The Effect of the Operational Exit Tolls on the Welfare of the Local Community

Inayati Nuraini Dwiputri1*, Albertus Girik Allo2, Ermita Yusida3, Linda Seprillina4
1, 3, 4Universitas Negeri Malang, Indonesia
2Universitas Papua, Indonesia
E-mail: 1inayati.dwiputri.fe@um.ac.id, 2ag.allo@unipa.ac.id, 3ermita.yusida.fe@um.ac.id, 4linda.seprillina.fe@um.ac.id
*Corresponding author

JEL Classification:
O1
O2
I3
R2

Abstract
Infrastructure is a part of accelerating economic growth. The construction of toll roads can provide positive and negative impacts. The existence of toll roads can reduce transportation and production costs, which will increase domestic and international market efficiency. However, the construction of toll roads is feared can kill small businesses. Studies of the effect of operational exit tolls on welfare are still limited in Indonesia. This study was conducted to identify the impact of toll roads on community welfare in the Pandaan-Malang exit tolls area. Using paired t-test and the cluster analysis method showed that the positive and negative impacts of toll roads construction on the community in the exit tolls area are varied for each cluster. This study can be used as the basis for formulating policies for communities affected by operational exit tolls, in particular. Creating new economic centers in the exit tolls based on local uniqueness can minimize the negative impacts on communities.

Keywords:
cluster, infrastructure, economic growth, exit toll

How to Cite:
INTRODUCTION

The Indonesian government continues to develop its national priority projects, one of which is toll roads. Within five years (2020 - 2024), toll roads built throughout Indonesia are targeted to reach 2,513 km (Kementerian PUPR, 2020). To improve the community’s welfare of Malang and its surroundings, the government intensively increases the quantity and quality of infrastructure. The construction of toll roads is done to facilitate the access of Malang to several districts and cities nearby. This infrastructure development was followed up with the construction of the Malang-Surabaya access toll road in East Java. That access will pass through four gates, namely the exit toll in Region Lawang, Pakis, Karanglo, and Madyopuro.

Infrastructure development is an effort to increase investment in an economy and face the international markets. According to the existing economic growth theory (Acemoglu, 2009; Barro & Sala-I-Martin, 2004; Mankiw, 2013; Solow, 1956; Swan, 1956), investment is one of the robust variables in providing a positive impact on economic growth. It indicates that more investment will trigger an increase in the economic growth level. Infrastructure development can also increase efficiency by reducing goods distribution costs significantly. Therefore, infrastructure development can contribute to increasing exports, which in turn can boost economic growth. The researchers found that export positively affects economic growth (Hessels & van Stel, 2011; Jarreau & Poncet, 2012; Lazarov, 2019; Tekin, 2012).

The construction of toll roads will greatly support various governmental, economic, industrial, and community activities that can increase economic growth, primarily through trade in the international market. Additionally, the development of infrastructure can decrease income inequality (Chatterjee & Turnovsky, 2012; Dwiputri et al., 2018). Therefore, this study was conducted to determine the impacts of opening four exit tolls access on the local community's welfare, which some of them had worked in small and medium enterprises (SMEs). Other researchers said that the role of SMEs is one aspect that encourages economic growth and development (Gherghina et al., 2020; Kostini & Raharja, 2019). Identification of the impact will help the government and community in their efforts to achieve public welfare and the success of trade in the international market.

This research will map the impact of policies in several clusters so that the follow-up policies that will be applied can align with the government’s target in facing the international market. This research identifies the public welfare difference between before and after infrastructure development. This study identified the changes in the addition of infrastructure, income, and consumption of local communities after opening and the use of access to the four exit tolls.

The construction of toll roads is considered one of the investments of government that can create new jobs, reduce transportation and production costs, develop community social activities, and increase economic growth and living standards. The results of several studies show that there is a positive relationship between infrastructure development and economic productivity (Annala et al., 2008; Aschauer, 1989; Esfahani & Ramírez, 2003; Laique et al., 2019). Infrastructure development can be a means of community economic
activities. Therefore, infrastructure can increase the quantity and quality of economic activity which will eventually provide increased income and prosperity of the community. Other researcher also reveals that infrastructure development as a part of capital is able to improve the economic performance of a country (Dwiputri et al., 2019; Pradhan & Bagchi, 2013).

Road infrastructure also can support the logistic service. So far, the distribution of goods, especially in Indonesia, mainly uses road infrastructure. Therefore, the construction of road infrastructure can facilitate the distribution of goods and services. Additionally, that logistic services are at the heart of the development of competitiveness and economy of the country (Bunrueang et al., 2019).

A favorable urban environment is the most crucial aspect of city competitiveness and urban development goals directly related to the public interest, quality of life of the population, and the sustainable development of urban society and economy (Khalil, 2012; Li et al., 2013). Growing population density results in hectic transportation (Hartono & Hapsari, 2019). To create an urban environment that supports sustainable development, the Government of Indonesia has been carrying out intensive infrastructure development. Therefore, the impact of infrastructure on sustainable development is one of the recent research topics in Indonesia. Other researchers found that Indonesia’s infrastructure development could increase economic growth, government revenue, and reduce poverty (Aswicahyono & Friawan, 2008; Irawan et al., 2012).

The results of previous studies indicate that the impact of toll road construction on community welfare can be positive or negative. However, there is limited research that specifically looks at the impact on the welfare of the local community around exit tolls. This research uses microdata and focuses more on the impact of infrastructure development, especially the follow-up policy applied to the local community, particularly those living around the Pandaan-Malang exit toll area. However, this research wants to identify the impact of infrastructure construction on public welfare.

METHODS

Development programs such as infrastructure and government policies are designed to change existing conditions for the better (Gertler et al., 2016). The research method often used for impact analysis is the Randomized Control Trial (RCT) method. The RCT method is usually implemented before the policy program is implemented. Policy makers divide the group into two parts which both have the same characteristics. The first group that gets the program is called the treatment group. Furthermore, the second group did not get the program, called the control group. The RCT method compares outputs before and after program implementation (Khandker et al., 2010). RCT is a method often used in research experiments. The purpose of RCT is to evaluate the impact of the existence of a program or policy intervention. The RCT method divides the two groups into a treatment group and a control or treatment group seen in the two periods. But, the RCT method could not be applied to this study because the program had implemented.
To reduce bias in estimation of impact of the program, this study compares the output variables before and after the exit tolls opened. By applying the Paired T-test, this study can identify the impact of program by comparing before and after implementation of program. Then, the deeply analysis is carried out with cluster analysis method to see the impact of the program based on clusters. Henceforth this study uses the Paired T-test and applies the Cluster Analysis methods in formulating the follow-up policy and find out the impact of infrastructure development is divided into several clusters. Paired T-test called dependent samples T-test is a statistical procedure used to determine whether the average difference between the two sets of observations is zero. In a Paired T-test, each subject was measured twice, producing paired observations. This study uses primary data obtained from a survey of local communities as respondents. The survey was conducted at four exit toll points: Lawang, Pakis, Karanglo, and Madyopuro.

**RESULT AND DISCUSSION**

The results showed that the construction of the toll road did not always have a positive impact on the entire community. Of 101 respondents, as many as 52 respondents stated that they got a change in income; the remaining 49 respondents stated no change in their income. 30 respondents had decreased income, and 22 respondents had increased income after the construction of Malang city toll road. Those who have benefited from the toll road have small and medium enterprises (SME’s) that are directly related to the economic activity of the toll road, for example, food and beverage vendors, souvenir sellers, grocery stores, and toll road employees.

The welfare measure often used is the consumption expenditure. From the interview, ten respondents stated that their total consumption increased, including food and non-food consumption. The rest of the respondents’ total consumption of both food and non-food did not change. Four respondents got to change their jobs, while 17 respondents argued that there were better facilities before and after exit toll construction. Furthermore, all respondents stated no change in their assets between before and after the exit toll construction. Using a paired t-test, some of the respondents’ characteristics before and after toll road construction did not show any significant difference. It is because the use of the new toll road is still only for one year.

Table 1 concluded that income before toll construction was higher with a significance level of 10% than income after toll construction. However, total consumption before toll construction was significantly lower than after toll construction by 5%. This result is in line with research conducted on the construction of toll Salatiga (Marpaung et al., 2021), Texas (Kalmanje & Kockelman, 2009), and southern Staffordshire (Pugh & Fairburn, 2008), where there is an increase in the welfare of society. However, social welfare as measured by income showed the opposite result where income significantly declining. People who use toll roads tend to be more efficient in distance and time, so that they would prefer to get to the destination right away instead of resting first at the exit toll gate. Although there is a decline in income, in the long term, the existence of toll roads is expected to have a positive impact on income, for example, from the increase in land prices (Rohman et al.,
Inayati Nuraini Dwiputri
The Effect of Operational Exit Tolls on The Welfare

2017). Overall, Table 1 showed that toll road construction negatively impacts the local community, significantly reducing revenue but increasing consumption. Furthermore, the type of consumption that has a significant increase would be identified further.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>N</th>
<th>Mean (in IDR)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>Before</td>
<td>101</td>
<td>949,505</td>
<td>mean(diff) &lt; 0</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>101</td>
<td>829,505</td>
<td>Pr(T &lt; t) = 0.0868</td>
</tr>
<tr>
<td>Total Consumption</td>
<td>Before</td>
<td>101</td>
<td>1,322,733</td>
<td>mean(diff) &gt; 0</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>101</td>
<td>1,348,277</td>
<td>Pr(T &gt; t) = 0.0487</td>
</tr>
<tr>
<td>Stapled Consumption</td>
<td>Before</td>
<td>100</td>
<td>252,330</td>
<td>mean(diff) &gt; 0</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>100</td>
<td>262,830</td>
<td>Pr(T &gt; t) = 0.0813</td>
</tr>
<tr>
<td>Vegetables Consumption</td>
<td>Before</td>
<td>97</td>
<td>271,804</td>
<td>mean(diff) &gt; 0</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>97</td>
<td>281,598</td>
<td>Pr(T &gt; t) = 0.0638</td>
</tr>
<tr>
<td>Side-dish Consumption</td>
<td>Before</td>
<td>96</td>
<td>396,354</td>
<td>mean(diff) &gt; 0</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>96</td>
<td>399,375</td>
<td>Pr(T &gt; t) = 0.3610</td>
</tr>
</tbody>
</table>

Note: diff = X<sub>after</sub> - X<sub>before</sub>

Using the paired t-test method showed that carbohydrate consumption (staple food) after the exit tolls construction was significantly higher than before the exit toll construction by 10%. Likewise, after exit tolls construction, vegetable consumption was also significantly higher than before by 10%. However, consumption of side dishes before and after exit tolls construction does not have a significant difference. Other consumption and asset ownership indicate that there is no significant difference too. It showed that exit tolls still do not have much economic impact, especially on the surrounding community. The impact given even tends to be negative.

For a deeper analysis, this study identified the division of clusters related to the impact received by the community on the use of exit tolls. The division of clusters can provide policy formulation to the government to increase the positive impact of exit tolls on local communities. The cluster analysis used in this study was a non-hierarchical cluster because the divided cluster has been identified based on the impact obtained by the community on the use of toll exits. The results of cluster analysis were as follows.

Table 2 concluded that local people who got the exit tolls construction effect are divided into two main clusters: the more educated cluster (Cluster 1) and the less educated cluster (Cluster 2). Cluster 1 has the characteristics of having a business in the field of food, has a relatively large number of family members, has increased income after the use of exit tolls, tends not to change job after the use of exit tolls, has increased consumption after the use of exit tolls, tends to have higher education compared to Cluster 2. Furthermore, Cluster 2 has the characteristics of having a business in the field of food, the family members were relatively less than Cluster 1, tends to get decreased income after the use of exit tolls, tends not to change job after the use of exit tolls, tends to decrease consumption after the use of exit tolls, and tends to have lower education compared to Cluster 1. The
results of this analysis show that those who can take advantage of opportunities from infrastructure development are those with higher education. The construction of toll roads will create new jobs for the surrounding community by providing materials and equipment (Almahmoud & Doloi, 2015). In addition, the construction of toll roads also has the potential to reduce poverty through employment (Lee & Chan, 2010).

Table 2. Cluster Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zscore_food</td>
<td>0.84074</td>
<td>0.84074</td>
</tr>
<tr>
<td>Zscore_transportation</td>
<td>-0.62228</td>
<td>-0.62228</td>
</tr>
<tr>
<td>Zscore_hhsize</td>
<td>0.40654</td>
<td>-1.45984</td>
</tr>
<tr>
<td>Zscore_income_change</td>
<td>0.30678</td>
<td>-2.13608</td>
</tr>
<tr>
<td>Zscore_job_change</td>
<td>-0.20206</td>
<td>-0.20206</td>
</tr>
<tr>
<td>Zscore_facility_change</td>
<td>-0.44764</td>
<td>-0.20206</td>
</tr>
<tr>
<td>Zscore_consumption_change</td>
<td>3.00165</td>
<td>-0.32985</td>
</tr>
<tr>
<td>Zscore_totalconsumption_change</td>
<td>8.63457</td>
<td>-2.12233</td>
</tr>
<tr>
<td>Zscore_education</td>
<td>-0.07451</td>
<td>-1.14963</td>
</tr>
</tbody>
</table>

Cluster 2 has a more positive perception related to an increase in facilities after exit tolls construction. Based on the in-depth interview, several things that have changed are the increase of quality and width of the road. Respondents agreed that an increase in infrastructure had smoothed traffic flow, and they are more satisfied when using the road because of the better road quality. This research result is in line with research conducted in southern Staffordshire, which indicates that the presence of the toll road provides an indirect impact on road infrastructure improvements (Pugh & Fairburn, 2008). These results are consistent with studies that showed people’s access to an activity center can be faster because of congestion avoidance on non-toll roads that divert vehicles to the motorway at peak traffic times (Doloi, 2012; Rohman et al., 2017).

From the different characteristics of the two clusters, the government can improve the community’s welfare by providing policy formulations for each cluster divided into more educated and less educated clusters. The cluster analysis can conclude that the key in improving the welfare of local communities, especially around the exit toll, would be through improving their education and/or upgrading their knowledge. The government should upgrade the knowledge by providing an understanding related to several ways to increase income, such as opening new businesses and business expansion, financial and saving literacy, and understanding related to consumption behavior. The main target for upgrading knowledge is the community included in Cluster 2, namely, the less educated cluster.

The construction of toll roads, especially at exit tolls, will create opportunities for the emergence of new small and medium enterprises (Rohman et al., 2017). Communities can use it to improve their welfare in the long term. The public needs to understand the business potential that can increase income by utilizing public facilities around the
exit tolls. Potential businesses that would have good prospects were the businesses in the food and transportation sector. From the interview, it is known that several people have side jobs as an online motorcycle or taxi drivers. In addition to understanding the business potential, the public also needs to understand how to run a business to be profitable with the concept of “low cost, optimal benefit.” That is because many people in Indonesia still traditionally run their businesses without involving cost-benefit analysis.

Financial literacy also needs to be given to Cluster 2 because in opening new businesses or expanding their businesses, the community often needs additional funds. So, the un-bankable community needs to be given upgraded knowledge in order to be bankable. In addition to providing knowledge in financial literacy, the community also needs knowledge related to saving and investment so that the public can know how to save from the income of their business and invest profitably. Furthermore, the community also needs to understand consumption behavior so that they can allocate consumption optimally to improve the quality of life when income increases.

Indonesian people tend to use their transitory income for investment and reduce consumption of non-essential goods such as cigarettes to increase their investment (Dwiputri, 2017). It showed that Indonesian people tend to save and invest when there is an increase in income. Therefore, a knowledge upgrade that related to investment and consumption behavior also needs to be given. The further analysis is to create clusters based on the income group shown in Table 3 below.

Table 3. Cluster Analysis (Case by Income Group)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zscore_food</td>
<td>0.84074</td>
<td>-0.00885</td>
</tr>
<tr>
<td>Zscore_transportation</td>
<td>-0.62228</td>
<td>0.00655</td>
</tr>
<tr>
<td>Zscore_hhsizw</td>
<td>0.40654</td>
<td>-0.02568</td>
</tr>
<tr>
<td>Zscore_income_change</td>
<td>0.30678</td>
<td>-0.01041</td>
</tr>
<tr>
<td>Zscore_job_change</td>
<td>-0.20206</td>
<td>0.01276</td>
</tr>
<tr>
<td>Zscore_facility_change</td>
<td>-0.44764</td>
<td>0.02827</td>
</tr>
<tr>
<td>Zscore_consumption_change</td>
<td>3.00165</td>
<td>-0.01424</td>
</tr>
<tr>
<td>Zscore_totalconsumption_change</td>
<td>8.63457</td>
<td>-0.08213</td>
</tr>
<tr>
<td>Zscore_education</td>
<td>-0.07451</td>
<td>-0.00661</td>
</tr>
</tbody>
</table>

Table 3 shows the same results as Table 2 that Cluster 2 remains categorized as “less educated” than Cluster 1. The characteristics of the cluster in both tables do not show significant differences. Several studies reveal that infrastructure development influences economic productivity (Annala et al., 2008; Aschauer, 1989; Esfahani & Ramírez, 2003). Study of the impact of construction of Malang toll road (Indonesia) to the community around the exit toll, showed that there was a decrease in income with a significance level of 10% and an increase in total consumption with a significance level of 5%. It showed that toll road construction significantly decreases revenue by 10% but increases consumption significantly by 5%.
The paired t-test method analysis showed that carbohydrates (staple food) and vegetable consumption experienced a significant increase by 10%. However, the consumption of side dishes does not significantly differ between before and after the toll road construction. The study found no significant difference in consumption of other types of goods and asset ownership. It showed that exit tolls yet to have a positive economic impact, especially on the surrounding community. To increase the positive impact, it needs a more strategic formulation of government policy.

Cluster analysis results showed that there were two clusters in the community around the exit toll. The difference between cluster 1 and cluster 2 is that people in cluster 1 relatively have more family members, have a higher level of education, and have increased income and consumption than cluster 2 after exit tolls construction. With the striking difference, cluster 1 is called the “more educated” cluster and cluster 2 is the “less educated” cluster.

CONCLUSION

Infrastructure is one of the transitions to boost economic growth. The construction of toll roads is expected to increase the people’s welfare, especially those in the exit toll area. This research focuses on the community who live around the Pandaan-Malang exit toll areas. The analysis results show that people living around the Pandaan-Malang exit tolls experience an increase in welfare as measured by expenditure. However, it has no impact on other welfare measures such as assets but has a negative impact on income. From the cluster analysis results, it can be seen that the improvement in the community’s welfare around the exit toll can be achieved through increasing the education rate and/or upgrading knowledge. Upgrading knowledge that the government can do is provide understanding related to several ways to increase income through opening new businesses and business expansion, financial literacy, saving, and understanding related to consumption behavior. The main target for this knowledge upgrade is the community included in cluster 2, namely the “less educated.”

REFERENCES


