BART’s Impact on Regional Economic Development
--GIS Research Report

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INTRODUCTION

BART Background
Bay Area Rapid Transit (BART) is a heavy rail rapid transit system connecting San Francisco to the East Bay suburbs and the city of Oakland. The system was initially developed in the late 1950s to deal with the congestion problem brought to the Bay Area by the post-war migration, and San Francisco Bay Area Rapid Transit District officially started BART operation in 1972. Currently, BART has 45 stations (plus 4 under construction and 9 planned) in the system, and the six lines (5 rapid transit lines and 1 automated guideway transit line) amount to 104 miles of rail routes travelling through four counties: Alameda, Contra Costa, San Francisco and San Mateo. According to BART Ridership Report, the system averagely transferred 392,293 passengers on weekdays in 2013, making it the fifth busiest heavy rail rapid transit system in America.

Research Question
Conventional wisdom has it that adequate transportation helps boost regional economy through connecting labor force to job centers, as well as customers to business locations. Such theory poses an assumption that the BART system would have stimulated local economic development from 2000 to 2010. The research question is to examine the validity of this assumption, specifically by answering whether or not families living closer to BART lines have higher increase rates of household income (especially for minority groups—African Americans, Hispanic and Latino householders) and home value in comparison to families living far away from the system.

Validity Examination
The two major indicators selected to examine the assumption validity are: household income increase rate and home value increase rate. GIS makes a proper tool for the research because it is able to process mass data conveniently, and at the same time enables us to present analysis result

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Data Source

Increase rates on household income (by ethnicity) and home value are needed in order to answer the research question and conduct comparison. Since there is no primary data on corresponding 2000-2010 increase rates, the following four sets of data are used to calculate them:

1. Metropolitan Transportation Commission
   Bay Area Water Clipped Shapefiles
   Bay Area Rapid Transit Shapefiles

2. United States Census Bureau – 2000 SF3 Sample Data
   a) Median Household Income in 1999 (Dollars)
   b) Median Household Income in 1999 (Dollars) (Black or African American Householder)
   c) Median Household Income in 1999 (Dollars) (Hispanic or Latino Alone Householder)
   d) Median Home Value (Dollars)

3. United States Census Bureau - 2010 ACS 5-year Estimates
   a) Median Income in the Past 12 Months (in 2010 Inflation-Adjusted Dollars)
   b) Median Income in the Past 12 Months (in 2010 Inflation-Adjusted Dollars) (Black or African American Householder)
   c) Median Income in the Past 12 Months (in 2010 Inflation-Adjusted Dollars) (Hispanic or Latino Householder)
   d) Median Home Value (Dollars)

4. US Inflation Calculator
   US 2000-2010 Inflation Rate

Data Processing

Bay Area Water Clipped Shapefiles is joined to Bay Area Rapid Transit Shapefiles based on spatial locations, and the two layers consist the base map of the whole project. Data on the same indicators (household income by ethnicity and home value) from 2000 and 2010 are joined by table attributes (census tract id) to create: Median Income Change Rate Calculate Table (Total), Median Income Change Rate Calculate Table (African American); Median Income Change Rate Calculate Table (Hispanic and Latino); and
Median Home Value Change Rate Calculate Table.

In the four newly created tables several new fields are added:

a) Household income/ Home value in numbers. This field was added because the original data are in “String” type and presented as text. The new field uses the type of “Double”, and transferred text data into calculable number data.

b) Household income absolute value. Household income below USD 2,500 is recorded as “2,500-” in the original data set, and when transferred to numbers, it becomes “-2,500”. This field was added to correct such error and avoid miscalculation.

c) Household income/ Home value in 2010 dollars. This field was added to control the inflation factor so as to get the real economic growth rate. It was calculated by multiplying 2000 household income/ home value by 126.6% (126.6%= 100%+26.6%, 26.6% being the 2000-2010 US inflation rate).

d) Household income/ Home value change. This field calculated the differences between 2000 data and 2010 data.

e) Household income/ Home value change rate. This field was calculated through the formula: Household income/ Home value change/ Household income/ Home value in 2010 dollars * 100%. Percentage change rate was adopted for comparison instead of change in Household income/ Home value because it illustrates BART’s economic impact on surrounding households more accurately.

MAP RESULTS

Different colors are used to suggest different change levels, with warm colors (red, orange) indicating negative change, and cold colors (green, blue) indicating positive change. The darker the color, the higher the percentage change (decrease/ increase). Break values are decided using the following method: first get 5 classes quintiles, and then manually change the computer-generated numbers into suitably round numbers.

The four maps created are presented as below:

Map 1
Map 2

2000-2010 Median Household Income Percentage Change
African American Householders

Map 3
CONCLUSION
Map 1 shows that through 2000 to 2010, about 60% of overall households within BART operation area experienced income decrease. Households with positive income change scattered around this area and have no distinct connection to BART route distribution.

Map 2 and Map 3 are created to examine BART’s economic impact on African American as well as Hispanic or Latino households. By comparing Map 2 and Map 3 to Map 1, it is found that there are more African American households experiencing income decrease than regional average level, while the number of Hispanic and Latino households with 10% or higher income increase is greater than regional average. Still, there is no evidence showing the decrease or increase is particularly linked to BART services accessibility.

According to the first three map results, BART rail system has no significant influence on neighboring household income, and neither did it play the role of promoting income of disadvantaged ethnic groups. Therefore, it is concluded that low-income communities living around BART route are not gaining advantage of the system to get higher-paid jobs.

Map 4 illustrates percentage change of home value within BART operating areas from 2000 to 2010. Home value percentage increase rates by householder ethnicities are not included here as in the earlier analysis because we only wish to examine the market value of properties close to and far from the BART system.

Generally speaking, home value across the research area increased during the 10 years, and most households with the greatest home value increase rate (70% and higher) are located alongside the BART rail route. This result suggests that development of the BART system does contribute to regional household value increase.

In summary, the assumption that BART would help boost regional economic development is partially true in that it increased the home value of surrounding households. However, this rail system failed to fulfill the expectation of connecting the local labor force to better job opportunities and promoting income of nearby households.
Bibliography


Appendix: Map Output
2000-2010 Median Household Income Percentage Change
All Householders

Data Source: United States Census Bureau
2000-2010 Median Household Income Percentage Change
African American Householders

BART Route
-98.4% - -15%
-14.99% - -7%
-6.99% - 0%
0.01% - 10%
10.01% - 3525.16%

Data Source: United States Census Bureau