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Open for Business?

Effects of Los Angeles Metro Rail Construction on Adjacent Businesses

A thesis submitted in partial satisfaction of

the requirements for the degree

Master of Urban and Regional Planning

by

Rosalie Singerman Ray

2015

ABSTRACT OF THE THESIS

Open for Business?

Effects of Los Angeles Metro Rail Construction on Adjacent Businesses

by

Rosalie Singerman Ray

Master of Urban and Regional Planning

University of California, Los Angeles, 2015

Professor Paul M. Ong, Chair

Recent court cases and news reports on transit projects have focused on the effects of construction on business revenue and survival, yet the topic remains underexplored in the scholarly literature. This thesis examines whether transit construction negatively affected businesses' revenue and survival along the second segment of the Los Angeles Metro Rail Red Line under Vermont and Hollywood Boulevards. Using regression analysis on National Establishment Time-Series data, I find that business survival was lower along the corridor than for the county as a whole, but not significantly different from a nearby control corridor. I also find little evidence of revenue impacts. These findings suggest that revenue loss from transit construction is not the main mechanism by which businesses are displaced and that further research is needed to understand the source of community concerns.

The thesis of Rosalie Singerman Ray is approved.

Evelyn A. Blumenberg

Brian D. Taylor

Paul M. Ong, Committee Chair

DEDICATION

To my West Coast family—Dan, Lilly, Liz, Silvia, Karna, Chhan, and Edber—as partial repayment for all the donuts, dinners, parking passes, and general support over the past two years. This never would have been finished without you.

TABLE OF CONTENTS

| | |
|---|-----------|
| INTRODUCTION | 1 |
| LITERATURE REVIEW | 6 |
| PLACING THE RED LINE IN CONTEXT | 13 |
| BUSINESS ANALYSIS DATA AND METHODOLOGY | 25 |
| BIVARIATE ANALYSIS | 28 |
| MULTIVARIATE RESULTS | 35 |
| DISCUSSION | 41 |
| APPENDIX A | 44 |
| BIBLIOGRAPHY | 45 |

Introduction

Gerard Duncan reports a 98 percent decrease in sales at his hair extension store this summer. His neighbors on the 4100 block of Crenshaw Boulevard also report declines in sales of 50-75 percent (Hernandez 2014). What economic catastrophe has befallen the area? To these small business owners the answer is obvious: Los Angeles Metro Rail construction.

The effects of construction—including noise, dust, loss of parking, and most importantly temporary loss of pedestrian and/or auto access—are frequently a major concern for businesses when public agencies undertake major transit investments (e.g. Houston Tomorrow, 2006; Fan and Guthrie, 2012). In 2010, the topic was the subject of a lawsuit when the St. Paul branch of the National Association for the Advancement of Colored People sued the U.S. Department of Transportation, the Federal Transit Administration, and the Metropolitan Council for failure to look at the effects on business revenue and the potential for community displacement during and following the construction of a light rail transit line (*St. Paul NAACP et. al. v. USDOT et. al.*, 2011). While the court found that the local and federal agencies had sufficiently explored the broader questions of gentrification and displacement, the judgment required the agencies to conduct a study of potential effects on business revenue. The subsequent technical report, included in the Appendix to the Supplemental Final Environmental Impact Statement, found a very small predicted negative effect on revenue. The report noted, however, that no research was available on how businesses are affected by transit construction, and that the researchers were forced to use data from a study of the impact of highway widening (FTA, 2013).

The link in the lawsuit between business revenue and community displacement is not to be overlooked. The lawsuit's plaintiffs made two important conceptual linkages, first between lost revenue and increased vulnerability to displacement and second from business closure or

displacement to community displacement. Compared to the volumes of research on residential gentrification and displacement (e.g. Glass, 1964; Smith, 1979; Beauregard, 1986; Freeman, 2006; Lees, Slater, and Wyly, 2008), the concept of commercial gentrification and displacement is relatively understudied as are the linkages between the two.

Given both the importance of construction effects on businesses to communities and the current academic interest in gentrification and displacement, it is somewhat surprising that there was no peer-reviewed scholarly research on the topic to draw on for the Twin Cities technical report. Instead, transit research typically focuses on the long-term economic impacts of transit investments, while environmental impact statements for individual projects attempt to address short-term impacts with varying degrees of success.

The thesis attempts to fill this gap in the literature by analyzing historical business data for Los Angeles businesses on Metrorail corridors. Of interest to both transit agencies and the communities they serve are (1) revenue loss, to help agencies shape future mitigation programs, and (2) business closure or displacement data, to inform transit planners about the commercial effects of construction. My goal with this research is to contribute to the literature on commercial gentrification.

Why Los Angeles?

The question of community impacts during rail construction is particularly relevant in Los Angeles. The Metro rail system is the biggest infrastructure investment in Los Angeles since the construction of the freeway system in the 1950s and 1960s (Elkind, 2014).¹ Metro's regional fixed-guideway transit system currently consists of two subway lines, four light rail lines, and two bus rapid transitways, with over 80 stations and 107 miles of track, all built since 1990

¹ The cost of the completed sections totals over \$9 billion (Metro, 2014a).

(Metro, 2014). Metro is also adding to the network (See Figure 1). Extensions of the Exposition Line to Santa Monica and the Gold Line to Azusa are opening within the next two years (Metro, 2015a). Construction has also begun on the Crenshaw Line, which will link the Exposition Line Crenshaw station with Los Angeles International Airport, the Regional Connector, a tunnel through downtown to link the Gold, Expo, and Blue Lines, and the Purple Line extension along Wilshire Boulevard to UCLA and the nearby Veterans Administration West Los Angeles Medical Center (Metro, 2015a). When fully built out, the rail transit system will stretch from Azusa to Long Beach and from East Los Angeles to the Santa Monica Pier.

The rail network's proponents hope that the system reshapes the "reluctant metropolis" into a network of dense centers, while its critics believe that the county would have been better off improving bus services (Fulton, 2001; Elkind, 2014). The research opportunities provided by this transformation, particularly in such a data-rich time and place, have not gone unnoticed. Researchers have studied the rail system's effect on travel behavior (Boarnet, Hong, Lee, Wang X., Wang W., Houston, and Spears, 2013), the politics of its construction (Taylor, Kim, and Gabhauer, 2009; Elkind, 2014), and its effect on neighborhoods or lack thereof (Schweitzer, 2012; Bannerjee and Loukaitou-Sideris, 1996; Ong, Pech, Ray, 2014; Dominie, 2012). As California moves to encourage transit-oriented development (TOD) through its Affordable Housing and Sustainable Communities Program, which provides funding to build affordable housing near high quality transit, even more research is needed on the mechanisms by which rail systems and associated development affect neighborhoods (California Strategic Growth Council, 2015).

Figure 1. Metro's "Under Construction" Map

Go Metro

metro.net



Source: Hyman, Steve (2013) "New 'under construction' map for Metro Rail debuts" The Source, June 13, 2013

Research Question, Hypotheses, and Structure

The main research question is “Does transit construction negatively affect business revenue and survival during the construction period?” The null hypotheses are that there is no difference between business revenues before and during construction, and no difference in survival rates for businesses on and off the affected corridor. If businesses are weakened by lost revenue during construction, they may be more vulnerable to displacement, even if they do not close or move during the construction period. Historical data allows me to track rates of business closure even after completion to see if there is a delayed effect.

The structure of the paper is as follows. I discuss the topic’s importance, then review the literature on small businesses, gentrification, and the effects of construction on businesses. From there, I provide context for the area surrounding the Red Line and the history of the Red Line’s construction. Once the stage has been set, I present the methodology and basic statistics on the corridors’ sector composition, survival rates, and revenue before proceeding with the multivariate analysis and discussion.

Importance

The phrase “what gets measured, gets managed” is a central tenant of the management literature, both for private businesses and in public sector performance management (Bethune, 1998). In infrastructure planning, the environmental review process measures a plethora of variables, from noise pollution to viewshed impacts (Sipes and Sipes, 2013). The effects of transit construction on businesses have not been studied. As a result, predictions of effects on revenue are often a source of contention between community members and transit agency managers during the construction process (Fan and Guthrie, 2012). But as both sides are for the most part unable to support their claims with evidence, they instead most often revert to language

of fear on the business side and dismissal on the transit side. At a minimum, the research reported in this thesis can provide some evidence using historical data, while at best it could serve as a model for predicting effects during future projects.

A second area of importance is how construction's effects on business may relate to questions of neighborhood change around transit. While most research on TOD has focused on residential displacement (Dominie, 2012; Pollack, Bluestone, and Billingham, 2010), community displacement involves the removal not just of housing but of businesses, non-profits, and cultural institutions (Fujioka, 2011). If transit construction destabilizes businesses through a loss of revenue, they are more vulnerable to displacement via higher rents and/or displacement of the customer base. Additionally, business death rates are of interest as the reason given for ignoring construction impacts is their temporary nature. Business death, on the other hand, is presumably a permanent impact that is significant for the owner and potentially the neighborhood.

Literature Review

While the only literature that focuses directly on the impacts of transit construction on businesses consists of student work, this research is informed by the broader academic literature on small business economics and survival. The research falls at the intersection of the small and growing literature on commercial displacement and gentrification and the scant literature on short-term revenue impacts of transportation infrastructure construction.

What do we know about small businesses?

For much of the twentieth century, the conventional wisdom was that four out of five firms fail within the first five years. In 1989, the U.S. Small Business Administration (SBA) utilized Dun & Bradstreet data to study the conventional wisdom and found that in fact, it was closer to three out of five, or a 60 percent failure rate (Phillips and Kirchhoff, 1989) – though the

SBA more optimistically referred to this as a 40 percent success rate. More recent studies have largely confirmed those findings, though with different time frames. Van Praag (2003) found that half fail within three years, for example.

Clearly, starting a business is risky. Everett and Watson (1998) delineate the risks faced by small businesses as economy risks, industry risks, and firm risks; firms are vulnerable to changes in the broader economy and in their particular sector as well as to the risks they can control within the firm. A number of economists have looked at the firm-level risk factors (Evans, 1987; Phillips and Kirchhoff 1989; Bates and Nucci, 1990; Bates, 1990; Headd, 2003) and reached a consensus that firm size, age, and sector are major factors in survival, as well as owner education and size of owner financial investment. Older, larger firms not in retail or construction owned by well-educated people with high financial capacity tend to survive longer than their counterparts.

There is disagreement on the importance of race. Bates (1990) and Immergluck (1999) find that the race is a significant factor in access to credit and investment, while Headd (2003) does not find it to be significant to business survival. Though the two outcomes differ, it seems unlikely that one holds while the other does not. The question of race is particularly relevant when businesses are viewed as a part of a neighborhood rather than simply an economic entity; business struggles affect a community's viability as much as residential struggles (Zukin, Trujillo, Frase, Jackson, Recuber, and Walker, 2009).

Gentrification

While studies have linked transit and gentrification, and business change and gentrification, I was able to find no study that looked at the three in combination, as I do here. The link between transit and gentrification has been reasonably well established. Kahn (2007)

found that new “walk and ride” transit stations resulted in increases in adjacent home prices and the share of nearby residents with a college education, while Lin (2002) found that Chicago property values increased 20 percent more near stations than half a mile away. Looking at three Canadian cities, Grube-Cavers and Patterson (2012) found evidence of gentrification following transit in Toronto and Montreal, though not in Vancouver, which they explained by the relatively young age of the city’s rapid transit system.

Two studies have looked at the displacement aspect of transit, Pollack, Bluestone, and Billingham (2010) and Dominie (2012). Both found increases in incomes and in the share of residents who drove around station areas. Pollack, et. al. (2010) note that the process of gentrification is more complex than they first envisioned; they had expected greater displacement but found that while many older residents are not displaced, the change in the retail mix still affects their sense of community within the neighborhood as former gathering places go out of business.

The synergistic relationship between businesses and neighborhoods is central to the small but growing literature on commercial gentrification. As Beauregard (1986) writes, “the purchase and rehabilitation of existing commercial establishments as a neighborhood begins to gentrify continue to further residential gentrification” (44). Gentrification is “the transformation of a working-class or vacant area of the central city into middle-class residential or commercial use.” (Lees, Slater, and Wyly 2007, xv). Kennedy and Leonard (2001) specify that it includes the displacement of existing residents, though others separate gentrification and displacement. In many cases, though not always, there is a racial component, with a gentrifying neighborhood also becoming whiter (Smith and Williams, 1986).

While commercial gentrification serves as a marker in many gentrification studies (e.g. Kennedy and Leonard, 2001; Freeman, 2006), only three studies have examined the questions of commercial gentrification quantitatively. Koebel (2002) studied six cities between from 1980 and 1993 and found that while gentrification “did not appear to be associated with change in neighborhood commerce [as measured by number of establishments] beyond the impacts of overall income and population trends,” racial composition played a role, with a higher percentage of non-white residents were associated with a decrease in the number of establishments (22). He also found that property and location characteristics (like the presence of a revitalization project) had impacts independent of and more significant than changes in neighborhood characteristics.

Chapple and Jacobus (2009), using the same database as I use in this research, found that establishment growth and increases in sales and employment were most likely in neighborhoods that were middle and upper income rather than gentrifying. They defined gentrifying as going from low income to upper income. Meltzer and Schuetz (2011) looked at New York City zip codes and found that low-income neighborhoods had less diverse retail mixes, a lower density of retail, and smaller average establishment size, which meant that when gentrification occurred, it rapidly improved retail access. Like Chapple and Jacobus, however, they found that retail expanded faster in already middle- or high-income neighborhoods.

In 2014, a group of students from UCLA studied the impact of rail transit on small and ethnic businesses (Ong, Pech, and Ray, 2014; Cha, Ray, Wei and Wong, 2014; Macedo and Nem, 2014; Fang and Le, 2014; and Hom, Toscano, and Yang, 2014). Utilizing the National

Establishment Time-Series (NETS) data and the Census Surname database², they analyzed the impact of rail station development on businesses in four Asian ethnic enclaves in Los Angeles: Little Tokyo, Chinatown, Koreatown, and Thai Town. They identified as businesses as Asian based on the last name of the officer listed in the NETS data. With the exception of Koreatown, which had a higher number of large (>19 employees) Asian businesses, Asian business growth in all of the ethnic enclaves, particularly small Asian business growth, occurred at a slower rate in the station areas than the county in the decade from 2001 to 2011. Chinatown in Los Angeles actually lost Asian businesses overall (Fang and Le, 2014). Further, analysis of Los Angeles parcel data showed that the rate of property transactions was higher in the TOD areas than the county as a whole. While the study fails to conclusively link these effects to transit construction, their work does suggest that small and ethnic businesses may lose out as property changes hands, perhaps as the result of a change in landlord or a building renovation that seeks to secure higher rent revenues per square foot.³

Impacts during Construction

Transit

Given the importance of lost access and other construction impacts to the residents and businesses in communities, particularly small businesses, I could find no peer-reviewed studies on business revenue impacts during transit construction (FTA, 2013). The most similar to the current research is a class project on the Central Corridor Light Rail Transit corridor between Minneapolis and St. Paul that included a sector-based analysis of the corridor's businesses

² The Census Surname database contains all last names reported by Census respondents broken down by ethnicity. Certain surnames are strongly associated with particular ethnicities, for example, 96% of those with the surname Yu reported an Asian ethnicity. The study selected as "Asian" any last name with an Asian share greater than 75%.

³ The study did not link findings to before and after stations opened, and failed to account for the fact that many of these enclaves (particularly Little Tokyo and Thai Town) also became less of a residential hub for their communities during the twenty years, perhaps leading businesses to follow former residents out to newer suburban enclaves.

(Agnew et. al., 2010). In the class the students identified five key sectors along the corridor and suggested potential impacts, but were unable to procure quantitative data to test their suggested effects. Two masters' theses, each of which focused on a single project, also explored the topic. Krieg (2009) studied the Central Link project in Seattle, focusing on the formalization of informal business that occurred as businesses attempted to access mitigation resources. Before planning was finalized on the Central Corridor project in Minneapolis-St. Paul, Collins (2007) compiled a set of case studies of previous light rail projects to identify construction impact mitigation strategies. Collins employed no statistical analysis in his thesis, while Krieg looked at pre- and post-construction, without exploring the construction phase itself.

In addition to the student work above, the Gulf Coast Institute (now known as Houston Tomorrow), a non-profit organization that seeks to promote livability in Houston, scanned completed light rail projects in an attempt to find ways to support nearby businesses during construction of the University Line. They identified only one city that had tracked business births and deaths during construction: Portland. The Rose City had only three businesses out of 106 close or relocate during construction of its Interstate Avenue light rail line (Houston Tomorrow, 2006). As for academic research, the University of Minnesota's Transitway Impacts Research Program has carried out much of the research on the issue, but focuses largely on opinion surveys for businesses or analysis of land values or ridership (Fan and Guthrie, 2012; Fan, Guthrie, and Teng, 2010; Cao and Jordan, 2009).

Highways

The academic literature on highway construction impacts is relatively small and produced by state departments of transportation (DOTs) on a project-by-project basis. The work focuses mostly on reconstruction, widening, and rehabilitation, rather than new construction. The

literature generally finds only a small impact or even a positive impact from construction. The standard methodology consists of a before and after survey, occasionally with a control group, and interviews with business owners during construction.

Among the earliest and most rigorous work is by de Solminhac and Harrison (1993) on a freeway rehabilitation project in Houston. The researchers used a before and after survey of business owners and verified it with county sales data. The innovative feature of the research was to break the data down by business sector to develop factors used in later research (e.g. Harrison and Waldman, 1998; FTA, 2013). The sector-based analysis was developed based on an earlier finding by the Wisconsin DOT that adjacent business vulnerability varied by sector (Wisconsin DOT, 1989). De Solminhac and Harrison find that general merchandise, food stores, automotive outlets, and home furnishings are mostly likely to be adversely affected. The finding makes sense, as each of these sectors sells relatively homogenous goods that can be found in stores off the corridor.

In the mid-2000s, the Federal Highway Administration revisited this highway construction business impacts work in conjunction with the Wyoming Department of Transportation. The work was spread into three phases and looked at nearly 20 highway projects ranging in size from sidewalk reconstruction to complete pavement rehabilitation projects. They conducted analyses of business revenue changes using tax revenue data and business surveys. The findings varied by project and context, suggesting that more research is needed and that many factors besides construction impact business health (Young, Wolffing, and Tomasini, 2005).

While the highway work provides a methodological framework for studies of transit construction's effects, the project contexts are very different from a dense urban corridor. De

Solminhac and Harrison (1993) studied a suburban area in Texas, while Young, Wolff, and Tomasini (2005) conducted their research in small towns in Wyoming. The St. Paul corridor studied as a part of the NAACP lawsuit had many business types not included in de Solminhac and Harrison (FTA, 2013). Trip mode is also more variable in an urban corridor, meaning that blocking access to a parking lot may matter less than obscuring the entrance from a sidewalk, for example.

Placing the Red Line in Context

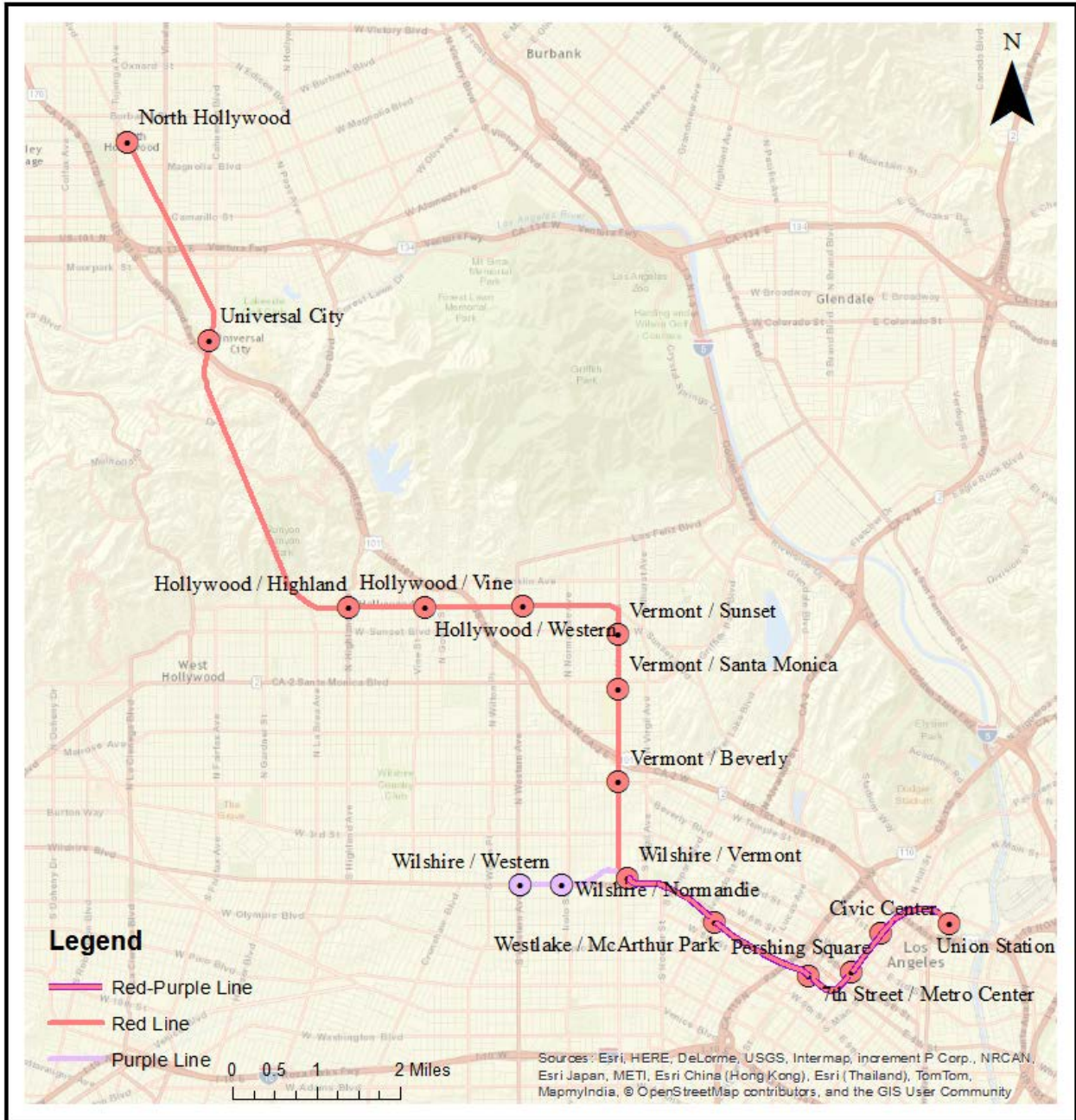
The Red Line runs from downtown Los Angeles to the San Fernando Valley (See Figure 2). Along with the Purple Line, it makes up the heavy rail portion of the Metro Rail network. The Red/Purple Lines were built in four stages between 1986 and 2000. The area of interest to this study is the portion of the Red Line from Wilshire/Vermont to Hollywood/Highland, which was under construction from 1993 to 1999. I chose the section because of the availability of business data for all the years of construction, but the area also happens to be one of the most dynamic regions in Los Angeles County during that time, with numerous articles detailing the “rebirth” of Hollywood (e.g. Kotkin, 2002; Kenyon, 1998; Fine, 2005; Boland, 2011; Steinhauer, 2007). This section details the demographic, economic, social, and even physical upheaval occurring in the area at the time, and then ties those changes into the construction decisions for the Red Line.

Demographic Change

The Hollywood Red Line station areas have largely moved in the opposite direction from county trends over the last thirty years. From 1990 to 2013, Los Angeles County gained roughly one million people, growing from 8.9 million to 9.9 million. Over that same period, the county experienced a decrease in the share of non-Hispanic White (NHW) residents as the share of

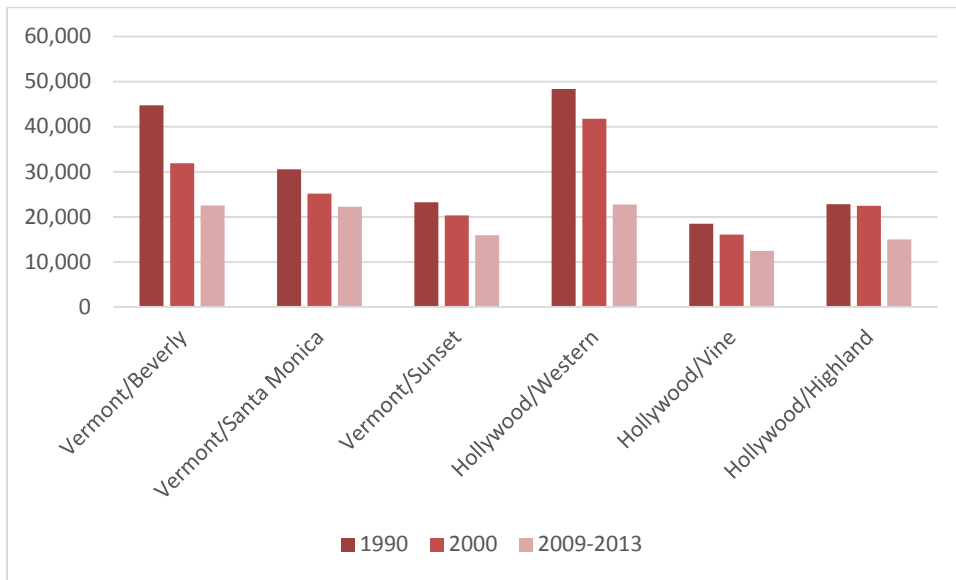
Hispanics and Asians rose. Overall, the share of NHW residents in Los Angeles County fell 13 percentage-points from 41 percent to 28 percent.

Figure 2. Red Line Map



Along the Red Line corridor, however, station area populations fell while four of the six stations increased their share of NHW residents (Figure 3).⁴ Moreover, Hollywood/Vine and Hollywood/Highland are the two stations with the highest overall increase in the share of NHW residents, roughly 9 percentage points, in the entire Metro network and no station on the Red Line segment saw their share of NHW residents fall by more than four percentage points.

Figure 3. Population decline along the Red Line

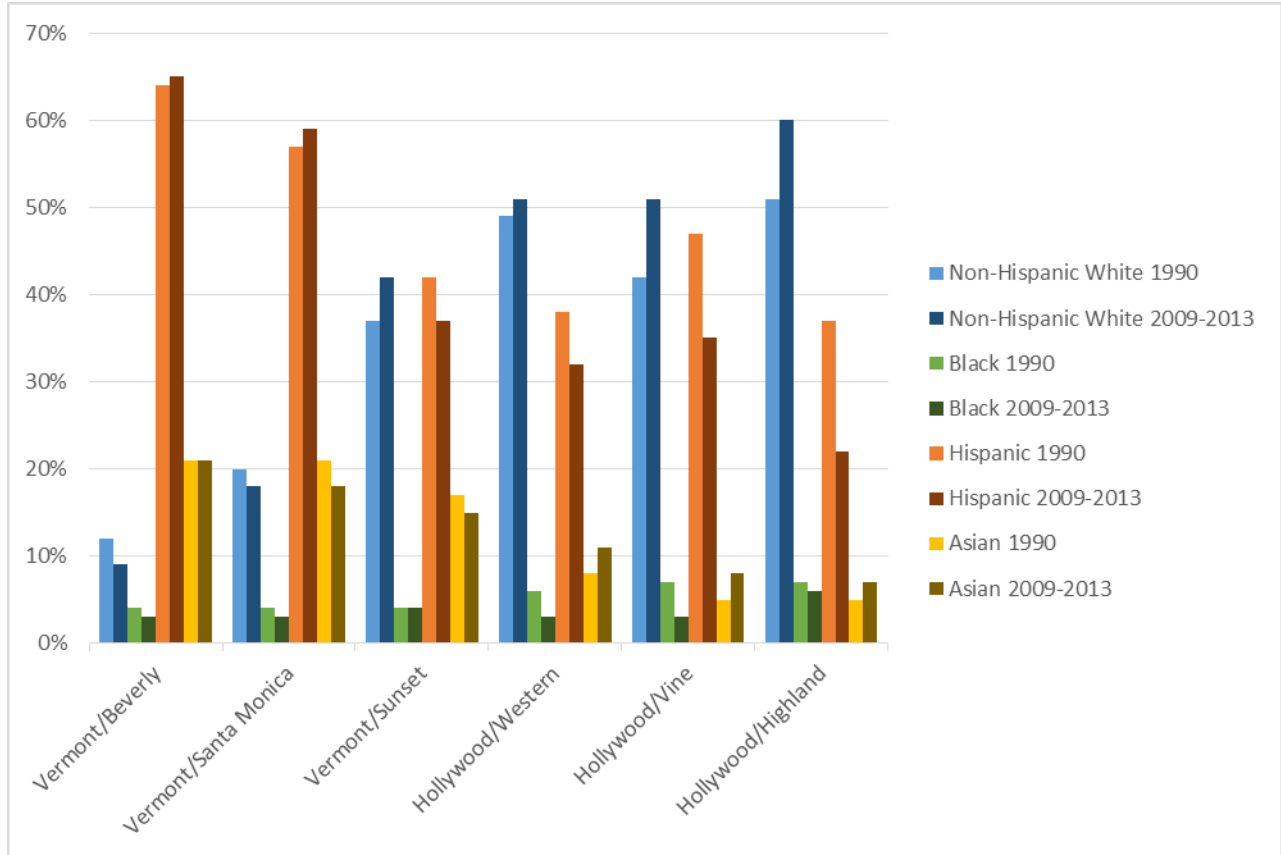


The gentrification literature that incorporates race includes as a marker of gentrification an influx of White residents (Pollack et. al., 2010). In Hollywood’s case, the racial shift appears to be less an influx and more about who is choosing to (or who is able to) stay. As Figure 4 below shows, the four northern stations on the Red Line Corridor (Vermont/Sunset to Hollywood/Highland) all saw the share of NHW residents increase while the share of Hispanics fell. Vermont/Sunset and Hollywood/Vine switched from being plurality Hispanic to plurality

⁴ Station areas comprise the ½ mile ring around the station. Demographic data were collected from census block groups and weighted by the portion of the block group within the ½ mile boundary. Because the area is the same for all stations, a decline in population can also be interpreted as a decline in density around stations.

White. The decline in overall population suggests this was the result of outmigration of Hispanics rather than in-migration of Whites.

Figure 4. Racial Change around Stations, 1990-2010

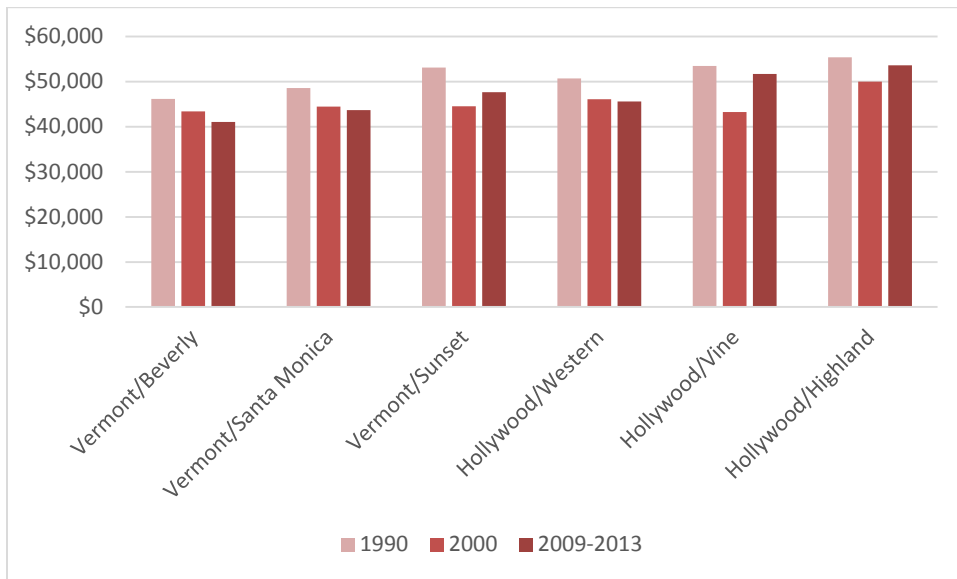


Economic Change

The western end and northern parts of the Red Line Corridor have historically been wealthier than the eastern and southern ends, and that discrepancy rose slightly between 1990 and 2010 (Figure 5). While every station saw a decline in mean income during the 1990s, the decline was reversed for nearly all of the four northern stations during the 2000s, while Vermont/Santa Monica and Vermont/Beverly saw continued decline and Hollywood/Western stabilized. No station has returned to their 1990 peak, though some of the decline may be due to

lingering effects of the 2008-2009 recession.⁵ Much like with the race data, the income data suggest that gentrification may be occurring along the Hollywood Boulevard section of the corridor but not quite in the way the popular image of gentrification would suggest. That is, rather than wealthier people entering a blighted area, the stations that have historically been wealthier and whiter are those that are seeing increases in income and growth in the share of NHW residents. Tied in with this economic and demographic context is the media narrative and political goal of “restoring” or “cleaning” Hollywood that appeared to apply largely to the northern part of the corridor rather than the stations along Vermont Avenue (Belden, 2011). Hollywood had also suffered from social and physical upheaval during the 1990s described below.

Figure 5. Mean Income by Station Area (2013 Dollars)



⁵ The most recent data from the American Community Survey are from 2009-2013, meaning that 20% of the data points were taken during the recession, and another 20% just following. That said, there is little difference between the 2008-2012 data and 2009-2013 data for the stations, with some stations seeing a slight increase while others decrease.

Social and Physical Upheaval

During the early 1990s, Hollywood experienced both civil unrest and literal physical upheaval. Hollywood, and the Vermont Avenue stations in particular, was among the areas affected by the 1992 civil unrest, leaving a number of properties damaged or vacant (Ong and Hee, 1993). Two years later, the Northridge earthquake rocked the area, causing further property damage. Taken together with rail construction, the upheavals created a sense of rupture and an opening to reimagine Hollywood.

The rail construction itself was also linked to physical upheaval. In June of 1995, a 70' x 70' sinkhole opened on Hollywood Boulevard just north of Vermont/Sunset (Gordon and Kennedy, 1995). The sinkhole shut Hollywood Boulevard for two weeks, delayed construction, and cost the project \$6.7 million. A report published in October of that year found Metro's contractor at fault as the result of improper shoring of the tunnels (Simon and Lichtblau, 1995). Adding insult to injury, *60 Minutes* aired a special in December of that year entitled "Riots, Earthquakes, and Now the Subway," grouping the error-plagued construction with the other forces of destruction to hit Hollywood in the early 1990s (Elkind, 2014). No compensation appears to have been paid out to businesses affected by the sinkhole.

History of the line

The first Minimum Operating Segment (MOS) of the Red Line opened on January 30, 1993, and ran 4.4 miles from Union Station to Westlake/McArthur Park. The segment was funded in part by a benefit assessment district, which levied a tax per square foot on businesses that would benefit from the increased foot traffic and access provided by Metro. The Southern California Rapid Transit District (SCRTD), Metro's predecessor, was granted the right to create

special benefit assessment districts under SB 1238, passed in 1983 (Stopher, 1993).⁶ In 1984, the SCRTD formed a benefit assessment task force and worked with local businesses to determine the most appropriate rules for assessment, eventually settling on a half-mile walking distance from the center of the station box. The decision resulted in the formation of two separate districts, one comprising the downtown core (where the station half-mile boundaries overlapped) and a separate one for Westlake/McArthur Park.

The district was responsible for roughly 11 percent of project costs (LACMTA, 1994). The SCRTD took in \$1 million in fees in 1986 following council approval of the assessment, after which downtown business owners asked, and the SCRTD agreed, to postpone further assessment until the line opened (Cervero, Hall, and Landis, 1990). Despite the community involvement in the rate setting process, commercial landowners who had not been consulted—largely a consortium of railroads with property near Union Station—sued the SCRTD on the grounds that only certain commercial property owners were consulted rather than all district owners. In 1992, the California Supreme Court denied the suit, stating that as the fee only applied to commercial property owners whose businesses benefitted from improved access (and not the railroads), the SCRTD had conducted its outreach appropriately (Stein and Hager, 1992).

Prior to 1996, benefit assessment districts only had to be approved by the city council (Stopher, 1993). By 1996, the Los Angeles County Metropolitan Transportation Authority (MTA) had established districts for all of the Red Line stations, and had begun to reach out to local businesses (LACMTA, 1994; Doherty, 1994).⁷ In 1996, California Proposition 218 passed,

⁶ SB 1238 amended the Public Utilities Code to allow the creation of assessment districts for transit. Previously, they had only been for other services, such as water or fire.

⁷ Prior to 1988, the SCRTD was responsible for building the heavy rail line and operating buses in the region and the Los Angeles County Transportation Commission (LACTC) was responsible for building the Blue and Green light

which required that benefit assessment districts be approved by 2/3rds of property owners within the district, largely halting their use (Mathur and Smith, 2012). As a result, no other Metro lines or segments utilized the benefit assessment district, though the districts had been projected to cover three percent of the costs of sections 2 and 3 of the Red Line (LACMTA, 1994).

Unique among its lines, the LACTC implemented a business mitigation program for part of the Red Line corridor (LACMTA, 2013). In December 1992, the LACTC voted on a \$27 million package called the Hollywood Construction Impact Program (LACMTA, 1998). Roughly \$11 million consisted of mitigation already included in the construction contract regarding cleanup, staging, etc. while \$16 million was new money dedicated to mitigating the impacts on businesses. Why this segment was the only piece to receive a program in advance of construction is unclear. Metro and its predecessors did receive complaints from businesses during the construction of MOS-1, prompting the delayed assessment. In 1994, when construction was finishing up along Wilshire Boulevard and heading up Vermont Avenue, Robert Mooney, a former public relations official with Metro who was then working for a hotel that had sued for damages, published an article in the *Los Angeles Times* with a set of recommendations for the agency (Mooney, 1994). The recommendations called for Metro to be proactive in assisting businesses, to recognize that there will be impacts from construction, and to work with the community to mitigate them before they received complaints. The article was published after the creation of the Hollywood program, suggesting that Metro may have been aware of the issues.

rail lines. In 1988, Mayor Bradley gave control of rail construction to the LACTC under the “Eight Point Plan”, which allowed the RTD to continue constructing the Red Line under the supervision of the LACTC. The compromise proved unworkable and in late 1992, the two agencies were merged to form the Los Angeles County Metropolitan Transportation Authority, known as the LACMTA or MTA (Elkind, 2014). The division of the LACMTA that constructs and operates transit for the county is known as Metro.

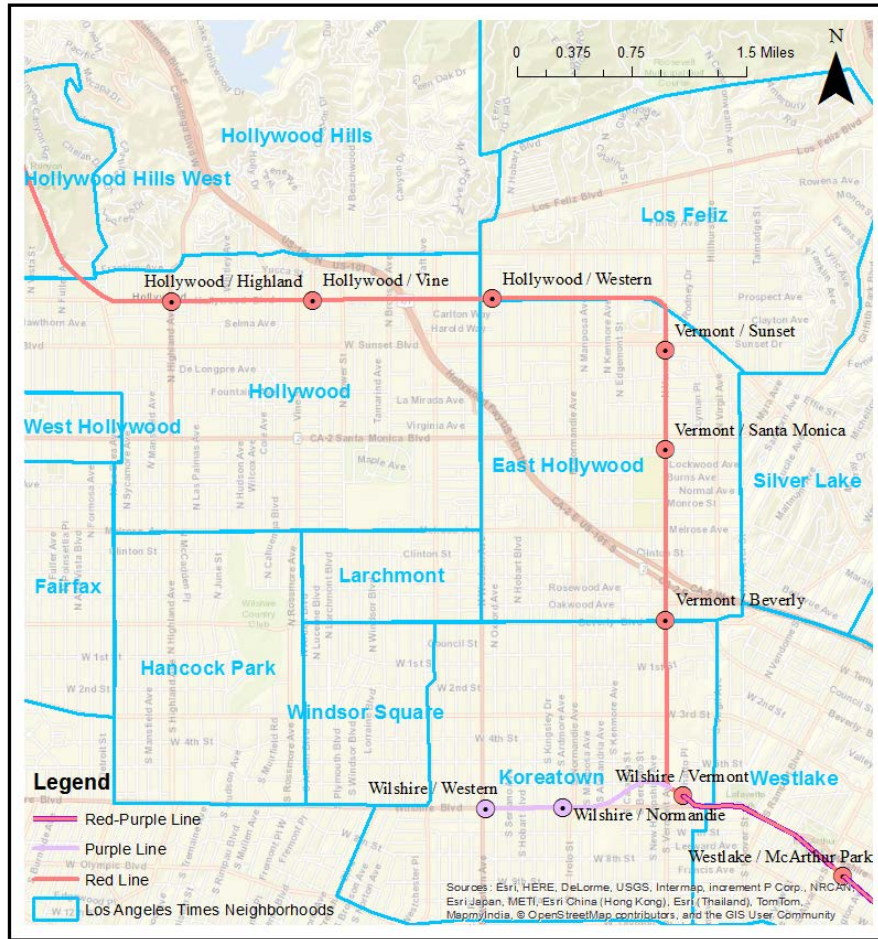
However, the program does not appear to have been enough of a success for Metro to choose to continue it for other lines, or even to expand it to all stations along the corridor.

The Hollywood Construction Impact Program (HCIP) did not apply to all stations on MOS-2, just Vermont/Sunset and those on Hollywood Boulevard (Drew, 1996). The reasoning behind the selection of just those stations is not provided in Metro's documentation of the program, though there are at least three possibilities (Drew, 1996). First, Vermont/Beverly, and to a lesser extent Vermont/Santa Monica, fall in the liminal space between East Hollywood and Koreatown (See Figure 6), and the program is clearly identified with Hollywood, supported by its politicians, and, as discussed later, shared with its redevelopment program. Second, the four stations are the wealthier, Whiter stations, whose merchants may have had more political power to campaign for assistance. Lastly, the four stations finished construction later than the other two, as the staging area for the tunnels was located by Vermont/Sunset and the tunnels to the San Fernando Valley began at Hollywood/Highland. The program had the most time to make an impact along Hollywood Boulevard.

Officials from the LACTC and its successor, the MTA, stated on multiple occasions that the business improvement program money was not to be given directly to businesses to cover rent or make up for lost revenue (e.g. Meyer, 1991; LACMTA, 1998). Instead, HCIP hired private security services, repainted and cleaned lampposts that had graffiti on them, and brought people to the corridor to celebrate and spend money, even throwing a large Christmas party on Hollywood Boulevard in 1994 (Jacobs, 1995).

Despite the initial commitment to provide money only indirectly, Metro did eventually give some of the money directly to merchants as a result of a construction delay. Rather than forcing the contractor to continue to abide by the daytime working restrictions that were part of

Figure 6. Map of neighborhoods along the Red Line Corridor⁸



the mitigation agreement, Metro gave area businesses \$1 million in exchange for allowing the contractors to work all day to stay on schedule during a four month closure of Hollywood Boulevard between McFadden Place and Highland (Bohlinger, 1997).

The Community Redevelopment Agency of Los Angeles (CRA/LA) partnered with the MTA to support businesses as well. In 1996, the two agencies agreed to form an “Economic Development and Public Improvement Program” along the Hollywood Corridor. CRA/LA used \$7 million of the construction improvement program money to support its existing loan programs

⁸ Neighborhood boundaries taken from the *Los Angeles Times* “Mapping Los Angeles” shapefile.

for historic preservation and entertainment businesses in Hollywood, begin new programs for façade and streetscape improvements, and provide seed money for a Hollywood Business Improvement District. While these monies were not directly tied to construction impacts, they did target businesses along the transit corridor (LACMTA, 1998).

The CRA/LA and MTA continued collaboration on larger projects as well. Metro's Joint Development Program, which administers the land Metro buys for construction and staging, partnered with the CRA/LA on projects at four different stations along the corridor (Metro, 2015b). The Hollywood/Highland Center opened in 2001 and is home to the Dolby (formerly Kodak) Theater, the permanent home of the Academy Awards. The development, which includes a shopping mall, offices, and the theater, is located directly above the Hollywood/Highland station entrance (Metro, 2015b). Metro's contribution was the land directly above the station, while the CRA/LA provided funding (Saito, 2007). Similarly, CRA/LA helped assemble a parcel adjacent to the Hollywood/Western station. The agencies collaborated to replace a 90-unit "slum" with 121 units of affordable housing, 9,000 ft² of retail space, and a child care center. The first 60 apartments opened in 2000, while the rest opened in 2004 (Pool, 2000; Metro, 2015b). At Vermont/Western, developers leveraged Metro land to create mixed-income apartments and a new school, which opened in 2007 and 2008 respectively, while at Hollywood/Vine, the pair of agencies got a community benefits agreement and affordable units from developers of a hotel and luxury apartment complex (Metro, 2015b). Again, I will note that the intensity of joint development (as seen in Figure 7, below), is greater toward the north and west and non-existent on Vermont until Wilshire Boulevard.

Figure 7. Stations with joint development projects (sized by sq.ft of development)



As noted at the beginning of this section, the Red Line corridor in Hollywood has seen considerable demographic, economic, social and physical change, particularly during and after Metro rail construction. To the degree possible given available data, the analysis below attempts to account for other factors besides construction. The analysis also recognizes that the MTA and its predecessors acknowledged from the outset that businesses may be affected by construction, possibly as the result of complaints from businesses along the first operating segment, and also

that while the program existed, it was not successful enough (or financially sustainable enough) for Metro to implement on future construction projects.⁹

Business Analysis Data and Methodology

For this analysis, my primary data source is the National Establishment Time-Series database (NETS). The database is maintained by Walls & Associates using annual snapshots (taken every January) from the Duns Marketing Information file produced by Dun & Bradstreet. Walls & Associates generate time-series information on every business, including when it became active, if and when it went out of business, any relocation of the business, number of employees, sector, and most relevant for this research, estimated annual sales. The database attempts to include every establishment in the country, but my dataset is limited to Los Angeles County. The data can be geocoded by address or latitude and longitude, enabling me to place businesses along construction corridors.

NETS has been used to identify business relocation dynamics (Kolko, Neumark, and Zhang, 2006; Kolko and Neumark, 2007), highlight growing regional clusters (Chapple, Kroll, Lester, and Montero, 2010), and explore job creation (Chapple, 2014; Neumark and Kolko, 2010). The Kolko and Neumark (2007) paper contains the most in-depth assessment of the dataset, its quality, and its limitations. The authors note that the NETS dataset allows for a finer grained analysis than government products such as the Longitudinal Employment and Household Dataset or the Current Employment Survey. In testing the NETs dataset against other available sources for employment counts and birth and death rates, they find that NETS consistently over counts employment as the result of counting owners of multiple establishments (or employees in

⁹ In addition to HCIP, Metro (and LACTC)'s forays into assisting affected businesses include along the Wilshire corridor during Purple Line construction (Stein, 1992), Lankersheim Boulevard in the San Fernando Valley during the last phase of Red Line construction (Fox, 1998) and most recently along the Crenshaw Line (Schreiber, 2014). All were *ad hoc*, restoring businesses that had already lost revenue during construction.

multiple establishments) with each establishment, but as the error is present throughout the dataset it is unlikely to produce a bias. For birth and death rates, they caution against using the final two years of the sample heavily, as there is occasionally a lag time in recognizing births.

I pulled from the NETS dataset any business that was located in Los Angeles County in 1993, the year construction began on the Red Line corridor. NETS provides the latitude and longitude of each establishment, which I used to map the businesses.¹⁰ I flagged those businesses within 200 feet of the Red Line segment, using a shapefile provided publicly on Metro's website. I used 200 feet because Hollywood Boulevard and Vermont Avenue are roughly 100 feet wide including sidewalks and I wanted to make sure to capture businesses that operated in a building that fronted the boulevard even if they had been geocoded somewhat off the street front. The wide buffer does capture some businesses on intersecting streets as well, but as access to a side street could be blocked as well, the wide net seemed more appropriate.

I also identified a control corridor consisting of Western Avenue (roughly one mile west of Vermont Avenue) from Wilshire Boulevard to Santa Monica Boulevard and then Santa Monica Boulevard (roughly $\frac{3}{4}$ of a mile south of Hollywood Boulevard) from Western to Fairfax (See Figure 8). Again, I flagged businesses within 200 feet of the control corridor street centerlines. I selected Western and Santa Monica because they were far enough away to be outside the half-mile buffer traditionally used around rail stations (Stopher, 1993), but close enough to be subject to relatively similar economic shocks. The control corridor does pass through an earlier construction site at Wilshire/Western, but the survival rate of businesses within that area is no different than the rest of the control corridor.

¹⁰ The latitude-longitude information is for the business' most recent location. As a result, the data capture businesses that were open in 1993 but may have moved to the corridor after 1993, and omits businesses that were open in 1993 and moved off the corridor. The only flag variable to identify moves captures businesses that moved outside of the county.

Figure 8. Map showing rail and control corridor



The analysis could benefit from finer grain data, both within the dataset (monthly or quarterly revenue rather than annual) and regarding construction. Metro used tunneling machines based out of a single staging area at Vermont/Sunset for the tubes, but used cut-and-cover construction (when they dig down through the street) for each station. It is possible that most revenue impacts were concentrated around the stations, rather than simply along the corridor. Additionally, I treat the construction period as a single six-year block, when in fact each business

probably faced severe access constraints for less than a year before construction moved on to the next stage location. I would like to have been able to flag each year as a construction or non-construction year by business, but the data did not allow me to do this.

Ideally, the dataset would also include owner demographic data and business rent data. Owner demographic data, particularly race, age, and level of financial investment in the business are as important to survival as size or business age (Bates, 1990; Headd, 2003), but are not available in NETS. Rent data would have allowed me to address another plausible and somewhat rail related explanation for a higher failure rate, the idea that businesses closed when their building changed hands or the landlord increased the rent. While a parcel dataset could show the rate of commercial transactions over time, commercial rent data, particularly for small businesses that may not have gone through a commercial broker, is lacking. Anecdotal stories along the Crenshaw corridor now, however, suggest that such transactions are a potent force of neighborhood change (Williford, 2013).

Bivariate analysis

Sector Composition

There were 1,321 businesses along the rail corridor in 1993. Figure 9 compares the sector breakdown of businesses on the rail corridor to those on the control corridor. Office services—which include professional and technical services like insurance, real estate, medical professionals, architects, and corporate administration—and retail are the two largest sectors on the rail corridor, at 28 and 27 percent respectively. Other sectors with a large presence on the corridor include education and health services (both Kaiser Permanente and Hollywood Presbyterian hospitals are adjacent to the Vermont/Sunset Metro stop), food and accommodation, entertainment, and other services, which include local shops like hair and nail salons and auto

repair. The control corridor is much the same, though somewhat more diverse. Retail is slightly larger than office services at 28 to 26 percent, while other services is the third largest at 13 percent. Educational and health services fall to fourth, and then a broad selection of sectors, including manufacturing, wholesale, and food and accommodation are tied for fifth.

Figure 9. Sector Comparison, Corridor v. Control

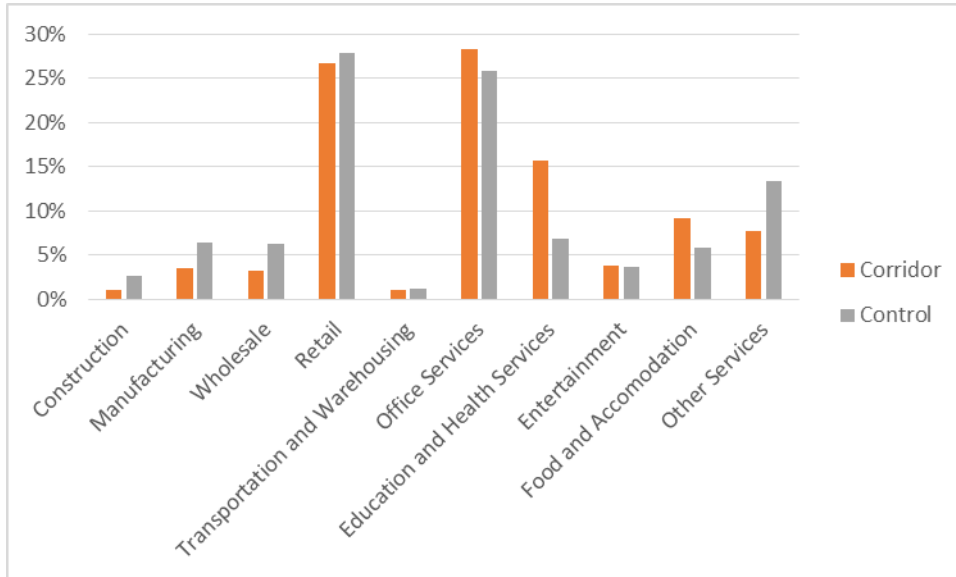
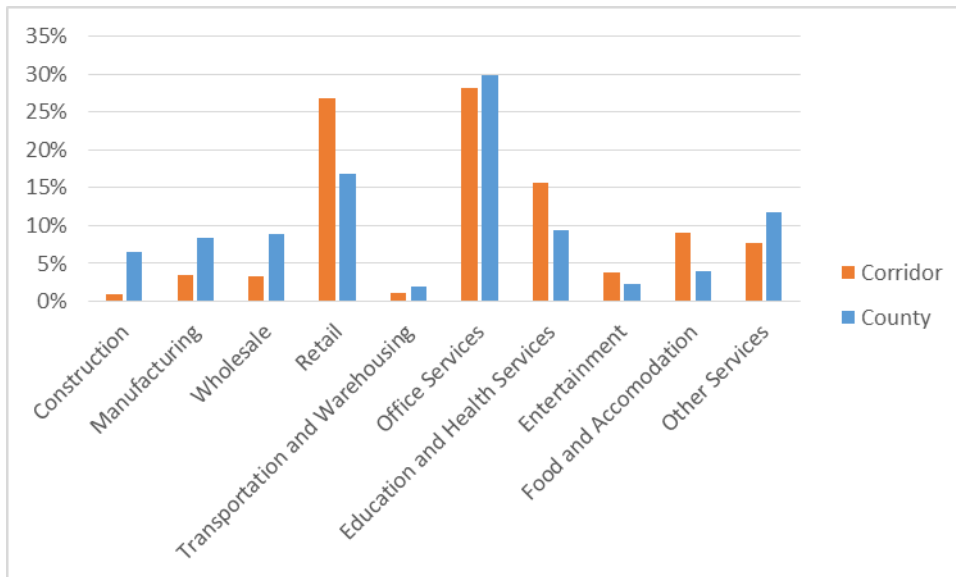


Figure 10. Sector Comparison, Corridor v. County



When looking at the sectors countywide, I focused only on those sectors that had a presence on the rail corridor (excluding agriculture and extraction industries). The county as a whole leans far more to office services (30%), with retail a distant second at 17 percent (See Figure 10). Other services follow at 12 percent, while education and health services and wholesale tie for fourth at 9 percent. The dataset contains 388,053 establishments in the county.

Survival

The construction period on the Red Line lasted six years, from 1993 to 1999. Given the long construction time frame and the fact that 60 percent of businesses fail after five years, I would expect a majority of businesses to have failed even in the absence of construction (Phillips and Kerchoff, 1989). In fact, in all three locations (corridor, control, and county) a majority of businesses survived, though the county as a whole had a higher business survival rate than either the control or rail corridors.

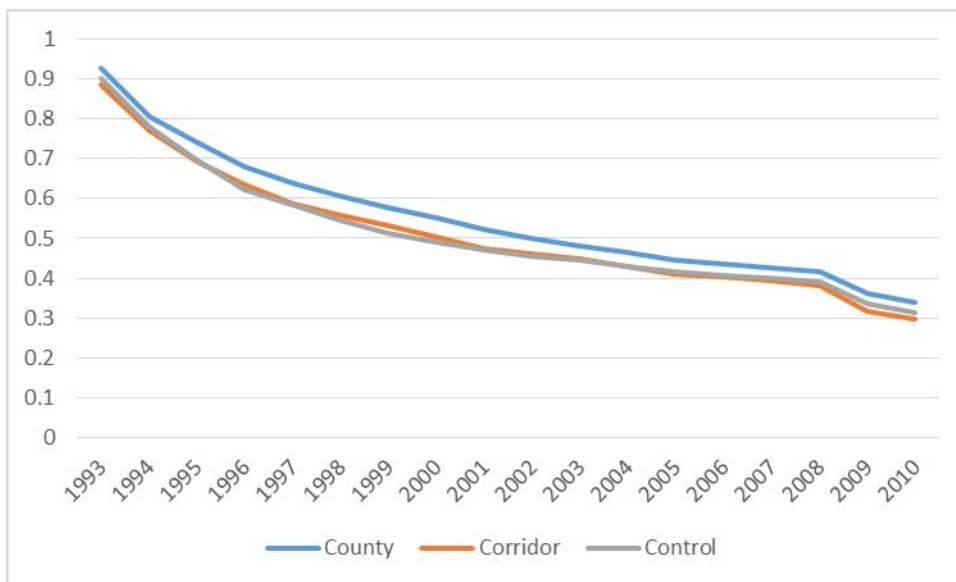
Table 1. Businesses that survived from 1993 to 1999

| | Corridor | Control | County |
|------------------------------------|-----------------|----------------|---------------|
| Survival Rate | 53% | 51% | 58% |
| Odds Ratio (compared to county) | 1.203 | 1.297 | N/A |
| <i>Chi Square</i> | 37.02 | | |

Table 1 provides the first indication that the rail corridor did not have significantly different outcomes than the control corridor. Businesses along the control corridor failed at a slightly higher rate along than the rail corridor, though both failed at a significantly higher rate than the county. Businesses on the corridor were roughly 20 percent more likely to fail than those off the corridor, while businesses on the control corridor were roughly 30 percent more likely to fail. The difference between the corridors is likely not meaningful, though the comparison to the county is.

Figure 11 shows the share of businesses that closed in a given year for the county, rail corridor, and control corridor. The major differences between the county and the other corridors occur in the beginning of the time frame, in the early 1990s, with the exception of 1994, the year of the Northridge earthquake. It is difficult to determine, however, how much is due to construction and/or the earthquake and how much to the fact that businesses are most vulnerable in the first few years, and thus I may be capturing businesses that would have gone out of business anyway. There is also no difference between the rail and control corridor.

Figure 11. Cumulative business survival rate, 1993-2010



Revenue

When it comes to revenue, I do find some notable differences among the rail corridor, the control corridor, and the county.¹¹ I looked at total revenue, mean revenue per business, and

¹¹ All revenue charts exclude a Hollywood hospital whose revenue jumped from \$1.6 million in 2002 to \$155 million in 2003 and continued rising. While that may be an accurate statement and reflect changes in hospital policy etc., the hospital's presence biased the corridor results drastically. Moreover, such a drastic change four years after the rail line's opening seems unrelated to the line's presence. All figures also exclude businesses with only a single employee.

median revenue per business from 1993 to 2009.¹² Given that the database contains only businesses that were open in 1993, total sales volume should be expected to decline over time. As businesses close, the total revenue declines and is not made up for by new businesses opening in my dataset (though of course new business usually do open in the vacated commercial space). On the corridor, however, I find that total sales for the surviving businesses climb or remain steady from 1996 to 2001 and then again from 2005 to 2009. Sales on the control corridor rise only between 1997 and 1999, while county-wide sales volumes steadily decline.

The trend is similar for mean sales per business. Mean sales per business rise slowly for the county throughout the time period, while the corridor sees a similar slow and steady increase until 2001, at which point revenues fall in 2002, and then rise again until 2009. The control corridor, on the other hand, sees mean revenue rise only until 2001-2002, after which it declines slowly through 2009. It is interesting that the rail corridor has consistently higher mean revenue per business than the county or control except for a brief period in the early 2000s, and that the disparity widens after 2005.

In contrast, when looking at median sales rather than mean, the control corridor actually appears better off than the rail corridor until the most recent time period. Combined with the mean and total sales data, it appears that a small number of well-off businesses are seeing business improve on the rail corridor, rather than an overall improvement. It is also interesting to note that the disparity in median sales between control and rail corridors appears first during the construction period, shrinks as the line opens, and then grows again.

¹² Because the data are unreliable the closer one gets to the present (Kolko and Neumark, 2007), I stop all graphs in 2009, omitting 2010 and 2011, which did appear to fluctuate more than previous years.

Figure 12. Total Sales Volume 1993-2009 (Indexed to 1993)

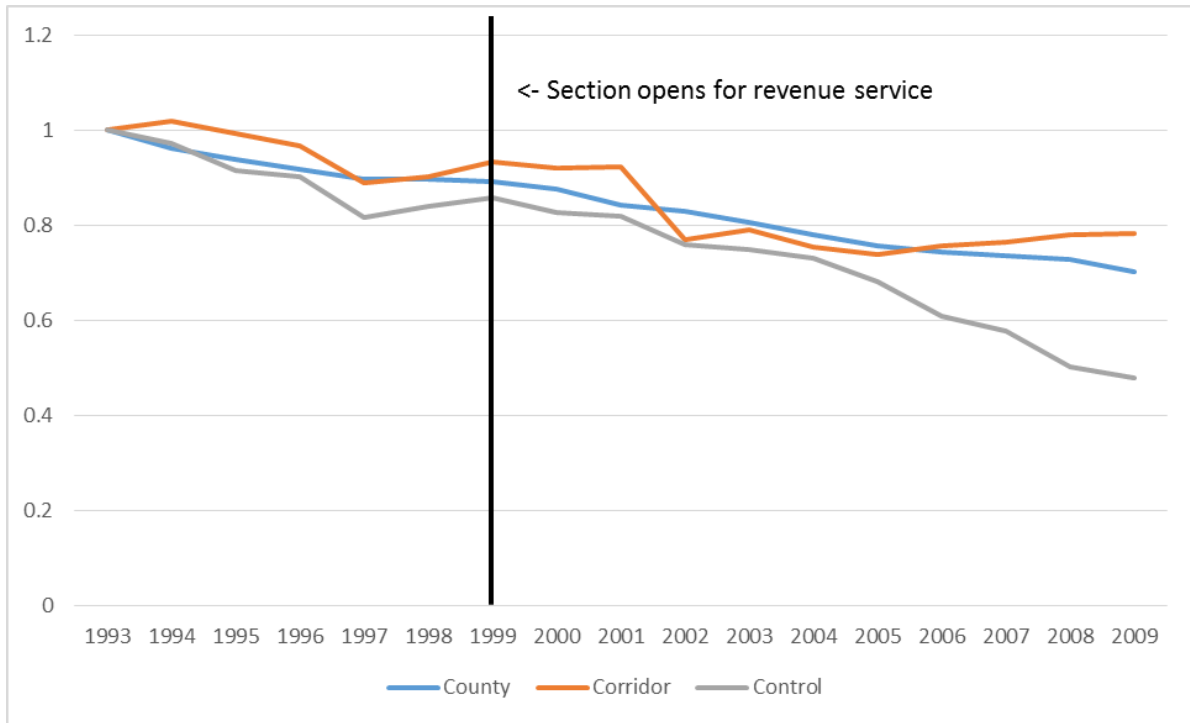


Figure 13. Mean Sales per Business 1993-2009 (Indexed to 1993)

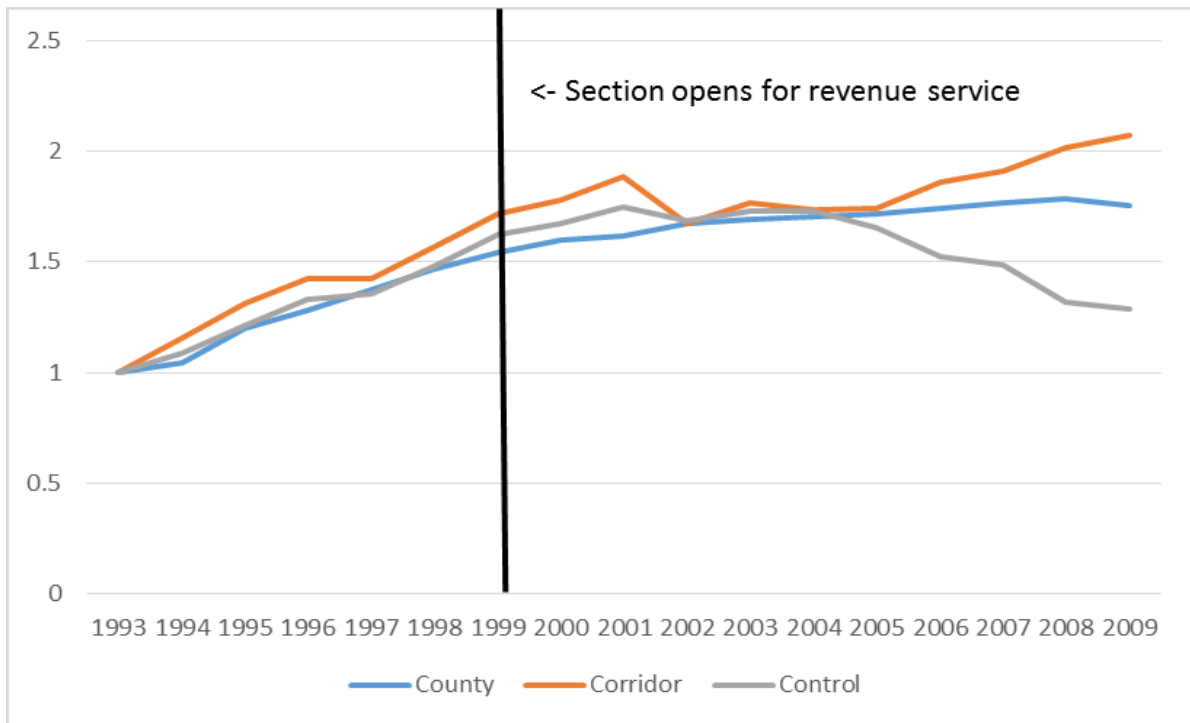
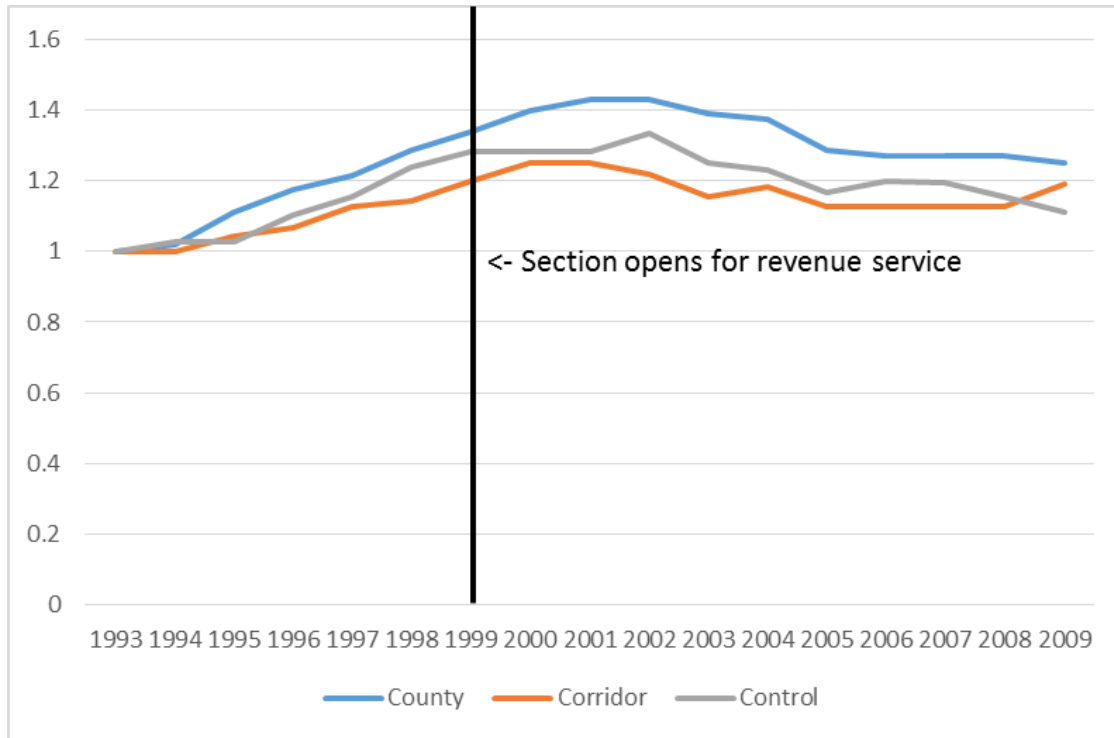


Figure 14. Median Sales, 1993-2009 (Indexed to 1993)



Discussion

The key takeaway from the bivariate analysis is that the control corridor comparison is unlikely to yield much in the way of significant results, as the survival rate was lower, though not significantly different, on the control corridor than the rail corridor, while the inferences are different for mean and median revenue. Mean revenue on the rail corridor is consistently higher, while median revenue is lower. One possibility is that while the corridors have a similar sector composition, the average size of the businesses on each corridor differs. Table 2 below, shows that indeed the average business on the control corridor brings in less revenue and has fewer employees than businesses in the county overall and on the rail corridor.

Table 2. Corridor Business Size Comparison

| | Mean 1993 Sales | Median 1993 Sales | Mean 1993 Employees | Median 1993 Employees |
|----------|-----------------|-------------------|---------------------|-----------------------|
| County | \$1,200,000 | \$210,000 | 11 | 3 |
| Corridor | \$978,000 | \$200,000 | 12 | 3 |

| | Mean 1993 Sales | Median 1993 Sales | Mean 1993 Employees | Median 1993 Employees |
|---------|-----------------|-------------------|---------------------|-----------------------|
| Control | \$675,000 | \$195,000 | 7 | 3 |

Multivariate results

To attempt to tease out a causal relationship between the construction on the rail corridor and business revenue and survival, I ran both probit and logit models on survival and ordinary least squares (OLS) regression on revenue change. I report the logit and OLS results here. The probit results are included in Appendix A to show that results are robust across functional forms. The variables I used all come from the NETS data and the GIS analysis described in the methodology section. Table 3 describes their construction and form.

Table 3. Table of Variables for Multivariate Analysis

| | Construction | Form |
|------------------------|--|--|
| Age | 1993 – First year where first year is the first year the business appears in the dataset | 0-4, because the dataset starts in 1989. ¹³ |
| Employment | The number of employees reported in 1993. Employment proxies for firm size. | Continuous from 1-15,568 |
| Rail Construction | 1 if the business lies within 200 feet of the Red Line, 0 if not. | Binary |
| Wholesale | 1 if the primary NAICS code begins in 42, 0 if not | Binary |
| Retail | 1 if the primary NAICS code begins in 44 or 45, 0 if not | Binary |
| Office Services | 1 if the primary NAICS code begins in 51-56, 0 if not | Binary |
| Entertainment | 1 if the primary NAICS code begins in 71, 0 if not | Binary |
| Food and Accommodation | 1 if the primary NAICS code begins in 72, 0 if not | Binary |
| Other Services | 1 if the primary NAICS code begins in 81, 0 if not | Binary |

¹³ The NETS data also include a YearStart variable denoting the year the business actually opened, but it is not consistently populated.

Survival

The logistic regression models one factor's contribution to the probability of an event while controlling for other factors. The event, in this case, is business failure. Businesses were deemed to have failed if the last year the business appeared in the dataset was 1999 or earlier.¹⁴ Following Evans (1987) and Bates and Nucci (1990), I included the number of employees in 1993 and the firm's age in 1993 as other factors, as well as location on the corridor. In later models, I also added sector, as Phillips and Kerchoff (1989) note that certain sectors, particularly retail, have much higher failure rates than others. The model takes the following form:

$$\text{Probability(Failure)} = 1/(1 + e^{\beta X})$$

where X is the vector of variables (age, employment (proxy for firm size), sector) and β is the coefficient vector.

The model includes the bare minimum variables that are known to affect firm survival (firm age, firm size proxied by employment, and sector). Ideally, the model would also include owner demographics, but they are not included in the NETS data.

As expected given the bivariate results, being on the rail corridor is not significantly different from being on the control corridor, but a rail corridor location does have a statistically significant effect when looking at the county as a whole. Adjusting for the different sector composition (Vermont Ave and Hollywood Boulevard are more retail-oriented than the county overall, and retail is riskier than other business types), the negative impact of rail construction decreases but only slightly. Corridor businesses are now 12 percent more likely to fail, compared to 15 percent without adjusting for sector.

¹⁴ The dataset is a snapshot taken in January of a given year. Because the Red Line opened in the summer of 1999, a business that last appeared in January of 1999 is deemed to not have survived the entire construction period.

Table 4. Odds Ratios for Business Survival

| | Control Corridor Comparison | County Comparison | County with Sectors |
|--|-----------------------------|-------------------|---------------------|
| Age | 0.663*** | 0.706*** | 0.700*** |
| Employment | 0.998 | 0.999*** | 0.999*** |
| Rail Construction | 0.955 | 1.153** | 1.124** |
| Wholesale | | | 1.527*** |
| Retail | | | 1.928*** |
| Office Services | | | 1.084*** |
| Entertainment | | | 1.107*** |
| Food and Accommodation | | | 0.773*** |
| Other Services | | | 1.067*** |
| AIC | 3767 | 512415 | 506576 |
| N | 2,856 | 388,053 | 388,053 |
| Significance: * p<0.1, ** p< 0.05, *** p<.01 | | | |

In interpreting the results in Table 4, keep in mind that values under one reduce the likelihood that the business failed during construction, while values over one increase it. Thus, being a retail or wholesale business was riskier than being on the rail corridor, all things equal, while other services (like hair salons), while still more likely to fail, were relatively less risky. Old restaurants (say, Musso & Frank Grill) were more likely than others to stay in business. The high Aikake Information Criterion (AIC) for the county wide models are equivalent to a very low r-squared, suggesting that this bare bones model is explaining very little of the county variation, though much more of the between corridor variation.

Revenue

If rail construction has a negative impact on businesses, the next step is to understand the mechanism. There are a number of potential ways by which businesses can be affected. First is temporary loss of access due to construction activity. When roads and/or sidewalks are closed for construction, when construction vehicles occupy parking lots, and when temporary walls or vehicles obstruct the view of the business from the street, all of these may hinder customers

wishing to transact business at a particular establishment and reduce the likelihood of walk-in or spontaneous purchases. In theory, this loss of revenue, the type currently occurring on Crenshaw Boulevard and described in the introduction, should be reflected in the sales data.

Another mechanism is by spurring turnover in property ownership. Transit access has been shown to increase commercial property values (e.g. Cervero and Duncan, 2002), which can often affect businesses in the form of increased rents. Sales may or may not increase, depending on the relationship of the business's clientele to the new populations accessing the location and on the business's capacity for growth. Some businesses may be able to increase sales and adapt to new consumers, while others may sell a more specialized product or lack the capital for growth. Property transactions can also rise as speculators hope to profit off the increasing land values, leading to instability in rents and lease arrangements. These mechanisms, while not unique to rail, could affect business survival rates without appearing in the sales data.

In exploring the sales data, I looked at two time periods: during construction and post-construction. I calculated the change in revenue for businesses between 1993 and 1996, the heart of the construction period, and between 1993 and 2006, long after the station had opened. Roughly 41 percent of Hollywood businesses survived that long, and 45 percent of county businesses.

I estimated an ordinary least squares regression model to analyze the impact several independent variables on a continuous dependent variable while holding other factors constant.

In this case, my models take the following form:

$$(Revenue\ 1996 - Revenue\ 1993) = \alpha + \beta(age) + \gamma(employment\ (proxy\ for\ firm\ size)) + \delta(location) + \zeta(sector) + \varepsilon(error)$$

and

$$(Revenue\ 2006 - Revenue\ 1993) = \alpha + \beta(age) + \gamma(employment\ (proxy\ for\ firm\ size)) + \delta(location) + \zeta(sector) + \varepsilon(error)$$

The coefficients are reported below. While they are dollar values, they are not adjusted for inflation, and as such serve as rough estimates of magnitude and direction on a per establishment basis. The key takeaway from Table 5 is that construction did not, in any model, have a significant impact on revenue, nor is the sign consistent across models, much in keeping with the bivariate results. As for the other variables, the explanatory power is so low on the county models and the signs are the opposite of what theory would predict (age should not necessarily matter to revenue, nor should an additional employee reduce revenue over time), that it would be unwise to lend them too much weight. It may be that the functional form of the model is a poor fit, or that the omitted variables like owner demographics, business tenure, or other location-based variables (urbanized area, redevelopment area) have more explanatory

Table 5. Revenue change in the study corridor in comparison to the controls, OLS regression results, 1993-1996

| | Control Corridor Comparison | County Comparison | County with Sectors |
|--|-----------------------------|-------------------|---------------------|
| Age | 4,560 | 25,129*** | 24,049** |
| Employment | 13,513*** | -2,074*** | -2,093*** |
| Rail Construction | -51,364 | 14,409 | 24,138 |
| Wholesale | | | 79,904* |
| Retail | | | -42,169 |
| Office Services | | | -96,111*** |
| Entertainment | | | -5,944 |
| Food and Accommodation | | | 54,943*** |
| Other Services | | | 38,304*** |
| R-squared | 0.5 | 0.0012 | 0.0013 |
| N | 1,986 | 287,262 | 287,262 |
| Significance: * p<0.1, ** p< 0.05, *** p<.01 | | | |

power than the included variables. Another possibility, and one that may be driving the oddly significant age coefficients, is the presence of outlier businesses. A large change in revenue for a small number of businesses may skew the results.

Table 6. Revenue change regression results, 1993-2006

| | Control Corridor Comparison | County Comparison | County with Sectors |
|------------------------|-----------------------------|-------------------|---------------------|
| Age | 174,224 | 37,889 | 32,907 |
| Employment | 77,924*** | 3,491*** | 3,420*** |
| Rail Construction | 1,346,336 | 1,322,149*** | 1,418,651*** |
| Wholesale | | | 852,522*** |
| Retail | | | -199,179** |
| Office Services | | | -233,527*** |
| Entertainment | | | -567,581*** |
| Food and Accommodation | | | -684,111*** |
| Other Services | | | -645,934*** |
| R-squared | 0.027 | 0.0008 | 0.0018 |
| N | 1182 | 173,201 | 173,201 |

Looking at revenue impacts after completion, those businesses that survived the construction period do appear to see a boost following the opening of the rail line. While the rail construction variable is not significant compared to the control corridor, it does trend to the positive, and it is significant, of large magnitude, and positive when compared to the county overall. Larger firms also did better, while age was not significant, both findings that confirm with theory. That said, the county explanatory power is still miniscule, and while including a squared variable for employment (not shown) improves the r-squared to 0.0025, the model remains quite weak, suggesting that even if rail transit does improve revenue, the improvement is relatively insignificant compared with the multitude of other factors affecting a business.

To summarize, the revenue models do a poor job of predicting revenue, and even within them, the rail construction variable is significant only when looking at the impact of being on a rail corridor after it is built. The fact that the variable is positive and significant lends support to

the idea behind the benefit assessment that rail can be good for business revenue, but the weakness of the model suggests that the effect of rail compared to other factors is relatively minor.

Discussion

The lack of significant differences between the control corridor and the rail corridor in any of my analyses makes it difficult to attribute the significantly lower survival rate (when compared to the county) to the impacts from rail construction. It is more likely that some factor(s) common to both corridors differentiate Hollywood from the rest of the county and lead to the lower survival rate. One potential confounding factor is the presence of redevelopment areas (nearly all of both corridors were within a redevelopment area). Koebel (2002) finds that redevelopment efforts matter more to business change than neighborhood demographic change. It is possible that these efforts, which include the use of public money and eminent domain to convert “blighted” uses to other kinds of private enterprise, resulted in the relatively higher rates of failure in both corridors relative to the county. Other factors may include a greater density of businesses (leading to increased competition and churn) or serving a population that is impoverished relative to the rest of the county.

Because of these other possible explanations and the data limitations, including the coarse grain of analysis and lack of owner demographics and business rent data, I am unable to reject my null hypothesis and conclude that subway construction had a negative economic effect on businesses in the Hollywood area during the 1990s. I am, in fact, unable to discern any construction effects using the data available for this analysis.

Despite the lack of quantitative findings, there is apparent agreement between Metro and the business owners that businesses are negatively affected during construction. Metro’s

predecessor's willingness to suspend assessment during construction, the Hollywood Construction Impact Program, and subsequent emergency business relief programs on Lankersheim and Crenshaw Boulevards, suggest that there are factors at play affecting businesses (Fox, 1998; Schreiber, 2014). A more detailed analysis with owner demographics and business tenure data may be able to reveal them.

If we proceed under the assumption that there are negative impacts to be mitigated, and since revenues do appear to increase following the opening of the Red Line subway for surviving businesses, a loan program may be a better mitigation strategy than the *ad hoc* rescue programs Metro has utilized in the past. Announcing the availability of low-interest loans to carry a business through the construction period with payments deferred until the line opens, much like a student loan, would go a long way to establishing Metro's credibility with business owners; and, if linked to incentives in the construction contract, it could potentially be operated at little cost to Metro. Transit agencies regularly provide bonuses to contractors for on-time or early completion of certain tasks, one could instead require the contractor to pay if certain timelines were not met, with fines going into the loan program to make businesses whole for the problems caused by the contractor. While I do not believe the idea of using fines to support business loans has been explored, the Metropolitan Council in the Twin Cities appointed a Construction Communication Committee, comprised of business owners, residents, and other corridor stakeholders, to distribute contractor bonuses each quarter during construction of the Green Line light rail (Met Council, 2013). The amount of funds awarded ranged from 33 percent to 99 percent of the total Met Council set aside each quarter for awards, depending on contractor performance (Met Council, 2013).

As for questions of commercial gentrification, it would appear that much like with residential gentrification, the key is in the changing property values and rising rents. One step for further research may be to look at the survival rates of businesses that own their space rather than renting, to see how it compares to the more common factors of age, employment and sector. Much like with residential gentrification, benefits may accrue to those who own, while those who rent are displaced.

Even more so than with residential gentrification, where it is difficult to discern neighborhood change and incumbent upgrading from an influx of better educated and wealthier residents, how can we spot commercial gentrification and differentiate it from economic development? The answer lies in finding out who benefits from the change. When the Metropolitan Council lost the lawsuit discussed in the introduction to this paper, they responded with a multi-pronged campaign to ensure that the businesses who got to reap the benefits of improved access were the ones who were already there. New development did come in, adding commercial density and providing space and opportunity for new businesses to also benefit. While they were not able to save every business, most of the businesses that saw expanded sales and that adapted their services and offerings to appeal to the wider range of consumers the light rail brought to their doorstep were the same ones that had served the community before light rail. A team of outreach workers, graphic designers, accountants, and other consultants shepherded a diverse corridor of small business owners through the three years of construction and left them not only with the expanded sales that signal economic development but also with new skills and knowledge, all for ~ \$16 million, the same amount Metro contributed to HCIP (Met Council, 2013).

APPENDIX A – Probit Results

| | Control Corridor Comparison | County Comparison | County with Sectors |
|--|--|------------------------------|--------------------------------|
| Age | -0.2556*** | -0.2179*** | -0.2220*** |
| Employment | -0.0013 | -0.0004*** | -0.0004*** |
| Rail Construction | -0.0287 | 0.0882** | 0.0711** |
| Wholesale | | | 0.2631*** |
| Retail | | | 0.4072*** |
| Office Services | | | 0.0514*** |
| Entertainment | | | 0.0635*** |
| Food and Accommodation | | | -0.1537*** |
| Other Services | | | 0.0427*** |
| Log-likelihood | -1880 | -256,260 | -253,321 |
| N | 2,856 | 388,053 | 388,053 |
| Significance: * p<0.1, ** p< 0.05, *** p<.01 | | | |

The results confirm the logit results. Age is the only significant factor in the control corridor comparison, while all variables are significant at the county level. Positive signs in this case indicate that a factor increases the likelihood of failure. Much like the logit, the high log-likelihood factors show that this model does a poor job of explaining the factors at play.

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