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Attaining the American Dream:
How Physical Mobility Shapes Upward Mobility

By

Elyse H. Lee

Thomas D. Lancaster
Adviser

Emory College Political Science Department

Thomas D. Lancaster
Adviser

Alexander Hicks
Committee Member

Michael Rich
Committee Member

Katherine Vigilante
Committee Member

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An abstract of
a thesis submitted to the Faculty of Emory College of Arts and Sciences
of Emory University in partial fulfillment
of the requirements of the degree of
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Abstract

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Scholars across various disciplines have studied how to increase opportunities for upward mobility, focusing on variables such as income inequality, education, racial dynamics, and family structures. This study contributes to the literature by exploring whether a virtually absent variable in the scholarship, access to public transit, can help explain the probability for a child born in the lowest income quartile to rise to the highest income quartile by the time they reach adulthood. This study utilizes a mixed quantitative and qualitative research design to explore this relationship across forty-five metropolitan statistical areas (MSAs) across the United States. Ultimately, the results of this study suggest that higher levels of public transit accessibility are positively correlated with higher levels of upward mobility in these MSAs.

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INTRODUCTION

To travel to her job interview, Lauren Scott took sixty-nine bus stops, a nine-minute train ride, an additional forty-nine bus stops, and walked a quarter of a mile. As a mother of one who had just lost her house and her car, this commute was a necessary burden in order to find a job to provide for herself and her child (Harlan 2015). Lauren Scott's anecdote was featured in a Washington Post article highlighting the excessive barriers the poor in the southeastern region of the United States face in order to attain opportunities to make better lives for themselves. Stories such as these prompted reflections on how the economic and time costs of travel affect the chances for the poorest populations in the United States to attain sustainable lifestyles. Does increased access to public transportation significantly create better economic opportunities? The alternative is individuals in these low-income communities being limited to work in the areas in which they live, leading to a vicious cycle of poverty and lost opportunity. I am curious about the potential impact of accessible public transportation on increasing economic opportunity. I am motivated to address the larger question of whether access to public transit could help more Americans attain the "American Dream," a concept engrained in this country's identity.

As a concept, the American Dream primarily rests on the notion that, with hard work and dedication, anyone can achieve prosperity and move up in social and economic rank. As described by Joseph Ferrie, the American Dream rests on "the belief that in the United States, history is not destiny: without a hereditary aristocracy or caste system or controls on internal migration, Americans are less constrained than others by their family background in shaping their own lives" (2005, 1). However, this concept is no longer best practiced in the United

States, and thus, it seems inappropriate to deem it the "American" dream. As indicated by Corak and Heisz (1999), the probability of Americans achieving upward mobility is only 7.5%, compared to countries such as Denmark and Canada, which have much higher probabilities, 11.7% and 13.4% respectively. Additionally, while the most recent data by Chetty et al (2014) suggests that overall upward mobility within the United States has remained stable throughout the last few decades, upward mobility drastically varies across regions of the United States. Where children are born and raised has a strong influence on predicting whether they can make better lives for themselves than those that their parents created (Isaacs, Sawhill, and Haskins 2013). This variation of upward mobility within the United States may lend a hand in explaining why a Gallup Poll found that Americans feel pessimistic about future generations achieving this coveted dream (Duggan and Newport 2013), even though overall upward mobility has not changed (Chetty et al. 2014). This paper utilizes intergenerational economic mobility, the ability to move up income quartiles within one generation, to capture the larger phenomenon of the American Dream, and seeks to explore how access to public transportation affects upward mobility for those born at the very bottom of the economic ladder.

By studying the consequences of public transportation accessibility across forty-five metropolitan statistical areas (MSAs)[1] in the United States, this study provides both theoretical and substantive contributions. First, this research advances research on upward mobility by

[1] A Metropolitan Statistical Area (MSA) is a also referred to as a 'core based statistical area', which is constructed by the United States Office of Management and Budget (OMB) It is defined as "county or counties or equivalent entities associated with at least one core (urbanized area or urban cluster) of at least 10,000 people in its population, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties with the counties associated with the core" (Office of Management and Budget 2015).

analyzing an untested variable: public transit accessibility, or more specifically, the ability for individuals to reach a destination within a given amount of travel time using public transit. Scholarship on this subject has focused primarily on understanding the status of upward mobility in the United States (Solon 1999), and has revealed some correlations with factors such as quality of education, ethnic diversity, and social capital levels (Chetty et al 2014). This study is valuable because it builds upon questions left from the existing scholarship and advances our knowledge in this subject. By studying an additional explanatory variable, this study helps the collective scholarship provide another significant explanation on how to increase opportunities for upward mobility. Secondly, this study has legitimate policy implications for federal, local, and regional governments that wish to increase equal opportunities for American citizens.

The first section of this paper begins by reviewing the existing explanations for upward mobility within the literature, and then identifies how studying public transit accessibility adds to the scholarship. The second section introduces the hypotheses of this study based on the theoretical framework. The third section outlines the research design and justifies its methodological approach. The fourth section reports on the quantitative data and the results of the empirical tests. The fifth section reports on an in-depth case study in the San Francisco, California MSA, and analyzes its observations with the results of the quantitative study. The last section closes with a summary of the findings, explores the policy implications, and offers guidance for further research.

THEORY

The phenomenon of intergenerational economic mobility has always been an interest of study to scholars, but it was not until Gary Solon published "Intergenerational Mobility in the Labor Market" in 1999 that social scientists began to examine the causal mechanisms that lead to increases or decreases in upward mobility (Black and Devereux 2010). Solon's (1999) article went beyond simply collecting economic estimates and data regarding the relationship between economics and upward mobility, but examined the causal effect between education and earnings as well as its change over time. Like Solon, most scholars such as Black, Devereux, Corak, and Hassler have approached this topic from an economic or sociological perspective and have focused on measuring intergenerational economic mobility. In this section, the theory will focus on competing explanations to justify the variation in upward mobility, and how public transit accessibility fits within the literature.

The most basic and original theoretical framework regarding intergenerational mobility is the theory of human capital investment. Human capital refers to the intangible knowledge, habits, social and personality attributes that provide economic value to individuals. Solon (2004) argues that upward mobility is easier to achieve when parents and caregivers can afford to invest heavily in their children's human capital. The literature on upward mobility focuses on education, especially higher education, as an important human capital investment (Machin 2007). Consequently, it is much more likely that the affluent population that can afford to provide their children with such opportunities will succeed and sustain the benefits at the top of the economic ladder. However, this discussion of the importance of human capital investments returns to the political question of whether governments have the authority or obligation to provide children from low-income communities the human capital resources their parents may not be able to afford.

Solon (2004) takes the position that the government has such a role, as he argues that public policy can seriously increase or decrease the influence of inequality in society. He argues that progressive public policy programs that cater to assist poorer demographics drastically promote intergenerational mobility. With this logic, he argues that the spending and priorities placed on public policy programs in the United States, notably on higher education, are skewed to benefit the already affluent population rather to provide opportunity to the less advantaged. Accepting the assumption that this logic applies to public policy programs such as public transportation, he argues that it is warranted to consider the government as an appropriate mechanism to take up such obligation. While there may be a convincing ideological argument for funding public transportation programs, this study explores whether there is statistical evidence to support this theory.

Many scholars and colleagues who are studying intergenerational economic mobility, such as Miles Corak (2013) and John Hassler (2007), have investigated the increasing income inequality in the United States as a key factor limiting upward mobility. Income inequality refers to the increasingly widening gap between the incomes of the rich and the poor. It is also characterized with a very small number of affluent individuals controlling a disproportionately large percentage of the economy’s wealth. One of the most damaging consequences of income inequality is income segregation. Income segregation is manifested when increased income inequality causes pockets of concentrated wealth in cities, and subsequently isolates the poor. This inequality creates greater disadvantages for the poor, as it removes access to important resources such as high quality education. On the opposite spectrum, it can also cause gentrification and force the poor out of their homes (Reardon and Bischoff 2011). This matters for upward mobility because Alan Krueger (2012) conducted a comparative study and coined the concept "The Great Gatsby Curve" to explain how countries with "greater inequality of incomes also tends to be the countries where a greater fraction of economic advantage and disadvantage is passed on between parents and their children" (Corak 2013, 8). This curve illustrates that, compared to most developed countries, the United States has significantly more inequality as well as more intergenerational elasticity (less mobility) than its Western counterparts such as Finland, Norway, Denmark, and Canada. The "American Dream" is alive and well—just not in the country that coined it. While this particular study only focuses on the variation of upward mobility within MSAs in the United States, it is useful to understand the larger global trends for possible future studies on upward mobility in a comparative context.

The most recent research on intergenerational economic mobility is by Raj Chetty, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez (2014). These scholars argue that geography has a significant effect on the opportunity to access upward mobility. Chetty et al. investigated potential mechanisms that contribute to the substantial variation in intergenerational economic mobility across regions of the United States. These variables included factors such as racial demographics, school quality, segregation, family structure, income inequality, local tax policies, social capital, higher education, labor market conditions, and migration. These scholars admit that while income inequality in the United States is increasing, the overall opportunities for upward mobility have not declined. They conducted a study of over five million households across both rural and urban areas in the United States in order to understand how society can improve economic opportunities for individuals from low-income communities. Their study argues that inequality has certainly increased as “the rungs of the ladder have grown farther apart, but children’s chances of climbing from lower to higher rungs have not changed” (2015, 141).

These scholars examined upward mobility in every metro and rural area in the United States, and captured the probability that a child born in the bottom 25% quartile income quarter of that area will be able to enter the top 25% quartile in their lifetime. Since this paper is studying access to upward mobility for the poorest and most disadvantaged populations in the United States, this is a practical measure for this study to consider utilizing. While these scholars did not evaluate causal mechanisms, they found five factors that strongly correlated with the variation in upward mobility. Many of these factors were similar to the existing theories of intergenerational mobility studied by other leading upward mobility scholars such as Solon and Black and Devereux.

First, the authors discovered that race played a significant role. Intergenerational mobility was considerably lower in areas with larger black populations. The authors suggest that two different mechanisms could drive this correlation—either black children on average had lower incomes than white children, or areas with large black populations just had lower rates of upward mobility for all races. Second, they found that areas with higher racial and income segregation tend to have lower upward mobility than more integrated communities, and pointed to many possible mechanisms for these results. Next, they affirmed the relevance of Krueger’s Great Gatsby Curve theory within the United States, as income inequality had a negative correlation with intergenerational economic mobility. Areas with high-income levels were not associated with large levels of upward mobility for individuals in the bottom 25% quartile. Additionally, there was a positive correlation between school quality and upward mobility, although it was not as strong as income inequality or segregation. The authors found that high class sizes were negatively correlated with upward mobility, as well as with the quality of the school. Next, social capital indices such as strong community networks lead to higher upward mobility opportunities, and consequently validated much of work of past scholars, such as Putnam (1995). The next variable, strong familial structures, particularly within married households, were correlated with stronger upward mobility levels than single households (Chetty et al. 2015). The variables they did not correlate with upward mobility were local tax policies, higher education, labor market conditions, and migration. Lastly, one of the strongest, and the most interesting correlations for this study, is that they found areas with less sprawl, and thus less commuting times, had significantly higher rates of upward mobility than areas with more sprawl. The authors did not elaborate on this point, but it provided an interesting statistic that this study seeks to further evaluate.

Chetty et al.'s study, along with the other previously mentioned scholars, has made great strides to paint a descriptive picture of intergenerational economic mobility over the span of America's history. However, these studies also reveal that there are many possible answers to explain the variation of upward mobility in the United States, and very few, if any, known direct causal mechanisms associated with upward mobility. While these other areas can be further elaborated in future studies, this study narrows its focuses on contributing to this scholarship by exploring another explanatory variable: public transit accessibility. While Chetty et al (2014) piece briefly provided a statistic indicating how more sprawl was negatively correlated with higher upward mobility levels, but it did not expand upon this, and it is relatively absent within the scholarship on upward mobility.

Access to public transportation provides a population physical mobility to access goods and services more efficiently. As described earlier, it is a relatively intuitive concept: by increasing access to reliable transportation methods, more people will have access to a greater quantity and quality of economic opportunities. With increased access and choice, individuals are able to access higher income opportunities and save time commuting to work. This saved time cost might lead to parents having more opportunities to provide their children attention at home (Weisbrod and Reno 2009). Chetty et al. reinforces this concept, as strong familial engagement has already demonstrated to be correlated positively with increased chances for upward mobility.

Increased transportation might also lead to better access to higher quality schools, medical services, housing, and community resources— all factors that are associated with goods in higher income quartiles (Weisbrod and Reno 2009). This could directly counteract the effects of income segregation that is caused by increasing income inequality. Furthermore, investments in public transportation have been found to lower business operating costs for communities. This allows businesses to increase local worker wages and consequently trickle down to some greater household incomes to benefit families in various capacities (Weisbrod and Reno 2009). All of these factors correlated with upward mobility are theoretically tied to benefits of increase public transportation access.

Critics may question whether transportation accessibility leads to economic performance, or if the causal pattern is reversed. Does transportation accessibility lead to increased economic performance and consequently higher upward mobility? Or, is it that high economic performance and upward mobility leads natural free market mechanisms to create more transportation accessibility? This is an important question, because it highlights the political implications of whether or not funding transportation infrastructure initiatives leads to higher upward mobility levels. Existing research does not provide a clear answer. However, studies by Andrew Haughwout (1999) does decisively indicate that, at the very least, funding more state infrastructure projects help redistribute economic growth across a given region. This paper does not advocate that access to public transit is the sole, or even the primary, variable that explains upward mobility. Instead, it posits that access to public transit is an antecedent variable— it provides individuals opportunities for more economic opportunity, and thus raises their chances to attain upward mobility and grasp the American Dream.

HYPOTHESES

This study asks the broad question of why there is such a robust variation of intergenerational economic mobility across the United States, and what factors could increase opportunities for more Americans to attain upward mobility within their lifetime. It potentially answers this by examining to what extent access to public transportation affects intergenerational economic mobility. This study tests whether access to public transit has a statistically significant correlation with upward mobility. Drawing from the literature and theoretical framework, this study employs the following hypotheses:

- **H1**: Greater access to transportation methods in MSAs will have a positive correlation with higher levels of absolute economic intergenerational mobility.

- **H2**: Greater access to transportation methods in MSAs will have a negative correlation with higher levels of relative economic intergenerational mobility.
- **H3**: When income inequality and racial segregation are controlled for, greater access to transportation methods in MSAs will have a positive correlation with higher levels of absolute economic intergenerational mobility.
- **H4**: San Francisco's high absolute upward mobility measure is positively correlated with its superior transportation accessibility.

RESEARCH DESIGN

This study utilizes a mixed quantitative and qualitative approach to explore these hypotheses. First, I conducted a quantitative study to examine general patterns of how public transportation accessibility correlates with intergenerational economic mobility in the United States. This provides a broad understanding of how these variables interact, and if any generalizations can be made. In the quantitative section, I utilize existing data provided publicly through scholars, institutes, and the federal government, and re-organize these data sets to fit the parameters of this study. I ran analytical and regression tests to test the relationships between public transit accessibility and upward mobility.

This mixed research design is a combination of both inductive and deductive processes, but ultimately the qualitative case study complements the the quantitative results. It has several advantages. First, the quantitative section only captures a glimpse of the relationship between public transportation accessibility and intergenerational economic mobility. A case study paints a more comprehensive picture of this relationship. Additionally, it is important to note that the geographic unit of analysis used in the quantitative study is aggregating the effects of the relationship at a high level, so conducting a case study will help establish the strength of the relationship between these two variables. Second, the operationalization of these two variables lacks a certain precision given the data availability. For example, the measure for public transit accessibility includes data for the entire MSA statistical study as a whole, although the focus population of this study are individuals in the 25% income bracket. The case study checks upon the reliability of this accessibility measure by collecting its own data for accessibility for the 25% income bracket, and ultimately verifies whether it matches with the public transit accessibility measure used in the quantitative study. Thus, the case study creates a more accurate operationalization of these two variables by increasing both external and internal validity. This, in turn, provides a more meaningful contribution to the scholarship by better understanding the mechanisms at play.

In the next few sections, I outline the unit of analysis, the independent and dependent and control variables, and describe the methods of data collection and organization for the quantitative segment. I then move on to provide the same approach for the qualitative segment with a distinctive focus on the San Francisco, California MSA.

PART I: QUANTITATIVE STUDY

Unit of Analysis

The geographic unit of analysis in this study is the 'metropolitan statistical area' as constructed by the United States Office of Management and Budget (OMB). These geographic entities are defined as "county or counties or equivalent entities associated with at least one core (urbanized area or urban cluster) of at least 10,000 people in its population, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties with the counties associated with the core" (Office of Management and Budget 2013). This classification is the most appropriate unit of analysis because it precisely identifies the locations within regions with major economic hubs rather than identifying entities whose lines are drawn for purely governing and residential purposes. The purpose of this study is to study economic mobility levels based on access to transportation for economic opportunity, so it is important to utilize a geographic entity that focuses on areas of high economic integration.

Other options considered were measuring this relationship on an individual level, county level, precinct level, traffic analysis zone level, and the commuting zone level. All of these units of analyses had merits, but ultimately the MSA was the most appropriate for the scope of this study. I chose not to scale down to any smaller units of analysis (counties or precincts) because it would have complicated the interpretation of the upward mobility statistics, by constricting the generalizability of the measures and adding in more variables, outside of the independent variable, to explain the dependent variable. Ideally, it would have been helpful to be able to use traffic analysis zones (TAZs) in this study as it would have balanced the ability to more precisely measure the relationship between the two variables while still being being broad enough to generalize across TAZs across the country. However, the data for upward mobility was not readily available in TAZ form, and would be a great option for future studies. I chose not to scale up to commuting zones[2] for also practical reasons. While it would have been a more comprehensive unit of analysis, the format of the independent

[2] A commuting zone is considered a comprehensive geographic unit that evolved from the MSA measure. The difference between the two is that commuting zones also includes rural areas, and thus better captures the economic and social activity of the United States (Office of Management and Budget 2015).

variable's data set was limited to MSAs. The dependent variable data was originally formatted to cater to commuting zones, but also included county-level and MSA level data. Lastly, because I wanted to study the relationship between these two variables across the United States, collecting data on the individual level was not the most feasible option. However, I utilize individual level data in the qualitative case study in order to verify if the larger unit of analysis, the MSA, can be generalized and applied accurately to the individual level. This is important to do because this study ultimately serves to provide statistical basis to support substantive consequences on an individual level. Overall, the MSA was the best unit of analysis for this quantitative study.

For similar reasons, this study limits its focus and analysis to the forty-five of fifty largest (population) MSAs in the United States out of a total of 381 MSAs. Four MSAs (Jacksonville, Memphis, Oklahoma City, and Richmond) could not be included because of the lack of transit data available. The last unavailable MSA was St. Louis, MO, because it was not included in the data set provided by Chetty et al. I also chose to select only fifty MSAs because of the reality behind building public transportation systems. In the United States, there is a considerable amount of sprawl, and public transportation projects are only worth the financial costs in areas with high population densities.[3]

Dependent Variable

The dependent variable focuses on relative and absolute intergenerational economic mobility from 1996-2012, and is derived from Chetty et al (2014). The dependent variable

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[3] It would be interesting to conduct a study on every MSA in the United States. This is a potential area for future research with a wider net of transportation methods included (private and public modes of transportation as well as the increasingly popular shared-ride services).

gauges the "intergenerational" time period, because it most accurately encompasses the "spirit of the American Dream, in which each generation is expected to do better than the one that came before" (Isaacs, Haskins and Sawhill 2013, 2). In other words, it gauges how much a child's income is influenced by his or her parents' income. Additionally, this study analyzes both relative and absolute mobility.

Relative mobility

There were multiple measures under consideration for relative mobility, which is a measure of immobility . Solon (1999) first introduced a measure called intergenerational income elasticity, which is the mean elasticity of a child's rank in the income distribution with respect to the parent's rank in the income distribution, and only includes representation for individuals with over zero income. Mitnik et al (2014) proposed a new measure of intergenerational mobility, which concentrates on the incomes at the bottom of the economic ladder by transitioning from using the person-weighted average to a dollar-weighted average of elasticity, and thus increases representation for individuals at the bottom bracket without destabilizing the statistical models. Clark (2014) captures estimates of upward mobility by tracking the averages of income of surnames, with the objective of measuring "status." By analyzing multiple generations and focusing on professional occupation, Clark identifies another proxy for the traditional income-weighted measure for upward mobility. Chetty et al (2014) departs from the intergenerational elasticity model and introduces a rank-rank slope measure to study relative mobility. The rank-rank slope measure is the joint distribution of a child's income rank and his or her parents' income rank, and differs from intergenerational income elasticity by accounting for more income inequality and not including the marginal distributions of the parent and child incomes. Thus, for the purposes of this study, the rank-rank slope is used to represent relative mobility by capturing the extent to which upward mobility is limited. Essentially, if the slope is at 1, relative mobility is at 0 and indicates that the parent's background would have no significance on the child's future income outcomes. On the contrary, if there is no intergenerational mobility whatsoever, which would mean the slope is closer to 0 and relative mobility is at 1, then that would mean a parent's background completely determines the income outcome of the child: wealthy children will become wealthy adults, and poor children will become poor adults. Thus, lower levels of the rank rank slope signify that there is a higher probability of children being able to move outside the income quartile they were born into. While wishing to maintain consistency with established scholarship in this field, this study focuses on absolute mobility for its primary dependent variable.

Absolute Mobility

While relative mobility compares incomes from children in the lowest-income families to the highest-income families, absolute mobility focuses on the outcomes of children from families from a particular income level, and ranks children based on their incomes relative to other children in their same birth cohort. Absolute mobility is the mean income rank of children whose parents' incomes were in the 25th income quartile and is linear to the rank-rank slope measure developed by the Chetty et al (2014). Higher levels of absolute mobility mean that there are higher levels of intergenerational economic mobility. This measure is of more interest to this study because it focuses on the poorest population of the United States, otherwise categorized as the bottom 25% income quartile. The IGE metric does not allow data to account for people with no earnings which is problematic for a study trying to capture the bottom 25%. Additionally, relative mobility is highly influenced by income inequality unlike absolute mobility which focuses on one particular income level at a time. Regardless, the data have indicated that absolute and relative mobility still tend to indicate the same patterns of spatial variation, so it should not be a source of major concern. For example, in Charlotte, the relative mobility was 39.7%, while the absolute mobility was 35.8%. (Chetty et al 2014). It is useful to utilize both measures to be comprehensive.

The Chetty et al (2014) data on intergenerational economic mobility are publicly available online as part of The Equal Opportunity Project funded by Harvard University. The authors created this measure by collecting income and zip codes from federal income tax returns and W-2 forms filed from 1996, when the cohort of children they are examining were approximately 14-16 years old. The authors tracked the children and their IRS tax returns and W-2 forms until they reached age 30, and compared their incomes to their parents. More specifically, the authors narrowed their study to measure only those children in 1996 who were born after the 1980 birth cohort[4]. They focused on measuring children born in the lowest 25% quartile, and capturing the percentage who were able to reach the top 25% quartile by age 30. While there are 44 million children in the entire sample, after sorting out children that met the three standards[5], there was a total of 10 million children included. The authors accounted for biases regarding capturing data of children at a young age (lifecycle bias) and parents at an old

[4] The authors only included children born after 1980 birth cohort and later, because for earlier cohorts the children were already 17 and beginning to leave the household.

[5] The core sample includes all children who were (1) born in the 1980-82 birth cohorts, (2) had parents that were able the identified, and (3) had a mean parent income between 1996-2000 that were strictly positive.

age (analogous lifestyle bias), and found that these biases had little statistical support to misrepresent the phenomenon at hand.[6] For the purposes of this study, I sorted through the 381 MSAs, and pulled forty five of the fifty largest units of analysis. Table I presents them in alphabetical order:

[Table I here]

Independent variable

The primary independent variable in this study is the accessibility of public transportation within these commuting zones. Focusing on the lowest 25% income quartile, this study focuses on public transportation since it is the most accessible method of transit, as it is generally the least expensive method of transportation in the United States. It is intentionally leaving out transportation methods of cars, and private shared ride services. Cars were left out of this study because while it is the most frequented method of transportation to commute to work by Americans, the scope of this study is narrowed to the poorest populations, who are not often able to have the means to afford a car even if they desperately need one. Shared ride services such as Uber and city bike programs were also intentionally left out, because while they are increasingly lessening the costs of private transportation methods, they are not scaled down enough to be accessible for the poor. Recent data from the 2014 Capital Bikeshare program in Washington D.C. indicated that the demographic that dominated the use of this program was overwhelmingly Caucasian (84%), and only 16% of the Bikeshare participants reported having incomes less than $50,000 which is well above the 25% bottom income

[6] The data is available in both Excel and STATA form and was easily exported for the uses of the quantitative segment of this study.

quartile (LDA Consulting 2015). This data reinforces how these programs are not accessible to the population in this study.

This study measures transportation systems'' effectiveness by measuring how accessible it is. Accessibility is considered by transportation experts, such as Victoria Transport Policy Institute, as the "ultimate goal of transportation" (Litman 2011, 5). Ideally, accessibility would encompass the three-part definition of "accessibility" employed by Mamun and Lownes (2011): "(1) trip coverage - travelers would consider public transit accessible when it is available to and from their trip origins/destinations, (2) spatial coverage - travelers would consider public transit accessible when it is within reasonable physical proximity to their home/destination, and (3) temporal coverage - a service is accessible when service is available at times that one wants to travel." There were various options to consider when deciding how to operationalize accessibility. Possible options included mimicking Chetty et al's measure of commuting times using the U.S. Census Bureau data and Census Transportation Planning Products data from the American Association of State Highway and Transportation Officials (AASHTO). However, after evaluating numerous data sets, I chose to operationalize the independent variable using data from the Accessibility Observatory within the Department of Civil, Environmental, and Geo-Engineering at the University of Minnesota because it was the most comprehensive and most closely matched accessibility as I was trying to define it.

The authors of the study, Andrew Owen and David Levinson (2014), created an accessibility metric by pulling data from the following sources: U.S. Census TIGER 2010 data sets, U.S. Census Longitudinal Employer-Household Dynamics (LEHD) 2011 Origin-Destination Employment Statistics (LODES), OpenStreetMap (OSM), and General Transit Feed Specification

(GTFS) schedule data from transit operators. Before creating the score, the authors divided the MSAs into smaller "analysis zones" that are no larger than 5,000 Census blocks. They prepped MSAs into more organized units in order to precisely capture origins and destinations within a given MSA, which they deemed "unified pedestrian-transit network graphs" (Owen and Levinson 2014).

After creating these network graphs, the authors evaluated transit travel times[7] by capturing data between 7 and 9 AM (commuting time) at one-minute intervals, and captured unique travel times from each Census block based on a detailed pedestrian networks[8] and available transit schedules[9]. These travel times capture how many job opportunities are reachable from each origin within 10, 20, 30, 40, 50, and 60 minutes, which is then averaged. After the average accessibility score is calculated, it is then weighted by the number of workers in each block, and then finally weighted for MSA to get the public transportation accessibility score.

It is important to note that the travel time includes the time traveling from an individual's home to the transit stop, the time waiting for the transit vehicle to come pick the individual up, the time spent on board the transit vehicle, any time waiting for a transfer, and the time spent traveling from the final transit station to the final destination. It should be emphasized that the authors assume that all individuals are walking when they are not taking the transit vehicle, and walking at a speed of 5 km/hour. Additionally, the transit time is derived by assuming there is no traffic and the published transit timetables are accurate.

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[7] Travel time calculations are captured by using the OpenTripPlanner (OPT) software, which is a graph-based transit routing system that included road, pedestrian, and transit facilities.
[8] The authors collected this using Open TripPlanner.
[9] The authors collected this data using GTFS.

I downloaded the publicly available information from the Accessibility Observatory website (Owen and Levinson 2014) under the Methodology tab. The data were easily exported into Excel as it was available in both CSV and Shapefile formats. The data were organized with each MSA individually filed under its Census designated number. Within each file, Owen and Levinson included the Census block ID, the travel time threshold in minutes, and the total number of jobs reachable for each individual network graph within that MSA. For the purposes of this study, I averaged all of the data of each network graph in order to get an average travel time threshold and total number of jobs reachable for MSA statistical study. For all the MSAs, the average time threshold is 30 minutes. The average total number of jobs reachable serves as the operationalized variable for transportation accessibility in this study.

Control Variables

To better understand the strength of the relative relationship between mobility and access to public transit, this study included two control variables: income segregation and racial segregation. Based on the existing literature, these are two explanatory variables that have the strongest correlations with upward mobility. I also chose these two particular variables because they were able to be converted into data sets that fit the scope of this study. Both of these variables were derived from the US2010 Project sponsored by the Russell Sage Foundation and the American Communities Project of Brown University.

The first control variable, income segregation, is one of the most negative consequences of income inequality, and has been covered extensively by scholars in this field such as Corak (2013) and Chetty et al (2014). Using data from Reardon and Bischoff (2011), income segregation is operationalized using the 2000 U.S. Census data. These authors organized families in metropolitan areas into several income categories: poor (median income ratio less than 67%), low income (median income ratio between 67% and 80%), low-middle income (median income ratio between 80% and 100%), high-middle income (median income ratio between 100% and 125%), high income (median income ratio between 125% and 150%), and affluent (median income ratio over 150%). To create the variable for income segregation, the authors then calculated the proportion of families living in poor and affluent neighborhoods. Reardon and Bischoff (2011) organized the data into counties and metropolitan areas for the 117 most populated cities in the United States. For the purposes of this study, I reorganized the data to fit the forty-five MSAs. Thus, in the data analysis, a higher measure of income segregation should be correlated with less upward mobility.

The next control variable, racial segregation, measures the percentage of the population that consist of non-Hispanic blacks. In the data, Hispanics were identified as their own independent group. Scholars in the literature, particularly Chetty et al, found that areas with higher populations of blacks had lower upward mobility. Thus, for this measure a higher percentage of blacks in a MSA should be correlated with a less upward mobility. To create this measure, Logan (2011) used data from the 2000 U.S. Census. Similar to the method for income segregation, in order to create the variable for racial segregation, I reorganized the data to fit the forty-five MSAs examined in this study.

Data Analysis

In this section, I tested for the first three hypotheses. Hypothesis 1 predicted that the explanatory variable, higher levels of public transit, will lead to higher levels of absolute mobility. There is a strong positive correlation coefficient of 0.44, and with a p-value of 0.002, there is also statistical significance for this correlation. The scatter plot below (Figure I) shows that there is a positive linear relationship between these two variables, and consequently supports Hypothesis 1. These results indicate that compared to their peers in the same income rank across different MSA's, the more accessible public transportation is for the poorest individuals in a given MSA, their chances of rising to the highest income quartile is more likely.

[Figure I here]

Next, I tested Hypothesis 2. Hypothesis 2 predicted that the explanatory variable, higher levels of public transit, will lead to lower levels of relative mobility. The correlation is a weak negative correlation coefficient of -0.19. Although it does follow theoretically with the hypothesis, it has a p-value of 0.1881. This indicates that it is not statistically significant. The scatter plot below (Figure II) visualizes this relationship between these two variables. Consequently, the data rejects Hypothesis 2.

[Figure II here]

To test Hypothesis 3, absolute mobility, the primary dependent variable in this study, is used as a measure of upward mobility. I ran a multivariate regression with absolute mobility modeled by public transit accessibility, racial segregation, and income segregation. The multivariate regression yielded an adjusted r-squared of 0.45, with income segregation and racial segregation being statistically significant with p-values smaller that 0.05, while public transit accessibility was not statistically significant. According to this regression, every increase in racial segregation increases chances for mobility by 3.94, and an increase in income segregation results in a decrease in mobility by -5.34. These results do not support Hypothesis 3, as it indicates no empirical support for public transit accessibility. However, it does confirm that the theory for racial segregation and income segregation are supported by the data. The scatter plot matrix below (Figure III) visualizes the mentions relationships.

[Figure III here]

Thus, these tests indicate that Hypothesis 1 is supported, as there is a statistically significant correlation between absolute mobility and access to public transportation. However, after controlling for racial segregation and income segregation, the significance of public transit accessibility could not be determined. This means that while there is statistical evidence to support that public transportation accessibility does play a role in increasing chances for upward mobility, it is not stable when accounting for other variables. Figure IV and V outlines these results in two tables.

[Figure IV, V here]

However, this does not necessarily refute the theory presented in this study. This study posits public transit accessibility as an antecedent variable that acts as a vehicle for other direct factors, such a racial and income segregation, to foster upward mobility. With that in mind, these results provide general support for the assertion that in cities with higher levels of access to public transportation, the probability for children born in the bottom 25% income quartile to reach the top 25% income quartile increase. This study will dive into the political implications of this later, but first the next section will test Hypothesis 3 through a qualitative case study of San Francisco, California.

PART II: QUALITATIVE STUDY

The motivation behind conducting a case study is to dive deeper into one of these forty-five MSAs, and test Hypothesis 4. In doing so, I hope to address two objectives. First, I am interested in exploring whether this in depth study verifies the quantitative data, or provides additional information to question the results. Second, while the quantitative data illustrated the existence of a significant positive relationship between upward mobility and public transit accessibility, this section is dedicated to explain more of *how* mechanisms drive the existence of this relationship.

This case study is organized as follows: the first section will explain the justification for selecting the San Francisco MSAs for this study. The next section will provide a comprehensive background of this MSA as well as its public transit system. This is done in the hopes of isolating the mechanisms that drives the high levels of public transit accessibility and the high upward mobility levels. The third section will explain the methodology of collecting primary data in this MSA study. The last section will analyze the data and provide general insights on the data collected, as well as how it fits with the results of the quantitative data.

Case Selection

To begin, the San Francisco MSA includes San Francisco, Oakland- Hayward. As explained earlier, this geographic unit includes the core economic hubs in relation to San Francisco. The figure below provides a geographic visual of this MSA (DMEPOS 2014).

[Figure VI here]

I chose to study San Francisco, California for both practical and intellectual reasons. First, it is the city I am currently residing in and serves as a practical choice. However, it also has one of the highest levels of upward mobility with Chetty et al (2014) ranking it as the second city with the highest upward mobility (12.2%) within the fifty largest cities in the United States. Thus, it is a unit of analysis that falls within the general relationship between the upward mobility and public transit accessibility, and can provide insight that may be indicative of other MSAs that are fall in this group. Another reason to study the San Francisco MSA is because it has one of the most accessible transportation systems in the country. Owen and Levinson (2014) ranked San Francisco as the second city with the most accessible transportation system. Lastly, from the upward mobility literature by Chetty et al (2014) and other scholars, income inequality is one of the most studied variables that is predicted to derail opportunities for upward mobility. However, San Francisco is considered to be one of the most expensive places to live, and the gap between the poor and wealthy is one of the highest in the United States. In 2013, the affluent in San Francisco topped the Brookings Institution list of top earners with the highest income within the 95th percentile income bracket in the United States (Berube and Holmes, 2015). By doing a case study, I am also able to dig deeper into other variables, such as income inequality, that may be significantly affecting the relationship between public transit accessibility and upward mobility. Ultimately, this case study serves to complement the quantitative section and explore whether it is properly capturing the relationship between these two variables.

It is important to consider that this case study will be utilizing data from March 2016, while the data was used in the quantitative section is collected from 2014 and 2012 for public transit accessibility and upward mobility, respectively. When conducting this case study, I am as transparent as possible about any significant changes that may have occurred to skew the data, but there generally have not been any significant changes in income, infrastructure creation, or demographic trends to cause any concern about making any generalizations from this case study to the quantitative results.

Background

SAN FRANCISCO METROPOLITAN STATISTICAL AREA

As of 2014, the San Francisco MSA includes three distinct divisions with a total of five counties: San Francisco (Marin county, San Francisco county), Oakland-Hayward –Berkeley (Alameda county, Contra Costa county) and San Rafael (San Mateo county). This MSA is part of the larger nine county “San Francisco Bay Area” which also includes the San Jose, California MSA (Office of Management and Budget, 2013). Prior to 2013, this MSA was called San Francisco-Oakland-Fremont, but because of the higher population, Fremont is now included within the Oakland-Hayward-Berkley division as a smaller city within Alameda county. Thus, this geographic entity has stayed fairly consistent for the cohort that is being studied (children born in 1996, and compared to their incomes in 2012). The 2013 census estimated the population to be around 4,594,060 with a density of 1,825 people per square mile This makes this MSA the eleventh most populous in the United States.

As of 2014, this MSA is mostly comprised of young white individuals. According to the Census Reporter (2014) the median age is 38.6 years old, and 41% of its citizens are white. 25% of the population are Asian, 22% are Hispanic, 7% of individuals are black, 4% are mixed races, and the remaining 1% are Islanders. As mentioned previously, income inequality and concern for the neediest population in San Francisco is a critical issue. While the median per capita income is $43,924, over 30% of individuals make under $50,000 while $14.5% make over

$200,000 (Census Reporter 2014). As mentioned previously, San Francisco topped the Brookings Institution list of top earners with the highest income within the 95th percentile income bracket in the United States with earnings at least $423,000 (Berube and Holmes, 2015). This income gap is frequently cited in policy reports and news sources. For example, Thomas Fuller (2016) wrote a feature in the New York Times about the city's alarming homeless population caused by the extreme income inequality in the region. Geographically, there aren't general assigned areas where the affluent live and where the poor live, but instead there are pockets of extreme wealth and extreme poverty. The map below (Figure V) illustrates this visually (Shifflet 2011) by indicating the percentage of individuals in this MSA living in poverty.

[Figure VII]

According to this visual map, the most notable affluent pockets are in Marin County, as well the Presidio, The Castro, Noe Valley and Diamond Heights neighborhoods. The poorest neighborhoods, which more than 35% live in chronic poverty, include East Oakland, a pocket in Richmond, and Bayview-Hunter's Point. For the rest of the MSA, most of it seems to waver around 8-20% of its residents living in poverty, with no clear neighborhood lines that define whether it is wealthy or not. This may because of the relatively small size of the San Francisco MSA (Glantz 2011).

However, while the income inequality is highly prevalent in this MSA, San Francisco is also exceptional in that from 2012-2013, it topped the list as the number one place in the United States where low-income households made the most significant income gains (Berube and Holmes 2015). Census Bureau data indicate that in that year, there was a 15% increase in income among the lowest income quartile, jumping from $21,500 to $24,800. Of course, these data do not include insights on gentrification and whether these poor households are simply being pushed out of the area (Berube and Holmes 2015). With this mind, it is still interesting and provokes the following questions: How is that the San Francisco area is a place with increasing rates of income inequality, as well as a place where the neediest have the best chance to improve their economic position? What role does public transit accessibility play in helping these populations improve their economic positions, and to what extent? In the next section, I focus on examining these questions.

PUBLIC TRANSIT SYSTEM

The San Francisco, CA MSA had a population of roughly 4,594,060 in 2014. Within this population, 9% use public transportation to commute to work (Census Reporter 2014). While this may seem like a small percentage of the population, data and surveys indicate that transit ridership within this MSA is steadily increasing and it is a popular transportation method in the Bay Area. For example, Reuben Fischer-Baum (2014) found that the data from the Federal Transit Administration ranked San Francisco as the second most utilized transit system in the United States. As supported by the theory and data provided in this study, there is clearly a relationship between this high quality public transit accessibility and the ability of individuals to attain upward mobility. In San Francisco, the phenomenon is very apparent: as previously mentioned, each year, individuals from low-income communities are making significant economic gains. However, part of the objective of the qualitative study is to examine whether this study can help establish causality: Does the historical time frame support that accessible public transportation systems play a role in explaining this phenomenon? While the lack of data hinders the ability to meticulously track a timeframe to mark when exactly income levels for the bottom 25% quartile, the general pattern of transit development does align with the increasing growth of the incomes in this quartile.

The transit system in this MSA includes an intricate portfolio of transit agencies and vehicle platforms that work together to provide one of the best transit services in the country, for what that is worth. A Brookings Institution report ranked the San Francisco-Oakland-Hayward area as the 16th most job assessable metropolitan area in the country, with 35% of jobs reachable via transit within 90 minutes. Additionally, it noted that the transit stations provided coverage for 98% of low income areas, 97% of middle income areas, and 81% of high income areas. The low income areas had the highest levels of job access at 44%, compared to middle income and high income areas, 34% and 26% respectively. The visual below, Figure VI) shows how accessible this area is compared to other regions (Berube, Kneebone, Puentes and Tomer 2011).

[Figure VIII here]

In this metropolitan area, there are two main transportation platforms: Bay Area Rapid Transport (BART), and the San Francisco Municipal Transportation Agency (SFMTA). There are also multiple public and private ferry services and cable car services, as well as the federal Amtrak system within the Bay area, but for this MSA these are the two transit agencies relevant to study. This study is also not including the private shuttle services that are free to the employees of the private companies, such as Google Bus, PresidiGo, and the Genentech shuttles. The figure below provides a visual of transportation layout in the region.

[Figure VIIII here]

The BART is considered the primary heavy rail system that began running in 1972, to the Daly City, Concord, Richmond, and Fremont areas. In 2003, BART went through a major expansion project to include stations at the San Francisco airport, San Bruno, Millbrae, and South San Francisco. Current plans include expanding services to further down in the Peninsula, where Silicon Valley is located. This may cause two effects: (1) More poor residents being pushed out of the city due to gentrification of Silicon Valley workers moving into the city due to this new line, or (2) the poor being able to further increase their relative incomes by being able to stay in the Bay Area by moving to the suburbs in southern Peninsula, since they will be able to access jobs in the city if they move where there is more affordable housing (San Francisco Transit History 2016).

The SFTMA is a department of the San Francisco government that oversees the Municipal Railway (MUNI), as well as other traffic and parking and taxi regulations. MUNI itself includes a series of cable cars, street cars, trolleys, hybrid buses, and light rails that run all over the city and in conjunction with the heavy rail lines. It is also the first major, publicly owned transit agency in the United States. In 2012, a study by the agency revealed that over 173,0500 riders use one of their transit lines per day. As of the latest number available on their website in March 2016, there are 151 light rail vehicles, 86 hybrid buses, 495 diesel buses, 333 electric trolley buses, 151 streetcars, 26 historic streetcars, and 40 cable cars. Progressively through history, MUNI has been increasing the number of their fleet and their lines to increase access across the Bay area. In particular, their motor buses operate within 2 blocks of 90% of all residences in the city, and some operate 24 hours a day (San Francisco Transit History 2016).

These numbers, and their continued infrastructure growth to increase accessibility, support the causal relationship between these two variables indicated from the quantitative study.

In order to supplement this information and strengthen the data, I conducted a real-time case study to test two concepts: (1) Does the real-time experiences of using the San Francisco MSA's public transit align with the levels of accessibility asserted by the data? (2) Does this real-time experience indicate any significant variables that need to be considered, but have been left out?

Case Methodology

For this case study, I tracked my experiences commuting on public transit from a residential area with the lowest income levels to an area of high economic activity in the San Francisco MSA. Since this study focuses on upward mobility for the poorest population, this case study catered to this population. As mentioned earlier, one distinct area with chronic poverty in this MSA is Bayview/Hunter's Point, which is located in the southeastern corner of San Francisco. This will serve as the home base (which I will refer to as the "origin"). Using Google Maps, I located the center of Bayview/Hunter's Point which is the neighborhood around 1250 La Salle Avenue, San Francisco, CA 94124. As for my "work" destination (which I will refer as the "destination") I chose the center of the Financial District in downtown San Francisco, as the Financial District is main economic hub in this MSA. The center of the Financial District is the intersection of Sacramento Street and Battery Street. The closest work institution from that street intersection is One Embarcadero Center, which houses multiple companies and organizations, and will consequently serve as my destination.

For the accessibility measure created by Owen and Levinson (2014), they collected data for their public transit accessibility measure on a Wednesday. To stay consistent, I conducted my case study on Wednesday, March 16, 2016. According to the American Community Survey through the U.S. Census Bureau, the average time Americans choose to leave for work is between 6:00am – 7:00am (American Community Survey 2014). Assuming that most people work an eight-hour work day that's begins at 8:00am that includes a one- hour lunch break, then the time to leave work is at approximately 5:00pm. Based on this information, I left the origin point at Bayview/Hunter's Point at 6:30am, and I left the destination at 5:00pm. During all points where I am walking, I utilized the "step tracker" on my Fitbit to measure how many steps it took to walk. I also kept track of the amount of time it took to walk. Additionally, I counted the time waiting at the transit stop, the time spent inside the transit vehicle, the time waiting for a transfer, and the time and steps walking from the transit drop-off point to the destination. I also kept track of the monetary costs of this travel.

According to the Google Maps, the entire commute should take 45 minutes to travel approximately 4.9 miles, and cost $2.25 to use the following route:

- Walk from origin point to the closet bus at La Salle Ave & Osceola Dr. (2 min)
- Wait for Bus 54 (Undetermined time)
- Take Bus 54 for seven stops to New Hall & Hudson SW-FS/BZ (5 min)
- Walk to Hudson Ave & 3rd St (1 min)
- Wait for the KT light rail, operated by SFMTA (Undetermined time)
- Take the KT light rail for 12 stops until Metro Embarcadero Station (25 min)
- Walk to destination (6 min)

To see a visual of this route, please refer to Figure VII below.

[Figure X here]

For the return commute back to the origin from the destination at 5:00pm, it would take 47 minutes, a slightly different route, and cost $4.20. The route would include:

- Walk from destination to Embarcadero Station (7 min)
- Wait for BART to Pittsburg/Bay Point – SFIA/Millbrae (Undetermined time)
- Take BART for 11 stops until Glen Park Station (11 min)
- Walk to Diamond ST & Bosworth St (1 min)
- Wait for Bus 44 (Undetermined time)
- Take Buss 44 for 24 stops to La Salle & Newcomb Ave (20 min)
- Walk to origin (3 min)

To see a visual of this route, please refer to Figure VII below.

[Figure XI here]

Data Analysis

On the morning Wednesday March 16, 2016 I left the origin at 6:37am. Walking from the origin to the MUNI bus stop (54) took less than a minute, and 298 steps. By the time I arrived at the bus stop, Bus 54 was already onboarding, so there was no wait time. While onboarding, I tapped my Clipper Card (which I previously bought) to pay the standard rate of $2.25. For MUNI, there is only a standard rate, unlike other transit agencies that may charge a variable fee depending on the distance a rider travels on that transit line. This is good for those individuals, such as riders from Bayview/Hunter's Point that are traveling longer distances because they live farther from their work destinations. The bus ride was relatively smooth, and it was a rather full capacity. I noticed that the demographic of people on the bus tended to be very diverse, with no white/Caucasian individuals in sight. I also noticed that it was rather difficult to gauge when the stops were, as there was no visual map included in the bus, nor did the driver announce upcoming stops. I had to verbally ask when I should expect to get off the bus, which indicated a lack of accessibility. I was only on the bus for five stops, which took 4 minutes. When I got off the bus, I walked less than a minute and 324 steps to take the KT light rail, which is run by the SFMTA. I waited 11 minutes for the KT light rail to come, and once I got on it took 21 minutes to get to the Embarcadero station. During the ride, I noticed that there were not that many riders in my particular train. Among the riders, most were of Hispanic ethnicity, and mostly women. As the train made stops closer to the destination, the bus capacity filled up and the ethnic diversity of the riders also increased. Once I got off the train, it took me 11 minutes to walk from the station to the destination. The total trip took almost twice as long as the transit schedule/Google indicated, but it was definitely due to the congestion level at the Embarcadero station and on the streets.

Later in that same day, I left the destination at 4:59pm. It took 8 minutes and 769 steps to reach the Embarcadero station, which is 1 minute more than the predicted time by Google Maps. I also had to purchase a BART ticket, which is included in the time. Next, I waited 10 minutes for the appropriate BART train to arrive. While waiting, I recognized that it was a very busy time for BART riders, but it was a very well organized process. Trains came every 2-3 minutes (granted, for different lines), and riders would self-organize themselves into queue lines for the next train. Once I got on the train, it took 10 minutes and 11 stops for the train to get to my stop at Glenn Park. During the ride, I noticed subjectively that there was a considerable diverse ridership including multiple ethnicities, ages, sexes, and income levels. However, unlike my experience commuting from the origin, there was a much higher population of white individuals in the mix. By the time my train stop arrived, most of the riders had already left at previous stops. Once I got off the station, I paid my $1.95 fare and headed to my transfer at the MUNI bus stop, which took 1 minute and 321 steps. At this point, my public transit experience on this route had been fairly straightforward and efficient. However, the first MUNI bus (44) that came skipped over my bus stop, as there was construction around the bus stop and it had been moved to the next street corner. However, there was no sign or notice indicating this move, and frustrated many of the other riders trying to take Bus 44. However, the next bus came fairly quickly and the total wait time to take the transfer was 7 minutes. When boarding the bus, I noticed that not everyone swiped their MUNI bus card. While MUNI provides free services for the elderly and disabled, the bus driver did not seem to care that other individuals were not swiping their cards. I was on Bus 44 for 22 stops, and it took 18 minutes to reach my bus stop. During the ride, I noticed that the automatic voiceover that announced the stops was spoken in three languages (English, Chinese, and Spanish). This surprised me, as I took other MUNI buses in San Francisco and they did not offer these language services in their buses. This observation indicated that the individuals that ride this route were more likely to be minorities. When I got off the bus, I paid the $2.25 fare and walked for 2 minutes and 367 steps to the final destination. The total trip cost $4.20 and took approximately 55 minutes, which was the same cost but 8 minutes longer than the Google Maps/transit allotted.

My experiences commuting that Wednesday did confirm that the San Francisco MSA does have a considerably sophisticated transit model that includes multiple different transit agencies. While there were some hiccups in the system, such as not providing notice of the moved MUNI stop or indication of what stops are arriving on the BART/MUNI, it seemed to be fairly reliable. Within Bayview/Hunter's Point, there were many transit stations and bus stops sprinkled throughout the area, even though it was considerably more residential and sprawled than downtown San Francisco. Making transfers through different transit agencies was fairly straightforward and they took the same form of payment (Clipper Card), if you were proactive enough to purchase one ahead of the commute.

This brief commuting experience helped verify the reliability of the transit schedule data, and thus helped affirm the measure of accessibility developed by Owen and Levinson (2014) in the quantitative system. Additionally, this experience helped me understand the conditions faced by individuals living in areas of chronic poverty. First, from a superficial observation standpoint, the differences between the aesthetics and resources available in these areas compared to the affluent areas of the San Francisco MSA was very clear. Additionally, in Bayview/Hunter's Point, the ethnic diversity was noticeably more prominent. I was also surprised by the lack of accountability when it came to paying for the MUNI buses. In other areas I rode the MUNI bus, the driver and passengers checked the payment almost aggressively, but in this area there was a clear air of apathy. This indicated while these services are still accessible for these individuals from the unspoken understanding to not pay for these services, these services on their face may still not be accessible enough. It would be helpful to conduct the same methodology in a city that had low public transit accessibility to compare and contrast, but that will have to be done in a future study. Overall, this case study helped provide evidence that the quantitative data results can be accurately applied to the individual level.

CONCLUDING NOTES

There are many avenues to interpret the results of the study. The positive correlation between public transit accessibility and absolute mobility measures indicate that there is a relationship, albeit not significant when controlling for other factors. The case study on San Francisco, California's MSA provides a more nuanced perspective to interpret these results, but ultimately supports the results of the quantitative data. With these results in mind, the next logical step is to ask the following questions: Can these results be interpreted into real policy decisions, and if so how? From these results of this study, how can we expand upon this research to further understand how to increase upward mobility opportunities? The next two sections of this study proceed to answer these questions.

Policy Implications

On the surface, the results of this study provide encouragement to public transportation advocates: to increase upward mobility opportunities, simply build more accessible public infrastructure systems. While there are many other variables that contribute to upward mobility, and while this study did not go as far to establish a causal relationship between these two variables, the data use comprehensive and timely indicators to support the impact of public transit. Theoretically, the simple solution is to build more accessible public transit systems. Of course, theoretical solutions are much easier developed than implemented. Thus, before considering the policy implications, it is important to understand the reality behind the politics of public transportation in the United States.

Paul Krugman asserted that “our inability to invest [in public transportation infrastructure] doesn’t reflect something wrong with “Washington”; it reflects the destructive ideology that has taken over the Republican Party” (Krugman 2014). While Krugman’s statement edges on a sensational note, it is clear that in the 21st century the two main political parties in the United States diverge on the issue of funding public transportation. For example, the American Recovery and Reinvestment Act of 2009 was signed into law based on the Keynesian idea that governments should invest more in public goods than in the private sector during times of recession. The voting pattern among Congressional members illustrate the stark ideological divide over how the budget should be appropriated: 96% of Democrats approved the bill while a stunning 0% Republicans voted in favor of it (Office of the Clerk of the House of Representatives 2009). Additionally, when President Barack Obama proposed a $28.5 billion investment for commuter rails across the country, it failed with the Republican majority voting it down 21-30 (Sarlin 2015).

These voting patterns align with the press releases and official party platform of the two parties. The 2012 Democratic National Committee platform highlights the importance of funding infrastructure to rebuild the American economy:

We support long- term investments in our infrastructure. Roads, bridges, rail and public transit systems, airports, ports, and sewers are all critical to economic growth, as they enable businesses to grow. That's why President Obama and Democrats in Congress have enacted infrastructure investments that will sustain our Highway Trust Fund and provide states, U.S. territories, and communities with two years of funding to build needed infrastructure. These investments are critical for putting Americans back to work and strengthening America's transportation system to grow our economy (DNC 2015).

The Democratic Party fundamentally believes that investing in public infrastructure is necessary for economic opportunity, which is a pillar of the American Dream. However, the American Dream is a concept most Americans, of all different political ideologies, believe in. For example, the Republican Party has an entire section of their platform devoted to the importance of this concept, and asserts that “Republicans believe in the Great American Dream, with its economics of inclusion, enabling everyone to have a chance to own, invest, build, and prosper” (RNC 2015). Yet, the platforms of the two parties diverge on the role of public transportation in promoting equal opportunity among Americans. The official press releases from the Republican Party argues against raising funding for public infrastructure, and instead encourages investment by the private sector and emphasizing the role of the state, rather than the federal government, to foster opportunities to access the American Dream (Republican Staff Commentary 2011).

The stark divide between political parties on funding transportation projects is not limited to the national stage. In fact, the partisan divide is intensifying on the state and local levels, where funding public programs are usually bipartisan efforts. To illustrate this, in the state of Pennsylvania, the issue of funding transportation projects has become a contested topic between the left and right winged policymakers. In 2013, the legislature failed to pass a transportation infrastructure project for critical repairs to the state’s failing transportation system. Eric Boehm (2013) observed that “conservative Republicans voted against the bill to avoid being attacked for raising taxes, and because some genuinely do not think the state needs to spend billions on its highways and mass-transit systems."

In 2016, it is clear that the partisan gridlock also extends to public infrastructure programs. The ideological divide on this topic further illustrates the importance of this study as it helps provide theoretical support for building more accessible public transit systems. However, it is rash to automatically lend support for the pro-public infrastructure policies that the Democratic party generally supports. As the tension between the two political parties indicate, there are other important considerations in terms of implementation. When considering the budget and time to build public transit in the United States, local, state, and federal projects have taken excessively long periods of time to jump through the bureaucracy and labor laws to actually construct these transit systems (Smith 2012). Additionally, as this study focused on measuring this relationship within the top forty-five most populated MSA in the United States. Studies indicate transportation systems are only efficient in areas of high density, so building public transit systems can only be applicable in areas with large populations (O'Flaherty 2005). This limits the scope of which accessible public transit can affect Americans across the country. While the normative question of whether the country *ought* to build these systems is rather clear, there is a less convincing argument of whether it will be worth the cost and wait time if the final objective is to improve upward mobility. Investing in the other explanatory variables that increase upward mobility, such as education and initiatives to decrease racial segregation, may be less time-consuming and more cost-effective.

While these are the major criticisms to build more accessible public transit systems that may seem to lend support for the Republication policies, the argument for increasing public transit accessibility is still a practical policy possibility. A more strategic application of implementing the results of this study may be using it to build a case to enhance the accessibility of public transit systems that already exists. While this will still have considerable costs and take time, it is much more reasonable than building completely new transportation methods. Many transportation methods have the necessary infrastructure, but lack the political support to be fully utilized to best serve the most disadvantaged populations. This study reinforces the importance of public transit accessibility, as there is a clear relationship between these two variables. As indicated by the San Francisco MSA based statistical study, simply adding more bus routes or BART lines to the low-income pockets could make a considerable difference in increasing accessibility, and thus increasing opportunities for these individuals the physical mobility they need.

Future Research

There are many areas in which this study could be improved and further elaborated upon, and they can be separated into two categories: increasing the internal and external validity of this research; and broadening the scope of this research. I begin by addressing how future studies can improve the results studied in this present study. First, the operationalization of the independent, dependent, and control variables could be better expanded upon. As indicated by the San Francisco MSA case study, the way they were measured in the quantitative section do not fully capture the intricacies of the concepts they represent. For example, public transit accessibility could be improved by including a weighted component of how affordable the transportation method is, as there are considerable differences in each transportation method. Subsequently, it will be valuable to control for variables other than racial and income segregation. There are many other explanatory variables included in the upward mobility scholarship, and better operationalizing these variables to measure the relationship between public transit accessibility and upward mobility is something that should be prioritized. It would be helpful to further narrow the scope of the detail to capture more relevant information. In particular, the results of the study would be more accurate if we were able to manipulate the data to only include individuals that were considered to be in the lowest income quartile, rather than the entire commuting population as it is organized now. Lastly, it would be helpful to conduct more in depth case studies. The San Francisco MSA was chosen because it was a data point that followed the line of best fit and located at the high end of public transit accessibility and upward mobility. For contrast, it would be a priority to conduct a study on a MSA that was located at the low end of public transit accessibility and upward mobility, such as the Atlanta, Georgia MSA. It would also be helpful to conduct a case study for MSAs that seemed to be outliers to the general correlation, or deviated from the correlation coefficient. These measures would help provide meaningful contributions to enhance the results of this study. While these are a few areas that can be refined and improved upon, there are also many ways to broaden the results found in this study.

This study was limited to assessing how public transit could affect upward mobility for the poorest demographic in the forty-five most populated MSAs in the United States. While this does capture the part of the American Dream, it is also important and worthwhile to evaluate how public transit accessibility has an effect on other income brackets, most notably the low-income and middle-income classes. Since the majority of Americans fall within these two brackets, practical political support for building more public transit accessibility may depend on what the results indicate. Even though it is normatively warranted to build these transportation networks to help the poor rise, if public transit accessibility is not found to increase upward mobility for the majority of the other income brackets, it may not be a political reality. Additionally, in future studies it may be interesting to expand physical mobility to other transportation methods, i.e. cars and ride sharing platforms. This goes hand in hand with increasing the populations in question, as higher income brackets will have the financial aptitude to use these different methods. In this same vein, it would be interesting to evaluate how physical mobility affects areas that were not included in the forty-five MSAs. It raises the following questions: How important is physical mobility in rural areas compared to urban areas, and does it affect their chances of upward mobility? Most Americans do not live in urban areas, so it may be of interest to study areas with more sprawl. Lastly, it would be interesting to examine how physical mobility affects upward mobility in a comparative context. Many of the scholars, such as Corak (2013), have analyzed upward mobility across countries and so there are plenty of data on upward mobility available. It would be interesting to compare overall accessibility in the United States to other similarly developed countries, particularly in Europe and East Asia where their transit systems are regarded as some of the best in the world. Additionally, it would be interesting to evaluate how public transit accessibility impacts economic growth and upward mobility in developing regions of the world: does it help expedite development, or does increased accessibility to physical mobility at least help distribute the amount of success in these regions?

These are a few of the many possibilities on how to expand upon this research. This study explored a new relationship within the scholarly literature on upward mobility, and ultimately provided a foundation to continue further research between physical mobility and upward mobility. Other than adding to the scholarship, the results of this study have direct, real-life policy implications that can help build support for specific policy initiatives on local, state, and federal policy levels. By contributing a specific explanatory variable to better understand the larger scholarship on upward mobility, this study contributed a small, but significant, insight on how the United States can improve providing access to the American Dream.

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TABLES

TABLE I

MSA ID Number	MSA Name
12060	Atlanta-Sandy Springs-Roswell
12420	Austin-Round Rock
12580	Baltimore-Columbia-Towson
13820	Birmingham-Hoover
14460	Boston-Cambridge-Newton
15380	Buffalo-Cheektowaga-Niagara Falls
16740	Charlotte-Concord-Gastonia
16980	Chicago-Naperville-Elgin
17140	Cincinnati
17460	Cleveland-Elyria
18140	Columbus
19100	Dallas-Fort Worth-Arlington
19740	Denver-Aurora-Lakewood
19820	Detroit-Warren-Dearborn
25540	Hartford-West Hartford-East Hartford
26420	Houston-The Woodlands-Sugar Land
26900	Indianapolis-Carmel-Anderson
28140	Kansas City
29820	Las Vegas-Henderson-Paradise
31080	Los Angeles-Long Beach-Anaheim
31140	Louisville/Jefferson County
33100	Miami-Fort Lauderdale-West Palm Beach
33340	Milwaukee-Waukesha-West Allis
33460	Minneapolis-St. Paul-Bloomington
34980	Nashville-Davidson--Murfreesboro--Franklin
35380	New Orleans-Metairie
35620	New York-Newark-Jersey City
36740	Orlando-Kissimmee-Sanford
37980	Philadelphia-Camden-Wilmington
38060	Phoenix-Mesa-Scottsdale
38300	Pittsburgh
38900	Portland-Vancouver-Hillsboro
39300	Providence-Warwick
39580	Raleigh
40140	Riverside-San Bernardino-Ontario
40900	Sacramento--Roseville--Arden-Arcade
41620	Salt Lake City
41700	San Antonio-New Braunfels
41740	San Diego-Carlsbad
41860	San Francisco-Oakland-Hayward
41940	San Jose-Sunnyvale-Santa Clara

42660	Seattle-Tacoma-Bellevue
45300	Tampa-St. Petersburg-Clearwater
47260	Virginia Beach-Norfolk-Newport News
47900	Washington-Arlington-Alexandria

FIGURES

Figure I

Correlation of Public Transit Accessibility on Absolute Mobility

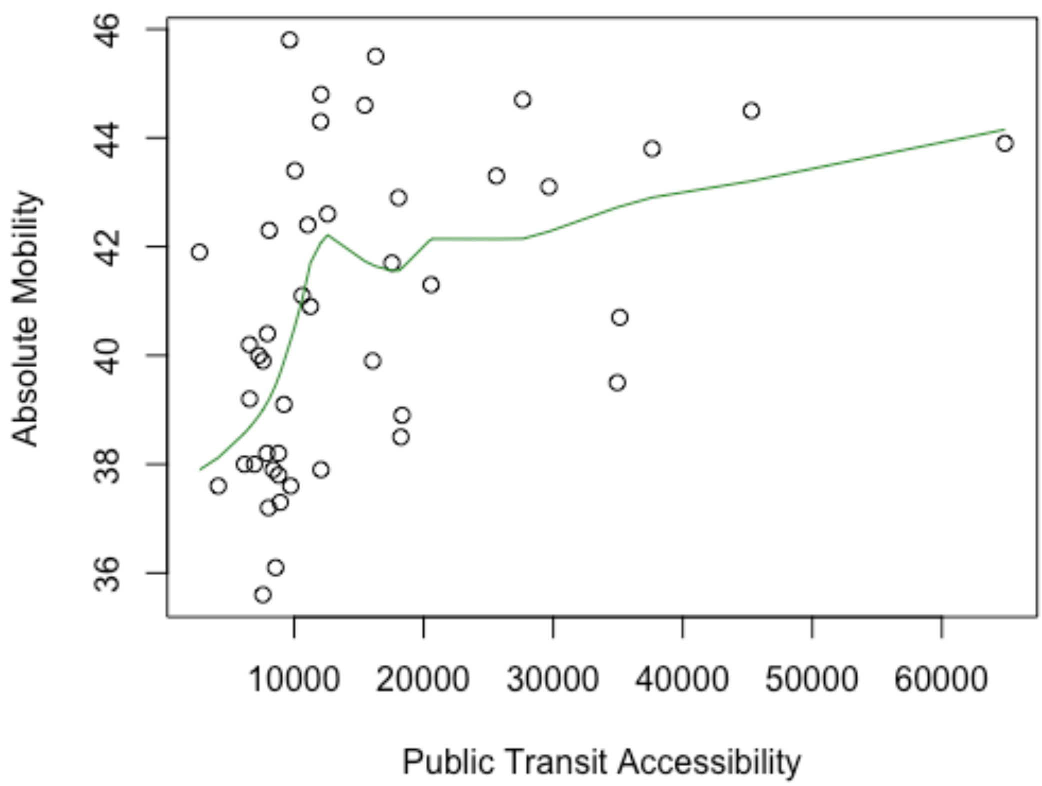

Figure II

Correlation of Public Transit Accessibility on Relative Mobility

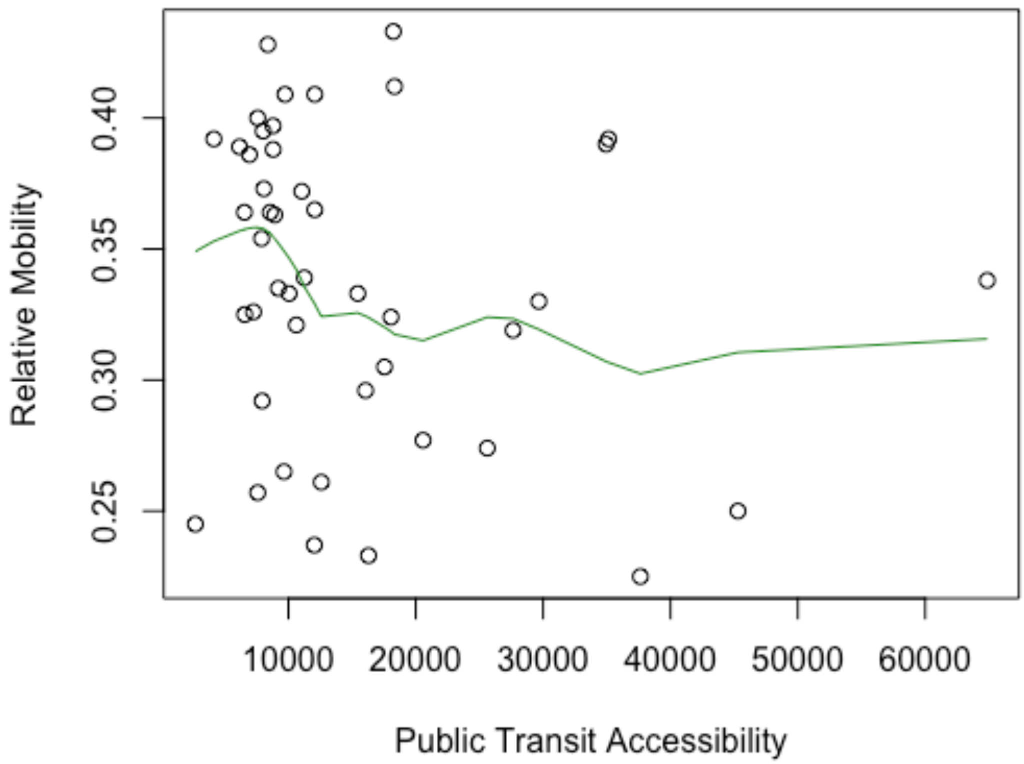

Figure III

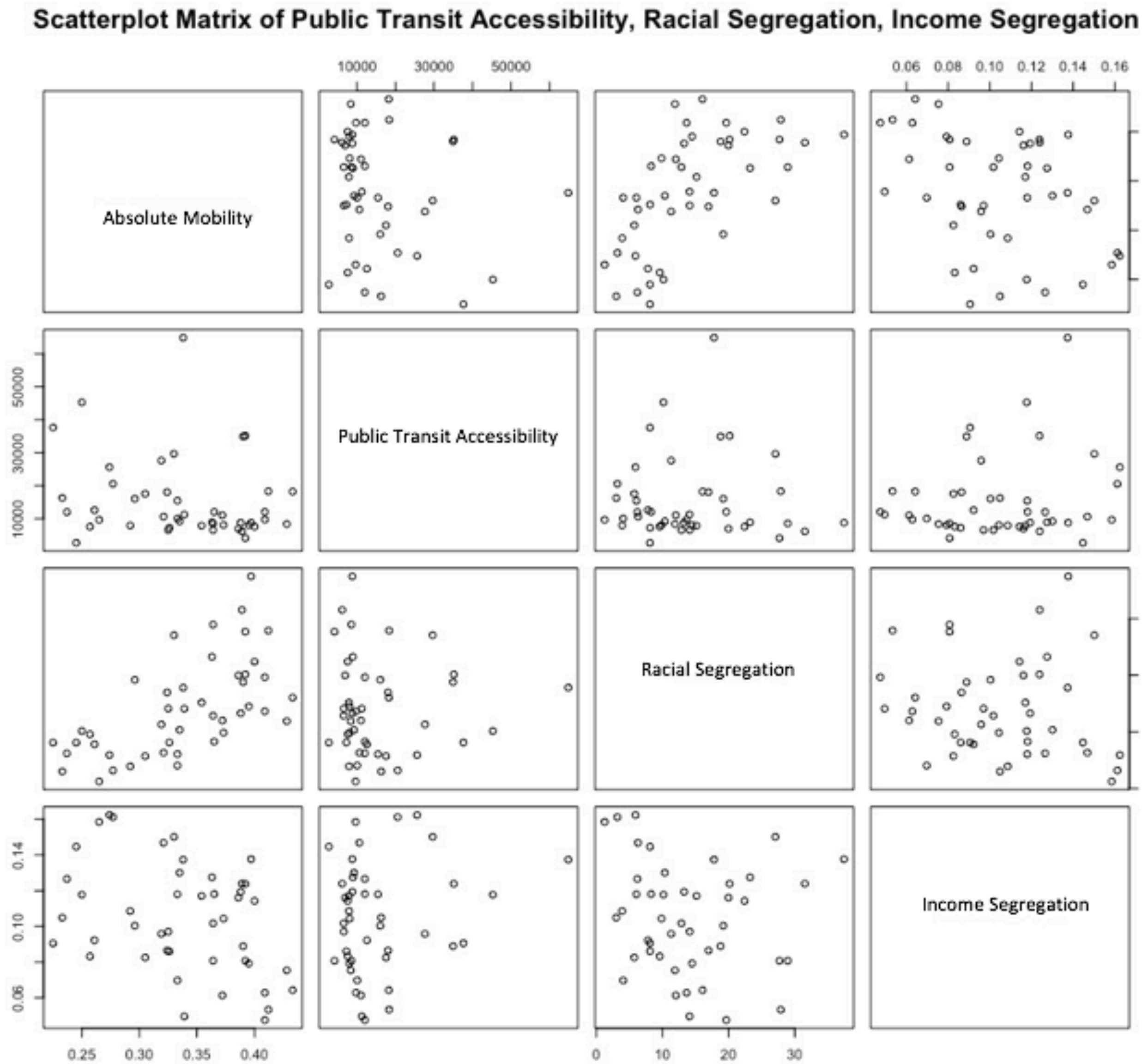
Scatterplot Matrix of Public Transit Accessibility, Racial Segregation, Income Segregation
Absolute Mobility
Public Transit Accessibility
Racial Segregation
Income Segregation
10000
30000
50000
0.06
0.08
0.10
0.12
0.14
0.16
0.25
0.30
0.35
0.40
0
10
20
30

Figure IV

Regression Table

	absolute mobility (1)	relative mobility (2)	absolute mobility (3)
accessibility	0.0001***	-0.00000	0.0001***
	(0.00003)	(0.00000)	(0.00002)
racial segregation			-0.193***
			(0.033)
income segregation			13.775
			(9.338)
Constant	39.173***	0.353***	40.558***
	(0.607)	(0.014)	(1.165)
N	45	45	45
R2	0.197	0.040	0.588
Adjusted R2	0.178	0.018	0.557
Residual Std. Error	2.515 (df = 43)	0.057 (df = 43)	1.846 (df = 41)
F Statistic	10.551*** (df = 1; 43)	1.789 (df = 1; 43)	19.477*** (df = 3; 41)

*p < .1; **p < .05; ***p < .01

Figure V

Upward Mobility Correlations with Public Transit Accessibility

	absolute mobility (1)	relative mobility (2)
Cor	0.4438766	-0.199856
t	3.2482	-1.3375
df	43	43
p-value	0.002256	0.1881

Figure VI

San Francisco-Oakland-Hayward, CA CBA

Source of Report: Competitive Bidding Implementation Contractor (CBIC)
Run Date: 5/8/2014

Figure VII

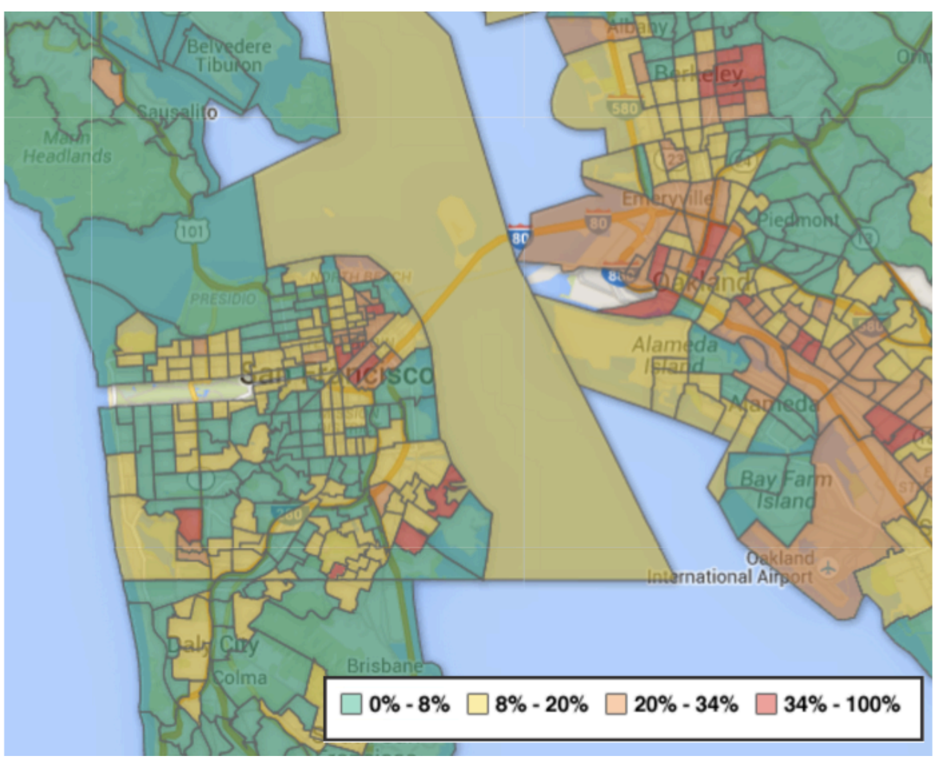

Figure VIII

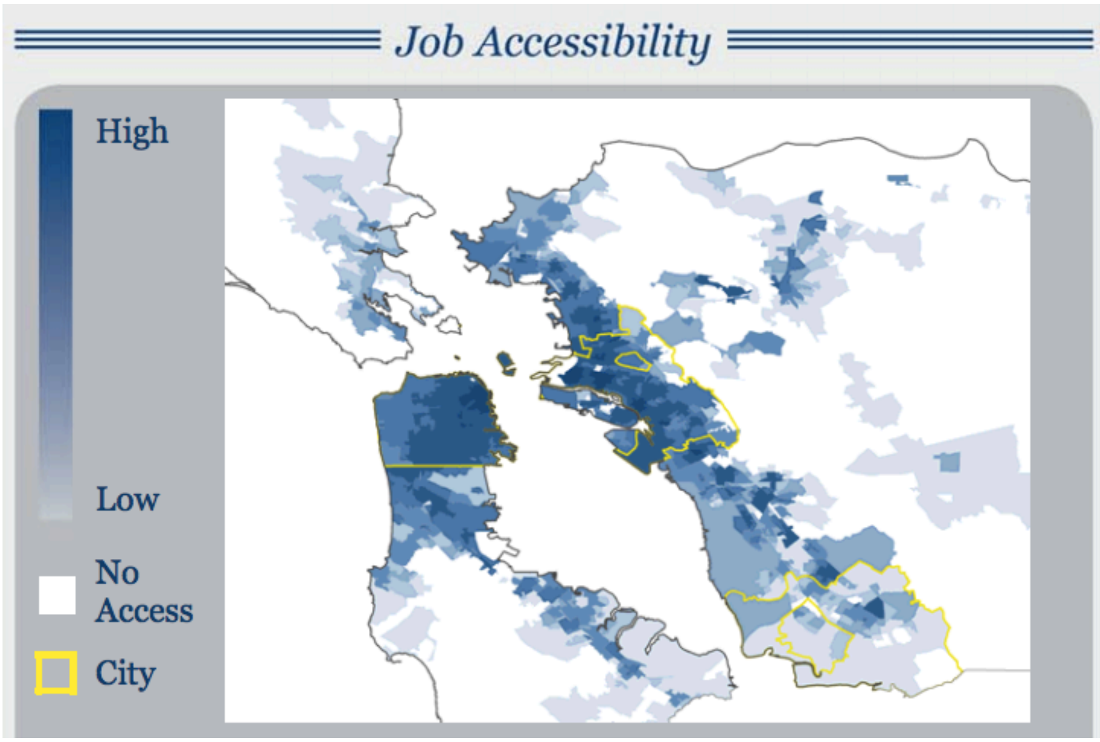

Figure VIIII

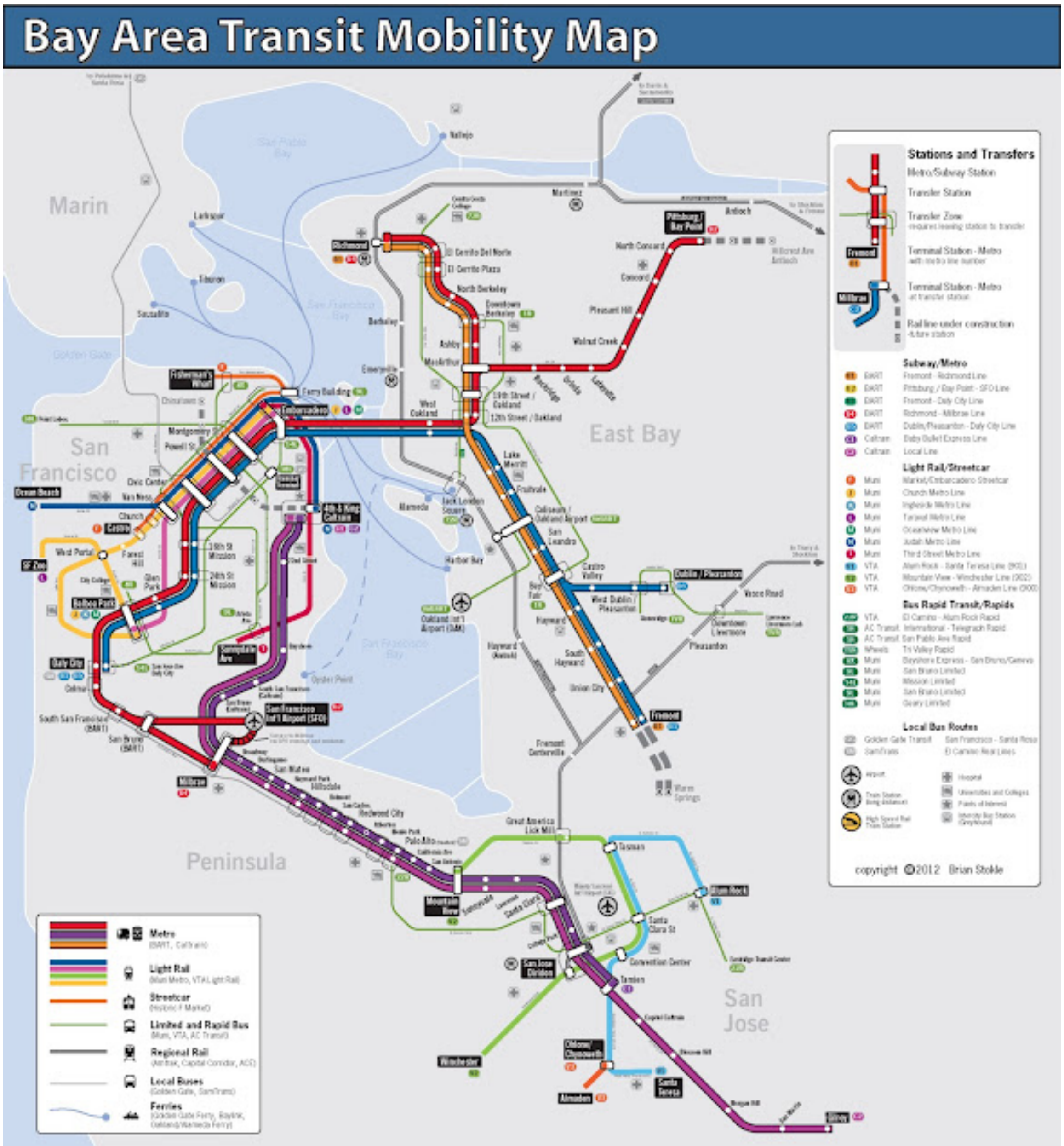

Figure X

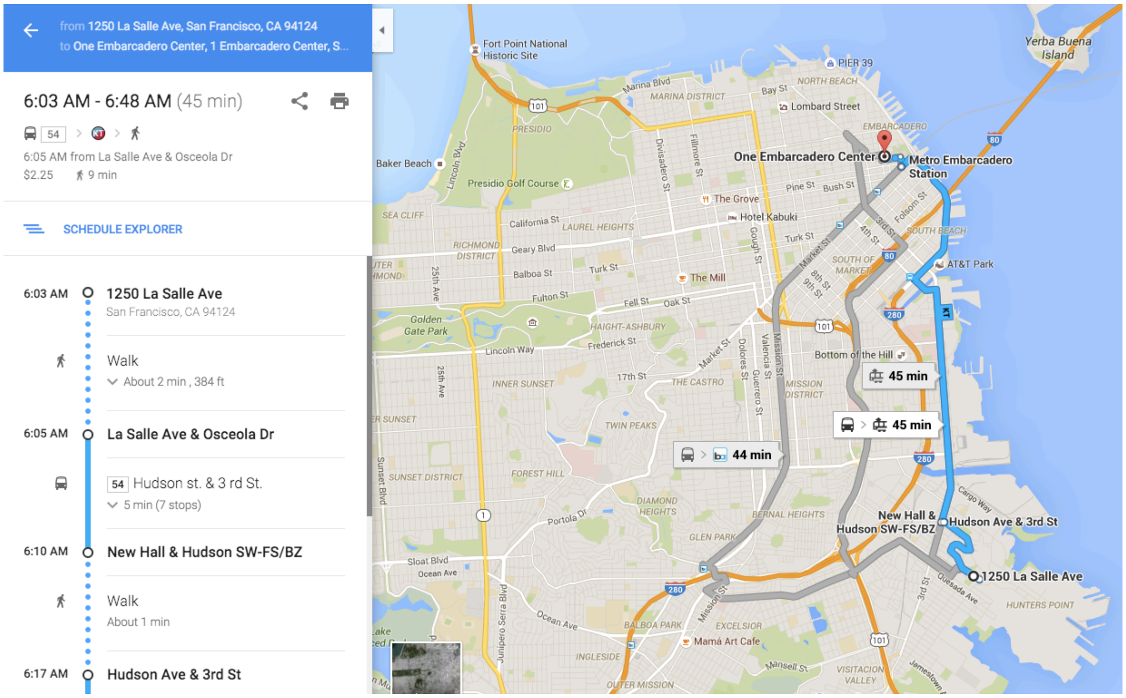

Figure XI