Public Transportation Usage, Commute Times, and Vehicle Ownership

A Study on the Relationship to Commuter Train Stations

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Abstract

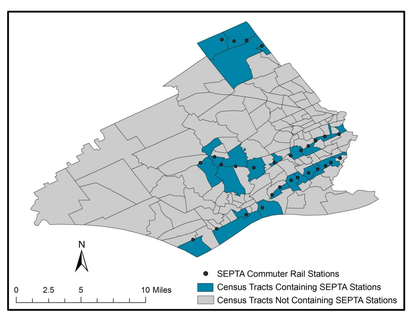
As transportation has evolved and expanded, central cities have decentralized. Commutes have changed from walking, to trolleys and trains, to the automobile. Commute radiuses have greatly expanded, bringing extremely varied commute times and longer distance commutes. This study examines the relationship between the presence of a commuter train station in a census tract and public transportation usage, commute times, and vehicle ownership.

Research Questions

- Do census tracts containing a commuter train station have a higher proportion of public transportation usage and a lower rate of vehicle ownership than those census tracts not containing a commuter train station?
- Does commute time by public transportation vary in regards to whether or not a commuter train station is located within census tracts?
- Is there a higher prevalence of residents commuting by train only than residents commuting by all modes of public transportation in census tracts with a commuter train station within its borders?
- How do the various modes of transportation studied in this research compare in terms of commute time in census tracts with or without a commuter train station in their borders?

Study Area

Figure 1. Delaware County, Pennsylvania



Methods

Expected findings are that there is a relationship between the presence of a commuter train station in a census tract and public transportation usage, commute times, and vehicle ownership. All data are from the American Community Census 2009-2013 5 year estimates at census tract level. Variables include commutes by car/truck/van, (all) public transportation, rail only, and total commuters, at less than 30 minutes and 30 minutes or more, as well as the variable for no vehicle available. GIS was used to join the census tract layer with SEPTA commuter train stations in order to find which census tracts contain a commuter train station. Descriptive Statistics were run to understand the distribution and proportions of the data variables. A Two Sample Difference of Proportions Z-Test was used in order to determine whether or not the difference in proportions of variables against census tracts with or without a train station was statistically significant.

Results

Table 1. Two Sample Difference of Proportions Z-Test

	Proportion			
	Commuter Population in census tracts with a commuter train station in their borders	Commuter Population in census tracts without a commuter train station in their borders		
	n=45276	n=204262	Zp1-p2	*p*
Total Car/Truck/Van	0.793	0.864	-38.042	0.000
Total Public Transportation	0.118	0.094	15.216	0.000
Total Railroad	0.064	0.028	38.129	0.000
Car/Truck/Van commute <30 minutes	0.470	0.502	-12.464	0.000
Car/Truck/Van commute 30+ minutes	0.324	0.362	-15.284	0.000
Public Transportation commute <30 minutes	0.019	0.017	3.093	0.05
Public Transportation commute 30+ minutes	0.099	0.077	15.132	0.000
Railroad commute <30 minutes	0.007	0.002	15.477	0.000
Railroad commute 30+ minutes	0.057	0.025	34.91	0.000
Total Commuters commute <30 minutes	0.569	0.555	5.122	0.000
Total Commuters commute 30+ minutes	0.431	0.445	-5.122	0.000
No Vehicle Available	0.050	0.047	2.675	0.05

All of the following percent's are calculated from the proportions section of Table 1.

- Census tracts containing a commuter train station have a higher percent of public transportation usage (11.8%) than those census tracts not containing a commuter train station (9.4%) as shown in Figure 2. Census tracts containing a commuter train station have a higher percent of residents with no vehicle available (5%) than those census tracts not containing a commuter train station (4.7%) displayed in Figure 4.
- Regardless of whether or not a train station is present in a census tract, a far greater proportion of residents commute for 30 minutes or more using public transportation; in census tracts that contain a commuter train station 9.9% travel 30 minutes or more while 1.9% travel 30 minutes or less, whereas in census tracts without a commuter train station 7.7% travel 30 minutes or more, while 1.7% travel 30 minutes or less.
- There is a higher prevalence of residents commuting by train only (referred to as 'Railroad' in Table 1.) than residents commuting by all modes of public transportation in census tracts with a commuter train station in their borders as highlighted in Figure 3.; 54% ((0.064/0.118)*100) of public transportation users use train only in census tracts with a commuter train station present, while only 30% ((0.028/0.094)*100) of public transportation users use train only in census tracts without a commuter train station present.
- When traveling by public transportation, 5 times more commuters commute 30 minutes or more than 30 minutes or less in census tracts containing a commuter train station. In census tracts not containing a commuter train station, 4.5 times more commuters commute 30 minutes or more than commute 30 minutes or less. 8 times more commuters travel 30 minutes or more when traveling by train only in census tracts containing a train station, while 12.5 times more commuters travel 30 minutes or more in census tracts not containing a commuter train station. More people have commutes less than 30 minutes traveling by car/truck/van; 1.5 times more people commute less than 30 minutes in census tracts with a train station, while 1.4 times more people commute less than 30 minutes in census tracts not containing a commuter train station.

It is important to note that while this study is based on the presence of commuter train stations; further research should include data on other forms of public transportation stations, such as bus stops. Furthermore, a more sufficient system for classifying data variables into areas around commuter train stations should be used; as at the census tract level those people who don't live in a census tract with a commuter train station were not counted in the proportion of people who reside in a census tract with a commuter train station-even though they may live within the same radius or distance of a commuter train station. This would allow for more accurate research on the relationship of commuter train stations to public transportation usage, commute times, and vehicle ownership.

Figure 2.
Commutes by Public Transportation

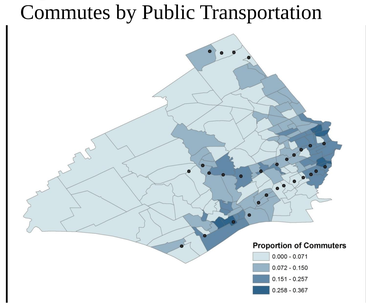


Figure 3.
Commutes by Train Only

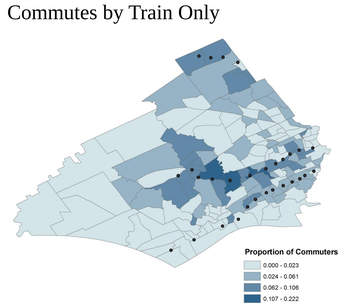
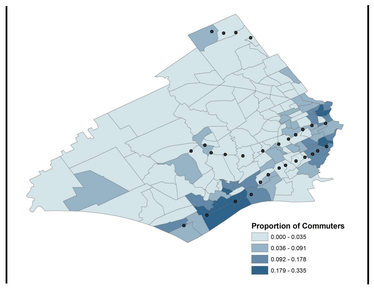


Figure 4.
No vehicle Available



Conclusion

This study suggests that there is a relationship between the presence of a commuter train station in a census tract and a higher usage of public transportation, particularly in terms of commutes by train. Lower vehicle ownership was also found to have a relationship with the presence of a commuter train station but only slightly. The relationship of Commute times to the presence or non-presence of a commuter train station varied by mode, but was the most impressive in the train only commute variable. Further research should include bus station data and focus on determining the spatial relationship of public transportation stops to commute mode, commute times, and vehicle ownership.