

# SGC PSM Writeup

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## Data Cleaning and PSM summary

The following visualizations and regressions rely on matched pairs of neighborhoods with investments and those without investments. Matched pairs are generated using Propensity Score Matching (PSM) - with `psm_test.Rmd` and its source code `psm_functions.R`. In order to create the matched pairs, investments must be first matched to 2010 boundary Census tracts using `invest_neighborhood_match.Rmd`. Next, investment-flagged Census tracts must be joined with 2009 and 2018 ACS data with `invest_nbr_traits.Rmd` (ACS data is converted from `.dta` to `.csv` in `tract_characteristics_convert.Rmd`, and 2009 ACS data is crosswalked to 2010 boundaries in `acs_crosswalk.Rmd`). The final result of this process is the `.csv` file `master_investments_09.csv`.

`master_investments_09.csv` is used by `psm_test.Rmd` to generate matched pairs. In order to determine the most suitable set of covariates to match on, a covariate table with multiple different combinations is created. Each combination goes through the PSM process and generates an average absolute standardized difference (AASD) as a measure of covariate balance. The mean AASD across study region is then determined, and the set of variables with lowest mean AASD is chosen as the final set of covariates. The set chosen includes the 2009 baseline proportions for the nonwhite population, college-educated population, renter-occupied housing units, population in poverty, and housing vacancy, as well as 2009 baseline measurements of median income and median rent.

Finally, based on the aforementioned covariates, PSM is carried out based on investment flags by study area (LA, SF Bay Area, and Fresno) and tables of matched pairs are generated (`psm_matched_la.csv`, `psm_matched_sf.csv`, and `psm_matched_fresno.csv`, respectively). From these tables, descriptive statistics are then developed - as well as accompanying plots and regressions (shown below).

## Descriptive Statistics Summary

In `sgc_psm_writeup.Rmd`, which uses the source code `psm_desc_funcs.R`, descriptive statistics and visualizations are generated (code used to create this document). Each study area's matched pairs table is joined into a single table with a study area flag. Next, the `.dta` NOAH files are converted to `.csv` format (`NOAH_SGC_2009_CHAS_PSH_ACS.dta` to `NOAH_SGC_2009.csv` and `NOAH_SGC_2016_CHAS_PSH_ACS.dta` to `NOAH_SGC_2016.csv`). Then, the 2009 NOAH data must be crosswalked to 2010 Census boundaries. Next, outmigration block group level data from the InfoGroup dataset is read in - using the "all", "low income", "renters", and "low income renters" data. This data must be cleaned and summarized at the tract level for comparison.

As will be seen below, each level of study generates descriptive statistics, visualizations from a NOAH investigation, and visualizations from an outmigration investigation. Analyses are broken into **TOTAL**, **INVESTMENT TYPE** (which is **TOTAL** summarized by investment type flags), **LOS ANGELES**, **FRESNO**, and **SF BAY AREA** levels. The implications of the findings for each analysis will be summarized at the beginning of each study level. See the separate **SGC Full Regressions** report for the full regression models.

## TOTAL

### Summary

- **NOAH:** When considering total NOAH units, the investigation shows that neighborhoods with investments saw a slightly slower increase in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. However, this trend is reversed if you only consider non-LIHTC NOAH units. Conducting a linear regression shows that the presence of investments indicates a negative relationship with NOAH units (although this is not statistically significant). Again, this trend is reversed to positive when considering only non-LIHTC units (again, not statistically significant).
- **Outmigration**
  - **Outmigration All:** The time series plot shows a mixed relationship between outmigration rates and investments, while the bar plot indicates that slightly higher outmigration rates are associated

with investments. However, a linear regression reverses the bar plot observation - demonstrating about 0.1% decrease in outmigration with the presence of an investment (this result is not statistically significant).

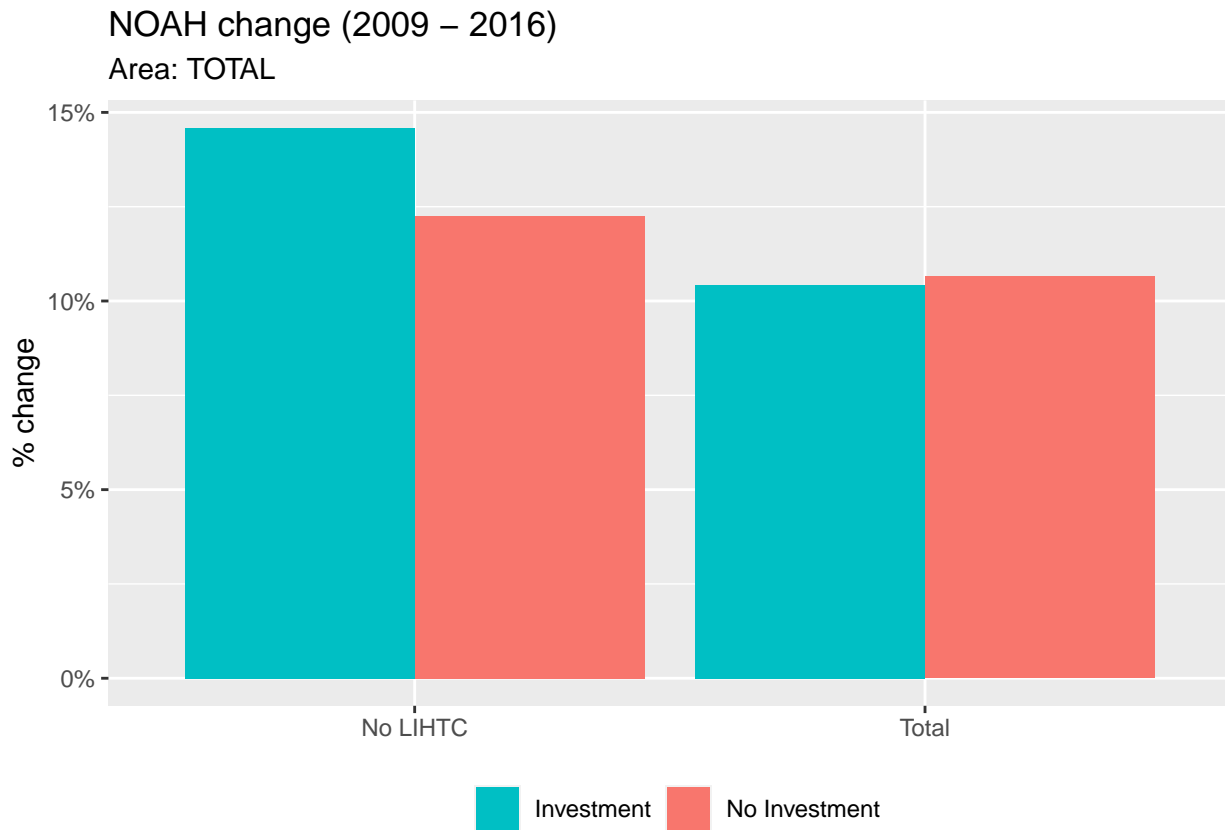
- **Outmigration Low Income:** The time series plot shows a mixed relationship between outmigration rates and investments, while the bar plot indicates that slightly lower outmigration rates are associated with investments. However, a linear regression reverses the bar plot observation - demonstrating about 0.1% increase in outmigration with the presence of an investment (this result is not statistically significant).
- **Outmigration Renters:** The time series plot shows a mixed relationship between outmigration rates and investments, while the bar plot indicates that slightly higher outmigration rates are associated with investments. However, a linear regression reverses the bar plot observation - demonstrating about 0.2% decrease in outmigration with the presence of an investment (this result is not statistically significant).
- **Outmigration Low Income Renters:** The time series plot shows a mixed relationship between outmigration rates and investments, while the bar plot indicates that slightly lower outmigration rates are associated with investments. However, a linear regression reverses the bar plot observation - demonstrating about 0.03% increase in outmigration with the presence of an investment (this result is not statistically significant).

## Summary Tables

	Overall NOAH % Change by Investment Type (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b>10.65%</b>	<b>12.26%</b>
Any Investment	10.43%	14.59%
Greening	51.94%	43.27%
Transit	11.05%	16.19%
Urban Infill	-1.20%	5.17%
Active Transportation	7.66%	10.15%

	Overall Average Outmigration Rate by Investment Type (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b><i>No Investment</i></b>	<b>29.62%</b>	<b>33.20%</b>	<b>37.39%</b>	<b>37.47%</b>
Any Investment	30.22%	32.54%	37.56%	36.91%
Greening	31.51%	33.03%	38.55%	37.51%
Transit	31.35%	34.39%	39.98%	39.82%
Urban Infill	27.82%	31.02%	33.85%	33.45%
Active Transportation	27.23%	28.63%	32.57%	31.78%

## NOAH Investigation

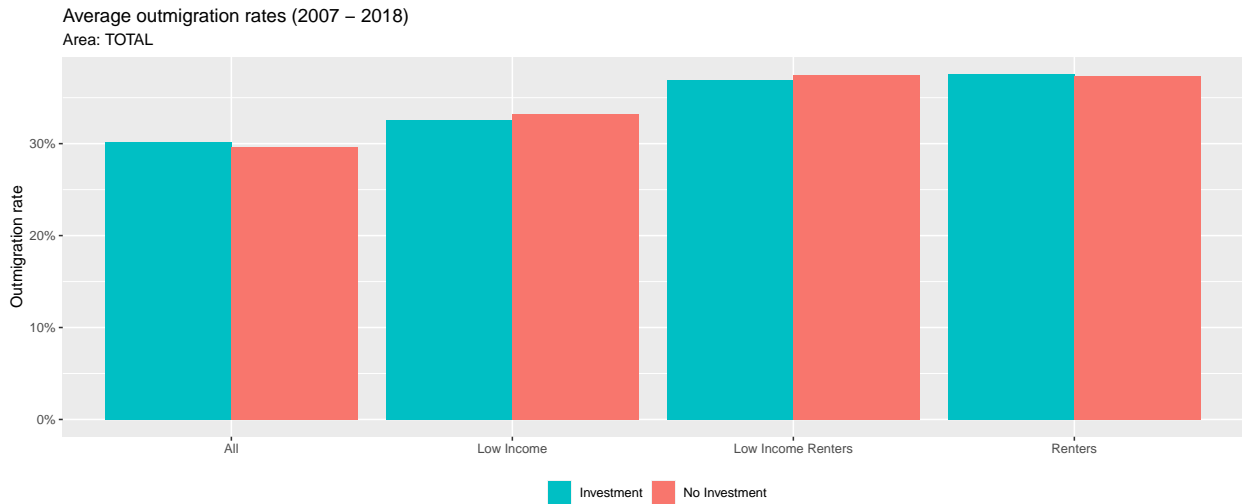
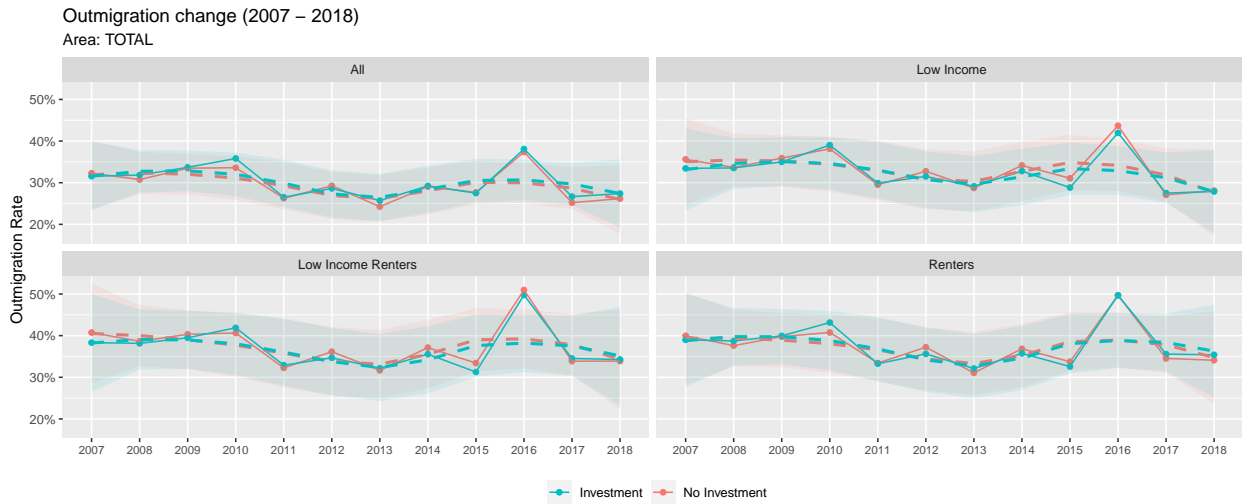


% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu % Date and time: Sun, Sep 06, 2020 - 3:39:39 PM

Table 1: NOAH by Investment in Area: TOTAL

	Dependent variable:	
	noah_tot_change	noah_nolihte_change
	(1)	(2)
investment1	-5.750 (20.124)	7.819 (20.687)
Constant	57.045*** (14.229)	70.845*** (14.628)
Observations	220	220
R <sup>2</sup>	0.0004	0.001
Adjusted R <sup>2</sup>	-0.004	-0.004
Residual Std. Error (df = 218)	149.240	153.418
F Statistic (df = 1; 218)	0.082	0.143
Note: *p<0.1; **p<0.05; ***p<0.01		

# Outmigration Investigation



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Table 2: Outmigration Rates by Investment in Area: TOTAL

	Dependent variable:			
	ALL	LOW INCOME	RENTER	LOW INCOME RENTER
	(1)	(2)	(3)	(4)
investment1	-0.001 (0.004)	0.001 (0.004)	-0.002 (0.004)	0.0003 (0.004)
Constant	0.303*** (0.002)	0.335*** (0.003)	0.393*** (0.003)	0.394*** (0.003)
Observations	2,638	2,624	2,638	2,622
R <sup>2</sup>	0.00001	0.00001	0.0001	0.00000
Adjusted R <sup>2</sup>	-0.0004	-0.0004	-0.0003	-0.0004
Residual Std. Error	0.090 (df = 2636)	0.096 (df = 2622)	0.093 (df = 2636)	0.099 (df = 2620)
F Statistic	0.035 (df = 1; 2636)	0.038 (df = 1; 2622)	0.270 (df = 1; 2636)	0.006 (df = 1; 2620)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

# INVESTMENT TYPE

## Summary

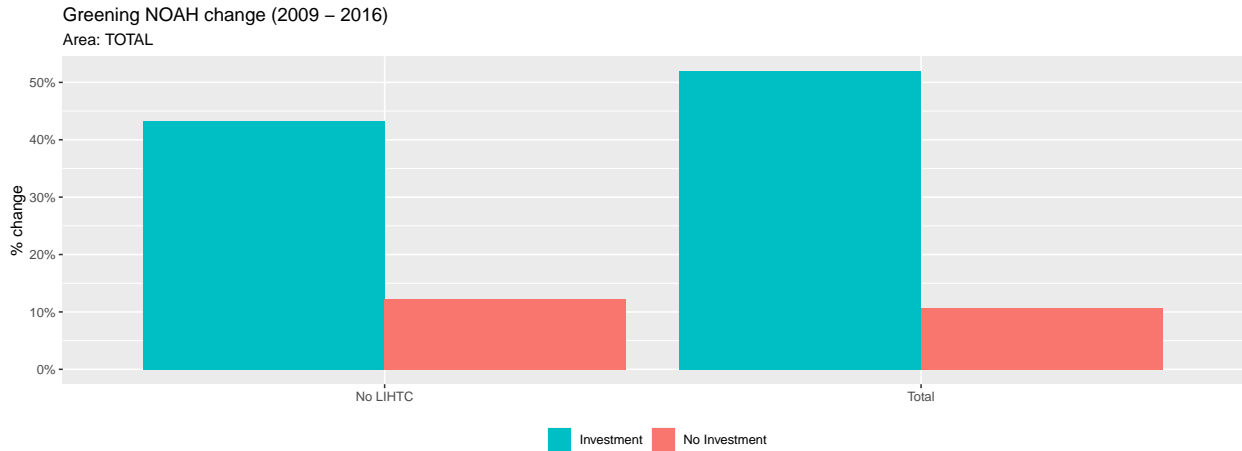
- **Greening**
  - **NOAH:** The NOAH investigation shows that neighborhoods with greening investments saw a much faster increase in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. This trend is maintained when only considering non-LIHTC NOAH units. Conducting a linear regression shows that the presence of investments indicates a positive relationship with NOAH units (this is statistically significant at  $p < 0.05$ ). Again, this trend is maintained when considering only non-LIHTC units (this is statistically significant at  $p < 0.1$ ).
  - **Outmigration**
    - \* **Outmigration All:** The time series plot shows a mixed relationship, while the bar plot indicates that higher outmigration rates are associated with greening investments. A linear regression confirms this observation - demonstrating about 0.7% increase in outmigration with the presence of an investment (this result is not statistically significant).
    - \* **Outmigration Low Income:** The time series plot indicates a mixed relationship, while the bar plot indicates a slight trend towards decreased outmigration in greening investment neighborhoods. A linear regression provides confirms the bar plot, demonstrating about 0.6% decrease in outmigration with the presence of an investment (this result is not statistically significant).
    - \* **Outmigration Renters:** The time series plot indicates a variable relationship between greening investments and outmigration, while the bar plot indicates a slight trend towards increased outmigration in greening investment neighborhoods. A linear regression reverses this observation - demonstrating about 1.8% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.1$ ).
    - \* **Outmigration Low Income Renters:** The time series plot indicates a variable relationship between greening investments and outmigration, while the bar plot indicates no trends. A linear regression demonstrates about 1.7% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.1$ ).
- **Transit**
  - **NOAH:** The NOAH investigation shows that neighborhoods with transit investments saw a slightly faster increase in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. This trend is increased when only considering non-LIHTC NOAH units. Conducting a linear regression shows that the presence of investments indicates a negative relationship with NOAH units (this is not statistically significant). This trend is reversed when considering only non-LIHTC units (this is not statistically significant).
  - **Outmigration**
    - \* **Outmigration All:** The time series plot shows a slightly higher outmigration rates associated with transit investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 0.7% increase in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.1$ ).
    - \* **Outmigration Low Income:** The time series plot shows a slightly higher outmigration rates associated with transit investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 1.3% increase in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
    - \* **Outmigration Renters:** The time series plot shows a slightly higher outmigration rates associated with transit investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 1.1% increase in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).

- \* **Outmigration Low Income Renters:** The time series plot shows a slightly higher outmigration rates associated with transit investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 1.4% increase in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
- **Urban Infill**
  - **NOAH:** The NOAH investigation shows that neighborhoods with urban infill investments saw a decrease in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. This trend is reversed (although the increase is for investment neighborhoods is slower) when only considering non-LIHTC NOAH units. Conducting a linear regression shows that the presence of investments indicates a negative relationship with NOAH units (this is statistically significant at  $p < 0.5$ ). This trend is maintained when considering only non-LIHTC units (this is not statistically significant).
  - **Outmigration**
    - \* **Outmigration All:** The time series plot shows that mostly lower outmigration rates associated with urban infill investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 2.9% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
    - \* **Outmigration Low Income:** The time series plot shows that mostly lower outmigration rates associated with urban infill investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 1.3% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.05$ ).
    - \* **Outmigration Renters:** The time series plot shows that mostly lower outmigration rates associated with urban infill investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 2.1% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
    - \* **Outmigration Low Income Renters:** The time series plot shows that mostly lower outmigration rates associated with urban infill investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 2.3% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
- **Active Transportation**
  - **NOAH:** The NOAH investigation shows that neighborhoods with active transportation investments saw a slower increase in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. This trend is maintained when only considering non-LIHTC NOAH units. Conducting a linear regression shows that the presence of investments indicates a negative relationship with NOAH units (this is not statistically significant). This trend is maintained when considering only non-LIHTC units (this is not statistically significant).
  - **Outmigration**
    - \* **Outmigration All:** The time series plot shows that lower outmigration rates associated with active transportation investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 2.1% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
    - \* **Outmigration Low Income:** The time series plot shows that lower outmigration rates associated with active transportation investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 3.4% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).
    - \* **Outmigration Renters:** The time series plot shows that lower outmigration rates associated with active transportation investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 3.2% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).

- \* **Outmigration Low Income Renters:** The time series plot shows that lower outmigration rates associated with active transportation investments, and the bar plot confirms this. A linear regression also confirms this observation - demonstrating about 3.4% decrease in outmigration with the presence of an investment (this result is statistically significant at  $p < 0.01$ ).

## Greening

### NOAH Investigation (GREENING)



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Table 3: NOAH by Greening in Area: TOTAL

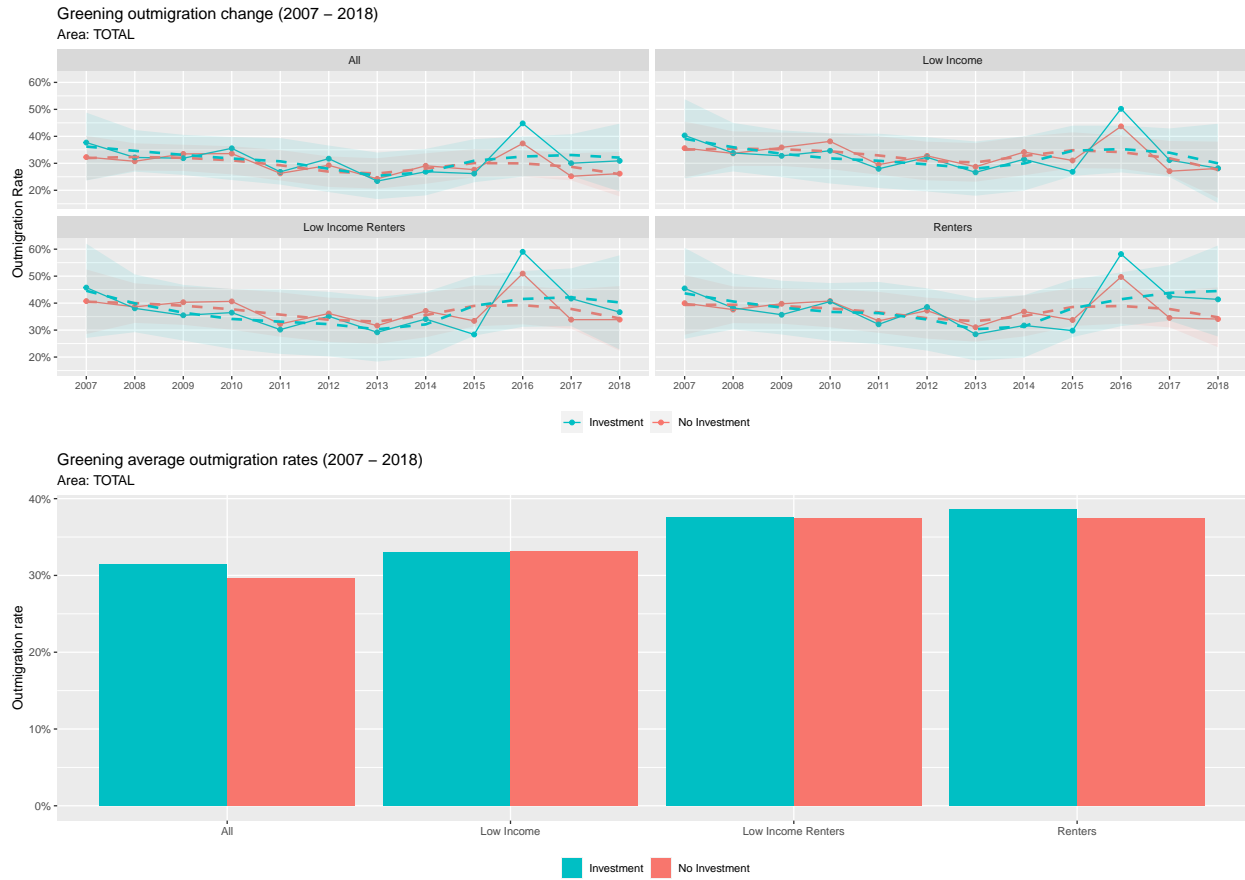
	<i>Dependent variable:</i>	
	noah_tot_change TOTAL	noah_nolihtc_change NO LIHTC
	(1)	(2)
greening1	119.712** (50.155)	101.956* (51.777)
Constant	49.273*** (10.144)	70.584*** (10.472)
Observations	220	220
R <sup>2</sup>	0.025	0.017
Adjusted R <sup>2</sup>	0.021	0.013
Residual Std. Error (df = 218)	147.355	152.121
F Statistic (df = 1; 218)	5.697**	3.877*

*Note:*

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$



## Outmigration Investigation (GREENING)



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Table 4: Outmigration Rates by Greening in Area: TOTAL

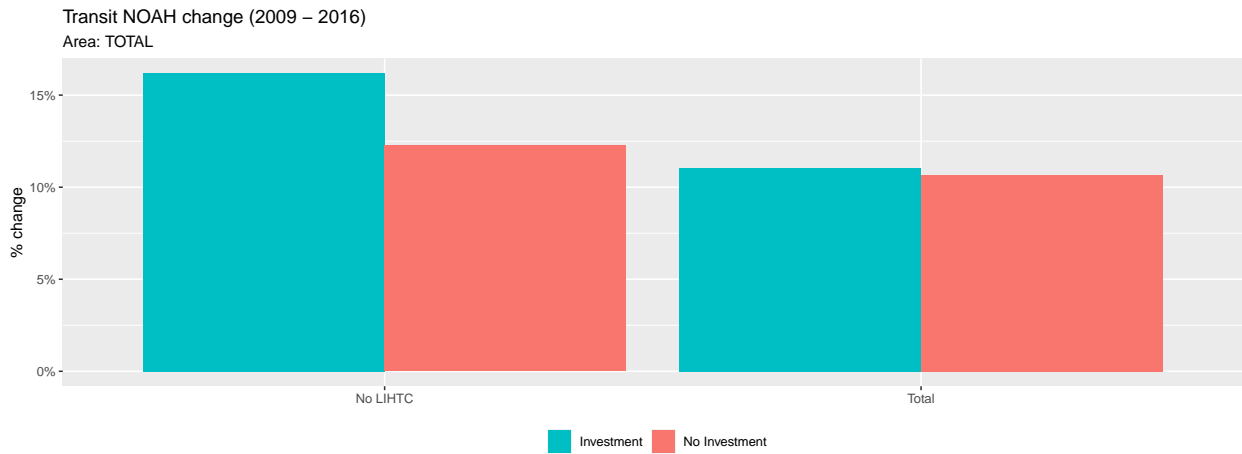
	Dependent variable:			
	ALL	LOW INCOME	RENTER	LOW INCOME RENTER
	(1)	(2)	(3)	(4)
greening1	0.007 (0.009)	-0.006 (0.010)	-0.018* (0.010)	-0.017* (0.010)
Constant	0.303*** (0.003)	0.335*** (0.003)	0.393*** (0.003)	0.394*** (0.003)
Observations	1,426	1,412	1,426	1,410
R <sup>2</sup>	0.0004	0.0002	0.002	0.002
Adjusted R <sup>2</sup>	-0.0003	-0.0005	0.002	0.001
Residual Std. Error	0.091 (df = 1424)	0.095 (df = 1410)	0.098 (df = 1424)	0.100 (df = 1408)
F Statistic	0.640 (df = 1; 1424)	0.346 (df = 1; 1410)	3.280* (df = 1; 1424)	2.999* (df = 1; 1408)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

## Transit

### NOAH Investigation (TRANSIT)



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Table 5: NOAH by Transit in Area: TOTAL

	<i>Dependent variable:</i>	
	noah_tot_change TOTAL	noah_nolihtc_change NO LIHTC
	(1)	(2)
transit1	-11.917 (20.797)	2.245 (21.398)
Constant	58.612*** (12.697)	73.918*** (13.064)
Observations	220	220
R <sup>2</sup>	0.002	0.0001
Adjusted R <sup>2</sup>	-0.003	-0.005
Residual Std. Error (df = 218)	149.156	153.465
F Statistic (df = 1; 218)	0.328	0.011

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (TRANSIT)



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Table 6: Outmigration Rates by Transit in Area: TOTAL

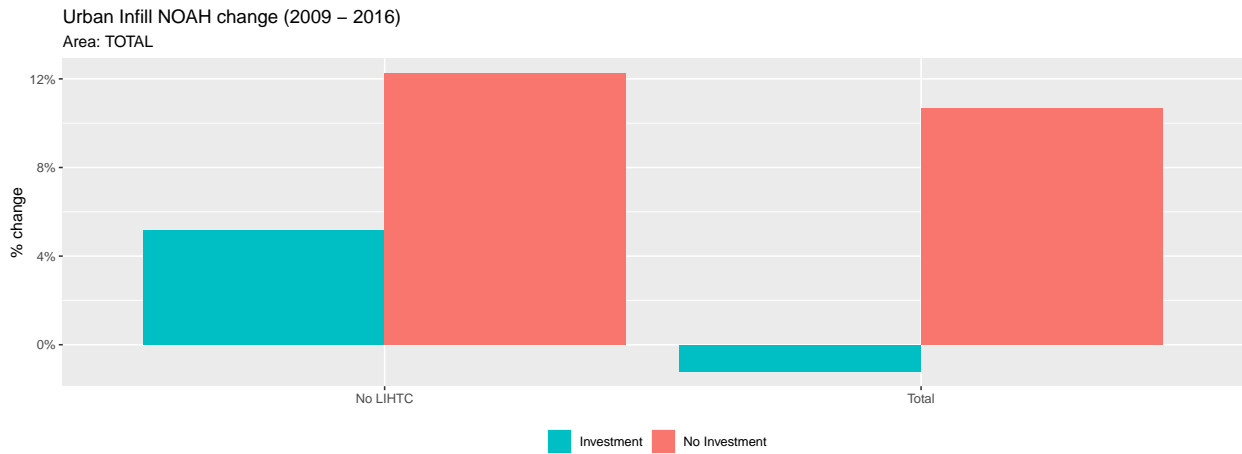
	Dependent variable: migration_rate			
	ALL (1)	LOW INCOME (2)	RENTER (3)	LOW INCOME RENTER (4)
transit1	0.007* (0.004)	0.013*** (0.004)	0.011*** (0.004)	0.014*** (0.004)
Constant	0.303*** (0.003)	0.335*** (0.003)	0.393*** (0.003)	0.394*** (0.003)
Observations	2,302	2,288	2,302	2,286
R <sup>2</sup>	0.002	0.004	0.003	0.005
Adjusted R <sup>2</sup>	0.001	0.004	0.003	0.005
Residual Std. Error	0.093 (df = 2300)	0.098 (df = 2286)	0.094 (df = 2300)	0.100 (df = 2284)
F Statistic	3.514* (df = 1; 2300)	9.404*** (df = 1; 2286)	7.871*** (df = 1; 2300)	11.647*** (df = 1; 2284)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Urban Infill

### NOAH Investigation (URBAN INFILL)



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Table 7: NOAH by Urban Infill in Area: TOTAL

	<i>Dependent variable:</i>	
	noah_tot_change TOTAL	noah_nolihtc_change NO LIHTC
	(1)	(2)
urban_infill1	-66.527** (33.241)	-54.508 (34.291)
Constant	60.823*** (10.512)	80.206*** (10.844)
Observations	220	220
R <sup>2</sup>	0.018	0.011
Adjusted R <sup>2</sup>	0.014	0.007
Residual Std. Error (df = 218)	147.915	152.587
F Statistic (df = 1; 218)	4.005**	2.527

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (URBAN INFILL)



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Table 8: Outmigration Rates by Urban Infill in Area: TOTAL

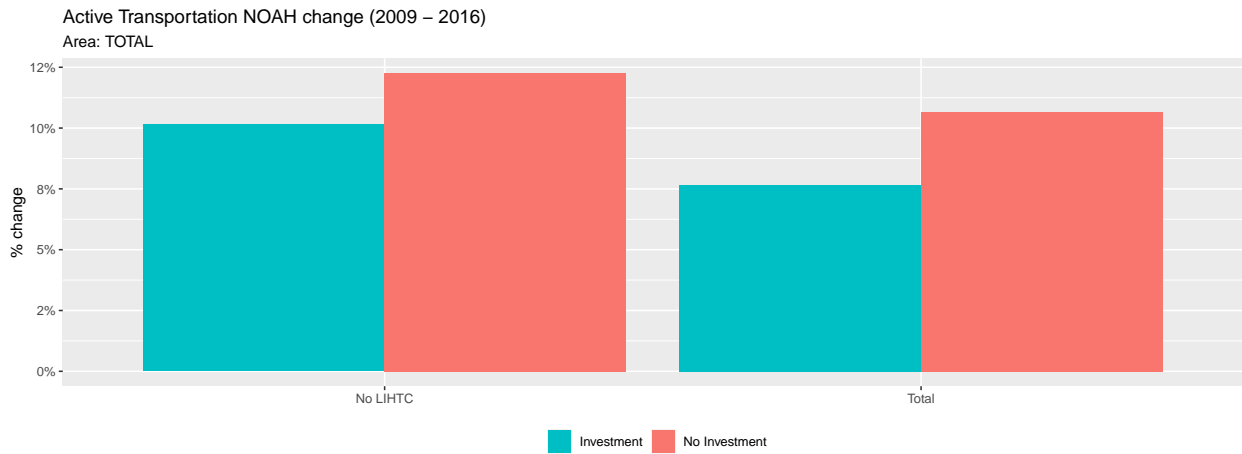
	Dependent variable: migration_rate			
	ALL (1)	LOW INCOME (2)	RENTER (3)	LOW INCOME RENTER (4)
urban_infill1	-0.029*** (0.006)	-0.013** (0.006)	-0.021*** (0.006)	-0.023*** (0.007)
Constant	0.303*** (0.002)	0.335*** (0.003)	0.393*** (0.003)	0.394*** (0.003)
Observations	1,582	1,568	1,582	1,566
R <sup>2</sup>	0.014	0.003	0.007	0.007
Adjusted R <sup>2</sup>	0.013	0.002	0.006	0.007
Residual Std. Error	0.090 (df = 1580)	0.094 (df = 1566)	0.096 (df = 1580)	0.100 (df = 1564)
F Statistic	22.416*** (df = 1; 1580)	4.329** (df = 1; 1566)	10.934*** (df = 1; 1580)	11.528*** (df = 1; 1564)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Active Transportation

### NOAH Investigation (GREENING)



% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu % Date and time: Sun, Sep 06, 2020 - 3:39:54 PM

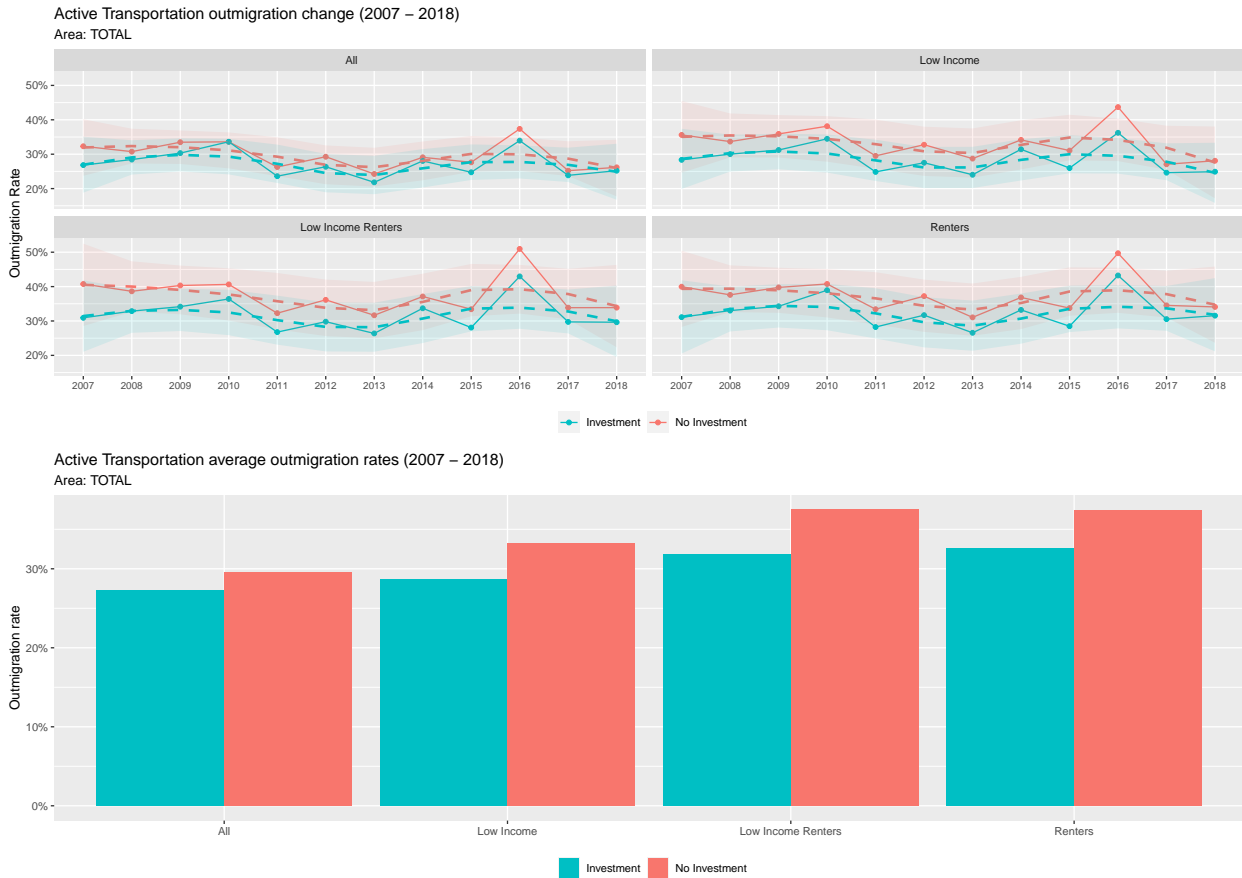
Table 9: NOAH by Active Transportation in Area: TOTAL

	<i>Dependent variable:</i>	
	noah_tot_change TOTAL	noah_nolihtc_change NO LIHTC
	(1)	(2)
active_transportation1	−8.673 (29.319)	−10.012 (30.143)
Constant	55.353*** (10.827)	76.120*** (11.131)
Observations	220	220
R <sup>2</sup>	0.0004	0.001
Adjusted R <sup>2</sup>	−0.004	−0.004
Residual Std. Error (df = 218)	149.238	153.430
F Statistic (df = 1; 218)	0.088	0.110

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (GREENING)



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Table 10: Outmigration Rates by Active Transportation in Area: TOTAL

	Dependent variable: migration_rate			
	ALL (1)	LOW INCOME (2)	RENTER (3)	LOW INCOME RENTER (4)
active_transportation1	-0.021*** (0.005)	-0.034*** (0.005)	-0.032*** (0.006)	-0.034*** (0.006)
Constant	0.303*** (0.002)	0.335*** (0.003)	0.393*** (0.003)	0.394*** (0.003)
Observations	1,678	1,664	1,678	1,662
R <sup>2</sup>	0.009	0.023	0.019	0.021
Adjusted R <sup>2</sup>	0.009	0.022	0.019	0.020
Residual Std. Error	0.088 (df = 1676)	0.091 (df = 1662)	0.094 (df = 1676)	0.096 (df = 1660)
F Statistic	15.752*** (df = 1; 1676)	38.505*** (df = 1; 1662)	33.086*** (df = 1; 1676)	35.226*** (df = 1; 1660)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

## LOS ANGELES

### Summary

- **NOAH:** The LA NOAH investigation shows that neighborhoods with investments saw a slower increase in the quantity NOAH units between 2009 and 2016 than did neighborhoods without. This trend is maintained when only considering non-LIHTC NOAH units. Conducting a linear regression shows that

the presence of investments indicates a negative relationship with NOAH units (this is not statistically significant at  $p < 0.1$ ). Again, this trend is maintained when considering only non-LIHTC units (this is not statistically significant). The NOAH summary tables break down this relationship by investment type, and then by the specific investment cases.

- **Outmigration**

- **Overall Patterns:** See the summary tables for LA outmigration rates, including by investment type and by specific investment. Both tables show neighborhood trends based on the presence of the investment/investment type.
- **Outmigration All:** Both time series and bar plots indicate that lower outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 1.4% decrease (this result is statistically significant at  $p < 0.01$ ).
- **Outmigration Low Income:** Both time series and bar plots indicate that lower outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 1.4% decrease (this result is statistically significant at  $p < 0.01$ ).
- **Outmigration Renters:** Both time series and bar plots indicate that lower outmigration rates are generally associated with the presence of investments, although the time series is less conclusive. A linear regression confirms the relationship with a 0.5% decrease (this result is not statistically significant).
- **Outmigration Low Income Renters:** Both time series and bar plots indicate that lower outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 0.9% decrease (this result is statistically significant at  $p < 0.01$ ).

## Summary Tables (LA)

	LA Area NOAH % Change by Investment Type (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b><i>12.33%</i></b>	<b><i>13.71%</i></b>
Any Investment	4.28%	7.65%
Greening	22.86%	25.28%
Transit	3.06%	7.16%
Urban Infill	6.63%	13.10%
Active Transportation	4.39%	6.41%

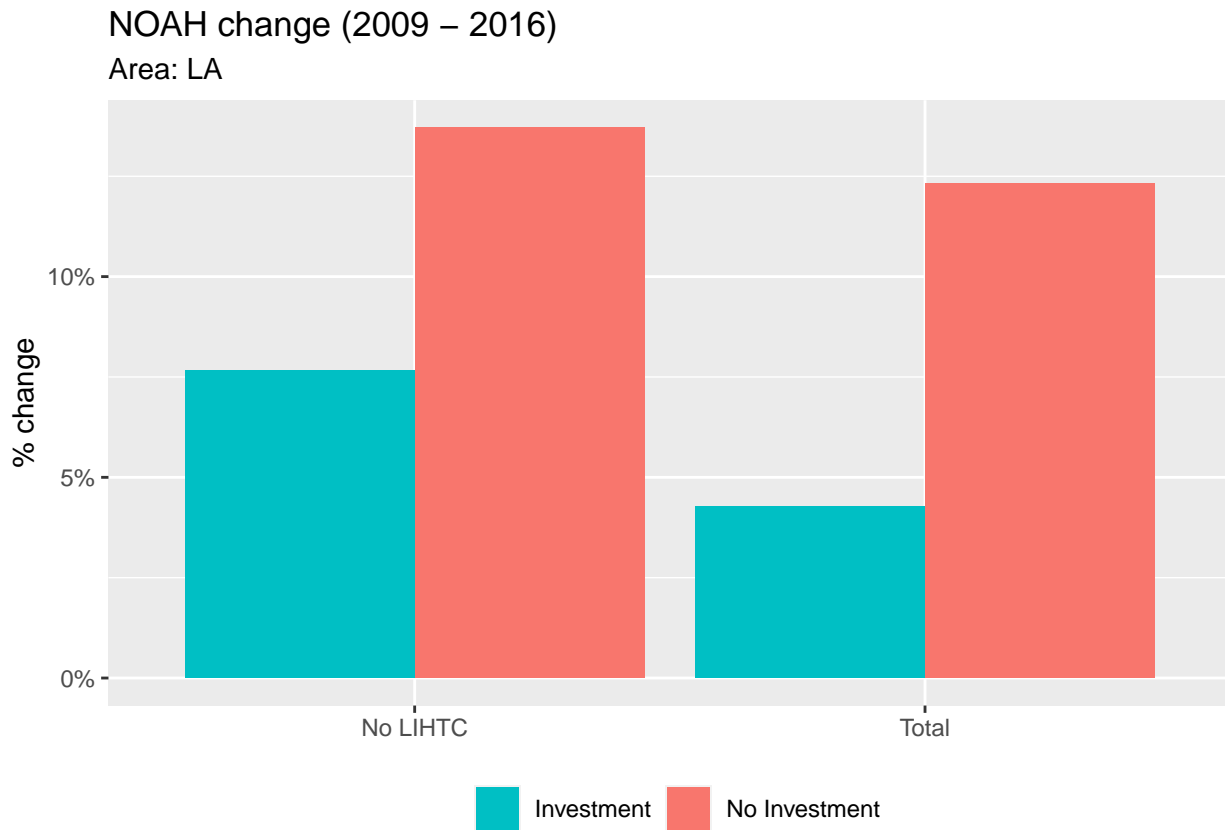
	LA Area Overall Average Outmigration Rate by Investment Type (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b><i>No Investment</i></b>	<b><i>29.32%</i></b>	<b><i>32.72%</i></b>	<b><i>35.87%</i></b>	<b><i>35.99%</i></b>
Any Investment	27.65%	30.24%	34.69%	34.24%
Greening	29.12%	30.69%	33.92%	33.89%
Transit	28.23%	31.38%	36.20%	35.93%
Urban Infill	25.75%	29.84%	34.45%	33.95%
Active Transportation	26.36%	28.39%	32.80%	32.39%



	LA Area NOAH % Change by Investment (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b><i>12.33%</i></b>	<b><i>13.71%</i></b>
Any Investment	4.28%	7.65%
Albion Riverside Park	16.70%	16.70%
Crenshaw Blvd Streetscape Plan	4.03%	5.12%
El Monte Transit Village	43.45%	43.65%
Exposition Line	-0.14%	3.60%
Gold Line Extension Line	5.80%	9.51%
Salud Park	13.77%	13.77%
Taylor Yard Transit Village	-31.77%	-1.15%
The Exchange At El Monte Gateway	13.94%	42.48%
Willowbrook Rosa Parks Station	6.99%	14.31%

	LA Area Overall Average Outmigration Rate by Investment (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b><i>No Investment</i></b>	<b><i>29.32%</i></b>	<b><i>32.72%</i></b>	<b><i>35.87%</i></b>	<b><i>35.99%</i></b>
Any Investment	27.65%	30.24%	34.69%	34.24%
Albion Riverside Park	28.59%	29.53%	31.00%	31.77%
Crenshaw Blvd Streetscape Plan	25.62%	27.87%	32.17%	31.58%
El Monte Transit Village	26.40%	28.56%	33.67%	33.58%
Exposition Line	31.54%	33.59%	38.66%	38.47%
Gold Line Extension Line	25.70%	30.12%	34.59%	34.11%
Salud Park	30.84%	32.24%	35.03%	34.80%
Taylor Yard Transit Village	25.75%	29.36%	34.35%	34.71%
The Exchange At El Monte Gateway	26.49%	29.38%	35.90%	35.92%
Willowbrook Rosa Parks Station	28.89%	29.80%	34.97%	34.96%

## NOAH Investigation (LA)



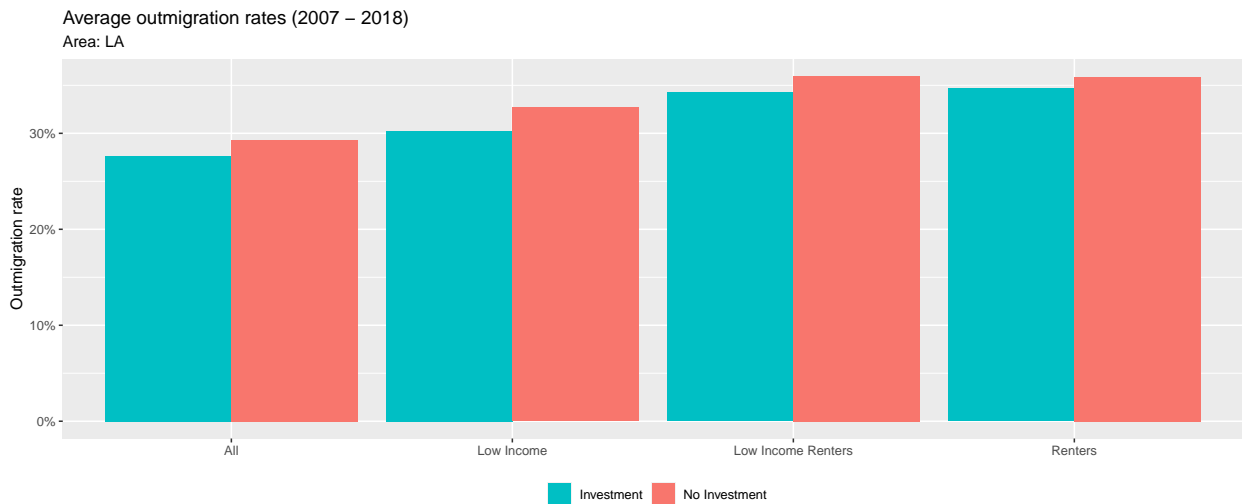
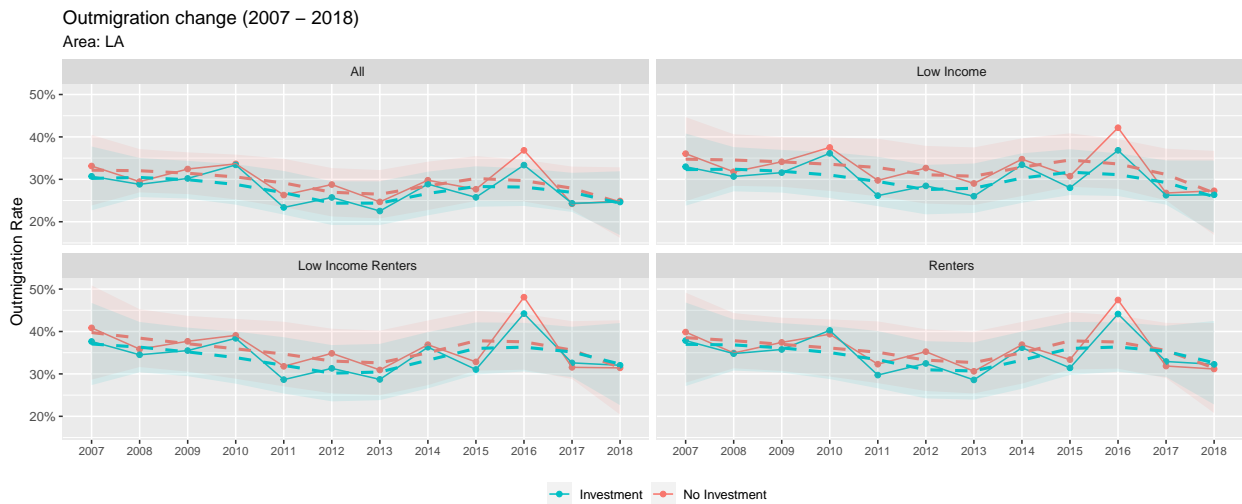
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Table 11: NOAH by Investment in Area: LA

	Dependent variable:	
	noah_tot_change	noah_nolihtc_change
	(1)	(2)
investment1	-45.190* (23.578)	-37.880 (23.470)
Constant	66.803*** (16.672)	79.186*** (16.596)
Observations	116	116
R <sup>2</sup>	0.031	0.022
Adjusted R <sup>2</sup>	0.023	0.014
Residual Std. Error (df = 114)	126.971	126.389
F Statistic (df = 1; 114)	3.673*	2.605

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (LA)



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Table 12: Outmigration Rates by Investment in Area: LA

	Dependent variable: migration_rate			
	ALL (1)	LOW INCOME (2)	RENTER (3)	LOW INCOME RENTER (4)
investment1	-0.014*** (0.005)	-0.014*** (0.005)	-0.005 (0.004)	-0.009* (0.005)
Constant	0.301*** (0.003)	0.328*** (0.003)	0.373*** (0.003)	0.374*** (0.003)
Observations	1,392	1,392	1,392	1,391
R <sup>2</sup>	0.006	0.006	0.001	0.002
Adjusted R <sup>2</sup>	0.005	0.005	0.0003	0.002
Residual Std. Error	0.089 (df = 1390)	0.089 (df = 1390)	0.084 (df = 1390)	0.090 (df = 1389)
F Statistic	8.410*** (df = 1; 1390)	8.479*** (df = 1; 1390)	1.473 (df = 1; 1390)	3.317* (df = 1; 1389)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

# FRESNO

## Summary

- **NOAH:** The Fresno NOAH investigation shows that neighborhoods with investments saw an increase in the quantity of NOAH units between 2009 and 2016, while neighborhoods without saw a decrease. This trend is slightly altered when considering only non-LIHTC NOAH units - non-investment neighborhoods have a slight increase in NOAH units (still below the rate of investment neighborhoods). Conducting a linear regression demonstrates that the presence of investments indicates a positive change in NOAH units (this is statistically significant at  $p < 0.1$ ). Again, this trend is maintained when considering only non-LIHTC units (this is statistically significant at  $p < 0.1$ ). The NOAH summary tables break down this relationship by investment type, and then by the specific investment cases.
- **Outmigration**
  - **Overall Patterns:** See the summary tables for Fresno outmigration rates, including by investment type and by specific investment. Both tables show neighborhood trends based on the presence of the investment/investment type.
  - **Outmigration All:** Both time series and bar plots indicate that higher outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 1.2% increase (this result is not statistically significant).
  - **Outmigration Low Income:** Both time series and bar plots indicate that higher outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 3.9% increase (this result is statistically significant at  $p < 0.01$ ).
  - **Outmigration Renters:** Both time series and bar plots indicate that higher outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 1.9% increase (this result is statistically significant at  $p < 0.05$ ).
  - **Outmigration Low Income Renters:** Both time series and bar plots indicate that higher outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 3.3% increase (this result is statistically significant at  $p < 0.01$ ).

## Summary Tables (FRESNO)

	Fresno Area NOAH % Change by Investment Type (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b><i>-2.49%</i></b>	<b><i>0.62%</i></b>
Any Investment	8.92%	12.31%
Greening	NA	NA
Transit	8.92%	12.31%
Urban Infill	-3.73%	1.73%
Active Transportation	NA	NA

	Fresno Area Overall Average Outmigration Rate by Investment Type (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b><i>No Investment</i></b>	<b><i>32.03%</i></b>	<b><i>35.63%</i></b>	<b><i>40.27%</i></b>	<b><i>41.20%</i></b>
Any Investment	34.13%	39.36%	43.78%	44.79%
Greening	46.19%	46.35%	46.40%	46.38%
Transit	34.13%	39.36%	43.78%	44.79%
Urban Infill	42.93%	43.62%	44.12%	44.83%
Active Transportation	46.19%	46.35%	46.40%	46.38%

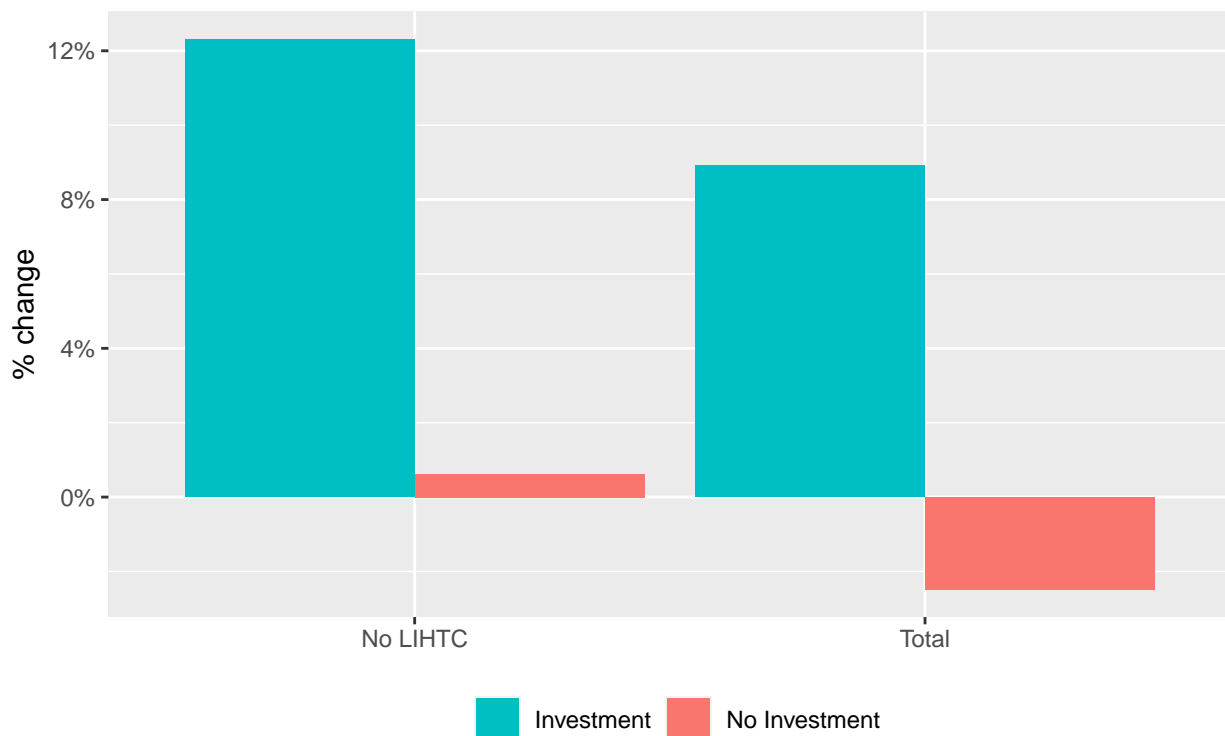
	Fresno Area NOAH % Change by Investment (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b><i>-2.49%</i></b>	<b><i>0.62%</i></b>
Any Investment	8.92%	12.31%
1612 Fulton St (Granville Properties)	NA	NA
Brio On Broadway (Granville Properties)	NA	NA
Bungalow Court (Granville Properties)	-3.73%	1.73%
Crichton Place (Granville Properties)	-3.73%	1.73%
Cultural Arts District Park	NA	NA
Fresno BRT Route	8.92%	12.31%
Fulton Mall Reconstruction Project	NA	NA
Fulton Village (Granville Properties)	NA	NA
The Lede (Granville Properties)	NA	NA
Van Ness Cottages (Granville Properties)	-3.73%	1.73%

	Fresno Area Overall Average Outmigration Rate by Investment (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b>No Investment</b>	<b>32.03%</b>	<b>35.63%</b>	<b>40.27%</b>	<b>41.20%</b>
Any Investment	34.13%	39.36%	43.78%	44.79%
1612 Fulton St (Granville Properties)	46.19%	46.35%	46.40%	46.38%
Brio On Broadway (Granville Properties)	46.19%	46.35%	46.40%	46.38%
Bungalow Court (Granville Properties)	42.71%	43.42%	43.96%	44.71%
Crichton Place (Granville Properties)	42.71%	43.42%	43.96%	44.71%
Cultural Arts District Park	46.19%	46.35%	46.40%	46.38%
Fresno BRT Route	34.13%	39.36%	43.78%	44.79%
Fulton Mall Reconstruction Project	46.19%	46.35%	46.40%	46.38%
Fulton Village (Granville Properties)	46.19%	46.35%	46.40%	46.38%
The Lede (Granville Properties)	46.19%	46.35%	46.40%	46.38%
Van Ness Cottages (Granville Properties)	42.71%	43.42%	43.96%	44.71%

## NOAH Investigation (FRESNO)

NOAH change (2009 – 2016)

Area: FRESNO



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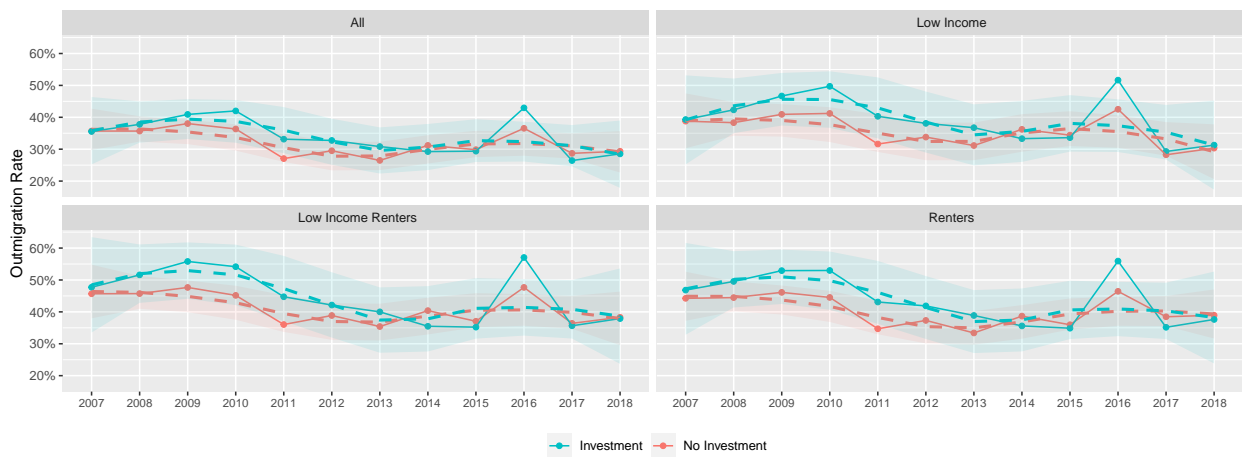
Table 13: NOAH by Investment in Area: FRESNO

	Dependent variable:	
	noah_tot_change (1)	noah_nolihtc_change (2)
investment1	70.146* (40.946)	72.718* (42.688)
Constant	-16.578 (28.953)	4.397 (30.185)
Observations	52	52
R <sup>2</sup>	0.055	0.055
Adjusted R <sup>2</sup>	0.037	0.036
Residual Std. Error (df = 50)	147.634	153.913
F Statistic (df = 1; 50)	2.935*	2.902*

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (FRESNO)

Outmigration change (2007 – 2018)  
Area: FRESNO



Average outmigration rates (2007 – 2018)  
Area: FRESNO



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Table 14: Outmigration Rates by Investment in Area: FRESNO

	Dependent variable:			
	migration_rate			
	ALL	LOW INCOME	RENTER	LOW INCOME RENTER
	(1)	(2)	(3)	(4)
investment1	0.012 (0.008)	0.039*** (0.008)	0.019** (0.008)	0.033*** (0.008)
Constant	0.325*** (0.005)	0.352*** (0.006)	0.417*** (0.006)	0.419*** (0.006)
Observations	622	619	622	619
R <sup>2</sup>	0.004	0.037	0.009	0.025
Adjusted R <sup>2</sup>	0.002	0.035	0.007	0.024
Residual Std. Error	0.096 (df = 620)	0.100 (df = 617)	0.098 (df = 620)	0.102 (df = 617)
F Statistic	2.470 (df = 1; 620)	23.540*** (df = 1; 617)	5.675** (df = 1; 620)	16.029*** (df = 1; 617)

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

## SF BAY AREA

### Summary

- **NOAH:** The SF Bay Area NOAH investigation shows that neighborhoods with investments saw a faster increase in the quantity of NOAH units between 2009 and 2016 than did neighborhoods without. This trend is maintained when only considering non-LIHTC NOAH units. This is a reversal of the general trend and trend seen in the other study areas. Conducting a linear regression shows that the presence of investments indicates a positive change in NOAH units (although this is not statistically significant). Again, this trend is maintained when considering only non-LIHTC units (this is not statistically significant). The NOAH summary tables break down this relationship by investment type, and then by the specific investment cases.
- **Outmigration**
  - **Overall Patterns:** See the summary tables for SF Bay Area outmigration rates, including by investment type and by specific investment. Both tables show neighborhood trends based on the presence of the investment/investment type.
  - **Outmigration All:** Both time series and bar plots indicate that higher outmigration rates are generally associated with the presence of investments, and a linear regression confirms this relationship with a 1.6% increase (this result is statistically significant at p<0.05).
  - **Outmigration Low Income:** The time series plot indicates a mixed relationship between investments and outmigration, while the bar plot indicates a slight trend towards decreased outmigration in investment neighborhoods. A linear regression confirms the bar plot, demonstrating about 0.5% decrease in outmigration with the presence of an investment (this result is not statistically significant).
  - **Outmigration Renters:** The time series plot indicates a mixed relationship between investments and outmigration, while the bar plot indicates a slight trend towards decreased outmigration in investment neighborhoods. A linear regression confirms the bar plot, demonstrating about 1.5% decrease in outmigration with the presence of an investment (this result is statistically significant at p<0.5).
  - **Outmigration Low Income Renters:** The time series plot indicates a mixed relationship between investments and outmigration, while the bar plot indicates a slight trend towards decreased outmigration in investment neighborhoods. A linear regression confirms the bar plot, demonstrating about 1.3% decrease in outmigration with the presence of an investment (this result is statistically significant at p<0.5).



## Summary Tables (SF BAY)

	SF Bay Area NOAH % Change by Investment Type (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b>27.94%</b>	<b>26.36%</b>
Any Investment	32.47%	36.29%
Greening	159.71%	90.72%
Transit	46.44%	50.72%
Urban Infill	-29.26%	-24.26%
Active Transportation	17.67%	20.74%

	SF Bay Area Overall Average Outmigration Rate by Investment Type (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b><i>No Investment</i></b>	<b>28.15%</b>	<b>31.76%</b>	<b>37.75%</b>	<b>36.92%</b>
Any Investment	31.21%	31.33%	37.43%	35.66%
Greening	32.87%	35.33%	43.20%	42.39%
Transit	32.63%	32.96%	41.07%	39.95%
Urban Infill	23.35%	23.30%	24.09%	23.73%
Active Transportation	28.72%	29.04%	32.24%	30.79%

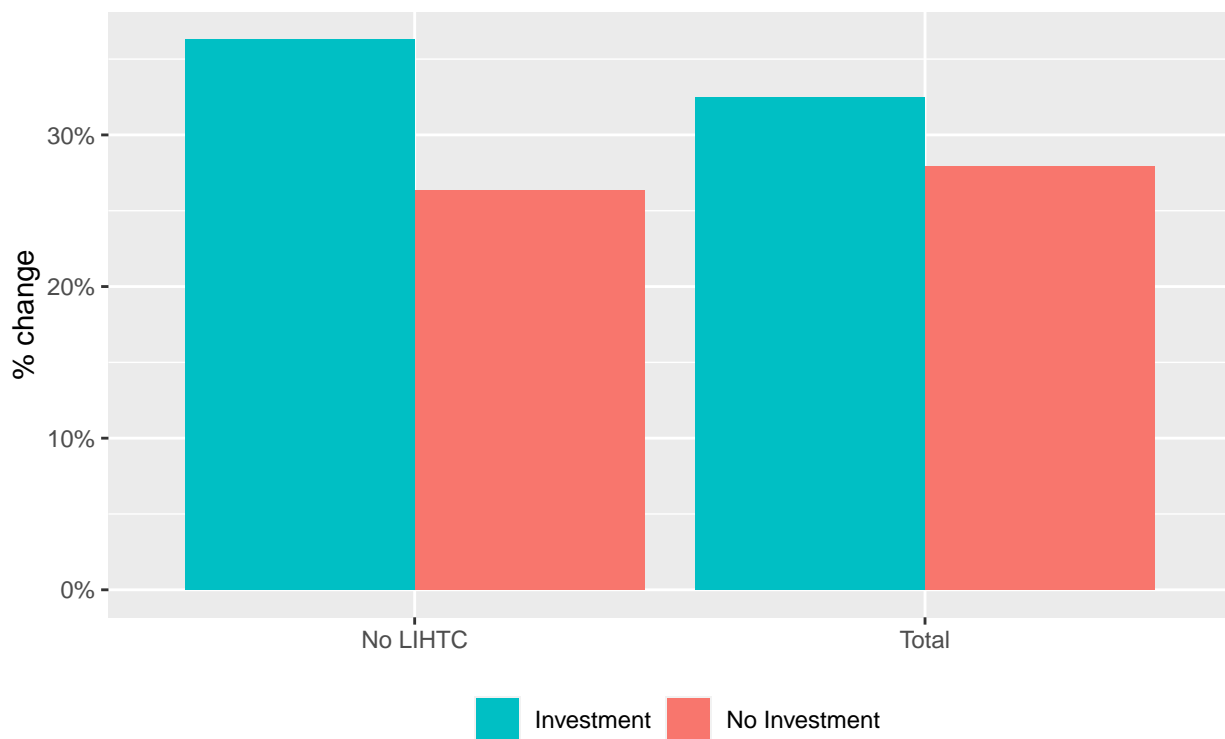
	SF Bay Area NOAH % Change by Investment (2009 - 2016)	
	Total NOAH Units	No LIHTC NOAH Units
<b><i>No Investment</i></b>	<b>27.94%</b>	<b>26.36%</b>
Any Investment	32.47%	36.29%
Concord Monument Blvd. Pedestrian Infrastructure Improvement Project	67.18%	68.00%
Ed Roberts Campus	-4.60%	-4.42%
Midtown Transportation and Streetscape Improvements	460.36%	179.26%
MacArthur Transit Village	-34.98%	-29.05%
South Sacramento Corridor Light Rail Extension Phase 2	62.96%	44.85%
Rumrill Sports Park	47.61%	21.14%
San Leandro Downtown BART Interface	-1.04%	-1.00%
SFMTA Third Street Light Rail	33.05%	55.38%

	SF Bay Area Overall Average Outmigration Rate by Investment (2007 - 2018)			
	Total	Low Income	Renters	Low Income Renters
<b>No Investment</b>	<b>28.15%</b>	<b>31.76%</b>	<b>37.75%</b>	<b>36.92%</b>
Any Investment	31.21%	31.33%	37.43%	35.66%
Concord Monument Blvd. Pedestrian Infrastructure Improvement Project	31.85%	34.50%	39.08%	39.17%
Ed Roberts Campus	30.63%	34.56%	39.95%	40.30%
Midtown Transportation and Streetscape Improvements	33.45%	37.03%	43.61%	42.88%
MacArthur Transit Village	22.58%	22.50%	22.94%	22.71%
South Sacramento Corridor Light Rail Extension Phase 2	30.49%	33.87%	43.62%	43.70%
Rumrill Sports Park	29.99%	30.92%	41.11%	41.18%
San Leandro Downtown BART Interface	31.11%	33.18%	37.36%	37.71%
SFMTA Third Street Light Rail	33.60%	32.69%	40.43%	38.95%

## NOAH Investigation (SF)

### NOAH change (2009 – 2016)

Area: SF



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Table 15: NOAH by Investment in Area: SF

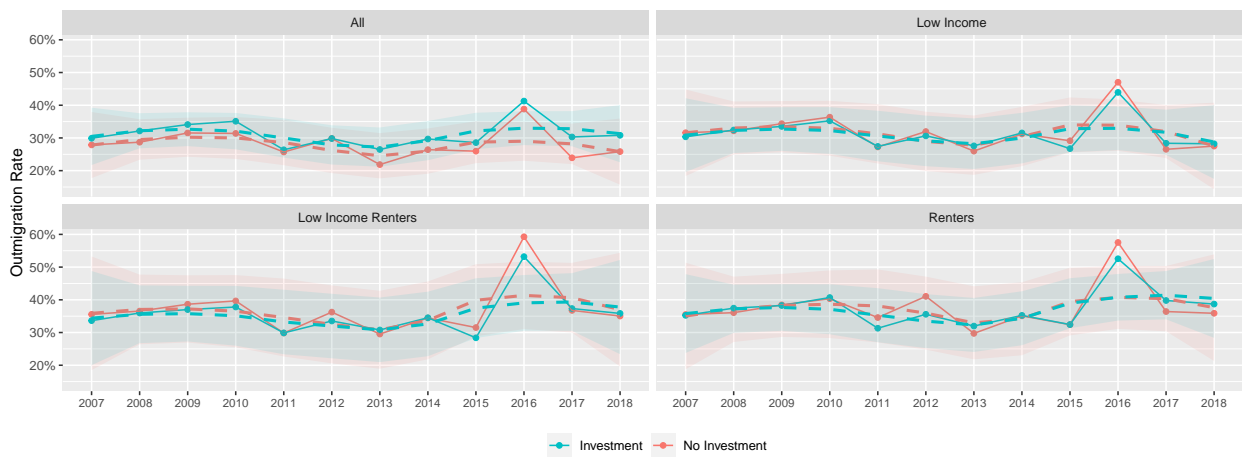
	Dependent variable:	
	noah_tot_change (1)	noah_nolihtc_change (2)
investment1	6.337 (48.893)	44.865 (50.822)
Constant	108.902*** (34.572)	118.687*** (35.936)
Observations	52	52
R <sup>2</sup>	0.0003	0.015
Adjusted R <sup>2</sup>	-0.020	-0.004
Residual Std. Error (df = 50)	176.286	183.241
F Statistic (df = 1; 50)	0.017	0.779

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Outmigration Investigation (SF)

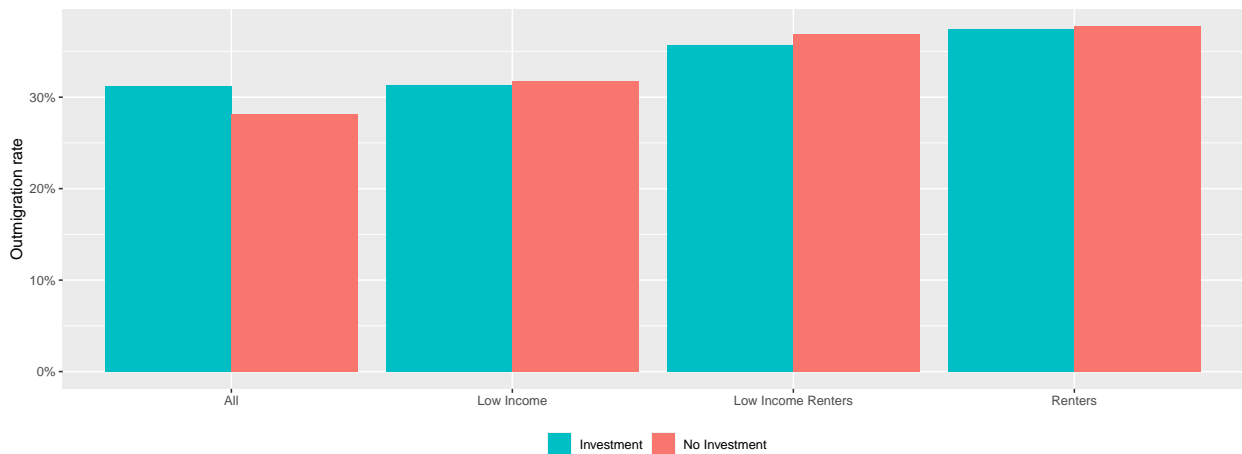
Outmigration change (2007 – 2018)

Area: SF



Average outmigration rates (2007 – 2018)

Area: SF



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Table 16: Outmigration Rates by Investment in Area: SF

	<i>Dependent variable:</i>			
	migration_rate			
	ALL	LOW INCOME	RENTER	LOW INCOME RENTER
	(1)	(2)	(3)	(4)
investment1	0.016** (0.006)	-0.005 (0.008)	-0.015* (0.008)	-0.013* (0.008)
Constant	0.285*** (0.005)	0.334*** (0.005)	0.414*** (0.005)	0.413*** (0.006)
Observations	624	613	624	612
R <sup>2</sup>	0.009	0.001	0.006	0.005
Adjusted R <sup>2</sup>	0.008	-0.001	0.005	0.003
Residual Std. Error	0.081 (df = 622)	0.095 (df = 611)	0.095 (df = 622)	0.098 (df = 610)
F Statistic	5.836** (df = 1; 622)	0.450 (df = 1; 611)	3.816* (df = 1; 622)	2.775* (df = 1; 610)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01