Infrastructure development in the form of transportation (roads, railroads, seaports, airports), electricity and communication (telephone) networks as well as drinking water installations and networks is very important in order to improve the economy of the people in a region. Infrastructure infrastructure is needed not only by households but also by industry. So that the increase in infrastructure infrastructure is expected to bring prosperity and accelerate economic growth.

The importance of infrastructure in economic growth is being debated among economists and even the availability of infrastructure is one of the things needed to achieve the expected economic growth. One of the facts is that before the economic crisis in 1997, Indonesia allocated

around 6 percent of the PBB for infrastructure and now this figure has fallen to only 2 percent and has had a huge impact on Indonesia's economic growth (APB, 2006).

But apart from that, the link between infrastructure and economic growth is still under debate (Wang 2002) at least until now there are 2 opinions regarding the effect of infrastructure on economic growth based on the results of their respective studies. The first opinion states that the effect of infrastructure on economic growth is positive (Ratner (1983), Aschauer (1989), Lynde (1992), Lau and Sin (1997), and Sanchez-Robles (1998). The second opinion says that the effect of infrastructure on economic growth is insignificant or even negative (TOM (1991) and Holtz-Eakin (1994

2. RESEARCH METHOD

In this study the samples used were provinces in Indonesia. The sampling method used was purposive sampling, which is a method of sampling, in which sample members are submitted to consideration of data collection based on considerations in accordance with certain aims and objectives. Its characteristics include: the sample according to the purpose, the number of samples is not disputed, and the sample units are adjusted according to certain criteria based on the research objectives.

Methods of data collection are very important to account for the scientific truth of a study, besides that research methods are also needed to obtain results that are in accordance with the desired research objectives. In this study, data was collected using secondary data, namely data obtained in finished form and has been processed by other parties, which are usually in the form of publications.

3. RESULTS AND DISCUSSIONS

Research Results and Discussion

A. Descriptive analysis

1. Descriptive Analysis of Real Gross Regional Domestic Product (GRDP) in Indonesia.

One of the important things in development and one of the goals of national development is high economic growth. In the context of economic growth in every province in Indonesia. it is also not much different. Each province certainly wants and makes economic growth one of the targets in the development of its province.

Gross regional domestic product describes the ability of a region to create added value at a certain time. GRDP can be seen from three approaches, namely production, use, and income. All three present the composition of value added data broken down by economic sector, components of use, and sources of income.

GRDP from the production side is the sum of all gross added values that are capable of being created by economic sectors for their various production activities. Meanwhile, from the use side, it explains the use of the added value. Furthermore, from the income side, added value is the sum of the wages/salaries of business surplus, depreciation, and net indirect taxes earned. GRDP is presented in two versions of the assessment, namely "on the basis of current prices", namely using current year prices and "on the basis of constant prices", namely using price data for a certain year (base year).

2. Descriptive Analysis of Road Infrastructure in Indonesia

Highways are one of the important infrastructure in land transportation. This is because of its strategic function, namely as a liaison between one region and another. roads as a link between production centers and marketing areas, the benefits are very much felt in the context of improving the economy of a region. Road length data is presented by province, construction authority, surface type and road condition. Roads are very closely related to economic growth because with roads the factors of production will continue to run, and can improve a good economy.

3. Descriptive Analysis of Electricity Infrastructure in Indonesia

Development of electricity in Indonesia began to develop since the 1950s. when government and private power plants during the colonial period were nationalized and controlled by the state (Bapenna, 2003). National electricity demand has continued to increase since 1980 and demands additional electricity capacity. In general, the electricity system in Indonesia is divided into two major

systems, namely the Java-Madura-Bali electricity system (JAMALI System) and the Java-Madura-Bali outside electricity system (Outer JAMALI).

The development of electricity consumption continues to grow. Within twenty years (1980-2000) electricity consumption increased quite a lot. In 1980 the national electricity consumption was 6,560 GWh. In 1990 it increased to around 27,741 GWh or an increase of 330 percent over ten years. In 2000, it increased to 79,165 GWh or an increase of 185 percent for ten years. Infrastructure can be a driver of economic growth, and conversely economic growth itself can also be a pressure for infrastructure. Positive economic growth will encourage increased demand for various infrastructure. An example is the need for electricity. As previously stated, in 2008,

4. Descriptive Analysis of Telephone Infrastructure in Indonesia

Infrastructure can be a driver of economic growth, and conversely economic growth itself can also be a pressure for infrastructure. Positive economic growth will encourage increased demand for various infrastructure. An example is the need for a telephone. As previously stated, in 2008, Indonesia experienced telephone problems where telephone connections could not meet the demand for telephones, resulting in no network or signal in remote areas of Indonesia. Infrastructure is not only important for economic growth, but also important for people's welfare. Research conducted by Ali and Pernia (2003) shows that the development of infrastructure projects can reduce poverty and the number of unemployed in a country.

5. Descriptive Analysis of Water Infrastructure in Indonesia

Water is an indispensable resource for human life and other living things. It can be said that there is no life on this earth that can take place without water, especially humans. However, it should be realized that the existence of water on earth is limited according to space and time both in quantity and quality. Water is not always available everywhere and from time to time. Water as a support for development today (even it has been felt for a long time) is increasingly being threatened, both in terms of quantity and quality. Most of this is caused by human activities that are not wise about the environment so that it affects water resources, and in the end it even has a negative impact on humans themselves.

In everyday life, humans will not be separated from the need for water, so in this case humans and their activities are influenced by the presence of water resources, both in quantity and quality. Conversely, humans with all their activities can also affect water resources. Water resources can be affected by the development itself. Changes in environmental conditions caused by development can have an impact on water resources both quantitatively and qualitatively. Flood events that often occur are inseparable from the impact of changes in land use. Pollution in river water and ground water which often occurs is also an impact of development as well.

Table 2. Development of GRDP (million/capita), roads (km/capita), electricity (watts/capita), telephone (SST/capita) and water ($M3$/capita) in provinces in Indonesia in 2004-2009

Province	yr	GRDP (million/capita)	Jln(km/capita)	Lstrk(Wtt/capita)	Tel(SST/capita)	Water(M^3/ $kapita$)
aceh	2004	8,983	0.00183606	147.0157373	0.1825	0.001902
aceh	2005	8,074	0.00263728	148.1745101	0.1829	0.003116
aceh	2006	8,199	0.00198024	161.5342169	0.1829	0.002752
aceh	2007	8,018	0.00079543	182.4308419	0.1837	0.001954
aceh	2008	7,583	0.00185742	200.2580984	0.1834	0.00163
aceh	2009	7,915	0.00187055	206.9775566	0.1847	0.002891
North Sumatra	2004	6,418	0.00120234	158.0349531	0.0835	0.013604
North Sumatra	2005	6,770	0.00124463	164.030006	0.0838	0.012569
North Sumatra	2006	7,190	0.00109789	170.9054179	0.0846	0.015194
North Sumatra	2007	7,686	0.00084377	175.9080353	0.0838	0.013365
North Sumatra	2008	8,178	0.00117438	182.318195	0.0853	0.013436
North Sumatra	2009	8,422	0.00121913	199.1605586	0.0884	0.014735
Boast	2004	5,689	0.00144855	151.9890305	0.1927	0.008725

Boast	2005	6,016	0.00209061	156.4421779	0.1932	0.007829
Boast	2006	6,385	0.00143122	160.7713287	0.1947	0.00831
Boast	2007	6,790	0.00195609	166.9144191	0.1957	0.005107
Boast	2008	7,222	0.00200623	174.7402314	0.1966	0.009468
Boast	2009	7,657	0.00200375	180.8470099	0.1951	0.009906
Riau	2004	13,581	0.00084664	96.62956608	0.1313	0.00863
Riau	2005	14,316	0.00117869	101.6610131	0.1315	0.001993
Riau	2006	15,053	0.00186896	105.5594546	0.1333	0.002416
Riau	2007	15,566	0.001016	109.8002353	0.1344	0.002273
Riau	2008	16,446	0.00104923	116.68295	0.1336	0.0025
Riau	2009	17,013	0.00105555	124.9803417	0.1405	0.00219
Jambi	2004	3,865	0.00129387	89.77852804	0.1647	0.007726
Jambi	2005	4,081	0.0016703	84.45977301	0.1655	0.006802
Jambi	2006	4,321	0.00115611	88.08397728	0.1668	0.006723
Jambi	2007	4,616	0.00166965	96.65245378	0.1674	0.006744
Jambi	2008	4,946	0.00175502	107.8545985	0.1678	0.007442
Jambi	2009	5,708	0.00178219	115.5282616	0.1671	0.007285
South Sumatra	2004	6,354	0.00198942	95.28529632	0.1534	0.005752
South Sumatra	2005	6,661	0.00158529	99.27837373	0.1538	0.005521
South Sumatra	2006	7,008	0.00066359	102.5163233	0.154	0.006686
South Sumatra	2007	7,417	0.00171521	106.9932677	0.1543	0.00762
East Kalimantan	2006	27,191	0.00106919	123,8106657	0.0927	0.012999
East Kalimantan	2007	27,526	0.0010191	124.7405466	0.0933	0.012999
East Kalimantan	2008	27,675	0.00114659	125.5271741	0.0938	0.020762
East Kalimantan	2009	27,734	0.00118993	126.7942213	0.1034	0.02343
ignite	2004	5,350	0.00124196	154.5070105	0.1548	0.007986
ignite	2005	5,612	0.00102352	159.0798187	0.1552	0.009165
ignite	2006	5,959	0.00086805	161.4783079	0.1556	0.005553
ignite	2007	6,345	0.00128424	163.1496752	0.1568	0.004068
ignite	2008	6,445	0.00125386	166.1845612	0.1622	0.006228
ignite	2009	6,660	0.00131507	170.1002732	0.1539	0.004003
Central Sulawesi	2004	4,118	0.00152979	94.4996237	0.0815	0.003458
Central Sulawesi	2005	4,460	0.00186337	100.5260324	0.0854	0.005896
Central Sulawesi	2006	4,776	0.00104819	103.7806702	0.0857	0.005203
Central Sulawesi	2007	5,193	0.00156166	106.1924267	0.0802	0.005131
Central Sulawesi	2008	5,363	0.00159734	108.5586425	0.0859	0.010934
Central Sulawesi	2009	5,564	0.00176204	111.6796945	0.092	0.005312

South Sulawesi	2004	4,638	0.0016171	145.7563969	0.0655	0.00319
South Sulawesi	2005	4,533	0.00152711	147,8822807	0.0656	0.006928
South Sulawesi	2006	4,837	0.00249851	140.4148666	0.0631	0.007036
South Sulawesi	2007	5,144	0.00265396	143.7702806	0.0628	0.007242
South Sulawesi	2008	5,181	0.0026694	148.1867074	0.0646	0.008124
South Sulawesi	2009	5,257	0.00282061	151.0393071	0.0647	0.008243
Southeast Sulawesi	2004	3,350	0.00102303	78.93805659	0.094	0.00269
Southeast Sulawesi	2005	3,595	0.00167832	81.24300699	0.0943	0.004136
Southeast Sulawesi	2006	3,871	0.00111575	85.06637594	0.0949	0.007287
Southeast Sulawesi	2007	4,179	0.00122817	87,78877947	0.0961	0.002657
Southeast Sulawesi	2008	4,294	0.00168325	88.81180837	0.095	0.004253
Southeast Sulawesi	2009	4,433	0.00176567	89.49128947	0.0995	0.005392
Maluku	2004	2,022	0.00101532	94.90213928	0.3999	0.003952
Maluku	2005	2,253	0.00082556	103.1440373	0.4007	0.003211
Maluku	2006	2,243	0.00115161	110.793828	0.4014	0.003899
Maluku	2007	2,369	0.00123834	112.8127311	0.4036	0.00144
Maluku	2008	2,491	0.00103228	121.9610487	0.4017	0.003157
Maluku	2009	2,692	0.00115487	123.4713134	0.4179	0.008618
Irja	2004	5,746	0.00131327	68.26826325	0.254	0.004781
Irja	2005	7,838	0.00101822	70.04776273	0.2545	0.005357
Irja	2006	6,490	0.00128363	72.83065708	0.2556	0.001277
Irja	2007	6,767	0.00132033	75.26767491	0.2564	0.004138
Irja	2008	6,897	0.00139304	77.94327695	0.2572	0.004247
Irja	2009	7,018	0.00142162	84,16693696	0.2651	0.003966

As shown in Table 2. in the 6 year period from 2004-2009, economic development in the provinces of Indonesia almost had different movements each year. This movement indicates that the existing economic structure still has similarities between provinces in Indonesia.

However, per capita economic growth has increased in the province of Jakarta, then continued with the provinces of East Kalimantan, Riau, Central Kalimantan, North Sumatra, South Kalimantan every year. This is due to an increase in the allocation of funds owned by provinces in Indonesia as a result of this policy. Then, in the following period economic growth still has the same movement, where the movement refers to a positive direction, even though the magnitude is still fluctuating.

From Table 2. above it can be seen that roads per capita in provinces in Indonesia fluctuate quite a bit from each year. The best per capita road development is in the eastern part of Indonesia because in the western part of Indonesia the population is greater than the population in the eastern region of Indonesia, this causes each resident in the western part of Indonesia to only get a small number of road lengths in good and moderate conditions .. Although there are still many roads that need to be repaired so that there is comfort in every province. The condition of damaged roads, both light and heavy, in each province affects the total length of roads that can be used properly by both

vehicles and people. The damaged condition of the road also includes changes in the function of the road so that the passable road becomes more risky and unsafe to pass. These conditions indicate that there are more roads that cannot be traversed safely and without risk in eastern Indonesia for both vehicles and people. On the other hand, there are more roads that can be traversed safely and without risk in western Indonesia, either by vehicles or by people. In general, road conditions in western Indonesia are better than those in eastern Indonesia. more roads that can be traveled safely and without risk in western Indonesia, either by vehicles or by people. In general, road conditions in western Indonesia are better than those in eastern Indonesia. more roads that can be traveled safely and without risk in western Indonesia, either by vehicles or by people. In general, road conditions in western Indonesia are better than those in eastern Indonesia.

B. Explanative Analysis

1. Assumption Testing

From the results of selecting the model above, it can be seen that the Fixed Effect Model is in fact the most suitable for Indonesian data 2004-2009. However, the model above (see Appendix 4) is not necessarily free from problems with classical assumptions so that the results obtained are BLUE (Best Linear Unbiased Estimator). Therefore it is necessary to carry out further tests and appropriate treatments in order to eliminate this problem. The tests carried out are the Multicollinearity test, the Heteroscedasticity test and the Autocorrelation test.

2. Analysis of the Influence of Roads, Electricity, Telephone and Water on Economic Growth in Indonesia simultaneously (together)

The F test aims to show whether all the independent variables included in the regression model have a significant effect simultaneously on the dependent variable. In the context of this study, simultaneous testing wanted to see whether the road, electricity, telephone and water variables had an effect on GRDP or not. To see whether or not there was an influence between the independent variables on the dependent variable was seen from its significant value. If the sig value <0.05, then there is a significant influence between the independent variables on the dependent variable, which means that there is a significant effect between the capital variable and the level of education on production output. Conversely, if the sig. > 0.05, then there is no significant effect between the independent variables on the dependent variable.

To test whether the independent variable simultaneously influences the dependent variable, the F test is used by comparing the F-statistics with the F-table. With n=156, k=4 then df (k-1, nk) = (3, 152). At α = 5%, the value of F-table = 2.66 is obtained. when compared to F-count (213.9020) > F-table (2.66) then the independent variables affect the dependent variable simultaneously at the 95% confidence level.

3. Analysis of the Influence of Road, Electricity, Telephone and Water Infrastructure on Economic Growth in Indonesia partially (individually)

The t statistical test shows how far the influence of one independent variable individually explains the variation of the dependent variable. To do the t test by means of Quick Look, which is to look at the probability value and the degree of confidence specified in the research or look at the t table value with the t count. If the Probability value < the specified degree of confidence and if the calculated t value is higher than t table then an independent variable individually affects the dependent variable (Kuncoro, 2003:219).

The electricity variable has a positive influence on economic growth in Indonesia. This is due to the supply of electricity production from the local government, and the addition of power plants in each region. Regression results Table 4.6 shows that the tcount value of the electricity variable is 4.544875 and the probability is 0.0000 because the probability is less than 0.05, the electricity variable has a significant influence on the dependent variable (GRDP). Likewise with the regression coefficient value of 0.489913, which means that if electricity increases by 1 percent, the GRDP increases by 0.489913 percent, ceteris paribus.

4. CONCLUSION

Road infrastructure shows a significant influence on economic growth in Indonesia. This can be seen if the length of the road increases by 1 percent, then economic growth will increase by 0.176395 percent. With the implementation of road decentralization, local governments have broader authority to build roads and repair damaged roads in an area. So that roads have a positive contribution to the process of forming quality and quantity which have an impact on increasing economic growth in Indonesia. The electricity infrastructure shows a significant influence on economic growth in Indonesia with a confidence level of 95 percent. As a manifestation of implementing electricity connections in remote areas in Indonesia, it is a major source for these areas to carry out all their activities. This makes the local government increase electricity revenues to increase economic growth in the province. Provide a statement that what is expected, as stated in the "Introduction" chapter can ultimately result in the "Results and Discussion" chapter, so there is compatibility. Moreover, it can also add prospects for the development of research results and application prospects for further studies into the next (based on results and discussion). Telephone infrastructure does not have a significant influence on economic growth in Indonesia. it can be seen that if the value of telephone connections increases by 1 percent, then economic growth will also decrease by 0.46 percent. This is due to a decrease in the quality of telephone services, a decrease in subscribers, and an increase in telephone rates. The telephone is the most important asset if it is supported by good planning, high quality, and sufficient quantity. however, this is not the same as this study because even though the number of telephone connections is rapid, if it is not matched by good planning, sufficient quantity and high quality can actually add a heavy burden to the development process and thereby reduce the rate of economic growth in Indonesia . Water infrastructure has no significant and negative effect on economic growth in Indonesia with a confidence level of 95 percent. As one form of implementing the provision of clean water in rural areas, this is the main source for rural areas to carry out all their activities. This has made the local government to increase the supply of clean water in order to increase economic growth in the area. However, the opposite is true, that the increase in existing clean water has not had an effect on economic growth in Indonesia. Water has no effect on economic growth in Indonesia in terms of the scarce amount of clean water, rising water rates, and so on. As one form of implementing the provision of clean water in rural areas, this is the main source for rural areas to carry out all their activities. This has made the local government to increase the supply of clean water in order to increase economic growth in the area. However, the opposite is true, that the increase in existing clean water has not had an effect on economic growth in Indonesia. Water has no effect on economic growth in Indonesia in terms of the scarce amount of clean water, rising water rates, and so on. As one form of implementing the provision of clean water in rural areas, this is the main source for rural areas to carry out all their activities. This has made the local government to increase the supply of clean water in order to increase economic growth in the area. However, the opposite is true, that the increase in existing clean water has not had an effect on economic growth in Indonesia. Water has no effect on economic growth in Indonesia in terms of the scarce amount of clean water, rising water rates, and so on. However, the opposite is true, that the increase in existing clean water has not had an effect on economic growth in Indonesia. Water has no effect on economic growth in Indonesia in terms of the scarce amount of clean water, rising water rates, and so on. However, the opposite is true, that the increase in existing clean water has not had an effect on economic growth in Indonesia. Water has no effect on economic growth in Indonesia in terms of the scarce amount of clean water, rising water rates, and so on.

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