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Is the light rail "Tide" lifting property values? Evidence from Hampton Roads, VA☆

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ABSTRACT

In this paper we examine the effect of light rail transit on the residential real estate market in Hampton Roads, Virginia. Norfolk's Tide light rail began operations in August of 2011 and has experienced disappointing levels of ridership compared to other light rail systems. We estimate the effect of the Tide using a difference-in-differences model and consider several outcome variables for the residential housing market, including sale price, sale-list price spread and the time-on-market. Our identification strategy exploits a proposed rail line in neighboring Virginia Beach, Virginia that was rejected by a referendum in 1999. Overall, the results show negative consequences from the constructed light rail line. Properties within 1500 meters experienced a decline in sale price of nearly 8%, while the sale-list price spread declined by approximately 2%. Our results highlight the potential negative effects of light rail when potential accessibility benefits do not out weigh apparent local costs.

1. Introduction

Rail transit systems have become an increasingly popular transportation alternative in many U.S. metropolitan areas. Public funds are often used not only to finance construction, but also to subsidize operating costs. A Brookings Institution report on transportation infrastructure shows that 31 large metro systems operated at a loss in 2013 (Kearney et al., 2015). Further, systems with fewer total passengers tended to lose more money per passenger ride than their more heavily used counterparts. Cities often justify the use of public funds by citing the benefits of commuter rail transit systems. Benefits often include reducing traffic congestion and emissions, increasing accessibility to jobs and amenities, providing an affordable and sustainable mode of transport, and spurring economic activity (Mohammad et al., 2013). Nonetheless, there are also potential negative externalities associated with light rail, such as crime, noise, safety and parking issues (Bowes and Ihlanfeldt, 2001). The degree of public financing along with the purported local economic benefits and potential negative externalities make measuring the local effect of rail transit an important consideration for policy makers and communities.

A popular strategy for measuring the effect of rail transit projects on local residents is examining the capitalization of stations on nearby home values. Researchers often argue that the main benefit due to rail transit stations comes from increased access to regional amenities such as central business districts, education centers, entertainment and recreation venues, etc. In this light, land and housing markets should adjust to account for the benefits of increased accessibility. However, current and future residents near stations could also consider the potential negative externalities of light rail when buying and selling a residential property. There is a large literature measuring the effect rail transit on various measures of the residential and commercial real estate market. The results have been mixed with studies suggesting a positive effect and others questioning the benefits (Debrezion et al., 2007). Mohammad et al. (2013) provide the distribution of the estimated land and property value changes due to light rail from 1991-2008. The average effect was found to be 8% with a standard deviation of 17%, while fewer than 5% of the 102 estimates examined in the study indicated a negative effect on prices. Billings (2011) suggests that the variation in estimated impacts could be due to the use of inadequate control groups. Similarly, Parmeter and Pope (2013) argues for leveraging quasi-experimental estimation techniques when estimating hedonic pricing models. Several studies have used credible identification strategies and have aided in further shedding light on the policy debate surrounding the effect of rail transit on real estate values.

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For example, Gatzlaff and Smith (1993) in Miami, McMillen and McDonald (2004) in Chicago, and Hurst and West (2014) in Minneapolis considered areas outside of a pre-determined threshold as the control group. Gibbons and Machin (2005) and Dubée et al. (2013) used the opening of new stations and service frequency for long-standing rail transit lines in London and Montreal. Alternatively, Billings (2011) exploited a proposed rail corridor to examine a newly constructed light rail system in Charlotte. Each of these studies took place in large metro areas with populations over 2 million residents and ridership figures exceeding 3 million passenger trips per year.[1] The ridership per capita for these metro areas were all above 2 trips per resident per year with Montreal having over 77 trips per resident in 2013. Thus, the quasi-experimental literature has focused on successful light rail systems, at least in terms of ridership, in large metro areas.

In this paper, we estimate the effect of Norfolk, Virginia's light rail system, named the Tide, on the residential housing market. Our estimates use data from a multiple listing service (MLS) for southeast Virginia and consider three housing outcomes: sale price, sale-list price spread, and time-on-market. Our identification strategy uses a difference-in-difference hedonic model for the Tide, which began construction in 2007 and opened in 2011. We exploit proposed station locations in neighboring Virginia Beach, Virginia as the control group. Voters in Virginia Beach rejected a referendum for a proposed light rail line in 1999. Our estimated results show the Tide light rail negatively effected the local residential real estate market. In particular, homes within 1500 meters of a constructed station sold for approximately 8% less than similar homes in the control group. This resulted in an approximately $75 million aggregate reduction in housing values due to the light rail.[2] Homes near constructed stations also sold for a lower amount versus the original list price (the sale-list price spread) compared to the control group. However, we do not find evidence that the time-on-market for homes near constructed light rail stations differ from those near proposed stations.

The paper contributes to the literature in several ways. First, we are the first paper to use a quasi-experimental identification strategy that finds a negative effect from light rail on residential real estate prices. Our identification strategy, by considering areas along a proposed route that was not ultimately developed as the control group, is similar to that used by Billings (2011) in Charlotte. Our paper as well as Billings (2011) examine nascent light rail lines in a city. In contrast to the previous literature, we are able to trace out the dynamic effect of light rail construction and operations on the local housing market. We show that for the Norfolk Tide there is a differential effect between the construction and operations phases for each of our outcome variables.

Second, in addition to sale price, we also examine several outcome variables that are often neglected in the academic literature on transit related economic development such as time-on-market and the sale-list price spread. To accomplish this we leverage information in our data that provides details on a wide-variety of status changes for every property listing, including re-listings and original listing prices. Time-on-market is a metric that is often used by real estate professionals, and provides a measure of the liquidity of a property (Krainer, 2001; Knight, 2002). Thus, we are able to measure if the real estate market around light rail stations is "hotter" or "colder" than the control group. Furthermore, we examine the effect of the light rail construction and operations on the sale-list price spread. The original list price represents the sellers perceived value of a home based on observed and unobserved housing and neighborhood characteristics. Thus, the sale-list price spread provides a measure of the disconnect between how buyers and sellers perceive the light rail. This notion has been examined in the housing foreclosure literature (e.g. Campbell et al. (2011)), however, to the best of our knowledge it has not been considered in quasi-experimental studies of transportation improvement.

Finally, we focus on a light rail transit system, the Norfolk Tide, that has struggled financially as well as with low ridership compared to similar sized metro areas. Kearney et al. (2015) shows that the Norfolk Tide light rail had the lowest number of passenger trips in 2013 of the light rail systems examined in the U.S. In comparison, Buffalo and Salt Lake City, each with a similar population to the Virginia Beach-Norfolk metro area, had 3.5 and 10.7 times the ridership.[3] Odell (2016), in an editorial written for *The Wall Street Journal*, recently went so far to say "The Tide moves from places you don't work to areas you don't wish to visit." The Tide was originally envisioned as a starter line that would be expanded in the future. However, with tight budgets and a tenuous political environment the expansion is unlikely to take place. Our results are useful as smaller metro areas continue to consider building new light rail infrastructure and to areas with potentially low ridership and low accessibility benefits.[4]

2. Background and literature review

In this paper, we examine several outcome variables related to residential real estate transactions and light rail transit in Hampton Roads, VA (sale price, time-on-market, and sale-list price spread). The economics literature has focused on real estate transaction prices. Therefore, we concentrate the theoretical considerations and literature review on light rail capitalization in the final sale price.

2.1. Overview and economic theory

Economic theory suggests that rail transit could have either a positive or negative effect on the residential housing market. In their original formulation, Alonso (1964) and Muth (1969) modeled the bid-rent for a property based on location. Holding utility levels constant across geographic space leads residential real estate prices to decline as the distance increases from a central business district. This prediction comes from the desire of residents to access jobs and amenities in the central business district. The academic literature on transit related economic development has focused on this notion of price capitalization from increased accessibility. Conversely, homes in a close proximity to rail transit could experience disamenity effects from a fear of increased crime (Phillips and Sandler, 2015), noise (Walker, 2016), congestion, and parking issues. There is a large economics literature on hedonic pricing models and environmental externalities (e.g. Boyle and Kiel, 2001). This literature highlights the NIMBY (Not in My Back Yard) sentiment for many types of externalities. There is some evidence of a similar NIMBY attitude for light rail transit stations (Atkinson-Palombo, 2010) as with other potential negative externalities.

There is a vast literature on the effect of rail transit on residential housing. Studies have analyzed a wide range of cities, types of rail systems, property types, and identification strategies.[5] Debrezion et al.

[1] The populations and ridership according to the Bureau of Economic Analysis, Statistics Canada, Eurostat and the American Public Transportation Association in 2013 were: Charlotte (2.34 million residents and 4.9 million trips), Minneapolis (3.46 million residents and 10.2 million trips), Montreal (3.99 million residents and 308.7 million trips), Miami (5.86 million residents and 22.8 million trips), Chicago (9.55 million residents and 278.2 million trips), and London (13.8 million residents).

[2] The aggregate reduction in home values due to the light rail construction and operations was calculated as the estimated average effect of the light rail * the average value of effected homes after construction began * total number of homes effected by the light rail (−7.8% * $234,800 * 4138).

[3] The light rail ridership numbers are provided by the Brookings Institution for 2013 and show 1.76million annual light rail trips on the Norfolk Tide, 6.3million annual trips on the Buffalo Metro Rail, and 18.9 million annual trips in Salt Lake City.

[4] See http://www.thetransportpolitic.com/under-consideration/planned-light-rail-systems/ for a list of light rail systems in the development stages.

[5] Previous studies have investigated the effects of rail systems in Atlanta, Buffalo, Calgary, Charlotte, Chicago, Dallas, London, Los Angeles, Manchester, Miami, New York, Philadelphia, Portland, Sacramento, St. Louis, San Diego, San Francisco, San Jose, Santa Clara, Seoul, Taipei, and Washington D.C.