Analysis on Public Transportation Influences on Real Estate Development in East Lansing

WANG Xiaoxiao¹, YAN Jie²
1. College of Architecture, Illinois Institute of Technology, 60616, USA
2. School of Planning, Design and Construction, Michigan State University, 48824, USA
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Abstract The purpose for this article is to research the relationship between public transportation and real estate based on the area of East Lansing. Two methods are mainly used to analyze the data: correlation analysis and means analysis with the help of Statistical Package for the Social Sciences (SPSS) data analyzing software. There are two analysis results: (1) the real estate, which is closer to public transportation, will have higher value than that is far from public transportation, and (2) the number of bus in one bus stop has no obvious relation with the value of real estate. Based on these results, real estate developers could build residential real estate close to public transportation or bring public transportation in their real estate community by contract with transportation corporations. In sum, they should reasonably use public transportation as attractive features to convince people to prefer to their houses.

Keywords public transportation; real estate; value; East Lansing

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Introduction

With the development of automobile industry and improvement of living quality, almost every American family owns car and takes it as daily necessity. Therefore, private cars have become the main short-distance transportation in the United States. Public transportation is increasingly ignored by people.¹ In order to figure out whether public transportation still is an aspect considered by people who choose place to live and who make house development, we choose the relation between public transportation and residential real estate value as research topic.

Real estate value could be influenced by many factors, such as market demand and supply, nearby job opportunity, price of construction material, its use, etc.² Therefore, developers should consider all of these dimensions to make decision on new real estate development.³ However, influences of public transportation to real estate development have not been confirmed. Furthermore, different places have different situations. In East Lansing area, the main public transportation system is CATA bus, and it almost covers the entire local East Lansing.⁴ Therefore, the relation between real estate value and CATA system in East Lansing area is a particular topic that is distinct from other places’ problems. East Lansing is the home of Michigan State University. Tens of thousands of students live and study there. Real estate development is important in this area and it should be well planned. Thus, developers should consider influences of public transportation.

Our hypothesis is that the closer the house is to bus stop, the higher the house value is. Also, the more the bus stop within a certain area from house is, the
higher the house value is. In other words, the house that is more convenient to public transportation than others has higher value or price. Public transportation will push nearby house’s value up.

Finding will be valuable for developers to make decision when they locate their future houses and negotiate with government or local organization about facilities. Developers could be easy to decide whether to build house close to bus stop and to bring bus route going through their housing communities. At the same time, government and public transportation organization could figure out how to arrange public transportation and could take convenient public transportation system as an attractive feature to convince real estate developers that it is a good place to invest. Therefore, this research is worthy and valuable.

1 Research design

The research purpose is finding out the relation between public transportation and real estate value. Therefore, it is an exploratory research. These two might or might not have relation. Also, relation may be positive or negative. Our hypothesis is that public transportation will have positive influence on real estate value. Moving further, it means that public transportation will bring nearby real estate value up. Specific detail will be mentioned in following context.

Real estate value could be influenced by lots of factors, such as market demand and supply, nearby job opportunity, and price of construction material. In research, we choose East Lansing as my target area in order to control influence from economic and market level. Because economic and market factors should be the same in one place, social and natural environment will stay same in one city. Although there are still some other aspects that exist to affect real estate value, these main ones are controlled.

The unit in this research is real estate parcel, which is already divided on the local land use parcel map. The topic focuses on residential real estate, so all other parcels that are not used as residential purposes should not be included. By using Geography Information System, residential parcel could be picked up from all these parcels. Every parcel has its size, number of floor, and taxable value. Here is the parcel map in East Lansing area (Fig. 1).

In this research, there are five variables: taxable value, taxable value per square foot, distance to nearest bus stop, number of bus, and average frequency of bus. Taxable value and taxable value per square foot are dependent variables. The rest three variables are independent variables.

Because the market value of real estate is not easy to assess and sale amount is type of private information, getting direct real estate value is hard. Therefore, we take taxable value, which could be found on East Lansing government Web site and in

Fig. 1  The parcel map in East Lansing area
Geography Information System Lansing data layer, instead of direct value. Taxable value is the value on which government base when collecting taxes. Taxable value has positive relation with direct value or market value. The higher the market value is, the higher the taxable value is. \[^6\] Although it is not equal to market value, it could still reflect the relation between real estate value and public transportation.

Different parcels have different size. Normally, the bigger the parcel is, the higher the value is. Thus, it is unreasonable to compare total value of two different size parcels. Using taxable value per square foot will be a better choice.

Distance to nearest bus stop is a variable that could directly reflect whether it is convenient to access bus from residential house.\[^7\] Sometimes there will be several bus stops around a parcel from different directions. We take nearest bus stop as target. It is the easiest and fastest way to get on bus. Our hypothesis is that the shorter the distance is, the higher real estate value is. Therefore, distance to bus stop will have a negative relation with taxable value.

The number of bus is about how many buses there are within 250 m radius from real estate parcel. It is a variable that could show the number of available bus from residential parcel.\[^8\] The more the bus is, the more convenient residents access to bus. Therefore, we make a hypothesis that the number of bus has positive relation with taxable value.

Average time of bus is our last variable. It is how often bus comes to bus stops. It is measured by minute. Because there is not only one route bus passing by target parcels, we just take average time as my variable. Some buses come every 10 minutes, but others come every 45 minutes. Thus, people will easier to get on the former than the latter. Our hypothesis is that average time has negative relation with taxable value. Longer time will bring low value.

| Value | Distance | Number | Time | Size  | Value per square foot | D2 | N2 | T2 |
|-------|----------|--------|------|------|----------------------|----|----|----|
| 4543  | 95       | 1      | 15   | 1430 | 31.769               | 2  | 1  | 1  |
| 74140 | 135      | 4      | 30   | 2700 | 27.459               | 2  | 2  | 2  |
| 32260 | 101      | 4      | 30   | 3130 | 10.307               | 2  | 2  | 2  |
| 43210 | 77       | 2      | 35   | 2770 | 15.599               | 1  | 1  | 2  |
| 34250 | 87       | 2      | 30   | 1440 | 23.785               | 2  | 1  | 2  |
| 74000 | 30       | 2      | 30   | 1553 | 47.65                | 1  | 1  | 1  |
| 57110 | 17       | 2      | 30   | 1250 | 45.688               | 1  | 1  | 2  |
| 62630 | 23       | 3      | 25   | 2400 | 26.096               | 1  | 2  | 1  |
| 17370 | 166      | 2      | 25   | 1364 | 12.735               | 2  | 1  | 1  |
| 60890 | 76       | 1      | 35   | 2650 | 22.977               | 1  | 1  | 2  |
| 76970 | 73       | 2      | 33   | 1560 | 49.34                | 1  | 1  | 2  |
| 14800 | 227      | 1      | 40   | 1870 | 7.194                | 2  | 1  | 2  |
| 11140 | 165      | 1      | 40   | 1380 | 8.072                | 2  | 1  | 2  |
| 43240 | 68       | 2      | 27   | 2475 | 17.471               | 1  | 1  | 1  |
| 46880 | 75       | 2      | 27   | 2800 | 16.743               | 1  | 1  | 1  |
| 47050 | 20       | 1      | 20   | 1430 | 32.902               | 1  | 1  | 1  |
| 37460 | 30       | 1      | 20   | 1560 | 24.013               | 1  | 1  | 1  |
| 57000 | 25       | 2      | 30   | 2670 | 21.348               | 1  | 1  | 2  |
| 52490 | 78       | 2      | 27   | 2630 | 19.958               | 2  | 1  | 1  |
| 79330 | 82       | 2      | 27   | 2798 | 28.352               | 2  | 1  | 1  |

In East Lansing, there are about 7000 parcels.\[^9\] It will be a tough work for me to collect all the data. Therefore, we take 20 parcels as my typical samples (Table 1), as the value ($10000-80000), value per square foot ($5-50), size (1000-3500 square feet), age time (10-40 years), number for housing (1-4), and distance to public transportation (20-250 feet) for housings (see Table 2).

The paper mainly uses GIS Lansing data layer and East Lansing government Web site as my data resource. Taxable value and parcel size could be found directly from these two places. The distance between bus stop and parcel is measured manually on GIS operation plat.\[^10\] Data about bus totally come from CATA bus system Web site.
there is positive strong relation between value and number. Also, the relation between value and frequency is negative and not very strong. Similarly, value per square foot has quite strong negative relation with distance and has weak relation with number. The relation between value per square foot and time is not very strong too and is also negative.

Also, we use SPSS to do mean comparing analysis. There is a sample table (Table 4).

Table 4  Mean comparing analysis for value and number

| Number | Mean   | N   | Std. Deviation |
|--------|--------|-----|----------------|
| 1      | 36128.33 | 6   | 19493.752      |
| 2      | 52859.45 | 11  | 18951.193      |
| 3      | 62630.00  | 1   |                 |
| 4      | 53200.00  | 2   | 29613.632      |
| Total  | 48382.50  | 20  | 20187.159      |

It shows the average value of houses that have the same number of bus round it. Taking the number 1 as example, there are six parcels that have only one bus around them and the average value is $36 128.33. Therefore, we could compare the average value among the bus numbers to find out whether there is any relation between them. However, there is not an obvious connection between these two variables from that table, so we combine bus numbers 1 and 2 as a group as well as numbers 3 and 4. Two new groups are created. Then, comparing these new groups’ means, we get another table (Table 5).

Table 5  Mean comparing analysis for new groups

| N2   | Mean    | N   | Std. Deviation |
|------|---------|-----|----------------|
| 1    | 46977.65 | 17  | 20283.891      |
| 2    | 56343.33 | 3   | 21636.202      |
| Total| 48382.50  | 20  | 20187.159      |

Table 5 shows that there is relation between average value and number: smaller number has lower value. It is clearer to see the trend than the table above.

Using that method, we also compare average parcel value of other two variables. Here are distance tables (Tables 6 and 7).

The paper sets distance that is greater than 77 m as a group and the rest as a group. Therefore, from Table 7, it is clear that shorter distance has higher average value.

The time tables (Tables 8 and 9) are as follows.

Shorter time has higher value. It could exactly meet our hypothesis. There are still many data tables about average value per square foot. Because these
will take much space, we will not present the data table here and will talk about the detail next section.

Table 6  Mean comparing analysis for value and distance 

| Distance | Mean   | N  | Std. Deviation |
|----------|--------|----|----------------|
| 17       | 57110.00 | 1  | .              |
| 20       | 47050.00 | 1  | .              |
| 23       | 62630.00 | 1  | .              |
| 25       | 57000.00 | 1  | .              |
| 30       | 55730.00 | 2  | 25837.682      |
| 68       | 43240.00 | 1  | .              |
| 73       | 76970.00 | 1  | .              |
| 75       | 46880.00 | 1  | .              |
| 76       | 60890.00 | 1  | .              |
| 77       | 43210.00 | 1  | .              |
| 78       | 52490.00 | 1  | .              |
| 82       | 34250.00 | 1  | .              |
| 95       | 45430.00 | 1  | .              |
| 101      | 32260.00 | 1  | .              |
| 135      | 74170.00 | 1  | .              |
| 165      | 11140.00 | 1  | .              |
| 166      | 17370.00 | 1  | .              |
| 227      | 14800.00 | 1  | .              |
| Total    | 48328.50 | 20 | 20187.159      |

Table 7  Mean comparing analysis for value and distance 

| D2     | Mean   | N  | Std. Deviation |
|--------|--------|----|----------------|
| 1      | 55130.91 | 11 | 12879.999      |
| 2      | 40134.44 | 9  | 24926.736      |
| Total  | 48382.50 | 20 | 20187.159      |

Table 8  Mean comparing analysis for value and time 

| Time   | Mean   | N  | Std. Deviation |
|--------|--------|----|----------------|
| 15     | 45430.00 | 1  | .              |
| 20     | 42255.00 | 2  | 6781.154       |
| 23     | 74000.00 | 1  | .              |
| 25     | 40000.00 | 2  | 32003.653      |
| 27     | 55485.00 | 4  | 16345.645      |
| 30     | 50952.00 | 5  | 17610.581      |
| 33     | 76970.00 | 1  | .              |
| 35     | 52050.00 | 2  | 12501.648      |
| 40     | 12970.00 | 2  | 2588.011       |
| Total  | 48382.50 | 20 | 20187.159      |

Table 9  Mean comparing analysis for value and time 

| T2     | Mean   | N  | Std. Deviation |
|--------|--------|----|----------------|
| 1      | 25.76890 | 10 | 10.162560      |
| 2      | 23.24890 | 10 | 14.519985      |
| Total  | 24.50890 | 20 | 12.266171      |

3 Results, discussion, and interpretation

On the basis of data analysis, we finally get several findings. We summarize them as the following points: At first, both value of real estate and value per square foot have negative relation with distance to bus stop. Value per square foot relation is a little bit stronger than value’s. Also, time has negative relation with value and value per square foot. Similarly, value per square foot is stronger than value’s. Number of bus has strong positive relation with value but has weak negative relation with value per square foot. There will be no obvious relation between number and real estate value and value per square foot.

Public transportation could affect the value of residential real estate. The correlations among variables are strong. That means there exists certain relation between them as our hypothesis.

The real estate that is closer to public transportation will have higher value than that is far from public transportation. That exactly meets our hypothesis. Because people would like to live close to public transportation, real estate nearby will be more expensive than others (market demand), and so does this variable: time. If it will take a shorter time to access to public transportation, people will prefer to live in that place and price will be raised.

The number of bus in one bus stop has no obvious relation with the value of real estate. That result is not in line with our assumption. As our hypothesis, the greater the number is, the higher the value is. The explanation is that people do not care how many bus they can get on one bus stop. What they are concerned about is whether there is the bus they usually take or they want to take. That will be the reason why there is no certain relation between them.

From review of the literature, 1) this research has the same result as Daniel P. Mc Millen and John McDonald’s (2004) research entitled “Reaction of House Prices to a New Rapid Transit Line, 1983-1999: Chicago’s Midway Line”.[12] Shorter distance to transit stations could bring higher house price, but at the same time, our researches are totally different from theirs. Besides distance to transit station, we also examine the relation among number of public transit,
time of transit, and house price. We only focus on one place, but this research compares two different places’ house price. That is another distinct point. In our future research, more places should be referred. 2) This research has same result as H.M. So, R.Y.C. Tse, and S. Ganesan’s (1997) paper entitled “Estimating the influence of transport on house prices”. However, we use different analysis methods. We mainly use correlation and means analysis. In this research, authors take mathematics model as major tools. Also, we specify convenience of transport as distance to bus stop, number of bus, and time of bus. The cost on transport is not considered in my research. It should be another factor we should think about in the future study. 3) This research has the same purpose that finds out whether convenient accessibility could bring high house price as K.W. Chau and F.F. Ng.’s (1998) paper entitled “The effects of improvement in public transportation capacity on residential price gradient in Hong Kong”. This research extends research field. Other variables that could present the convenience of public transportation are brought in. From this research, we should learn comparison between different areas and use more analysis methods.

4 Conclusion

Public transportation has direct influences on value of residential real estate. Convenient public transportation facilities could bring the value of nearby residential real estate up. From results of quantitative analysis, value per square foot has quite strong negative relation with distance and there will be no obvious relation between number of bus and real estate value and value per square foot. Therefore, real estate developers could build residential real estate close to public transportation or bring public transportation in their real estate community by contract with transportation corporations. Public transportation is a critical determining factor to value of real estate. Government also could use local advanced public transportation system to attract developers to invest and build more residential real estate. Also, transportation corporations could use this research result to arrange traffic route.

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