

Preparing for Light Rail in the Purple Line Corridor

By: Richard Duckworth

Advisor: Dr. Alex Karner

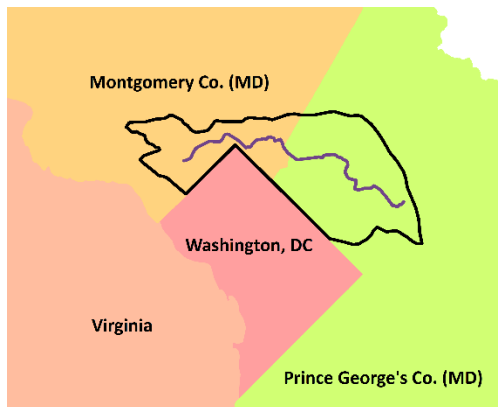
Table of Contents

INTRODUCTION	2
CAPITALIZATION OF PUBLIC INVESTMENT INTO PRIVATE PROPERTY VALUES	3
EMPIRICAL STUDY	4
TIMELINE OF PURPLE LINE PLANNING	6
STUDY OF PURPLE LINE EFFECTS	9
HOME SALE DATA	9
METHODOLOGY	11
OTHER DATA SOURCES	12
FINDINGS	13
ENTIRE STUDY AREA	13
PRE-CONSTRUCTION EFFECTS ON HOME PRICES	16
EAST ZONE	17
PRE-CONSTRUCTION EFFECTS ON HOME PRICES IN THE EAST ZONE	18
UNIVERSITY BOULEVARD ZONE	19
PRE-CONSTRUCTION EFFECTS ON HOME PRICES IN THE UNIVERSITY BOULEVARD ZONE	21
SILVER SPRING ZONE	22
PRE-CONSTRUCTION EFFECTS ON HOME PRICES IN THE SILVER SPRING ZONE	23
WEST ZONE	24
PRE-CONSTRUCTION EFFECTS ON HOME PRICES IN THE WEST ZONE	26
SUMMARY	26
CONCLUSION	27
REFERENCES	28
APPENDIX A: SINGLE-FAMILY HOME SALES DATASET	31
APPENDIX B: FULL REGRESSION RESULTS	32

Introduction

The Purple Line is a proposed light rail transit line that will run 16 miles through Maryland's inner suburbs of Washington, DC. A team led by Fluor Corporation, in a public-private partnership with the State of Maryland, will build seventeen new rail stations and four stops at existing Metrorail stations. The new transit corridor stretches sixteen miles from New Carrollton in Prince George's County to Bethesda in Montgomery County, with the new stations split evenly between the two counties.

In 2014, the Federal Transit Administration recommended \$900 million in federal grants for the project. Prince George's and Montgomery Counties are expected to contribute about \$330 million, and the state estimates that it will spend \$3.3 billion over 36 years on the Purple Line (Office of Governor Larry Hogan 2016).



The state officially selected the current alignment and station locations in August 2009. The Purple Line will be largely surface-running, mainly in dedicated street lanes with one short tunnel, one aerial section, and several underpasses and overpasses of major roadways (Maryland Department of Transportation 2009). Most of the planned stations are at street level and will be smaller than Metrorail stations. The project contains no new parking; riders will walk, bike or transfer from other transit lines to use the Purple Line (Ma and Knaap 2015).

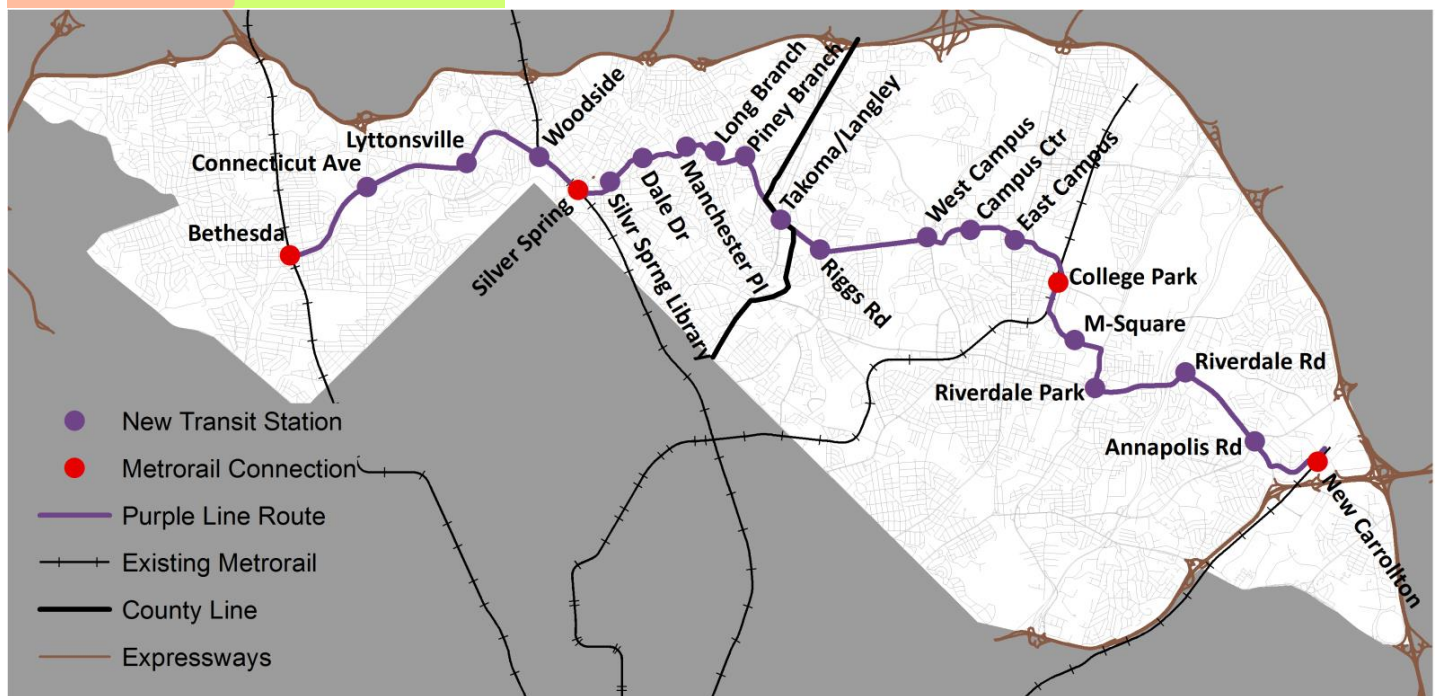


Figure 1: Purple Line Study Area

The area that will host the Purple Line is primarily residential. These older, inner suburbs were almost all developed before the 1970s. There are also significant differences within the corridor. Generally, conditions change from relatively low-income and development-starved in the east to very affluent and high-demand in the west.

Officials claim that the project will “serve the large populations in the corridor that are heavily dependent on transit, help to support smart growth initiatives and promote community revitalization and transit oriented

development where planned” (Maryland Department of Transportation 2009, 1). They expect their investment to (1) improve accessibility to jobs, (2) attract development to older inner suburbs, and (3) reduce car use by concentrating that development around stations and providing a more efficient alternative to driving. It may deliver on these goals, but there is a danger that the public investment in transit will ultimately increase housing costs in the neighborhoods around the new stations and displace communities.

This paper examines the implications of public transit investment for housing costs and demographic change in the neighborhoods along the Purple Line alignment. To investigate single-family house price increases spurred by speculation and anticipation associated with the transit planning, it uses a database of single-family home sales since 1999. The prices of these homes sales are regressed on their locations, timing and other characteristics to isolate price changes associated with proximity to the planned station locations and the planning process moving from a vague idea to a more certain plan. These findings are then considered alongside additional data about the neighborhoods to anticipate future shifts in property values with the eventual construction of the transit, and ultimately the Purple Line’s impact on housing costs and neighborhood demographic/socioeconomic change.

Capitalization of public investment into private property values

Purple Line proponents’ promises of better accessibility to jobs, reduced congestion on roadways, and revitalized commercial areas could all come true alongside the unfortunate side effects of increased housing cost burden and displacement of residents. Past research has established a link between transit infrastructure and increased property values, which directly affect the cost of housing. It is important to understand and monitor the Purple Line’s impact on home prices, rents and property taxes, which will determine who gets to enjoy the benefits of the transit.

Many proponents of the Purple Line see the increase in property values as a primary benefit of the investment. One leader of a pro-Purple Line coalition of business and civic organizations said that property value appreciation “is already happening all along the line, in Chevy Chase Lake, Silver Spring, and the University of Maryland” (Holleran 2013). The expected boost in property tax revenue also features prominently in the economic impact study conducted for the project (TEMS 2015).

There are several theoretical explanations for why property values and housing costs should be higher near transit stations, and it is possible that all could happen simultaneously and to varying degrees with the construction of a facility like a Purple Line station. First, proximity to transit improves the convenience of living in a place. People living nearby can more easily travel between work, home and entertainment destinations. Ease and convenience are amenities of the housing location that command a price premium (Kilpatrick et al. 2007). Residents can also spend less money on transportation and more on housing than in a location without any transit options, and they gain time not spent sitting in traffic or on less efficient transit. The value of that extra time should be reflected in home prices (Hess and Almeida 2007). Good transit access also might enable workers to access higher-paying jobs, as Purple Line advocates have argued. The increased incomes of residents of stations areas, who can now access better jobs, would theoretically lead to more housing consumption and thus higher housing prices. Finally, the commercial areas adjacent to transit stops experience high pedestrian activity and visibility, and therefore often attract vibrant shops, restaurants and bars. These desirable establishments are another amenity that commands a price premium in nearby housing.

There is evidence that an amenity related to this last effect, a walkable, urban development form, is having an increasingly positive effect on property values. Since the beginning of the 21st century, shifts in consumer preferences and demographics have led to an increased demand for urban lifestyles and walkable places

(Myers and Gearin 2001). We expect these shifts to be reflected in the price people are willing to pay to live in these types of environments. Transit infrastructure, particularly rail stations, attract mixed-use, walkable clusters of development, including desirable retail, restaurants and entertainment. Research has confirmed that demand for urban, walkable environments is being capitalized into real estate prices and shows that the amenities of transit oriented development place upward pressure on property values, regardless of the accessibility added by the transit itself (Bartholomew and Ewing 2011).

We can also expect some negative externalities from transit infrastructure such as increased noise, pollution, and traffic (Kilpatrick et al. 2007). Some residents near the proposed Purple Line corridor (especially in more affluent areas) have expressed opposition to the transit because they claim it would damage the natural environment, disrupt their neighborhoods' wooded character and carve up well-connected neighborhoods (Grant 2015). They have also expressed concern about harm to their home values caused by these externalities (Ruben 2003).

Since the Purple Line corridor is heterogeneous, its effects on property values may vary for different segments or stations, and may even be opposite at opposite ends of the corridor. There is likely even variation between the effects of a single stations in different adjacent neighborhoods. These effects will then have different consequences in the different types of neighborhoods.

Empirical Study

Empirical research agrees that, generally, proximity to public transit leads to higher home values and rents, but it is more difficult to agree on the magnitude of the impact (Wardrip 2011). The impact of transit on housing prices depends on mediating factors including housing tenure and type, the extent and reliability of the transit system, the strength of the housing market, and the nature of the surrounding development. There is likely to be a high price premium associated with transit if there is a strong housing market and if the transit system is frequent and reliable (Giuliano and Agarwal 2011).

Summarizing the available research is also difficult because methodologies and contexts differ, but most researchers have studied the effect of transit on housing prices by using a hedonic model to compare housing near transit with similar housing farther away. They use regressions to attempt to separate and quantify the effects of all the determinants of the price of the housing. The impact of location is separated from physical characteristics of the housing and social characteristics of the neighborhood, then the effect of the proximity to transit is isolated from other locational amenities like schools, parks and highway access. The independent variable used to detect the price effects of transit is usually distance from the nearest transit station, either straight-line distance or along a street network (Chatman, Tulach, and Kim 2012; Duncan 2008; Cervero and Duncan 2002a). Other studies have assigned properties to discrete groups depending upon the buffer distance into which they fall (Immergluck 2009).

In theory, these methodologies could be applied to any type of housing price – rents, condo or house sales, commercial multifamily sales. Sales prices of single-family homes are a popular measurable housing price because this type of price can be observed many times within small areas over short periods of time (relative to commercial sales), details of the sale are well documented within publicly-available tax records, and these public records usually contain other attributes of the housing sufficient to do hedonic modeling like house size, age, number of bathrooms, etc. (Wardrip 2011).

Some studies add a temporal dimension, using observations before and after the transit is planned and/or built. This requires more data, but it is very helpful if the researcher wishes to suggest that the transit is *causing* a shift in prices. For example, Chatman, Tulach and Kim (2012) use the ratio of a property's values

before and after the construction of transit as the dependent variable in their hedonic model, rather than the value at one point in time. Before-and-after research has investigated shifts in prices caused by both the construction of transit infrastructure and planning for transit infrastructure.

Several strategies have been used to model the timing of planning events in regression analysis. Knaap et al. (2001) model light rail planning with three approaches. First, they use dummy variables for proximity to planned stations (half mile or mile) interacted with dummy variables for each year in their study period. This captured the value of proximity to the site of the rail station in each year. The years were then compared. Their second and third approaches interact the proximity variables with dummy variables for “pre” and “post” announcement of the station sites. Pinpointing an “announcement” date may be difficult with the Purple Line because plans evolved slowly over time. Knaap and his coauthors found that light rail planning in Oregon had significant positive impacts on the value of nearby vacant land. Knaap is now a professor at the University of Maryland and involved in advocacy and research around the Purple Line. In 2013, he said: “I have very little doubt that the Purple Line will increase property values. Wherever information becomes available about where light-rail stations are going to be built, property values begin to increase. This happens long before the system goes into service.” (Holleran 2013)

Another study of transit (and park) planning in Atlanta (Immergluck 2009) eschewed the dichotomous before/after designation. Immergluck examines changes in the effect of proximity to the public amenity each year and compares these changes with public discussion of the plans, as measured in newspaper article mentions.

Jud and Winkler (2006) estimate the effects of changing plans on prices with two separate regressions – one before plans for a new airport were announced and one after. They then compare the coefficient estimates using a Wald statistic. They argue that “although a dummy variable pre- and post-event could be introduced... this specification would assume that the other coefficients would not change pre- and post-event. We find that this assumption is not true.”

This paper explores how property values have been affected by Purple Line planning and the government’s commitment to invest. This process has been underway for over a decade, and the idea of a fixed route transit corridor in the area has been proposed and debated for almost three. To investigate the effects of the planning on property values, I identified several milestones over the past ten years.

Timeline of Purple Line Planning

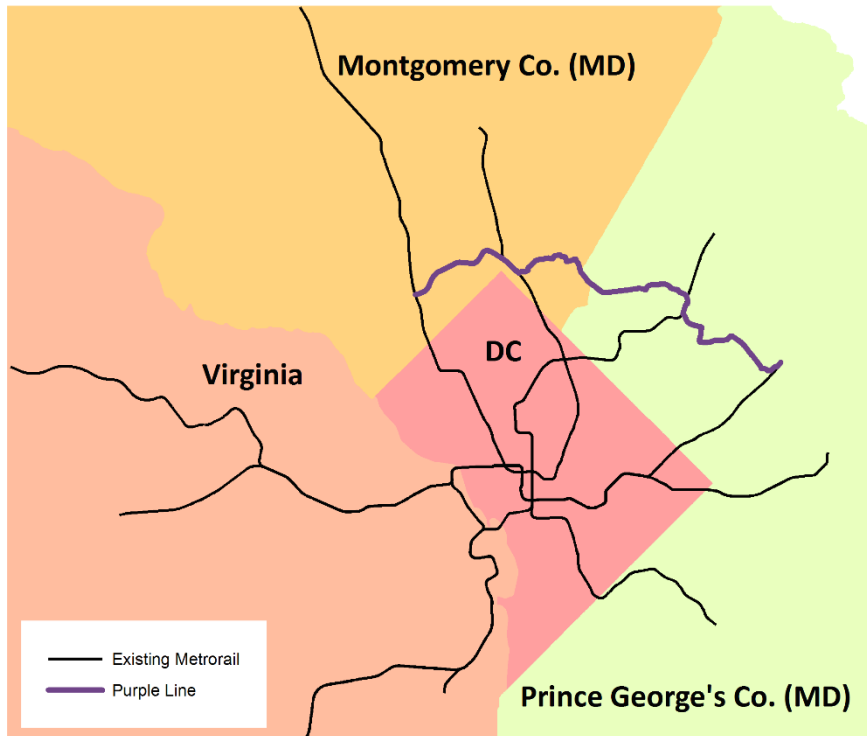


Figure 2: The Purple Line and Metrorail

Since this paper seeks to isolate the effect of *plans* on property values, it is important to identify the dates of appropriate milestones in the planning process, and apply them to the model. The narrative below traces the planning of the Purple Line from the 1980s to April 2017 and identifies some key events.

Metrorail is a hub-and-spoke system designed to move commuters working in or near downtown Washington, DC. The emphasis and goals of the original 1968 plan that envisioned the system were to ameliorate road congestion by getting suburb-to-downtown commuters out of their cars (Schrag 2006). Since 1968, the suburban counties surrounding DC have become denser, more economically diverse and home to job centers that rival

downtown Washington. The need for high capacity transit to link the suburban ends of the Metrorail spokes developed. Leaders in Maryland began discussing such a link in the 1980s. In 1988, Montgomery purchased right-of-way for future transit: the former CSX rail corridor that provides three miles of the current Purple Line route (Shaver 2011). In the 1990s, the state conducted a study to explore building rapid transit between Montgomery and Prince George's Counties (Ma and Knaap 2015).

In the early 2000s, a rail link between New Carrollton and Bethesda became a priority of both governor Parris Glendening and Montgomery County Executive Doug Duncan. However, each politician supported an entirely different alignment. Duncan favored a longer, more expensive heavy rail line (like Metrorail) that would run through newer development outside the Capital Beltway, connecting the *ends* of the Metrorail spokes. Glendening's favored proposal eventually became the current Purple Line alignment: a cheaper light rail line through the inner suburbs and the University of Maryland (Shaver 2001).

Proponents of the outer alignment cited estimates that it would attract about twice as many daily riders as the inner alignment. By capturing choice riders who would otherwise be driving cars, the outer alignment was touted as a superior congestion-reducer (Mosk 2001).

Glendening and others argued that the inner-suburb alignment would better serve low-income residents who lacked adequate transportation options and would be more likely to use the transit service. The infrastructure could also attract economic activity to older, struggling communities. The inner alignment had "strong support" in immigrant communities located near the midpoint of the proposed corridor (Becker 2001).

In early 2003, Bob Ehrlich became the first Republican governor of Maryland in 40 years. He initially sided with Duncan in support of the outer heavy rail proposal, putting him at odds with majorities of the two county

councils (Lindsey and Matthew 2003). The lack of consensus among officials prevented the project from moving forward in pursuit of federal funding. Governor Ehrlich later proposed abandoning rail altogether and building a bus rapid transit system to link the spokes of the Metrorail system. When he lost the 2006 gubernatorial election, it was not clear whether or how the “bi-county transitway” would be built (Shaver 2007).

The new governor, Martin O’Malley revived the “Purple Line” name for the project and vowed to seriously move forward with the planning process. His administration said it would continue to study all options but indicated a preference for rail because of its ability to attract development around stations (The Washington Post 2007). At this point, state and federal transit officials began developing the draft environmental impact analysis (EIS), which is an early step in the planning requirements set forth in the National Environmental Policy Act (NEPA). NEPA requires federal agencies to consider the potential social and natural environmental consequences of proposals that involve federal funding, to document the analysis, and to make this information available to the public for comment before the implementation of the proposals. For transportation projects, the analysis must weigh the transportation needs of the overall public in reaching a decision. The draft EIS details the project’s purpose, reasonable alternatives, the environment effects, and the anticipated benefits of the alternatives (AASHTO 2017).

The draft EIS process for the Purple Line involved public meetings about the potential modes, station locations, and alignments. All alignments seriously considered during this process were inside the Beltway; the ‘outer alignment’ of the early 2000s had died. The planning process included very public announcements about 23 possible station locations (Rich and Shaver 2007). In October 2008, the Maryland Transit Administration and Federal Transit Administration released the official draft EIS, which presented eight alternative combinations of alignments and modes for the project. Ten months later, the governor announced that the state had selected one of the alternatives in the draft EIS - the “medium investment light rail transit alternative” - as its locally preferred alternative (LPA). Officials cited light rail's greater potential for attracting development as a chief reason they endorsed it over a less-expensive busway (Maryland Department of Transportation 2009).

The Purple Line now had official state-selected station locations and no notable public officials opposed to the plan. However, developers were not ready to begin investing in projects near the planned stations. The sluggish 2009 economy and continued uncertainty about the construction of the transit dampened speculative development efforts. One local developer said, "It's not to say developers with land don't see the benefits of a Purple Line -- they clearly see them. It just may be a little too distant in the future for them to really get excited. (Shaver 2009a)" Developers, builders and other businesses were a crucial part of the coalition lobbying for federal support of the project. But according to state transit officials, their first argument in applying for federal funds was the Purple Line's ability to provide faster commutes between suburbs and its environmentally benefits. One official said: "We're not building it just for development. Those things will come in time. Hopefully, when developers see how light rail can bring people to jobs, they'll start with their redevelopment plans and make the investment. (Shaver 2009a)"

After a required comment period, NEPA regulations require a final EIS to be prepared. The FTA began this process in October 2011, signaling more concrete support from the entities that were to eventually build the Purple Line (Shaver 2011). News coverage of the Purple Line between 2009 and 2013 also included some state fiscal problems that could potentially halt design work, but they were ultimately solved (Shaver 2013). The final EIS was completed and released in August 2013 and further assessed the impacts and benefits of the project, focusing specifically on the state-selected locally preferred alternative. The state also announced in

August 2013 that it would seek to deliver the Purple Line through a public-private partnership (Ma and Knaap 2015).

The final step in the NEPA process is the federal agency's record of decision (ROD) that makes a conclusion based on its documented analysis and comments from the public and other agencies (AASHTO 2017). The FTA released a ROD approving the Purple Line's FEIS and recommending a "full federal funding grant agreement" on March 20, 2014. This amounted to \$900 million in federal construction aid. President Obama's budget was released the same week and included \$100 million for Purple Line during that fiscal year (Maryland Transit Administration 2014). At this point, the state issued a request for proposals for its private partner and hoped to begin construction in 2015 and service in 2030. The next month, the Maryland Transit Administration began sending purchase offers to property owners in the proposed right-of-way, sending a strong signal that the project was moving forward (Shaver 2014).

In November 2014, Larry Hogan unexpectedly won the 2014 gubernatorial election. The Republican businessman promised to reduce government spending and reexamine the state's commitment to the Purple Line. His victory gave Purple Line opponents hope that the project would be scrapped, while those in support believed the economic development benefits would appeal to his pro-business orientation (Shaver and Turque 2014a).

In June 2015, Governor Hogan announced that the state would continue to pursue the Purple Line, contingent on larger contributions from Montgomery and Prince George's County. He also announced \$215 million in cost reductions, but did not significantly alter the route or planned station locations. Prince George's County initially balked at the governor's demand for extra funds, but in August agreed to commit an additional \$20 million (Hernandez 2015).

Agreements existed for all the funding sources, and major construction was expected to begin in fall 2016. However, in August 2016, a federal judge ordered the FTA to suspend their approval of the FEIS (which came in March 2014) until further analysis could be completed that reconsidered Purple Line ridership projections in light of a decrease in Metrorail ridership, resulting from recent safety and reliability issues in the aging Metrorail system (Shaver 2016a). The plaintiffs requesting the suspension, who cited the Metrorail problems as a new legal argument in May 2016, had been fighting the Purple Line's path through Chevy Chase in federal court since 2014. They include two residents and a pro-greenspace group from an affluent community near the western terminus of the corridor (Shaver 2016b). As of April 2017, the suspension was still in place as lawyers from the state and federal government appealed, hoping to avoid a costly and time-consuming redo of the environmental impact statement. Governor Hogan, who claims the judge's ruling is invalid because of a conflict of interest, said, "We can't move forward because of a judge who lives at Chevy Chase Country Club. (Metcalf 2017)"

Purple Line planning has generally moved in a progressive direction; events like the completion of steps in the NEPA process, the selection of official LPA station locations, and a new governor's affirmation of the state's intention to invest billions have signaled increasing certainty that the stations would one day exist. However, another series of snags has attenuated that certainty at other times over the years. It is unclear at which points in time actors in the single-family housing market would have had enough certainty in the transit planning for it to change their behavior. To shed light on when these shifts happened (or didn't happen), I chose three points in time representing significant milestones that theoretically would have an impact on demand for property near the planned stations. They are:

- January 2007 – Gov. O'Malley signals preference for inner route, light rail mode and seriously begins pursuing planning and NEPA process

- September 2009 – Gov. O’Malley officially selects the LPA, including station locations and the light rail mode
- April 2014 – the FTA’s ROD approves the Purple Line EIS and recommends full federal funding; the state begins the process of selecting private partner and buying land in right-of-way

These points in time divide the 1999-2015 single-family sale observations into four periods as shown in figure 3. Figure 3 also charts the number of Washington Post articles per year that mentioned the Purple Line. This metric was not used to select the planning periods (the significance of the events did) but it illustrates the level of media attention focused on the project.

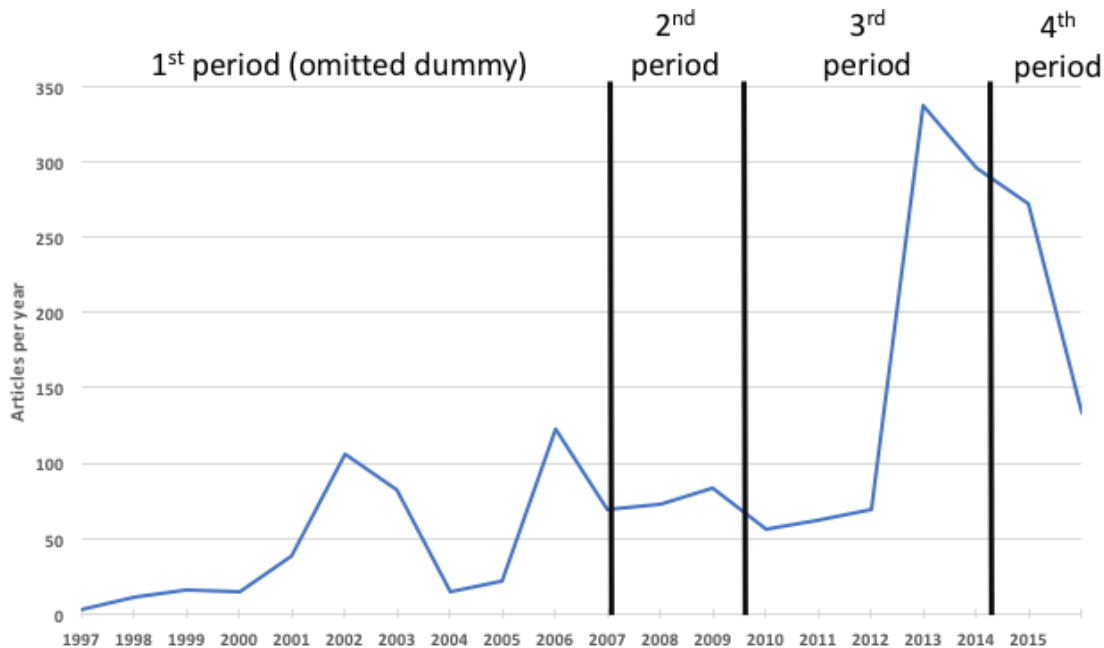


Figure 3: Purple Line Mentions in the Washington Post, and Planning Periods Modeled in Regressions

Study of Purple Line Effects

Home Sale Data

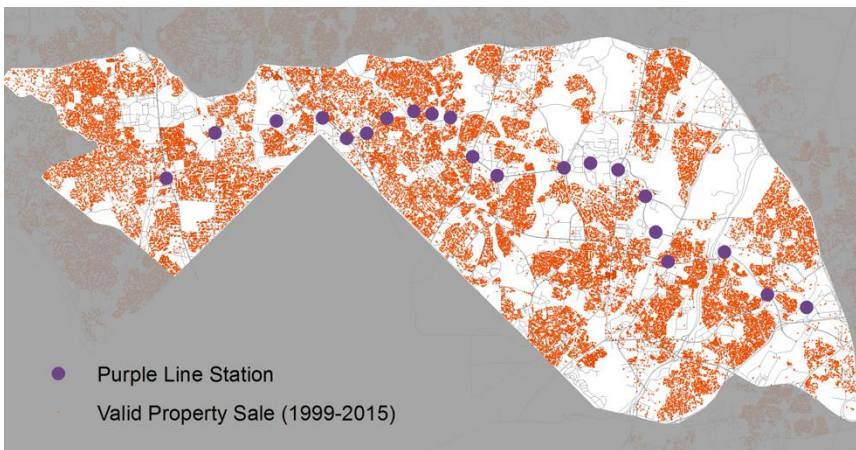


Figure 4: Study Area with Sale Observations from the Maryland Department of Planning

To analyze the effect of Purple Line planning on single-family home prices, I acquired Sales Extract shapefiles for 1999 through 2015 from the Maryland Department of Planning (MDP). MDP receives sales extracts each month from counties, geocodes the sales, and converts them into shapefile format. After downloading the 34 shapefiles, I merged them into a single 16-year dataset and eliminated duplicates and records that did not appear to represent valid arms-length sales (429,609 sales for all of Montgomery and Prince George’s counties, see Figure 4).

For this analysis, I further filtered the arms-length sale records to include only the single-family home sales. I also defined a study area (see Figure 1) and eliminated records outside of it, resulting in 45,787 observations. Appendix A contains more detail about which records were kept for this analysis and which were discarded. The study area includes neighborhoods with planned Purple Line stations and neighborhoods that are like them. It encompasses Maryland's 'inside-the-beltway' communities, minus far southwestern Montgomery County and southern Prince George's County. Far southwestern Montgomery County is dominated by large, high-value homes on very large lots, unlike the Purple Line neighborhoods. Southern Prince George's is also lower density, was generally developed later, and is less racially diverse than the Purple Line corridor.

The MDP shapefiles contain the following property and sale characteristics that were used as variables in the regressions:

- Sale price
- Date of sale
- Year house was built (I subtracted this from year of sale to get house age at sale)
- Foundation square footage structure
- Parcel land area (acres)
- Presence of a basement
- Whether the house is attached or detached
- Number of stories in structure

I used ESRI ArcGIS software to add the following attributes to each sale record:

- Census tract information from the 2000 Decennial Census or one of the seven (2009, 2010, 2011, 2012, 2013, 2014 or 2015) 5-year American Community Surveys, whichever is closest to the year of the sale, including:
 - o Tract median household income (nominal dollars, in year of survey)
 - o Tract percent white population
 - o Tract percent Hispanic population
- Public high school attendance zone from shapefiles provided by the Montgomery County Planning Department and Prince George's County Planning Department
- Network distance to existing Metrorail station. This was calculated using station locations from the Center for Transit-Oriented Development's TOD Database and street centerline shapefiles from the U.S. Census Bureau. (meters via street/trail network)
- Network distance to *new* proposed transit station. This was calculated using the same sources as above. (meters via street/trail network)

This dataset includes only single-family home sales and attributes related to the price of single-family homes. I could expand my findings on the effect of to-date Purple Line planning by examining the prices and rents of commercial properties and spaces, and the prices and rents of multifamily properties and apartments. It is likely that these prices and rents are even more susceptible than home prices to significant increases related to transit investment and anticipation of it. Figures 13, 14, 15 and 16 show commercial and residential land uses in the study area. Commercial and high-density residential land uses cluster around the planned station locations, but they do not contain observations in this dataset. This dataset observes, for the most part, transactions in low or medium density residential areas, which are generally located farther from the planned stations. It may be possible to do statistical analyses of commercial and multifamily values using the MDP sales extracts, which include all sales recorded by the counties. A study of rents would certainly require another data source.

Methodology

To estimate the effect of Purple Line planning on home prices, I used this dataset to create a hedonic pricing model that estimates the effects on sale price from property characteristics, neighborhood characteristics, housing market trends, and finally, anticipation of the transit station. The property and neighborhood characteristic variables are described above.



Figure 5: Average Sale Price by Year (Valid SF Sales only)

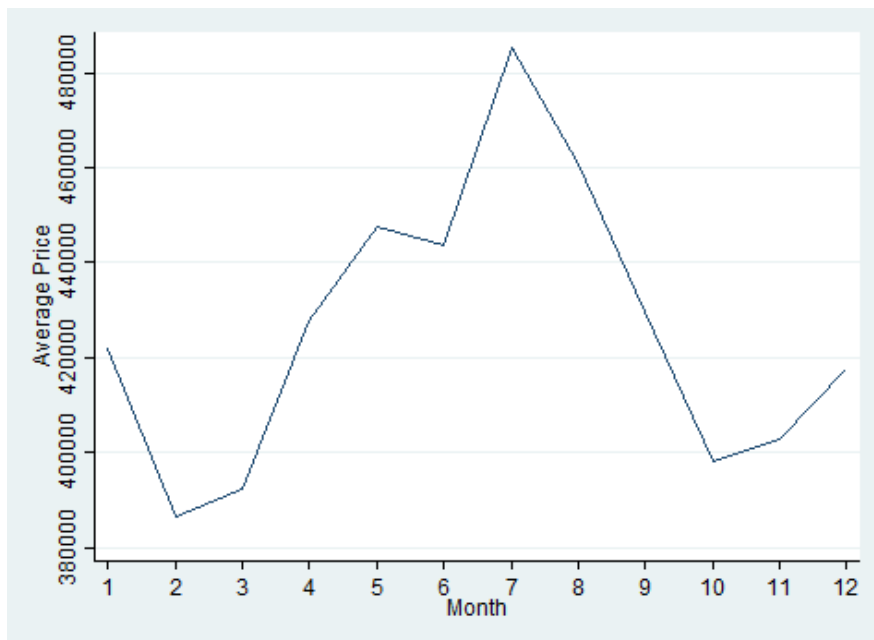


Figure 6: Average Sale Price by Month (All Years, Valid SF Sales Only)

The point in time where the sale occurred is important for two reasons. The first is the importance of controlling for the effect of the housing market on the observed price, since the observations that are being compared to one another occur over 16 years of very volatile market conditions. The second is that time is vital to understanding the effect of transit planning.

To control for housing market trends, I used a cubic time trend where the number of months since May 1999 (the month before the observations begin), number of months squared, and number of months cubed are entered into the ordinary least squares regression. A linear time trend is insufficient here because housing prices across the region increased rapidly from 1999 to 2008, decreased between 2008 and 2011, and then began increasing again in 2012 (see Figure 5). A dummy variable for sales occurring between May and August each year was also used to control for consistently higher prices for sales during the summertime (see Figure 6).

Time is also part of the variables used to measure the effect of the anticipated transit investment. As detailed above, I divided the planning process into four periods of time separated by milestone events (see Figure 3) that I believe signaled to the market increased

certainty that the project would be built and the stations would be located in specific places. Happening within the second, third or fourth period of planning are dummy variables observed for each sale. These dummies

were then interacted with network distance from the location of the planned station¹. Statistically significant interactions between proximity to the planned station location and the sale occurring in later periods of planning would suggest that the transit planning could be affecting home prices.

In addition to modeling home prices for the entire study area, I developed separate regressions for four zones within the study area (see Figure 7). I anticipate that transit planning will have a different effect on home prices in different areas, and the separate models will illuminate these differences. Each of the four zones includes neighborhoods of interest that are adjacent to new station locations, and each only contains neighborhoods that are relatively alike. The next section details differences between the zones and how their boundaries were chosen. Creating separate models for single-family homes in each zone also allows for better model specification. For example, the percent of the census tract population that is Hispanic appears in the price model for the University Boulevard zone but not in any of the others. This is because none of the other zones have tracts with significant concentrations of Hispanic people.

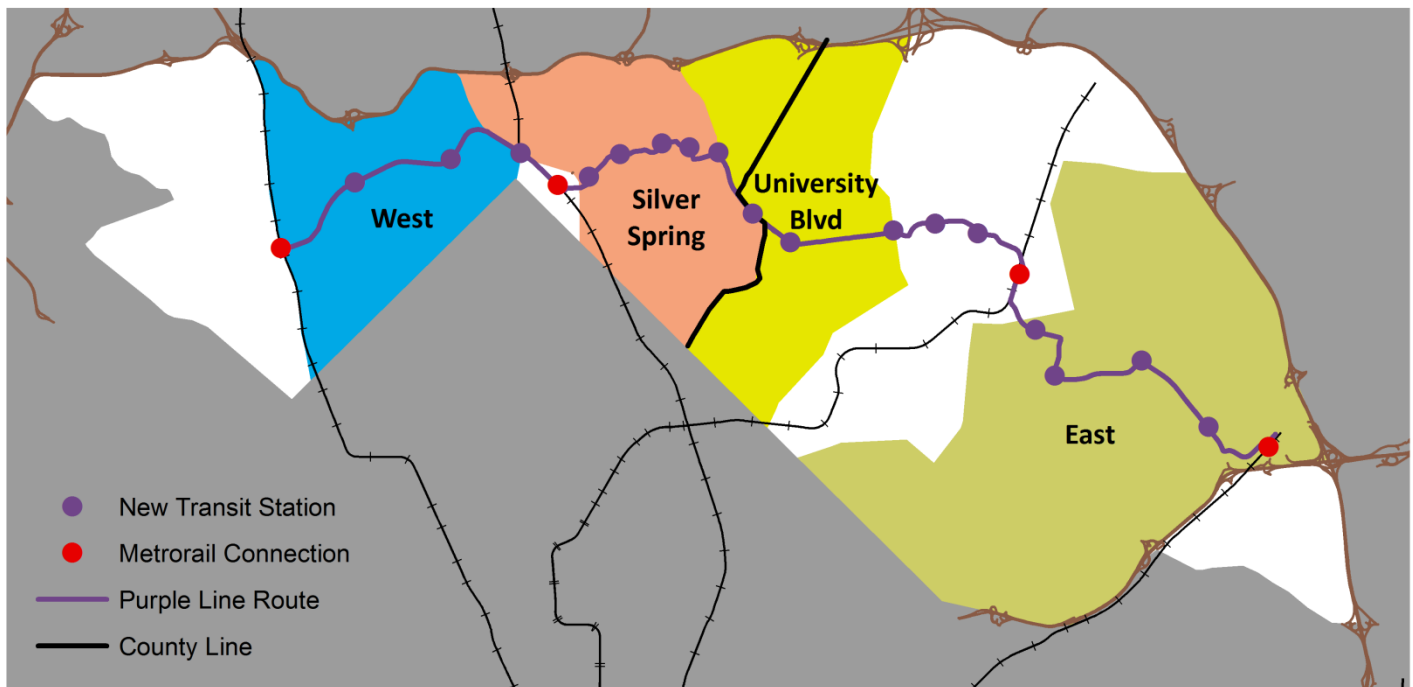


Figure 7: 'Zones' Examined for Purple Line Effects

Some of the study area does not fall into any of the zones. The area between the East and University Boulevard zones contains the University of Maryland and several existing Metrorail stations (the Green Line), price influencers that would be difficult to properly control for. Also, the new stations in this area do not have nearby single-family homes because they are on the University campus. The far western and eastern ends of the study area were not similar enough to the West and East zones, respectively, to include in those regressions.

Other data sources

Alongside the modeling of single-family home prices, I consider neighborhood descriptors from the 2015 5-year American Community Survey, newspaper and blog articles, and local planning documents and reports to

¹ Only distances to *new* transit stations are measured, so planned Purple Line connections to Metrorail at New Carrollton, College Park, Silver Spring and Bethesda are ignored.

understand how planning for the Purple Line has affected its surrounding neighborhoods and predict how it will change them once it becomes a reality.

Findings

Entire Study Area

The Purple Line will connect diverse suburbs, from exclusive Chevy Chase, where census tract median house values are over \$1 million, to renter-dominated Langley Park where most residents are immigrants, to West Lanham Hills, which has a median household income that is only 43% of the metropolitan area's. The maps below show a corridor with high-value homes and high-earning households in the west to more modestly priced housing and lower incomes in the east. The transit link is exciting because it could connect opportunities in the west, which also has higher concentrations of jobs than the east, to residents elsewhere in the corridor. It could also promote social mixing between people from different backgrounds and communities. However, the stark gradient of affluence also illustrates the danger that the transit connection will contribute to the destruction of some of the last remaining affordable neighborhoods with close proximity to downtown Washington and other employment and cultural centers.

Figure 8 shows home prices from the dataset of single-family sales observed in its most recent two years. These prices were a primary consideration in setting the zone boundaries used to make comparisons between areas of the corridor in the regression analysis. They show the gradient from the West zone with many sales over \$1 million to the East zone with many under \$225,000.

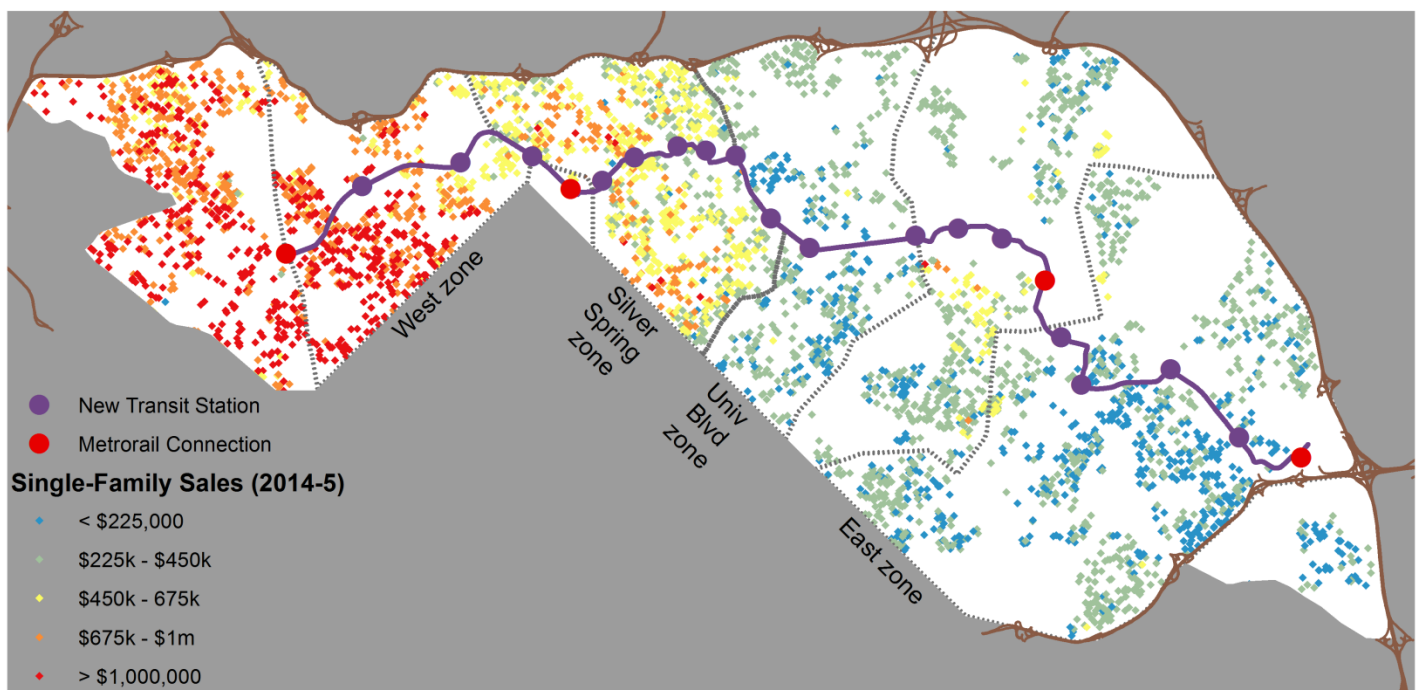


Figure 8: Single-Family Sale Prices (2014 & 2015 Only)

Figures 9, 10 and 11 show demographic information from the Census Bureau about the neighborhoods around the Purple Line corridor. Again, there is a strong east-west gradient in incomes and black population. Immigrants cluster in the area of the proposed stations along University Boulevard and near the Riverdale Park station.

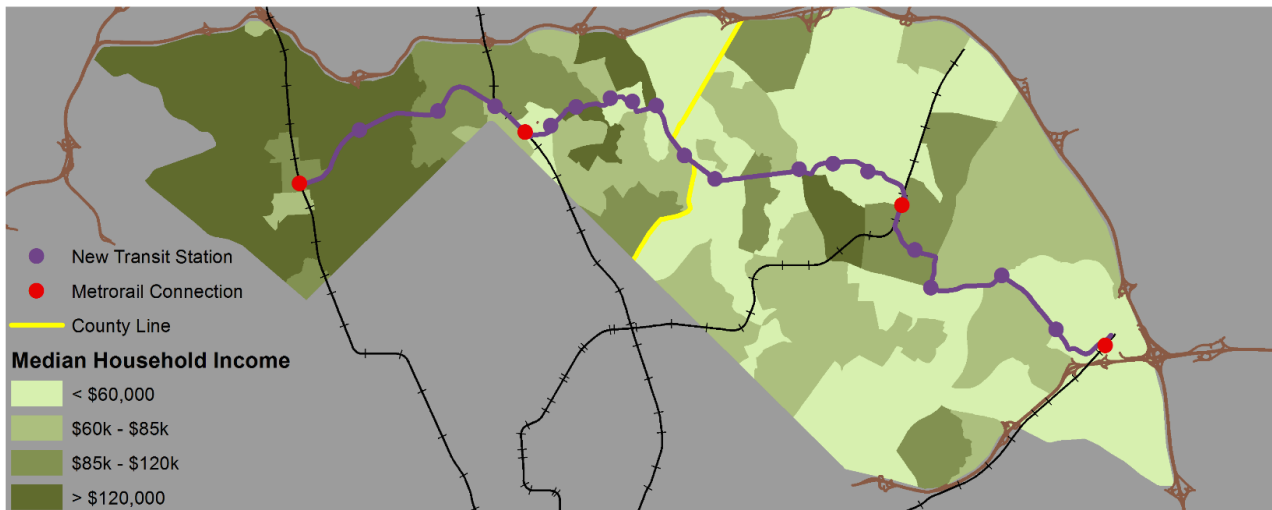


Figure 9: Census Tract Median Income (2015 5yr ACS)

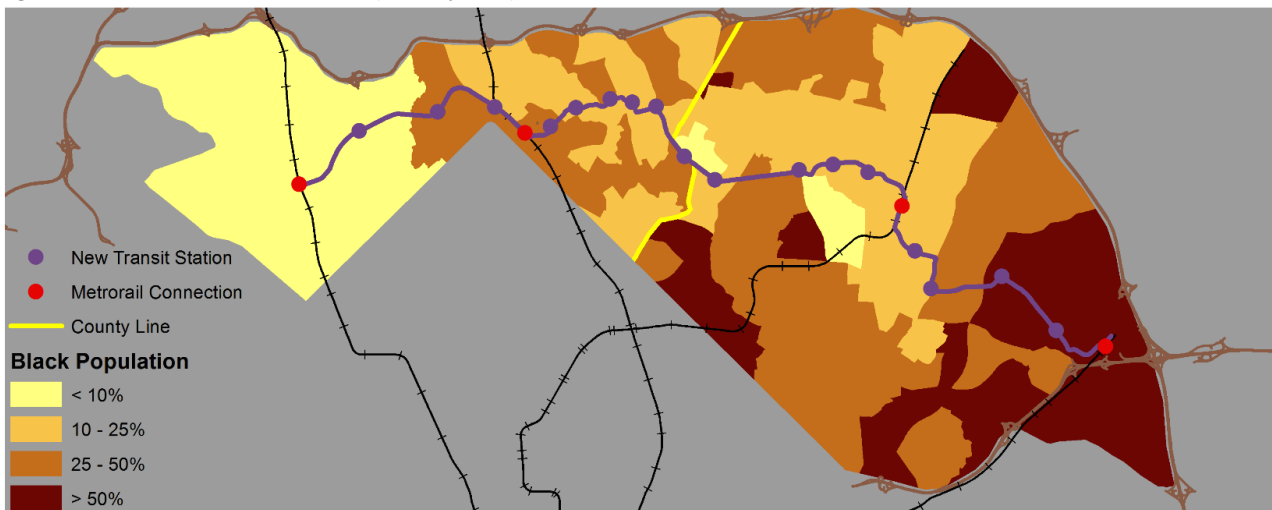


Figure 10: Census Tract Black Population (2015 5yr ACS)

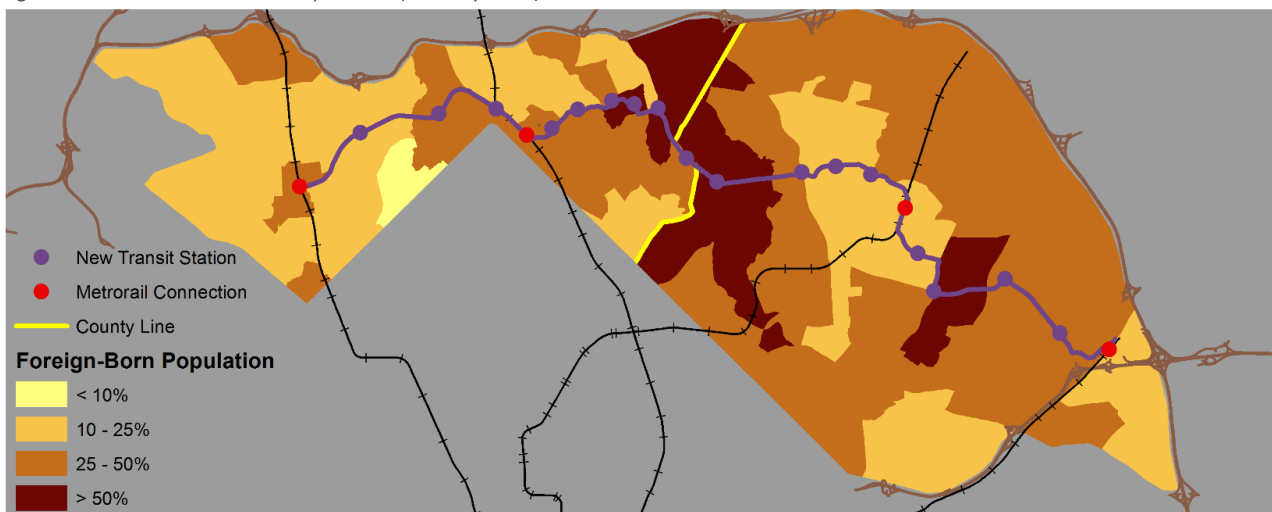


Figure 11: Census Tract Foreign-Born Population (2015 5yr ACS)

Renter households are more dispersed throughout the study area than concentrations of poor and rich (see figure 12). However, areas dominated by renters do cluster around the future Purple Line alignment, and in census tracts near the University of Maryland.

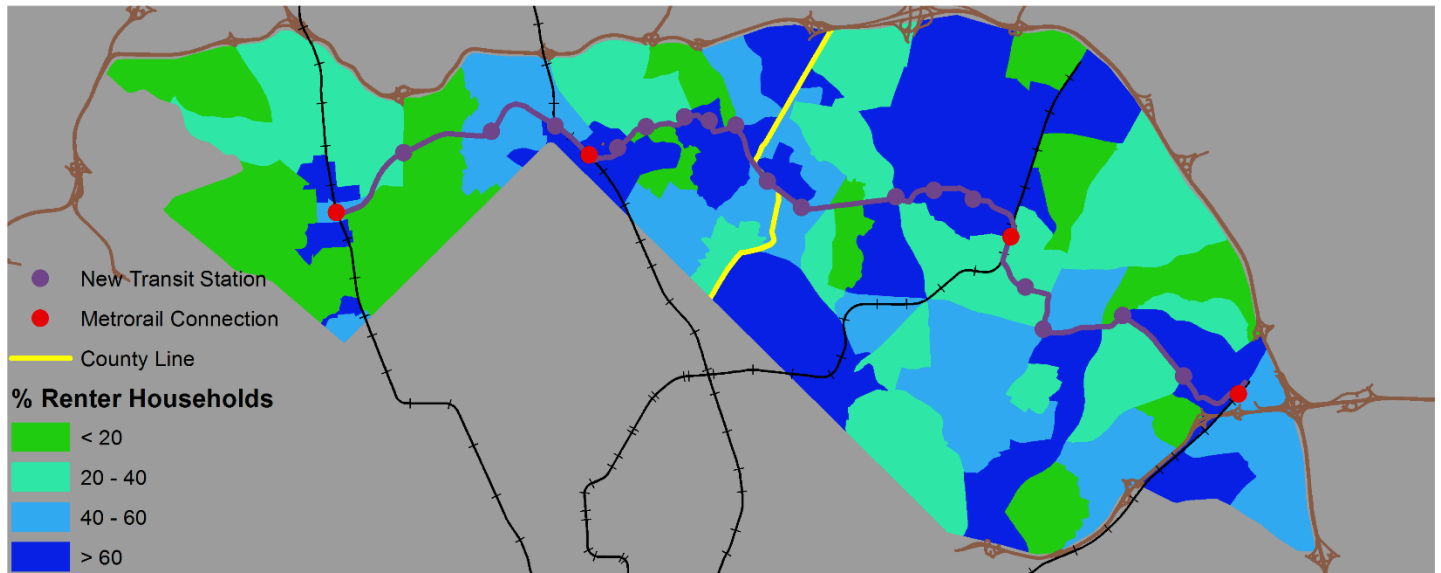


Figure 12: Census Tract Housing Tenure (2015 5yr ACS)

The table below further summarizes and compares the zones defined for the single-family home price analysis. These numbers also illustrate the disparities between the neighborhoods that will host the Purple Line.

	Entire study area	East zone	University Blvd zone	Silver Spring zone	West zone
Total population	402,753	100,676	85,919	62,671	34,598
Persons per square mile	10,464	6,841	16,890	10,307	6,830
Black population	31.1%	47.4%	32.0%	26.9%	12.3%
Hispanic population	29.4%	34.3%	55.8%	21.7%	10.9%
Non-citizen population	24.0%	24.1%	42.6%	19.2%	10.7%
Average median income	\$84,921	\$63,963	\$61,126	\$83,520	\$168,348
Average median owner-occ home value	\$394,426	\$225,328	\$247,917	\$448,247	\$875,938
Renter households	52.7%	45.7%	63.8%	55.1%	33.2%
Households using public assistance or SNAP	10.0%	15.5%	12.6%	8.3%	2.5%
Average median monthly owner costs	\$1,916	\$1,651	\$1,559	\$2,115	\$2,779
Average median monthly rent	\$1,573	\$1,262	\$1,366	\$1,310	\$2,612
Owner households (mortgage) paying > 30% of income for housing	34.7%	44.1%	41.9%	26.0%	21.7%
Renter households paying > 30% of income for rent	51.4%	57.9%	50.9%	49.1%	52.3%

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-3,062.04	< 0.01
(House age at sale) ²	27.34	< 0.01
Foundation size (sq ft)	232.11	< 0.01
Parcel size (acres)	240,741.20	< 0.01
Basement (dummy)	63,624.75	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	1.99	< 0.01
High school (12 dummies)	(see appendix B)	
Distance to Metrorail	-22.32	< 0.01
<u>Time</u>		
Months since May 1999	4,302.08	< 0.01
(Months since May 1999) ²	-8.39	< 0.01
(Months since May 1999) ³	-0.02	< 0.1
Summer sale (dummy)	9,905.97	< 0.01
Second period (dummy)	-73,465.88	< 0.01
Third period (dummy)	-230,841.70	< 0.01
Fourth period (dummy)	-181,886.10	< 0.01
<u>Effect of Planning</u>		
Distance to new station	3.01	< 0.01
Second period (dummy) *	5.29	< 0.01
Distance to new station		
Third period (dummy) *	9.48	< 0.01
Distance to new station		
Fourth period (dummy) *	14.22	< 0.01
Distance to new station		
Adjusted R ²	0.801	
Observations	45,648	

The table to the left shows the results of the regression for the *entire study area*, or 45,648 observed single-family home sales between 1999 and 2015.

The property characteristic results are logical: houses tend to fetch lower prices as they age, with that trend decreasing as houses get very old and gain historic value. Larger houses on larger lots and with basements are worth more.

Houses in neighborhoods with higher incomes are more expensive, with every extra dollar of median tract income increasing the price of the house by about \$2. All twelve of the high school dummies were significant at the .01 level, and all the coefficients were negative. This result is sensible because the omitted high school dummy represented house location in the sought-after Bethesda-Chevy Chase attendance zone. The negative coefficient on distance to existing Metrorail station means that houses tend to lose value as they get farther away from Metro, as we would expect. Over the entire study area, we find that that loss of value is about \$22 for every meter away from Metro.

The month and planning period variables are difficult to interpret because they are probably affecting each other. Generally, prices are increasing with months since the beginning of the sample (positive linear part of month polynomial), but this trend reverses in later years (negative squared and cubed parts of month polynomial and later period dummies). The sale occurring during the summer adds almost

\$10,000 dollars to the prices, as expected.

This study area-wide regression did not find a price premium associated with proximity to planned Purple Line station locations. It suggests the opposite. Prices tended to increase by \$3 per meter moving *away* from the station location before January 2007, by \$8 per meter (distance to new station coefficient + coefficient of interaction between distance and second planning period dummy) between January 2007 and May 2009, by \$12 per meter between May 2009 and April 2014, and by \$17 per meter between April 2014 and December 2015. We cannot definitively conclude that it was the station planning that caused prices to decrease around the station locations as time went on, but this regression does show that, generally across the entire study area, people were *not* paying a premium for houses near the station locations as plans for them became more concrete and certain.

The sections below discuss the neighborhoods of the corridor moving from east to west, divided into the four zones defined above. Each concludes with the results of the separate hedonic regression analysis for single-family home prices in that zone.

East Zone

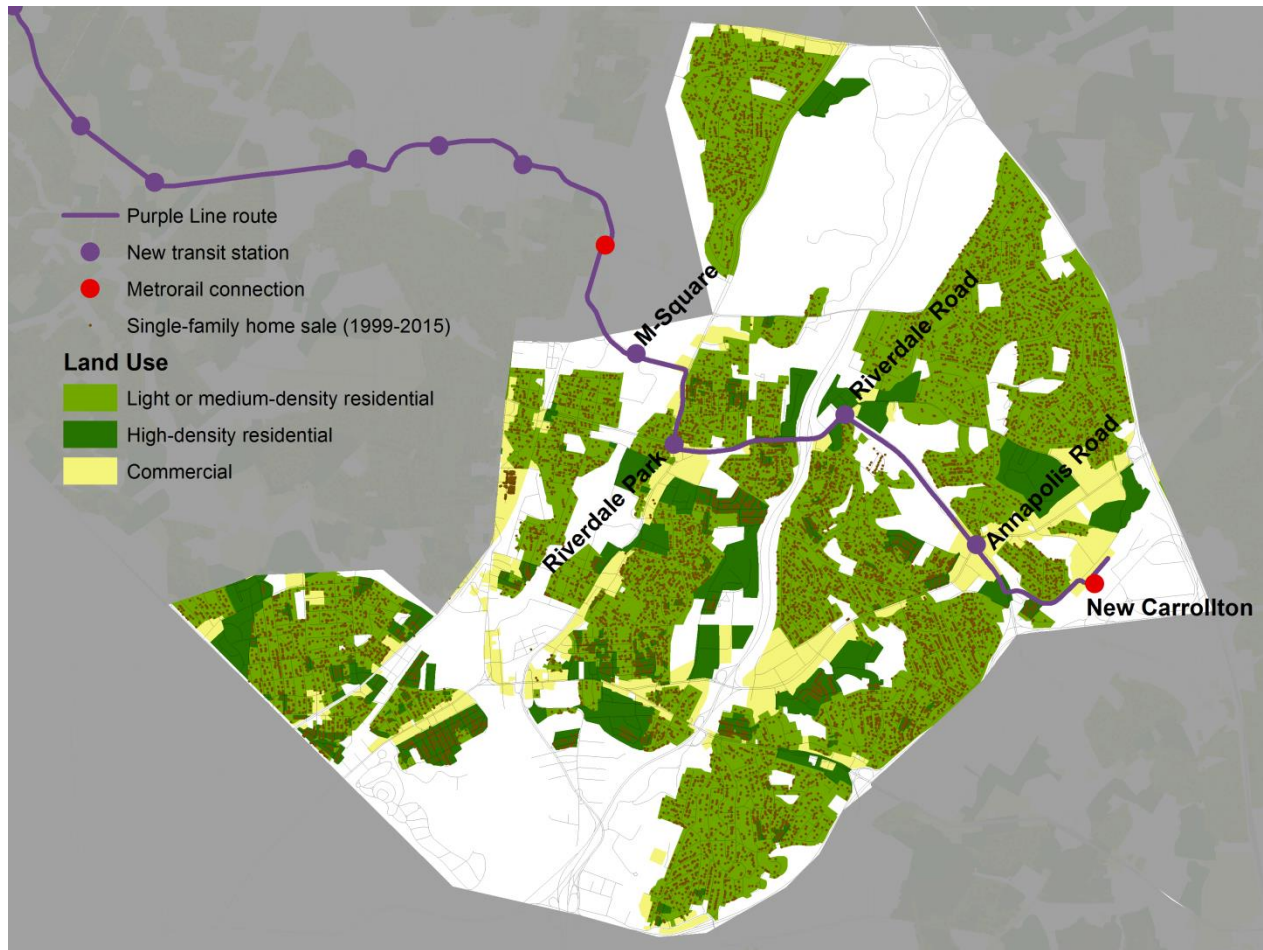


Figure 13: East Zone Land Use and SF Home Sale Observations

The Eastern terminus of the Purple Line is New Carrollton station, an existing regional transportation hub with commuter and intercity rail. New Carrollton station is located near several large institutional trip generators, including federal office buildings and other large office and industrial employers. Since 2009, New Carrollton's Transit District Development Plan has called for high-rises and up to 5,500 housing units and 6.1 million square feet of office and retail space (MTA and FTA 2013). However, like most of Prince George's County's Metrorail stations, it has thus far failed to attract transit-oriented development.

The first new rail station of the Purple Line LPA is located at the intersection of Veterans Parkway and Annapolis Road. It is adjacent to strip commercial uses along Annapolis Road, mostly auto dealers and chain restaurants. Adjacent to the station and along Veterans Parkway, there is empty, developable land. Planners expect mixed-use transit-oriented development to occur here. Some area residents have complained about the lack of diversity in extant commercial development. "We've got like a ton of fried chicken places, but that's about it," one resident said in 2004 (Stewart).

Immediately surrounding these arterial roads are several single-family neighborhoods, including West Lanham Hills and Woodlawn. They contain many modest Cape Cod houses built for moderate-income workers around 1940 (Stewart 2004). To the north, between the proposed Annapolis Road and Riverdale Road stations (the

stations are only 1.2 miles apart) is the Glenridge neighborhood, which also contains primarily detached, single-family homes. Most of these houses were built in the 1950s, 60s and 70s. At the north end of the neighborhood, closer to the Riverdale Road station, there is a cluster of garden apartment complexes and an aging strip shopping center. Within a half-mile of the Riverdale Road station, there are approximately 6,000 residents living in 1,750 housing units. Over 1,000 of these units are single-family homes, both attached and detached (MNCPPC 2013).

Density increases west of the Baltimore-Washington Parkway, in the Riverdale Park area, especially along East-West Highway (which will contain the Purple Line tracks) and Kenilworth Avenue. At the intersection of the two arterials is the proposed Riverdale Park station. Its surrounding area is still primarily single-family, with slightly more automobile-oriented commercial use land than areas to the east. It is also older; the Riverdale Park Company built the first subdivisions in the 1890s. Since then the neighborhood has continually expanded and experienced infill development, including some small apartment buildings within blocks of single-family homes (Lazo 2013). Within a half-mile of the proposed station, there are approximately 2,400 housing units, 40% of which are single-family dwellings (MNCPPC 2013).

The Purple Line alignment then makes a right and runs north along Kenilworth Avenue before turning west again on River Road. It crosses the Northeast Branch of the Anacostia River and a large park, then enters the City of College Park, where transit planning and the real estate market are strongly affected by the presence of the University of Maryland. The next planned station, M-Square will primarily serve the University's large research park with the same name. The area already contains several institutional office complexes, including NOAA, FDA, Raytheon, and the American Center of Physics. M-Square is expected to eventually employ 6,500 people (MTA and FTA 2013). There are some residences within walking distance, mostly to the south in Riverdale Park. Of the 300 dwelling units within a half mile of the station, 85 percent are single-family homes (MNCPPC 2013).

Pre-construction effects on home prices in the East Zone

	Coefficient	Sig. Level
(See appendix B for effects of property and neighborhood characteristics, and time trends)		
<u>Effect of Planning</u>		
Distance to new station	-3.791	< 0.01
Second period (dummy) *	-4.618	< 0.01
Distance to new station		
Third period (dummy) *	4.982	< 0.01
Distance to new station		
Fourth period (dummy) *	7.444	< 0.01
Distance to new station		
Adjusted R2	0.691	
Observations	13,234	

The table to the left shows the results of the single-family home price regression analysis for the East zone. Relative to the study area regression, it appears that houses near the planned stations may have commanded a premium during the early stages of planning, but that premium disappeared around 2009, at the start of the 'third period' of planning. By the fourth period, homes that were equivalent in terms of the other variables included in the regression tended to fetch higher prices as their distance from the planned station increases.

After M-Square, the Purple Line will make three stops that do not fall into any of the zones used here for smaller-area regression analyses of the effects of Purple Line planning on single-family home prices. The first is the Metrorail connection at College Park-UM station. The site has been served by Metrorail's Green Line since 1993 and commuter rail since the 19th century (Schrag 2006). Its adjacent residential neighborhood is dominated by student rentals. The next two planned stations, East Campus and Campus Center, are located on University property and will support the its major mixed-use redevelopment project at East Campus and its approximately 50,000 students and employees (MTA and FTA 2013).

University Boulevard Zone

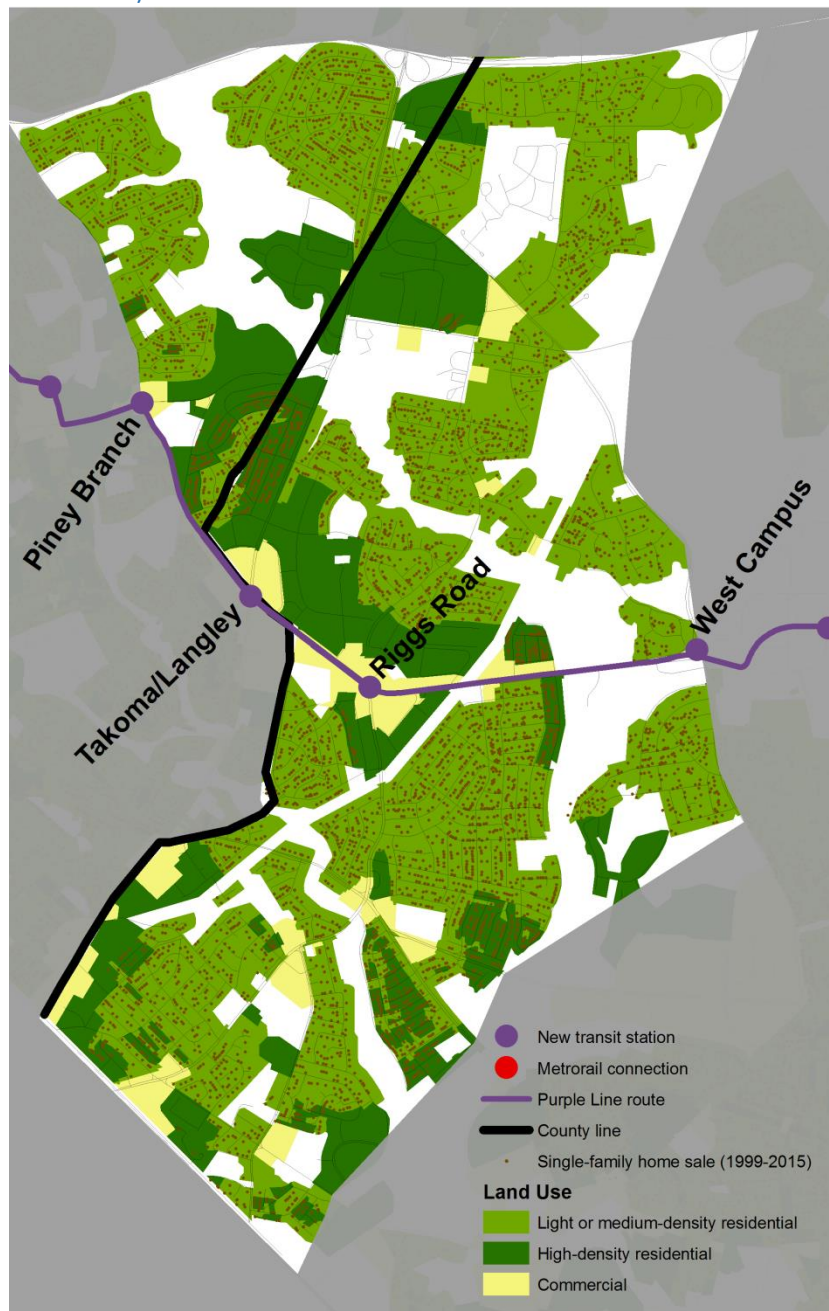


Figure 14: Univ Blvd Zone Land Use and SF Home Sale Observations

West Campus is the next planned station west of Campus Center and the first station that has nearby residences in this study's University Boulevard zone. The University of Maryland makes up a large portion of the land uses immediately surrounding the West Campus station. Across Adelphi Road to the west and north, there are pockets of single-family residences as well as forested areas and open space associated with various public parks.

After exiting the University campus, the Purple Line will run on University Boulevard for 2.7 miles, making four stops. The arterial is lined with garden apartments and auto-oriented commercial land uses. Many of its shops and restaurants specialize in products from outside the United States, including Central America, Mexico, the Caribbean, China and Cambodia, and its surrounding neighborhoods host the highest concentration of immigrants anywhere in the Purple Line corridor (see figure 11). According to a 2011 Washington Post profile (Lazo), residents in the University Boulevard corridor represent more than 40 countries and speak dozens of languages. Nearly 80 percent are Hispanic, however.

Hispanic people make up only seven percent of Prince George County's population, but

they are heavily concentrated in this area.

Many immigrants were attracted to the area

by its affordable apartment complexes, but now first-generation Americans and established immigrants are gaining wealth and purchasing single-family homes in nearby residential neighborhoods (Feola 2002).

The area around the next planned station, Riggs Road, generally contains large-lot commercial areas lining University Boulevard, with garden apartment complexes behind them and single-family residences behind the apartments. South and east of the proposed station, but still less than a kilometer walking distance away is a large post-World War II community of modest single-family homes called Lewisdale. The community has already been experiencing some demographic change-related tension over the past decade. The neighborhood is majority-black, and as more Hispanic people purchase homes, some long-time residents have complained about violations of local ordinances such as storing vehicles in yards and running unlicensed businesses out of homes (Aizenman 2001).

North and west of the Riggs Road station location is the community of Langley Park. Its garden apartments are known across the region for their low cost. They offer residents modest living in the heart of a vibrant immigrant enclave, with easy access to 11 bus lines. However, many are old, crowded and rundown. There are also challenges associated with high concentrations of immigrants and limited-English populations. Many Langley Park residents do not own cars and work low-wage jobs in Montgomery County (Lazo 2017).

Langley Park and a similar development pattern stretch west along University Boulevard to the next station location, the Takoma/Langley Transit Center. The station is planned for the busy intersection of University Boulevard and New Hampshire Avenue (the Takoma/Langley Crossroads). The commercial and residential densities are higher here than at Riggs Road. Already, the area around the congested intersection has heavy pedestrian activity and the transit center that will eventually contain the Purple Line station opened in December 2016. It has already improved safety by enabling bus riders to transfer without crossing up to twelve lanes of roadway. It hosts four different bus operators and as many as 60 buses per hour (Lazo 2016). Plans for the area have incorporated the Purple Line and call for a concentration of mixed-use development with denser office and retail buildings (MNCPPC 2013).

The Purple Line will more conveniently connect workers in this working-class, immigrant-dominated area to jobs in more affluent Montgomery County. It could also spark renovation of the deteriorated housing in Langley Park. However, the improvements also present a threat to the residents as they are likely to come with rent hikes and loss of affordable housing (Lazo 2017). The improved access to jobs will not help Langley Park residents if they can no longer afford to live there.

University of Maryland researchers and the immigrant advocacy group CASA de Maryland, a community organization that focuses on Latino rights, conducted a study that found “risk of displacement and increased housing cost burdens” associated with the coming Purple Line (Lung-Amam et al. 2017). CASA supports the Purple Line, but it has consistently argued for protections from displacement of the immigrant and low-income households along the proposed route. CASA officials have articulated that they believe property values could double or triple once the Purple Line opens, creating incentives for landlords to seek new tenants willing to pay a premium for transit proximity. Prince George’s County regulations offer no substantial tenant protections compared to those in Washington, DC, which require landlords to offer the building to tenants before selling to outsiders. CASA says protections like these needed to prevent area residents from being displaced without compensation (Shaver 2008).

In addition to improved access to regional job centers and rejuvenated housing, another benefit touted by Purple Line supporters is the promise of commercial revitalization and redevelopment. Prince George’s County planners have articulated their intention to use the Purple Line to transform older, struggling areas into thriving hubs of new transit-focused development. The corridors of Riverdale Road and University Boulevard are dominated by outdated 1950s-era strip malls, which county officials hope to see replaced with high-rise

homes, offices, restaurants and shops clustered around train stations. One senior economic developer cited "a lot of data [that] says that mass transit can be key to development and redevelopment opportunities. (Shaver and Turque 2014b)" Business owners in the Takoma/Langley area have said that they welcome renewal, but have also expressed concerns about gentrification. The executive director of one local business association said, "We don't want gentrification to happen to the degree that some folks fear it will. We need low-rent housing to serve the people who are here. (Shaver 2009a)"

There is local precedence for the transit contributing to gentrification and displacement of low-income residents, like the Green Line Metro built through the center of DC in the late 90s. The average income of households in the Green Line corridor grew by over 500% between 1990 and 2016, and a recent report called the area the "region's corridor of choice for young professionals. (RCLCO 2017)" As the Green Line corridor and many other areas of Washington gentrified after 2000, Prince George's County served as the nearby affordable alternative for low-income households that had been priced out. One Langley Park business owner's interview with the Washington Post (Lazo 2017) illustrates this connection. She fears that her shop will face the same fate as the record store her family opened in the early 1970s seven miles away, in central Washington. That store closed soon after Metrorail's Green Line opened in the area in the late 1990s. As buildings were renovated and rents went up, many of store's Latino customers, and eventually the store itself, were pushed out of the neighborhood. "There's nothing wrong with new construction and investment, but all of a sudden the current residents can no longer keep up with the rents," she said.

Pre-construction effects on home prices in the University Boulevard Zone

	Coefficient	Sig. Level
(See appendix B for effects of property and neighborhood characteristics, and time trends)		
Effect of Planning		
Distance to new station	-6.42	< 0.01
Second period (dummy) *	-12.56	< 0.01
Distance to new station		
Third period (dummy) *	4.13	< 0.01
Distance to new station		
Fourth period (dummy) *	4.72	< 0.05
Distance to new station		
Adjusted R ²	0.743	
Observations	6,206	

This table shows the results of the single-family home price regression analysis for the University Boulevard zone. They suggest a price premium for proximity to planned station locations more strongly than in any of the other zones. The premium appears to peak during the second planning period, or between Governor O'Malley's election and indication of state support for light rail and the official selection of the LPA in 2009. During this period, houses that were equivalent in terms of the other variables included in the regression lost almost \$19,000 for each kilometer farther away from a proposed station. But, like in every other zone, the premium appears to decrease in later planning periods.

Silver Spring Zone

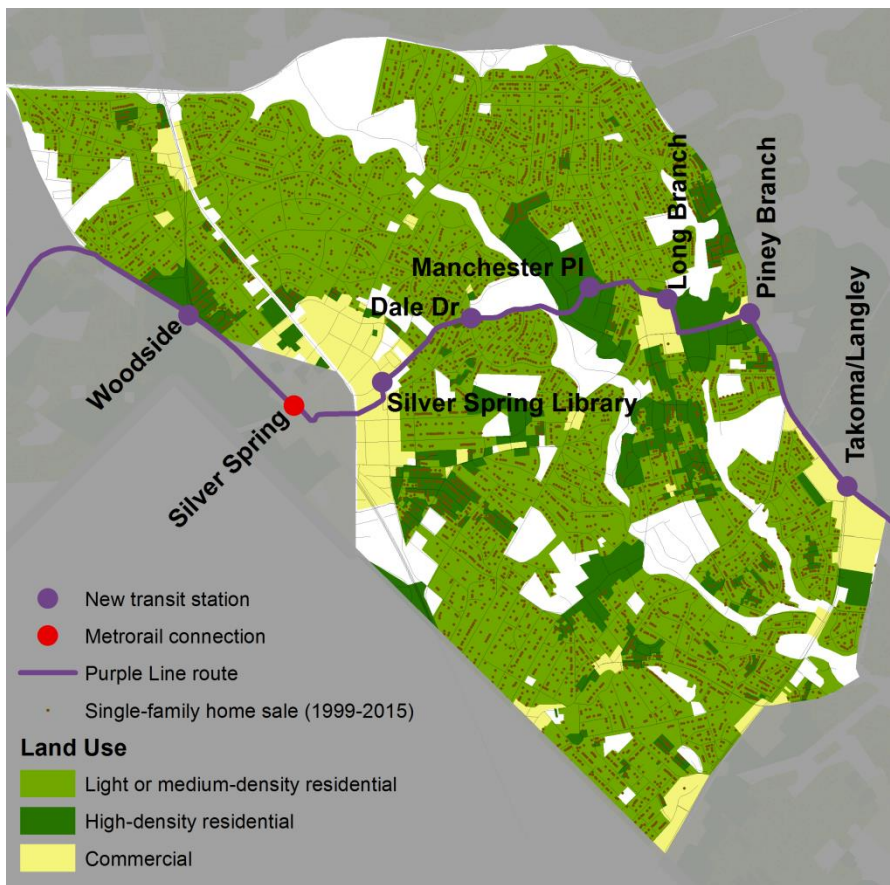


Figure 15: Silver Spring Zone Land Use and SF Home Sale Observations

The Takoma/Langley Crossroads is also where Prince George's County ends and Montgomery County begins. The south side of University Boulevard, starting at the Takoma/Langley Crossroads, is part of Montgomery County and the residential areas behind the commercial development on this side of the street differ from that of Langley Park (on the north side). They include the affluent town of Takoma Park, a 19th century planned suburb known for its Victorian houses and outspoken liberal politics.

At University Boulevard's intersection with Piney Branch Road, the Purple Line will stop at the Piney Branch station and make a left into Montgomery County, which will surround it for the rest of its route. Land uses around the intersection are more residential and slightly lower-density than at the

Takoma/Langley crossroads. There are both single-family homes and

apartments immediately around the station. The next planned station, Long Branch is proximate to low-rise garden apartments, small-lot single-family homes, and a commercial node (MTA and FTA 2013). Long Branch is also an immigrant hub, though on a somewhat smaller scale than University Boulevard near Langley Park, and experiences some similar challenges around crime and deteriorated housing (Moore 1997, Enagonio 2015).

The next two stations, Manchester Place and Dale Drive, are planned after very short distances of track, both in a relatively dense and affluent residential area bordering vibrant downtown Silver Spring. Manchester Place is within a cluster of high-density apartment complexes with small-lot single-family homes behind them. The area immediately around Dale Drive is nearly all single-family residential, mostly with a lot areas of around 6,000 square feet (MTA and FTA 2013).

The Purple Line then enters the Silver Spring central business district and stops inside the Silver Spring Library, which opened in June 2015 and is designed to accommodate the train (Turque and Koh 2015). The library is near high-rise office buildings with ground floor retail and commercial developments. There are also some multi-story apartments and, back towards Dale Drive station, single-family residences. Only half of the area surrounding this station location is zoned for residential use (MTA and FTA 2013).

Downtown Silver Spring is a thriving business center and regional entertainment destination. Some residents and businesses have worried that the Purple Line will threaten its success by crowding streets. Others assert that it will only improve its status in the region (Shaver 2009b). In downtown Silver Spring, the Purple Line will connect with Metrorail, then continue along a CSX railroad to a new station planned in the Woodside

community. Multi-story apartment complexes, townhomes, and single-family residences all exist in the surrounding area. To the northeast of the CSX railroad tracks, on the Silver Spring side, there are small-lot single-family homes, most dating to the 1920s and occupied by relatively affluent households (MTA and FTA 2013, Meyer 2001).

Pre-construction effects on home prices in the Silver Spring Zone

	Coefficient	Sig. Level
(See appendix B for effects of property and neighborhood characteristics, and time trends)		
<u>Effect of Planning</u>		
Distance to new station	11.46	< 0.01
Second period (dummy) *	-1.158	NS
Distance to new station		
Third period (dummy) *	5.117	<0.1
Distance to new station		
Fourth period (dummy) *	0.122	NS
Distance to new station		
Adjusted R2	0.722	
Observations	7,949	

The table to the left shows the results of the regression for the Silver Spring zone. House locations near the planned stations is associated with lower sale price (prices increase by \$11 for each meter away from the station location). The effect does not appear to change as planning progressed, as none of the interactions between proximity and the later planning period dummies were significant at the 95% confidence level.

West Zone

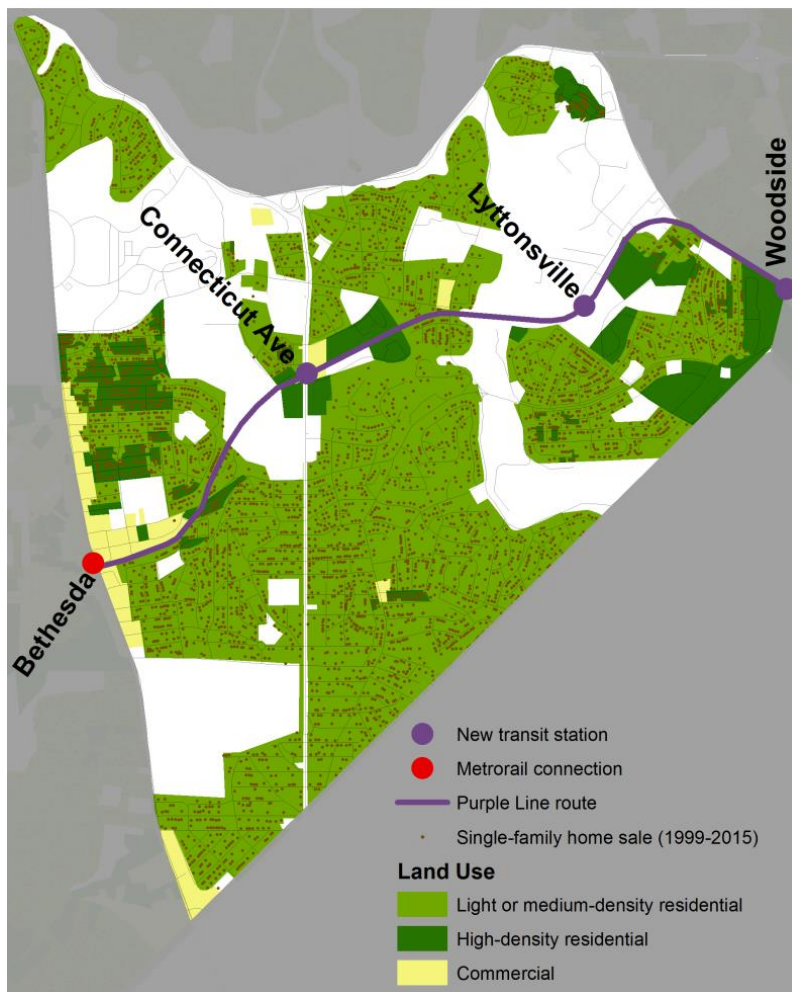


Figure 16: West Zone Land Use and SF Home Sale Observations

Across the CSX railroad and future Purple Line tracks from the Silver Spring side of the planned Woodside station, are the Woodside community's multifamily complexes. Single-family land uses appear farther from the station, along the planned light rail route as it follows the CSX corridor northwest, then turns west into the former right-of-way of the Georgetown Branch of the Baltimore and Ohio Railroad. Montgomery County purchased the right-of-way in 1988 for eventual use as a transitway. Since 2003, it has been a trail popular with bicycle commuters and recreational walkers and cyclists. The Purple Line will follow this right-of-way for three miles, to its western terminus in downtown Bethesda at a Metrorail station. Along it there are stops at two new stations: Lyttonsville and Connecticut Avenue.

Immediately west of Woodside, Lyttonsville is a moderate-income area compared to the affluent suburbs on either side of it. It contains some apartments near the proposed station:

roughly 85 in a garden-style complex and 400 in a high-rise (Reinink 2012). Also immediately

around the proposed station are some industrial and commercial uses, including warehouses, manufacturing and a bus depot, plus parkland associated with the Georgetown Branch trail and Rock Creek Park (MTA and FTA 2013).

Former slaves founded Lyttonsville in the 1850s, and as surrounding areas became all-white suburbs in the mid-20th century, it remained majority-black and lacked public services like running water and paved roads. In the 1970s Montgomery County seized land in the community's commercial area, replacing much of the main street with what is now the industrial park and public works facilities that surround the proposed station location. The garden apartment complexes also replaced many of the older homes around this time (Reed 2016). In addition to the station, 21st century Purple Line plans initially proposed a rail yard and maintenance facility in Lyttonsville that would have displaced 17 properties. The Lyttonsville Community Civic Association successfully lobbied for a new location and current plans call for a more compact facility farther from the residential part of the neighborhood (Reinink 2012). The Civic Association also hopes the station will bring more development along Brookville Road and that Lyttonsville will become a regional destination for its parks (Reinink 2012).

After crossing Rock Creek and Rock Creek Park, the Purple Line enters very affluent Chevy Chase. The Chevy Chase area was home to an amusement park at the end of a streetcar line in early 20th century. It developed

into several neighborhoods of curving, dead-end streets with a range of house types, including ramblers, townhouses, and mansions (Ruben 2003).

Commercial and multifamily residential land uses in the area cluster around a node at Connecticut Avenue, the location of a planned Purple Line station. The owner of much of the commercial land, the Chevy Chase Land Company, proposed a four million square-foot mixed-use transit-oriented development in 2011, three years before the FTA even approved the EIS for the station whose construction date remains uncertain as of April 2017. The proposal sparked debate over the appropriate intensity of development at the site. The president of the Land Company hailed the Purple Line as a “wonderful opportunity” to reverse previous trends of “mudane sprawl.” Real estate scholar Christopher Leinberger reviewed the preemptive TOD plans for the Connecticut Avenue site and agreed: “The folks around the development will have a nice little windfall. They’ll be living in suburbia and will be able to walk to great urbanism and a transit stop.” However, Montgomery County planners have only recommended a quarter of the residential and retail space the Land Company proposed, and most of that recommendation is contingent on the completion of the Purple Line (Shaver and Aratani 2011). Many residents and the Town Council oppose the increased density: “We’re in danger of becoming a mini-Bethesda or a mini-Silver Spring when we all chose to live here because we wanted a place that was quieter, more residential and peaceful without buildings towering over our homes,” said one resident (Shaver 2012).

Chevy Chase residents’ desire to live in tranquility is also related to its continued opposition to the current Purple Line routing, which some of its residents have consistently fought since the early 1990s when it was only a vague possibility (Mosk 2001). Nearly all the organized community resistance to the construction of the Purple Line has come from this area. In 2003, an area real estate agent and community association president said that 90 percent of residents in the neighborhood opposed the proposed transit route, and that “anyone who lives near the Purple Line should be worried about the value of their property. (Ruben 2003)” In 2006, John Warnock of the Greater Bethesda-Chevy Chase Coalition said, “We have nothing against transit, but we don’t want them to chop down all the trees and destroy the neighborhoods. (Trejos 2006)” Most of their arguments against the current planned route have centered around the disruption of the Georgetown Branch trail and Columbia Country Club. Another clever Coalition leader said, “This is not smart growth, to destroy three miles of an irreplaceable green space; it’s dumb growth (Hohmann 2009).”

When the state selected the LPA and set the light rail alignment through Chevy Chase in 2009, Town officials announced that lawyers who lived in Chevy Chase were working pro bono to fight the plans. They also paid an engineering firm \$430,000 to dispute the state’s decision and support other options, such as bus rapid transit along existing roads on the edge of the town. About the LPA announcement, the Mayor of Chevy Chase said: “We’re very disappointed with where we are today. This is far from over. (Hohmann 2009)” After the FTA approved the Purple Line EIS, the Chevy Chase Town Council set aside an additional \$350,000 for lobbying federal and state officials to reconsider the bus rapid transit around Chevy Chase, rather than light rail through the middle (McCartney 2014). The same year, two Chevy Chase residents and a group called Friends of the Capital Crescent Trail filed the lawsuit that today prevents major construction from beginning.

Pre-construction effects on home prices in the West Zone

	Coefficient	Sig. Level
(See appendix B for effects of property and neighborhood characteristics, and time trends)		
Effect of Planning		
Distance to new station	15.66	<0.05
Second period (dummy) *	38.29	< 0.01
Distance to new station		
Third period (dummy) *	36.64	< 0.01
Distance to new station		
Fourth period (dummy) *	52.85	< 0.01
Distance to new station		
Adjusted R2	0.773	
Observations	5,321	

This table shows the results of the regression for the West zone. Given the opposition to the Purple Line that has come from this area and the presence of exclusive neighborhoods prized for their tranquility, it is not surprising that the results for this zone show the strongest disamenity effect from Purple Line planning. Location near the planned stations appears to have a negative effect on single-family house prices, which increases sharply as planning for the transit progresses. By the fourth planning period, houses that are equivalent in terms of the other variables included in the regression gain nearly \$70,000 in price for being another kilometer farther away from the planned station.

Summary

The table below compares the coefficients for the ‘effect of planning’ variables in each of the five regressions. Transit planning activity in the study area has not spurred rampant speculation in the single-family home market. There is some evidence that a positive price premium existed for houses near the planned station locations in the East and University Boulevard zones in Prince George’s County. However, this premium diminished after 2009. In addition, it is possible that other features of the planned station locations not represented by the variables in the regression drove the apparent premiums. On the other hand, the West zone’s much higher coefficients more strongly indicate a negative relationship between transit planning and home values since they align with vocal opposition to the project among residents of that area.

	Entire study area	East zone	University Blvd zone	Silver Spring zone	West zone
Distance to new planned rail station (meters via street/trail network)	3.01	-3.791	-6.42	11.46	15.66
Sale between 1/07 & 9/09 (dummy) *	5.29	-4.618	-12.56		38.29
distance to new planned rail station				(Not significant at 0.5 level)	
Sale between 10/09 & 4/14 (dummy) *	9.48	4.982	4.13		36.64
distance to new planned rail station					
Sale between 5/14 & 12/15 (dummy) *	14.22	7.444	4.72		52.85
distance to new planned rail station					

Conclusion

The builders of the Purple Line have not expressed strong opinions or predictions about how their project will affect property values. A project manager with the Maryland Transit Administration said in 2013 that “MTA does not have its own empirical data to support this supposition [that transit service will increase property values], but we have no reason to refute it. There are many variables to consider and there is no guarantee that this claim will prove to be true in the case of the Purple Line. (Holleran 2013)” However, its stated goal of “community revitalization and transit oriented development” (Maryland Department of Transportation 2009, 1) suggests that, in at least some areas of the corridor, planners expect the project to raise property values. Value uplift is also eagerly anticipated by government officials in Prince George’s County who yearn for a bigger slice of the region’s development and Montgomery County business leaders who already have transit-oriented plans. Community organizations like CASA de Maryland and researchers at the University of Maryland also expect property values to increase, along with housing costs and displacement. In the University Boulevard area, this report’s analysis suggests that the market did place a premium on proximity to station locations during the transit planning period, in agreement with the positive findings of most previous empirical research (Wardrip 2011).

Other residents and real estate professionals in the western end of the Purple Line corridor predict a negative impact on property values. The strongest impact found by the house value analysis in this report supports their position. This contradicts the findings of most previous research and reflects the unique situation of the planned station locations in the West zone – the area already has some of the highest property values in the region, and the transit plans call for the modification of beloved greenspace.

Quantifying the effect of transit investment on property values is one step towards understanding its effect on neighborhoods and the people who live in them. Studies have found that the price increases associated with rail transit can change the demographics of the surrounding neighborhoods (Cervero and Duncan 2004, Feinstein and Allen 2011, Lin 2002). The Purple Line seems poised to raise property values and housing cost in the University Boulevard area, which is adjacent to higher value areas and home to many low-income renters. To ensure the project has a socially equitable impact, local governments and community leaders must take initiatives to prevent displacement and limit housing costs increases. Displacement also threatens to compromise the state’s own goals for its investment: improved accessibility to jobs and reduced car use, since the higher-income residents that could displace existing residents already have rich transportation options and tend to use transit less (Danyluk and Ley 2007).

Though it is unclear precisely how the Purple Line will affect property values, costs of living and demographics in its diverse corridor, leaders must actively pursue policies that ensure that the project’s economic success does not undermine its basic goal of increasing opportunity for people in nearby communities.

References

- AASHTO. *NEPA Process*. American Association of State Highway and Transportation Officials 2017. Available from http://environment.transportation.org/environmental_topics/nepa_process.
- Aizenman, Nurith C. 2001. "The Culture Clash Next Door; Neighborhood Quarrels Take On Ethnic Tint as Pr. George's Gains Hispanics." *The Washington Post*, 2001 Mar 21, A.1.
- Bartholomew, Keith, and Reid Ewing. 2011. "Hedonic Price Effects of Pedestrian- and Transit-Oriented Development." *Journal of Planning Literature* no. 26 (1):18-34.
- Becker, Jo. 2001. "New Md. Metro Route Down to 2 Choices; Options Are Slow Trolley Inside Or Fast Train Outside Beltway." *The Washington Post*, 2001 Sep 01, B01.
- Cervero, Robert, and Michael Duncan. 2004. "Neighbourhood composition and residential land prices: does exclusion raise or lower values?" *Urban Studies* no. 41 (2):299-315.
- Center for Transit-Oriented Development. 2017. TOD Database. Accessed from <http://toddata.cnt.org/>.
- Chatman, Daniel G., Nicholas K. Tulach, and Kyeongsu Kim. 2012. "Evaluating the Economic Impacts of Light Rail by Measuring Home Appreciation A First Look at New Jersey's River Line." *Urban Studies* no. 49 (3):467-487.
- Danyluk, M., and D. Ley. 2007. Modalities of the new middle class: Ideology and behaviour in the journey-to-work from gentrified neighbourhoods. *Urban Studies* 44(11): 2195–2210.
- Enagonio, John. 2015. Long Branch is primed for revitalization, but it needs the Purple Line to make it happen. In *Greater Greater Washington*.
- Feinstein, Brian D., and Ashley Allen. 2011. "Community Benefits Agreements with Transit Agencies: Neighborhood Change Along Boston's Rail Lines and a Legal Strategy for Addressing Gentrification." *Transportation Law Journal* 38.
- Feola, Carolyn. 2002. "Langley Park: 'Maryland's International Corridor'." *The Washington Post*, 2002 Jul 06.
- Giuliano, Genevieve, and Ajay Agarwal. 2011. "Public Transit as a Metropolitan Growth and Development Strategy." In *Urban and Regional Policy and Its Effects*, edited by Nancy Pindus, Howard Wial and Harold Wolman, 205-252. Washington, DC: Brookings Institution Press.
- Grant, Kinsey. 2015. "Maryland's Purple Line: The Winners and Losers." *NBC Washington*.
- Hernandez, Arelis R. 2015. "Pr. George's adds \$20 million for Purple Line, with some conditions." *The Washington Post*, 2015 Aug 14.
- Hess, Daniel Baldwin, and Tangerine Maria Almeida. 2007. "Impact of Proximity to Light Rail Rapid Transit on Station-Area Property Values in Buffalo, New York." *Urban Studies* no. 44 (5):1041-1068.
- Hohmann, Lisa. 2009. "Light Rail Picked for Purple Line; O'Malley Says U.S. Funds Also Sought for Baltimore Project." *The Washington Post*, 2009 Aug 05.
- Holleran, Bill. 2013. Experts Predict Rising Property Values Along Maryland's Proposed Light-Rail Purple Line. In *Mobility Lab*.
- Immergluck, Dan. 2009. "Large Redevelopment Initiatives, Housing Values and Gentrification: The Case of the Atlanta Beltline." *Urban Studies* no. 46 (8):1723-1745.
- Jud, G. Donald, and Daniel T. Winkler. 2006. "The Announcement Effect of an Airport Expansion on Housing Prices." *Journal of Real Estate Finance Economics* no. 33:91-103.
- Kilpatrick, John A., Ronald L. Throupe, John I. Carruthers, and Andrew Krause. 2007. "The Impact of Transit Corridors on Residential Property Values." *Journal of Real Estate Research* no. 29 (3):303-320.
- Knaap, Gerrit J., Chengri Ding, and Lewis D. Hopkins. 2001. "Do Plans Matter? The Effects of Light Rail Plans on Land Values in Station Areas." *Journal of Planning Education and Research* no. 21:32-39.
- Lazo, Luz. 2011. "In Langley Park, fear of losing the spirit of the neighborhood." *The Washington Post*, 2011 Oct 01.
- Lazo, Luz. 2013. "Amid redevelopment plans, 'Riverdale Park's time has arrived'." *The Washington Post*, 2013 Jul 01, B.1.

Lazo, Luz. 2016. "Long-delayed transit hub set to open." *The Washington Post*, 2016 Dec 13.

Lazo, Luz. 2017. "Priced out as transit growth pushes in." *The Washington Post*, 2017 Feb 19.

Lin, Jane. 2002. "Gentrification and transit in northwest Chicago." *Journal of the Transportation Research Forum* no. 56.

Lindsey, Layton, and Mosk Matthew. 2003. "Planners Discourage Purple Line Alternate; Duncan Coalition Faces First Challenge." *The Washington Post*, 2003 Jan 31.

Lung-Amam, Willow, Casey Dawkins, Zorayda Moreira-Smith, Gerrit-Jan Knaap, and Alonzo Washington. 2017. Preparing for the Purple Line: Affordable Housing Strategies for Langley Park, MD. College Park, MD.

Ma, Ting, and Gerrit-Jan Knaap. 2015. Understanding Opportunities and Challenges: A Review of the Purple Line Transit Corridor. National Center for Smart Growth Research & Education.

Maryland Department of Planning. 2017. Calendar Year sales Source Data 1999 thru 2015 for Montgomery & Prince George's.

Maryland Department of Transportation. 2009. Purple Line Locally Preferred Alternative.

Maryland Transit Administration. 2014. GOVERNOR O'MALLEY ANNOUNCES PURPLE LINE RECEIVES FEDERAL ENVIRONMENTAL APPROVAL.

McCartney, Robert. 2014. "Futile and costly chase to alter Purple Line." *The Washington Post*, 2014 Mar 20.

Metcalf, Andrew. 2017. *Gov. Larry Hogan says today that judge in Purple Line case has a conflict of interest*. Twitter. Video.

Meyer, Eugene L. 2001. "Where Porches Are King; Neighborliness Rules, and Moving Up Doesn't Mean Moving Out." *The Washington Post*, 2001 Dec 08, J.1.

MNCPPC. 2013. Purple Line TOD Study. The Maryland-National Capital Park and Planning Commission.

Montgomery County Planning Department. 2017. Public high school attendance zone shapefiles.

Moore, Kate. 1997. "Eclectic Living In Long Branch; Montgomery Community Varied in Style, Ethnicity." *The Washington Post*, 1997 Dec 20, E01.

Mosk, Matthew. 2001. "Purple Line Breeds More Confusion; Sides Attempt to Clarify Two Competing Routes." *The Washington Post*, 2001 Dec 02, C.1.

MTA, and FTA. 2013. Purple Line Final Environmental Impact Statement & Draft Section 4(F) Evaluation. Maryland Transit Administration and Federal Transit Administration.

Myers, Dowell, and Elizabeth Gearin. 2001. "Current preferences and future demand for denser residential environments." *Housing Policy Debate* no. 4:633-659.

Office of Governor Larry Hogan. 2016. Governor Larry Hogan Green Lights Purple Line Contract.

Prince George's County Planning Department. 2017. Public high school attendance zone shapefiles.

RCLCO. 2017. GreenPrint of Growth 2.0. Capital Riverfront BID.

Reed, D. (2014). Behold how the Purple Line corridor is changing. Retrieved from <https://ggwash.org/view/33919/behold-how-the-purple-line-corridor-is-changing>

Reed, Dan. 2016. Scarred by urban renewal, Silver Spring's Lyttonsville neighborhood gets a second chance. In *Greater Greater Washington*.

Reinink, Amy. 2012. "Where change once came slowly." *The Washington Post*, 2012 Jul 28.

Rich, Eric, and Katherine Shaver. 2007. "More Stations, Bigger Welcome for Purple Line Plans." *The Washington Post*, 2007 Jun 07, PGE.1.

Ruben, Barbara. 2003. "Living on a Lakebed, Feeding the Memories." *The Washington Post*, 2003 Feb 01.

Schrag, Zachary M. 2006. *The Great Society Subway: A History of the Washington Metro*: Johns Hopkins University Press.

Shaver, Katherine. 2001. "Glendening Stokes Rail Fight; Decision to Build Purple Line Inside Beltway Fires Up Duncan." *The Washington Post*, 2001 Oct 30.

Shaver, Katherine. 2007. "Backers Revive Push for Light Rail; Chief Obstacle To Purple Line May Be Its Cost." *The Washington Post*, 2007 Feb 08, ME.1.

- Shaver, Katherine. 2008. "East-West Divide Shadows Debate Over Purple Line; Md. Transit Route Would Connect 'Worlds Separated by Economic Class'." *The Washington Post*, 2008 Dec 01.
- Shaver, Katherine. 2009a. "Builders Take Wait-and-See Approach to Purple Line; Completion Is Too Distant For Strapped Developers." *The Washington Post*, 2009 Aug 23.
- Shaver, Katherine. 2009b. "Silver Spring Frets Over Purple Line; Some Worry About Effect on Downtown." *The Washington Post*, 2009 Mar 05, ME.1.
- Shaver, Katherine. 2011. "Purple Line's plans are getting down to details." *The Washington Post*, 2011 Jan 11.
- Shaver, Katherine. 2012. "Purple Line sets up change." *The Washington Post*, 2012 Jul 15, C.1.
- Shaver, Katherine. 2013. "Purple Line at risk of stalling." *The Washington Post*, 2013 Feb 10.
- Shaver, Katherine. 2014. "Md. ready to buy properties for Purple Line route." *The Washington Post*, 2014 Apr 12.
- Shaver, Katherine. 2016a. "Added doubts about light rail." *The Washington Post*, 2016 May 30.
- Shaver, Katherine. 2016b. "Purple Line hits new snag." *The Washington Post*, 2016 Aug 04.
- Shaver, Katherine, and Lori Aratani. 2011. "Seeing red over the Purple Line." *The Washington Post*, 2011 Jul 19.
- Shaver, Katherine, and Bill Turque. 2014a. "Battle for Purple Line heats up as Hogan prepares to become Maryland governor (Posted 2014-12-11 23:14:00)." *The Washington Post*, 2014 Dec 11.
- Shaver, Katherine, and Bill Turque. 2014b. "Purple Line fight hits key stretch." *The Washington Post*, 2014 Dec 12.
- Stewart, Keisha. 2004. "Affordable, Affable, Adaptable, Accessible." *The Washington Post*, 2004 Nov 20.
- TEMS. 2015. Purple Line Preliminary Economic Impact Study: Update. Maryland Transit Administration,,.
- The Washington Post. 2007. "Transportation Trifecta; The O'Malley program includes an intercounty connector, a Purple Line and dedicated funds for Metro." *The Washington Post*, 2007 Jan 26.
- Trejos, Nancy. 2006. "Purple Line Emerging as Issue in Race; Montgomery Executive Candidates Debate Details." *The Washington Post*, 2006 May 14, C01.
- Turque, Bill, and Elizabeth Koh. 2015. "New Silver Spring Library opens as a gathering spot." *The Washington Post*, 2015 Jun 21.
- U.S. Census Bureau. Decennial Census, 2000. Prepared by Social Explorer.
- U.S. Census Bureau. American Community Survey 5-Year Estimates, 2009, 2010, 2011, 2012, 2013, 2014 and 2015. Prepared by Social Explorer.
- U.S. Census Bureau. TIGER/Line Shapefiles, 2016. Accessed from <https://www.census.gov/geo/maps-data/data/tiger.html>.
- Wardrip, Keith. 2011. Public Transit's Impact on Housing Costs: A Review of the Literature Washington, DC: Center for Housing Policy and National Housing Conference.

APPENDIX A: Single-Family Home Sales Dataset

To prepare a valid sales database from the Maryland Department of Planning's Prince George's and Montgomery sales extracts, the following steps were taken:

1. Duplicate entries of the same account ID, transaction date and sales price were removed.
2. All records from 1999 to 2015 were combined into one dataset.
3. Entries that weren't geolocated, had prices under \$200, and we're arms-length were removed.
4. Station locations from the National TOD database and street centerline shapefiles from Montgomery and Prince George's Counties were used with ESRI ArcMap software to assign street network distances to proposed Purple Line stations and existing Metrorail stations to each sale record.

To filter the sales to the single-family database used in the regression, the following steps were taken:

1. Sales without year of construction, foundational square footage or parcel acreage were dropped.
2. Sales with prices under \$10,000, over \$10,000,000, or over \$1,000,000 with a county-appraised value under 1/10th of the sales price were dropped.
3. Sales with parcels over 100 acres or foundational size over 25,000 square feet or under 200 square feet were dropped.
4. Only sales that had a 'residential' or 'townhouse' land use designation were kept (condominiums were excluded).
5. Attributes were created that reflected the existence of a basement or the property being a townhouse, based on land use designations and structure descriptions

APPENDIX B: Full Regression Results

ENTIRE STUDY AREA

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-3,062.04	< 0.01
(House age at sale) ²	27.34	< 0.01
Foundation size (sq ft)	232.11	< 0.01
Parcel size (acres)	240,741.20	< 0.01
Basement (dummy)	63,624.75	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	1.99	< 0.01
Bethesda – CC HS (omitted)		
Bladensburg HS (dummy)	-277,582.700	< 0.01
Blair HS (dummy)	-158,748.300	< 0.01
Flowers HS (dummy)	-296,751.400	< 0.01
Duval HS (dummy)	-225,708.100	< 0.01
Einstein HS (dummy)	-185,948.300	< 0.01
High Point HS (dummy)	-219,133.600	< 0.01
Northwestern HS (dummy)	-292,637.000	< 0.01
Northwood HS (dummy)	-184,123.400	< 0.01
Parkdale HS (dummy)	-267,724.600	< 0.01
Springbrook HS (dummy)	-143,113.100	< 0.01
Johnson HS (dummy)	-194,959.200	< 0.01
Whitman HS (dummy)	-110,739.100	< 0.01
Distance to Metrorail	-22.32	< 0.01
<u>Time</u>		
Months since May 1999	4,302.08	< 0.01
(Months since May 1999) ²	-8.39	< 0.01
(Months since May 1999) ³	-0.02	< 0.1
Summer sale (dummy)	9,905.97	< 0.01
Second period (dummy)	-73,465.88	< 0.01
Third period (dummy)	-230,841.70	< 0.01
Fourth period (dummy)	-181,886.10	< 0.01
<u>Effect of Planning</u>		
Distance to new station	3.01	< 0.01
Second period (dummy) *	5.29	< 0.01
Distance to new station		
Third period (dummy) *	9.48	< 0.01
Distance to new station		
Fourth period (dummy) *	14.22	< 0.01
Distance to new station		
Constant	-71,356.76	< 0.01
R2	0.801	
Adjusted R2	0.801	
Observations	45,648	

EAST ZONE

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-2,192.12	< 0.01
(House age at sale)^2	10.427	< 0.01
Foundation size (sq ft)	50.238	< 0.01
Stories	10,230.50	< 0.01
Parcel size (acres)	37,139.73	< 0.01
Basement (dummy)	24,540.94	< 0.01
Townhouse (dummy)	-42,352.41	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	1.151	< 0.01
Tract percent white	29,338.09	< 0.01
HS (omitted)	NA	NA
Northwestern HS (dummy)	25,399.680	< 0.01
Parkdale HS (dummy)	-3,008.178	< 0.05
Distance to Metrorail	-1.56	< 0.01
<u>Time</u>		
Months since May 1999	491.014	< 0.01
(Months since May 1999)^2	30.533	< 0.01
(Months since May 1999)^3	-0.127	< 0.01
January sale (omitted)	NA	NA
February sale (dummy)	-5,739.158	< 0.05
March sale (dummy)	-4,474.498	< 0.05
April sale (dummy)	-8,539.627	< 0.01
May sale (dummy)	-6,931.392	< 0.01
June sale (dummy)	-5,301.304	< 0.05
July sale (dummy)	-5,872.283	< 0.05
August sale (dummy)	-6,781.566	< 0.01
September sale (dummy)	-9,719.334	< 0.01
October sale (dummy)	-8,384.319	< 0.01
November sale (dummy)	-8,153.857	< 0.01
December sale (dummy)	-6,267.44	< 0.01
Second period (dummy)	-36,793.85	< 0.01
Third period (dummy)	-281,302.30	< 0.01
Fourth period (dummy)	-211,877.20	< 0.01
<u>Effect of Planning</u>		
Distance to new station	-3.791	< 0.01
Second period (dummy) *	-4.618	< 0.01
Distance to new station		
Third period (dummy) *	4.982	< 0.01
Distance to new station		
Fourth period (dummy) *	7.444	< 0.01
Distance to new station		
Constant	38188.78	< 0.01
R2	0.692	
Adjusted R2	0.691	
Observations	13,234	

UNIV ZONE

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-2,206.56	< 0.01
(House age at sale)^2	11.82	< 0.01
Foundation size (sq ft)	52.83	< 0.01
Parcel size (acres)	73,443.05	< 0.01
Basement (dummy)	29,533.88	< 0.01
Townhouse (dummy)	-55,477.35	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	0.65	< 0.01
Tract percent Hispanic	-23,621.85	< 0.01
HS (omitted)		
High Point HS (dummy)	-45,026.030	< 0.01
Northwestern HS (dummy)	-45,203.180	< 0.01
Springbrook HS (dummy)	17,794.930	< 0.01
<u>Time</u>		
Months since May 1999	1,396.89	< 0.01
(Months since May 1999)^2	29.06	< 0.01
(Months since May 1999)^3	-0.13	< 0.01
Second period (dummy)	-39,042.96	< 0.01
Third period (dummy)	-314,023.90	< 0.01
Fourth period (dummy)	-236,935.10	< 0.01
<u>Effect of Planning</u>		
Distance to new station	-6.42	< 0.01
Second period (dummy) *	-12.56	< 0.01
Distance to new station		
Third period (dummy) *	4.13	< 0.01
Distance to new station		
Fourth period (dummy) *	4.72	< 0.05
Distance to new station		
Constant	116,118.70	< 0.01
R ²	0.744	
Adjusted R ²	0.743	
Observations	6,206	

SILVER SPRING ZONE

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-2,523.06	< 0.01
(House age at sale) ²	24.944	< 0.01
Foundation size (sq ft)	145.456	< 0.01
Stories	11,252.24	< 0.01
Parcel size (acres)	270,776.60	< 0.01
Basement (dummy)	60,281.07	< 0.01
Townhouse (dummy)	-45,200.39	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	0.371	< 0.01
HS (omitted)		
Einstein HS (dummy)	1,203.795	NS
High Point HS (dummy)	-227,209.600	< 0.01
Northwood HS (dummy)	4,495.770	NS
Distance to Metrorail	-26.622	< 0.01
<u>Time</u>		
Months since May 1999	4,107.14	< 0.01
(Months since May 1999) ²	1.718	NS
(Months since May 1999) ³	-0.059	< 0.01
Summer sale (dummy)	16,754.59	< 0.01
Second period (dummy)	-67,941.97	< 0.01
Third period (dummy)	-176,085.40	< 0.01
Fourth period (dummy)	-109,403.30	< 0.01
<u>Effect of Planning</u>		
Distance to new station	11.46	< 0.01
Second period (dummy) * Distance to new station	-1.158	NS
Third period (dummy) * Distance to new station	5.117	<0.1
Fourth period (dummy) * Distance to new station	0.122	NS
Constant	-81,044.10	<0.1
R2	0.723	
Adjusted R2	0.722	
Observations	7,949	

WEST ZONE

	Coefficient	Sig. Level
<u>Property Characteristics</u>		
House age at sale (years)	-5,256.88	< 0.01
(House age at sale) ²	64.19	< 0.01
Foundation size (sq ft)	300.83	< 0.01
Parcel size (acres)	278,126.10	< 0.01
Basement (dummy)	115,725.10	< 0.01
Townhouse (dummy)	-81,519.97	< 0.01
<u>Neighborhood characteristics</u>		
Tract median hh income	1.72	< 0.01
Bethesda-CC HS (omitted)		
Einstein HS (dummy)	-35,677.710	NS
Johnson HS (dummy)	-196,820.500	< 0.01
Distance to Metrorail	-63.14	< 0.01
<u>Time</u>		
Months since May 1999	8,149.43	< 0.01
(Months since May 1999) ²	-32.84	< 0.01
(Months since May 1999) ³	0.04	NS
Summer sale (dummy)	19,016.96	< 0.01
Second period (dummy)	-147,807.20	< 0.01
Third period (dummy)	-290,985.60	< 0.01
Fourth period (dummy)	-271,358.80	< 0.01
<u>Effect of Planning</u>		
Distance to new station	15.66	<0.05
Second period (dummy) * Distance to new station	38.29	< 0.01
Third period (dummy) * Distance to new station	36.64	< 0.01
Fourth period (dummy) * Distance to new station	52.85	< 0.01
Constant	-392,253.90	< 0.01
R2	0.774	
Adjusted R2	0.773	
Observations	5,321	