NATIONAL STREET IMPROVEMENT STUDY

peopleforbikes | BENNETTMIDLAND | Portland State UNIVERSITY | THE SUMMIT FOUNDATION

FINDINGS FROM INDIANAPOLIS

OVERVIEW[1]

Across the country, policymakers and planning departments are making cities more livable by better accommodating people who walk and bike. Improving streets and upgrading transportation infrastructure often require reducing on-street parking or traffic lanes. While studies have shown how such upgrades improve traffic safety and mobility for city residents, the question remains how such infrastructure improvements affect economic outcomes.

This study will attempt to answer to what extent these types of corridor-level street improvements impact economic activity and business vitality in the immediate vicinity. In particular, how do street improvements impact retail sales and employment?

Indianapolis has conducted many street improvement projects in past years, including new separated bike trails, bike lanes and road diets. This report explores two segments of recent street improvement corridors - Massachusetts Avenue and Virginia Avenue—to understand the economic and business impact of these active transportation infrastructure investments. The treatment in both corridors is the addition of the Indianapolis Cultural Trail: A Legacy of Gene and Marilyn Glick, a separated bike and pedestrian path that also serves as a linear park.

Assessing the impact of street improvements and the accompanying reduction of on-street parking or travel lanes on a neighborhood's economic activity and vibrancy is a new field of research. In 2013, the New York City Department of Transportation commissioned a first-of-its-kind, using sales tax data to evaluate how businesses on improved corridors have been affected. This current study builds on past work by examining additional cities and incorporating new research methods and data sources.

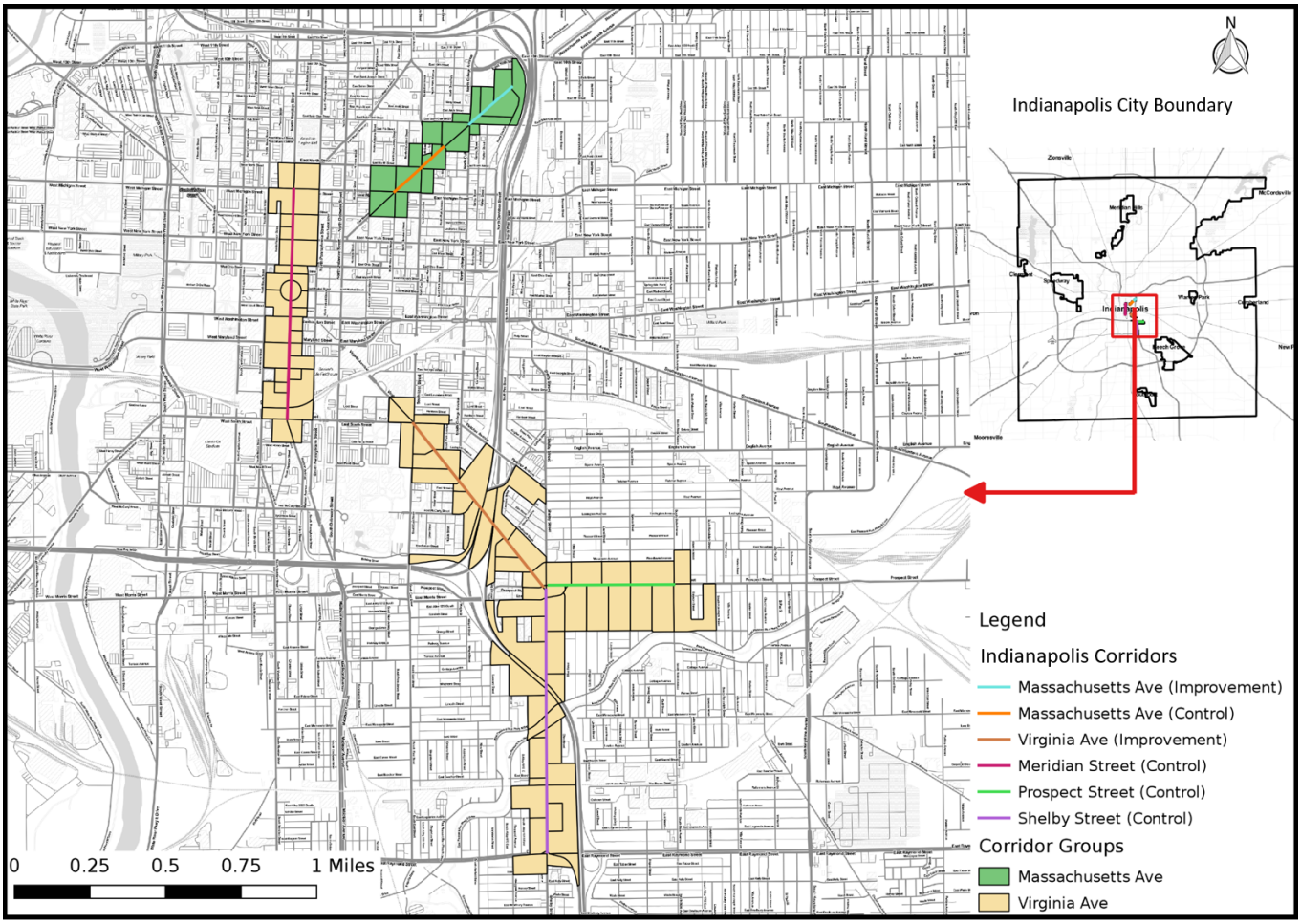
KEY FINDINGS

Based on our analysis, we found the street improvement projects in Indianapolis did not impede economic vitality, and may have contributed to positive growth. In particular, we can conclude that:

1 **ALONG VIRGINIA AVENUE, THE CORRIDOR SHOWS SUBSTANTIAL GROWTH IN ALL FOOD SERVICE INDUSTRY METRICS—EMPLOYMENT, SALES, AND WAGES—AFTER BIKE LANE INSTALLATION. EVIDENCE OF THESE POSITIVE IMPACTS IS SUPPORTED CONSISTENTLY ACROSS ALL ANALYSIS RESULTS USING ALL DATA SOURCES.**

2 **ON THE IMPROVED CORRIDOR OF MASSACHUSETTS AVENUE, FOOD SERVICES EMPLOYMENT GROWTH SIGNIFICANTLY OUTPACED GROWTH IN INDIANAPOLIS AS A WHOLE FOLLOWING ITS BIKE LANE INSTALLATION.**

In terms of the retail service sector, we found either mixed or insignificant results.[2] However, the insignificant results may be significant in this context, indicating that there does not appear to be a negative causal impact of right-of-way or parking lane removal on economic outcomes.



DATA SOURCES

For this study we used multiple data sources to estimate the effect of new bike lane infrastructure investment, each with its pros and cons.[3] As such, the analysis results using the three data sources should be viewed as complementary to each other.

LEHD

First, we used the Longitudinal Origin-Destination Employment Statistics (LODES) dataset from the **Longitudinal Employer-Household Dynamics Dataset** (LEHD). LEHD provides geographically granular detail about jobs, workers and local economies, allowing us to examine employment by broad industry sector, wage and educational attainment. One major disadvantage of the LEHD dataset is that in order to guarantee confidentiality, block level data is "fuzzed" so the numbers do not reflect the exact number of jobs at this geographical level. Additionally, though employment is disaggregated by industry, it is only provided at the most general level (the equivalent of two-digit NAICS[4] codes) so we are unable to isolate restaurant workers from hotel service workers, for example. That being said, the LEHD data set is comprehensive, offers unprecedented geographic detail, and is longitudinal, allowing for consistent comparisons over time.

SALES TAX DATA

Sales tax data is collected as the primary data source to allow us to estimate a more sensitive measure of economic activity than employment (as the decision to hire or fire employees for a firm is often an expensive one, and thus we would expect employment to be a delayed response to changes in economic activities). Some drawbacks of sales tax data are that some states do not have a sales tax or, in states or cities that do have one, the sales tax data is not broken down by specific industry and it is difficult to parse out accurate figures. But the benefits of sales tax data largely outweigh these issues and do offer a more sensitive metric than employment. Indiana has a general 7% sales tax for all businesses, with additional taxes based on the type of good or service and the city/county where an establishment is located. For example, Marion County, the home county of Indianapolis, has an additional 2% food and beverage tax as well as a 10% accommodations tax. These produce a sales tax range of 7-19% in the city. However, unprepared grocery food and health care items are exempted from tax collection, which may hamper the ability of sales tax data to accurately reflect all retail business vitality.

QCEW

This report also takes advantage of establishment level **Quarterly Census of Employment and Wages (QCEW)** data. The QCEW gives us address level data on individual establishments as well as detailed employment information, allowing for more accurate pinpointing of the geographic location of businesses and industrial classifications. In addition, the research team is able to use employment and wages as additional indicators of economic performance in the corridors. However, individual establishment-level QCEW data is confidential and requires special permission from the state, and is subject to additional data use restrictions. The State of Indiana owns this disaggregated establishment-level data. Due to confidentiality restrictions, we were only able to obtain corridor-level food and drinking place employment data aggregated by the Indiana Business Research Center, but not for retail services. These aggregated numbers correspond closely to the LEHD data used elsewhere in the report, but with the advantage that the numbers are not "fuzzed" for confidentiality concerns.

1. The National Street Improvements Study is a research project by Portland State University, Bennett Midland, and PeopleForBikes. An accompanying report with more detailed information on methodology can be accessed at https://peopleforbikes.org/placesforbikes/resources/

2. This is typically due to either an insufficient number of data points after the completion of the street improvement (for ITS analysis) or control corridors that may not be fully comparable (for DID analysis), methods explained further in Section 3 ("Methodology").

3. Because this project makes use of a variety of different data sources, it required collaboration between the research team and representatives from multiple agencies/departments. Our principle contact was with Indianapolis Cultural Trail Inc.: sales tax data was provided by Indianapolis Cultural Trail Inc. and QCEW data was retrieved from State of Indiana and aggregated by Indiana Bureau of Research Center; and LEHD data was publicly available at United State Census Bureau.

4. For the North American Industry Classification System (NAICS), please visit https://www.census.gov/eos/www/naics/

METHODOLOGY

Three analytical methods were applied in order to isolate the impact of street improvements while controlling for other economic and regional factors. The methods are an aggregated trend analysis (following the NYC DOT study), a difference-in-difference approach, and an interrupted time series analysis. The time frame used in the analysis for LEHD data is 2004-2015, 2008-2016 for sales data, and 2004-2016 for QCEW data.

In order to properly isolate the effect of the street improvements we must identify treatment corridors (corridors that actually were improved) and control corridors (corridors that are similar to the treatment corridors except they remain unimproved). Treatment corridors are corridors where new bike or pedestrian related improvements were installed, ideally made up of a minimum of ten adjacent, or intersecting, census blocks with a minimal number of retail and food service jobs. Additionally, we chose street improvement corridors installed between 2008 and 2013 in order to guarantee we have sufficient data (at least three data points pre- and post-treatment) to track pre- and post-treatment economic trends. Once corridors are selected based on these criteria, further testing is conducted to discern the level of similarity between treatment and control corridors. The tests include quintile comparisons of corridor-level employment to city-wide employment, and statistical tests of average block level employment that compare control corridors to the treatment corridors.

AGGREGATED TREND ANALYSIS

This first analytical method, aggregated trend analysis, follows a previous NYC Department of Transportation study (NYCDOT, 2013), examining whether the treatment corridors tend to have better business performance than comparison corridors after street improvements. The approach compares the trends of treatment and control corridors in addition to city-wide trends over the full time period covered by the data. If treatment corridors show greater increases in employment or sales tax receipts, then that would represent a positive impact of street improvement on business activities. This method is easy to follow and represents the aggregated trend of business activities. However, it lacks the rigor of econometric estimates and statistical tests that explicitly test whether the street improvement caused the change.

DIFFERENCE-IN-DIFFERENCE APPROACH

The second method aims to estimate the difference in business vitality of pre- and post-improvement periods between treatment and control corridors within the same time period. This is known as a difference-in-difference (DID) approach. The approach looks at the change in the variable of interest—employment levels or sales revenues in our case—in the treatment corridor before and after the street improvement. Meanwhile, the control group has not been treated in either time period. The difference in growth trajectories between the two periods should provide us with an unbiased estimate of the effect of the street improvement.

INTERRUPTED TIME SERIES

The third method, interrupted time series (ITS), is an econometric technique that estimates how street improvements impact corridor economic vitality from a longitudinal perspective. This approach treats the street improvement as the "interruption" and estimates the change in the level and the growth trend of business activities in the corridor after the street improvement. If the street improvement treatment has a causal impact, the post-intervention sales revenue or employment should show a different level or slope compared to the pre-intervention data.[5]

5. The aggregated trend analysis is a visual and growth trend comparison approach where statistical significance cannot be assigned. However, for the two econometric approaches, DID and ITS analysis, we refer to statistically significant impacts whenever positive or negative impacts are stated in this report.

CONCLUSION

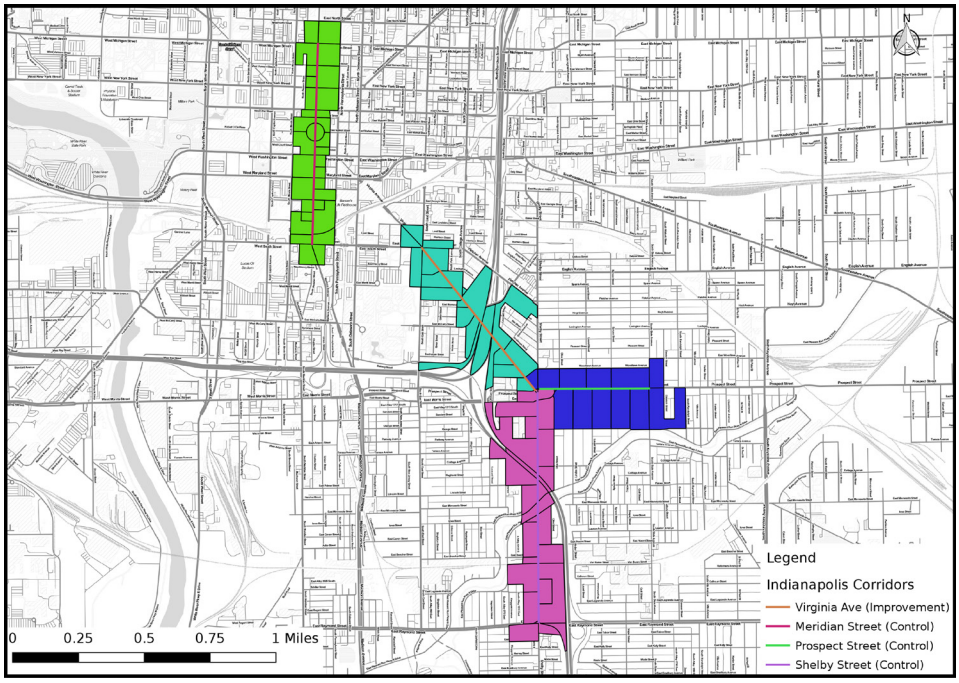
In conclusion, aggregated trend analysis and DID analysis both utilize control corridors to determine the impacts of the street improvement corridor, while the ITS analysis uses multiple time points on the street improvement corridor itself to pinpoint economic outcomes. In general, the ITS analysis provides more robust results than the other two methods, since it is less likely to be affected by the selection of control corridors. However, this method generally requires more data points post-intervention to achieve meaningful and valid impact estimations. The DID approach is heavily dependent on finding comparable control corridors (which may not always exist), so the analytical results may be weakened when appropriate corridors cannot be identified.

Additional data points after the completion of street improvements may help to provide further validity and rigor to the analysis of resulting economic outcomes. Moreover, further contextual information about the street improvement corridor, such as quality or level of the improvement, number of parking spot reduction, and subsequent bicycle ridership or pedestrian increases, would help to better understand the linkages between the improvements and potential economic impacts. Extending this research to more closely examine the changes and shifts in industrial patterns will be valuable as well.

CORRIDOR ANALYSIS

VIRGINIA AVENUE

Our first treatment corridor is Virginia Avenue, which installed a separated bike lane in 2011 with travel lane removal. The proposed control corridors are Meridian Street, Prospect Street, and Shelby Street. Prospect Street and Shelby Street are close to the treatment corridor in southeast downtown Indianapolis, have similar business characteristics as treatment corridor, and have some level of existing bike infrastructure. Meridian Street was excluded from our analysis during the corridor selection process.



KEY TAKEAWAYS

» Although Virginia Avenue retail employment shows a more negative growth trend when compared with the corresponding control corridors in the aggregated trend analysis, the more rigorous DID and ITS approaches indicate that the bike lane installation did not significantly impact retail employment, either positively or negatively, along the Virginia Avenue corridor.

» The Virginia Avenue corridor shows substantial growth in all food services industry metrics—employment, sales and wages—after bike lane installation. Both DID and ITS models indicate positive causal effects on food service businesses. These positive impacts are supported consistently across all analysis results using all data sources.

» In conclusion, the separated bike lane triggered significant employment, sales, and wage increases in the food services industry, indicating an improvement in business vitality as a result.

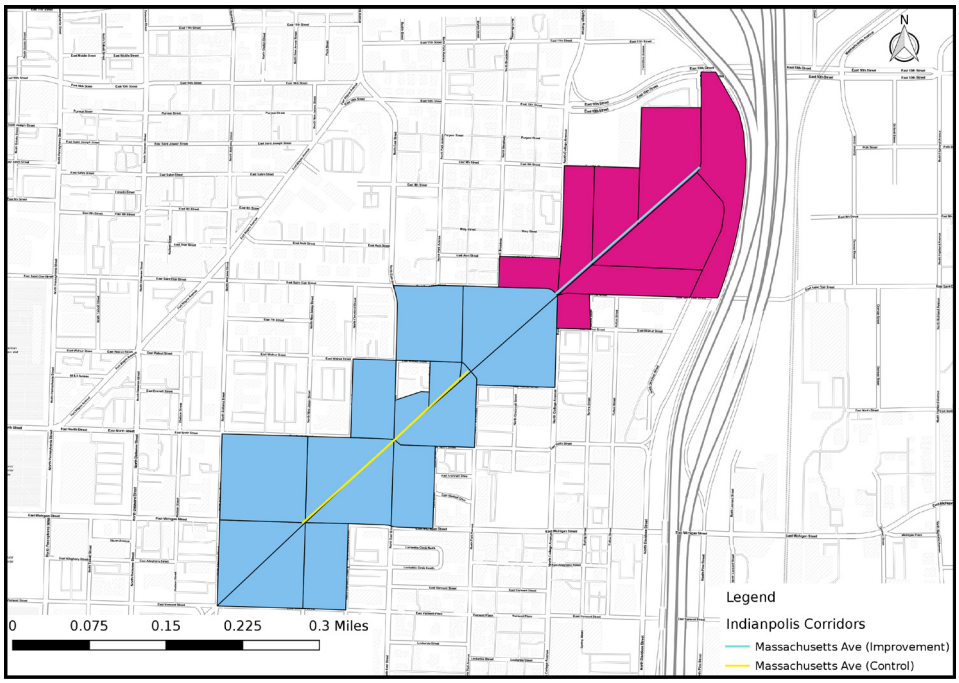
		Retail			Food		
Data	**Area**	**Baseline**	**Pre-Growth**	**Post-Growth**	**Baseline**	**Pre-Growth**	**Post-Growth**
LEHD [Employment]	Treatment	25	-3.41%	-11.79%	47	21.40%	70.59%
	Control: Shelby	108	-0.59%	0.10%	113	26.64%	7.13%
	Control: Prospect	49	26.46%	-3.06%	37	62.50%	40.32%
QCEW [Employment]	Treatment	-	-	-	42	41.01%	92.55%
	Control: Shelby	-	-	-	72	-1.68%	11.58%
	Control: Prospect	-	-	-	36	6.20%	14.55%

			Baseline	Pre-Growth	Post-Growth
Sales [Sales tax]	Treatment		$404,527	37.08%	55.80%
	Control: Shelby		$794,351	-0.37%	8.32%
	Control: Prospect		$427,695	2.00%	6.65%

VIRGINIA AVENUE

MASSACHUSETTS AVENUE

Massachusetts Avenue's separated bike lane was installed in 2009 and involved the removal of a travel lane. The control corridor is designated as a separate segment of Massachusetts Avenue without any street improvements.



KEY TAKEAWAYS

The following findings are mainly based on the aggregated trend analysis and ITS approach using LEHD data due to data[6] and methodological[7] limitations.

» In the food services sector, both the improved corridor of Massachusetts Avenue and the control corridor show similar increasing employment trends. The growth on Massachusetts Avenue significantly outpaced food services employment growth in the city as a whole following bike lane installation in 2009. In addition, this growth is confirmed by the positive significant impact on employment growth using the ITS approach.

» While growth in retail employment and sales revenue was observed in the years following the construction of the separated bike lane on Massachusetts Avenue, we are unable to calculate pre- and post-construction growth rates due to zero retail employment in some of the years. However, the DID and ITS approaches both indicate that the bike lane installation did not significantly impact retail employment, either positively or negatively, along this corridor.

» In conclusion, on Massachusetts Avenue, we found a significant positive impact on food services employment following its separated bike lane construction, indicating an improvement in business vitality.

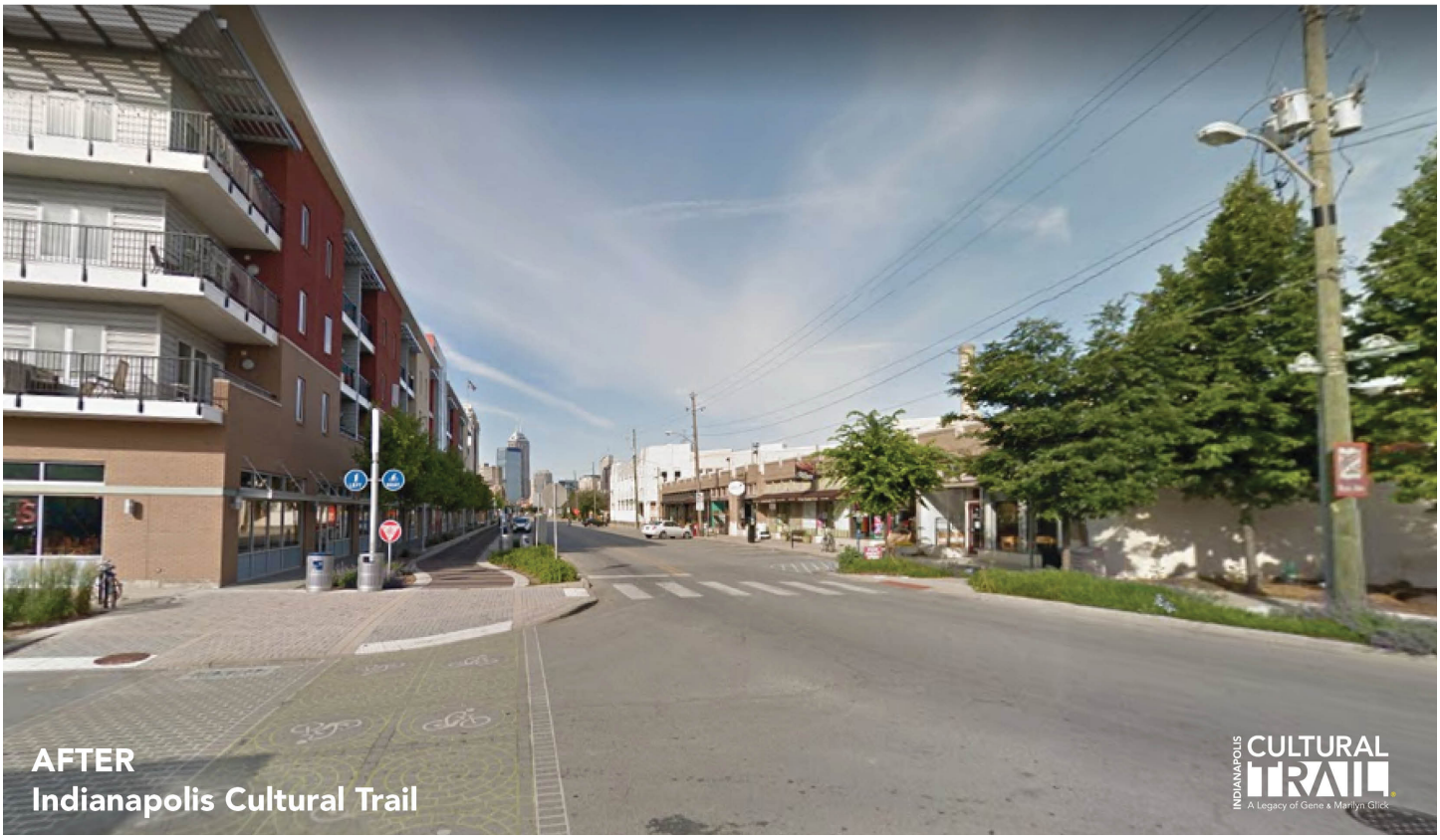
Data	Area	Retail			Food		
		Baseline	Pre-Growth	Post-Growth	Baseline	Pre-Growth	Post-Growth
LEHD [Employment]	Treatment	12	-	-	129	-9.07%	15.32%
	Control: Mass Ave	20	-14.29%	11.88%	273	-3.38%	12.43%

Data	Area	Baseline	Pre-Growth	Post-Growth
Sales [Sales tax]	Treatment	$66,527	-	22.03%
	Control: Mass Ave	$137,819	-	1.32%

6. The Sales Tax and QCEW data was only available for one year prior to bike lane construction. In addition, many of the QCEW data points were suppressed due to confidentiality reasons (less than three retail establishments on the corridor).

7. The DID approach was not appropriate in this circumstance since the economic indicators of the treatment and control corridors of Massachusetts Avenue are highly correlated.

MASSACHUSETTS AVENUE



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Special thanks to Indianapolis Cultural Trail, Inc. for the valuable assistance that made this study possible.

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8. A complete reference list is available as part of the accompanying report at https://peopleforbikes.org/placesforbikes/resources/