Spatial patterns of land prices changing around toll gates (Cipali Toll Road case study)

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Abstract. Toll road construction has been carried out and has had an direct and indirect economic impact, which applies to Cipali Toll Road as well. High economic activities, growth of new facilities, and land use changes around this toll road are signs of new economic activities. New economic activity centers have triggered an increase in land prices in the surrounding area. The objective of this study is to determine the land use price changes along the Cipali Toll Road and understand the factors that influence it, namely the economic activity, distance from the toll road gate, land status, and land use. Data were collected by interviewing key informants from formal agencies and the communities as well. Using overlay technic between land price changes and factors that influence it, the result shows that land price changes did not happen in all areas around the toll road in the same way. Changes in land price also vary. The factor that influences land price changes is the distance from the toll road gate. This result was supported by Pearson Product Moment analysis. The conclusion of this study shows that land price changes in areas that have urban characteristics.

1. Introduction

Land is one of the most important resources that humans need. Human’s need for space has led them to always want to open new spaces. The opening of a new space tends to be intensive and in line with human growth that continues to increase [1]. This situation creates an imbalance between needs and availability, or between supply and demand. The establishment of land prices is always related to the maturity of the land itself, that is, supported by facilities and accessibility. Facilities and accessibility act as a support for economic activities surrounding the location of the land. The more economic activities take place in the land location, the higher the price of land in the area [2]. Accessibility has a direct impact on economic activities in an area. This is due to the relationship between economic activities and accessibility [3]. When accessibility is high, economic activities are also high because economic activities are formed by several factors, one of which is accessibility. Road network is one example or part of accessibility. The road network itself according to its user’s rights is divided into two, namely public roads and toll roads [4]. Cipali Toll Road (Cikopo - Palimanan) is a toll road that has been planned and completed through six periods of leadership.

The Cipali Toll Road was built from 2011 to 2015. The construction of this toll road was financed through a combination of funds from the Government and the private sector, which was bound in a Public-Private Partnership (KPS). The investment value of the toll road was IDR 12.56 trillion with a 35-year concession period with the Toll Road Regulatory Agency (BPJT).
An increase in economic activities and number of population is a domino effect that occurs as a result of the construction of accessibility in the form of the Cipali. There is a strong correlation between land prices and the distance of land locations with accessibility [5], such as highways [2]. This statement supports the assumption that Cipali Toll is one of the factors in the increase in land prices.

2. Research Methods

2.1 Research Area
Cipali Toll becomes the object of this research area. The selection of the Cipali toll road is based on the fact that the construction of the Cipali toll road that connects the city of Jakarta with the city of Cirebon, and the position of the Cipali toll road as one part of the Trans Java toll road network that connects cities on the island of Java. The position of the Cipali toll road has led to the formation of new accessibility. The establishment of new accessibility will cause changes in land prices [6].

2.2 Quantitative method
Quantitative data processing is carried out using the Pearson Product Moment formula correlation test. Pearson Product Moment correlation test is used for discrete data and continuous data and is suitable for parametric statistics. So, when using this correlation test it must be assumed that the data is normally distributed or the normality of the data must be known when using this correlation analysis.Basically, this formula will test the correlation between two variables as well as the correlation form of the two variables. The correlation results are, very weak, weak, strong enough, strong and perfect. Other than that, the correlation form is either positive or negative.

The formula of Pearson's Own Product Moment is:

\[ r = \frac{n \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{(n \Sigma x^2 - (\Sigma x)^2)(n \Sigma y^2 - (\Sigma y)^2)}} \]  

With the following information:

- \( n \) : Number of Data Pairs X and Y
- \( \Sigma x^2 \) : Square of Total Amount of Variable X
- \( \Sigma y^2 \) : Square of Total Amount of Variables Y
- \( \Sigma xy \) : Multiplication Result of The Total amount of Variables X and Y Variabels

In addition to the above formula, to find out whether or not the two variables have strong correlations, reference tables are used to determine the resulting correlation criteria. The reference table to find out the correlation criteria is as follows:
Table 1. Reference Table Degrees of Correlations. [1]

| Coefficient Interval | Note           |
|----------------------|----------------|
| 0.00 – 0.199         | Very Weak      |
| 0.20 – 0.399         | Weak           |
| 0.40 – 0.599         | Strong Enough  |
| 0.60 – 0.799         | Strong         |
| 0.80 – 1             | Perfect        |

The correlation results can be either positive or negative [1]. If the result showed a negative correlation, the x variable increases while the y variable decreases. And vice versa.

3. Result And Discussion

The land prices have a correlation with accessibility. Land prices will rise when there is good accessibility [7]. In this study, the toll gate is assumed to be the center of economic activities.

3.1 The High Land Price

Figure 2 shows that the Kalijati toll gate area which is in the west part has relatively high land prices. Although it is far from the toll gate, land prices in the western region are high due to high economic activities. This phenomenon is in line with the theory, which shows that rent value will be more expensive as it approaches the center of economic activities [8].

![Land Price Around Kalijati Toll Gates](image)

**Figure 2.** Land Prices around the Kalijati toll gate

Figure 3 also shows that land prices decrease as they move further away from the toll booth [2]. Pratiwi mentions that land prices will fall even further away from the city center. Thus this research is in accordance with what was mentioned by Pratiwi [2] and also theory of Alonso [8] which states that land rent price will decrease when getting 8 further away from the city center.
Land prices have risen again when they are farther away from the toll booth. This situation occurs because the location of the land is getting closer to the other toll gate. In general, land prices within the toll gate area are in accordance with Alonso’s theory. In this area, high land price occurs in a location that is getting closer to the toll gate. This situation is caused by the distance from the toll gate, which is not too far away, making access to other locations easier and nearer. Finally this location will be a favorite because it does not need too much cost to get to the nearest access from there. Since this location is a favorite, it can be concluded that the demand for land will be high while the availability of land will not change. Naturally, this will cause demand to be higher than supply, therefore land prices will automatically increase significantly.

3.2 The Low Land Price
Land price in this region has also increased from it was in the previous year. The increase in land prices ranges from 500 percent to 4000 percent. The highest increase was found in areas close to the Kalijati toll gate. According to an informant, around 2009 the price of land in the area was around IDR 100,000 to IDR 200,000 per square meter and currently it has increased to around IDR 4,000,000 per square meter, or it has changed by around 2000 percent from the price in 2009.

Alonso [8], Hill [9] and Rakhmatulloh et. al [10] state that land prices are influenced by land use. The results showed that this high land price also occurred in areas where the land use is in the form of built-up land. Increasingly eastward, land prices are decreasing, which is due to the central region getting...
further away from the toll gate, and is assumed to be new accessibility. This phenomenon supported by previous research that show commercial properties have the most expensive land value [10].

**Figure 5. Land Prices Around the Cikedung Toll Gate**

In terms of the comparison between land prices of 2009 and 2019, there was a significant change at each end of the Cikedung toll gate area. According to Figure 5, the highest increase occurred in areas that are increasingly away from the Cikedung toll booth, or areas that are getting closer to the Subang toll gate. The increase in land prices in 2019 in this part reached 3000 percent compared to the price of land in 2009.

The lowest land changes price between 2009 and 2019 occure at Cikedung toll gate, which is 500%. This is showed at Figure 6.

**Figure 6. Changes in Land Prices in Percent**

The land prices will rise when accessibility is good [6]. However, changes in land prices in the Cikedung toll gate area show that land price changes are higher as they move away from the toll gate. This situation shows that there are differences between the results of this study with previous one [6].

This situation is supported by the situation around the toll gate that is still relatively quiet or the absence of economic activities in the vicinity. Such situation makes the community less interested in living or utilizing the land around the Cikedung toll gate. With low demand and high availability, land prices do not experience a significant increase. Meanwhile, as it gets further away from the toll gate, the price will
be more expensive considering that the location of the Cikedung toll booth that is increasingly away from the toll gate is, however, getting closer to urban areas or closer to the center of economic activities.

![Figure 7. Land Price around Cikedung Toll Gates](image)

In Figure 7, it can be seen that the low land price occurs in the Cikedung toll gate area. In this region, the price of land is evenly distributed along the road around the Cikedung toll gate. The land prices in this toll gate area are within range of IDR 2,000,000 and below. Therefore, classified into parts or groups of low land prices.

3.3 The Medium Land Price
Situation in the Kertajati toll gate area is different from that of the other toll gates. In the Kertajati toll gate area, land prices vary greatly. Land prices do not always follow the position of the toll gate itself. In this region, land prices are high in the middle, or not close to the Kertajati toll gate, and not too far from it. According to Pratiwi [2], land prices will decrease as they move further away from the city center.

![Figure 8. Land Price around Kertajati Toll Gates](image)

Figure 8, shows that the high land price is clustered in the middle, which is located not too close to the Kertajati toll gate. This proves that there are different situations with Hill [9] which states that land prices will get higher as they approach accessibility. Other factors, such as the presence of a city or a
center of economic activities contribute to differences in land price theories from the facts in the field. This is in accordance with Pratiwi [2] which states that the price of land will be more expensive as it approaches the city center.

![Land Price around Kertajati Toll Gates](image)

**Figure 9. Land Price around Kertajati Toll Gates**

In this region, high land prices are found in the central part, which is part of the Kertajati urban area. The middle area is where the centers of economic and government activities are. As a result, the location of land in the area is a favorite for the community. And in the end, price of land will go up and be high along with the high interest of the community in using and utilizing the land at that location.

![Land Price Changes in Percent](image)

**Figure 10. Land Price around Kertajati Toll Gates**

Figure 10. shows that land prices that have experienced high changes are located in the furthest part of the toll gate. This is unique considering that changes in land prices should occur in areas located at the closest to the toll gate. In reality, however, the highest land price change in this region occurs in areas that is located in the furthest part of the toll gate. This also shows that there are other factors that affect land prices.
Table 2. The Correlation between Land Price, Land Price Increase, and Distance from the toll gate

| Land Price 2019 (Rp) | Pearson Corellation (Sig. 2-tailed) | Distance from Toll Gate (meter) | Land price changes (%) |
|----------------------|-------------------------------------|--------------------------------|------------------------|
| Land Price 2019      |                                    | Pearson Corellation (Sig. 2-tailed) | 1                      | -.152                    | .253**                  |
|                      |                                    | N                               | 229                    | .021                      | .000                     |
| Distance from Toll   |                                    | Pearson Corellation (Sig. 2-tailed) | -.152*                 | 1                        | .141                     |
| Gate (meter)         |                                    | N                               | 229                    | .021                      | .034                     |
| Land price changes   | Pearson Corellation (Sig. 2-tailed) | .253**                          | 1.141                  | 1                         |
| (%)                  |                                    | N                               | 229                    | .000                      | .034                     |

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Table 2, or the correlation table, shows that correlation between the distance from the toll gate to the land price increase shows a significant value. The correlation between the distance from the toll booth and the price of land is 0.152 and negative. The negative correlation means that land price, does not have correlation with the toll gate location. High land price are not close to the toll gate. Table 2.1 also shows that changes in land prices are also significant to the distance from the toll gate. With a correlation value of 0.141, changes in land prices have a correlation with the distance from the toll gate. The positive value also shows the direction of the correlation, namely if the distance is farther or goes up, the change in land prices will also be greater. The results of the correlation between land prices, changes in land prices and the distance from the toll gate shows that the distance from the toll gate has a correlation with land prices as well as changes in land prices. This research was conducted in 2009 and 2019. This is the weakness of this research. However, if the research conducted for several years, it is likely to know the pattern of changes in the actual price of land. Their research shows that relationships between accessibility and house prices that appear in models fitted to cross sectional data are weakened when measured in terms of changes over time.

4. Conclusion
The distance from the toll gate influences the land price pattern. Tollgate functions as access and is classified as high access. The type of land use formed as the determining factor of land price changes as well. High land prices occur in areas that show urban characteristics.

5. References
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