Grocery Stores Raise Property Values: Evidence from FRESH

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October 29, 2021

Abstract

The effect of grocery stores on property values is difficult to establish because of the endogeneity between where people choose to live and where grocery stores choose to operate. This paper is the first to establish that grocery stores are local amenities by using the Food Retail Expansion to Support Health (FRESH) program in New York City. On average, a non-commercial property located in a FRESH area experiences a 2.07% increase in value. An exploration of mechanisms indicates that opening more grocery stores not only contributes a direct effect to the increase in property values through an improvement of local amenities, but it also engenders the establishment of complementary businesses such as restaurants, thereby leading to a further increase in property values through an indirect effect on local amenities.

Keywords: Local amenities, Hedonic Pricing, Food Policy, Zoning

JEL Classification: L81, R31, R52

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1 Introduction

The Whole Foods Effect colloquially refers to the positive correlation between house values and the number of nearby upscale grocery stores, such as its namesake, Whole Foods. Despite only being a correlation, the Whole Foods Effect is misconstrued to represent a causal effect: when a grocery store opens, surrounding property values rise. Claiming a causal relationship between property values and grocery stores is difficult because where people live and where grocery stores operate are endogenous choices. On one hand, a rise in property values could reflect general improvements to the neighborhood, attracting the grocery store to open nearby. On the other hand, a new grocery store could provide local amenities, attracting more residents, and raising property values.

This paper establishes that grocery stores are local amenities that increase non-commercial property values by using the Food Retail Expansion to Support Health (FRESH) program in New York City (NYC). Introduced in 2009 and still ongoing, FRESH offers financial and zoning incentives to foster opening grocery stores in areas of high need. A panel IV instruments for the number of grocery stores in a census tract using the sudden introduction of FRESH as an instrument. The resulting estimate shows that an additional grocery store increases non-commercial assessed property values by 6.77%. Additionally, a difference-in-difference model finds that the average intent-to-treat effect is an increase in property values of 2.07% for non-commercial properties in FRESH areas relative to similar properties in non-FRESH areas. Consistent with a hesitancy in uptake, the increase in property values strengthens over time.

An exploration of the mechanisms behind the effect suggest that grocery stores directly contribute to the increase in property values because grocery stores directly improve local amenities. Furthermore, grocery stores attract complementary retail and services, such as restaurants, thereby leading to a further increase in property values through an indirect improvement of local amenities. The indirect effect is evidenced by an observable increase in sales per employee for restaurants in FRESH areas relative to restaurants in non-FRESH areas, suggesting potential profits as an incentive for restaurants to locate

in FRESH areas. Indeed, an observable increase in restaurant employment concentration supports the idea that restaurants have responded to this incentive by locating within FRESH areas.

Prior studies have not been able to conclude that grocery stores are considered a local amenity. A nearby grocery store could be appealing because it can provide more convenience in obtaining necessities. In contrast, a grocery store could be unappealing because it can lead to undesirable traffic congestion by attracting non-residents to the neighborhood, requiring the disposal of trash, and receiving regular product deliveries. Furthermore, the endogeneity between residential location choice and firm location choice precludes disentangling the causal relationship between grocery stores and property values, a relationship that is necessary to conclude whether a grocery store is an amenity. This paper is the first to overcome the endogeneity issue and provide evidence indicating that grocery stores are an amenity. This finding speaks to several strands of literature, one of which is the literature on the hedonic pricing of amenities. Rosen (1974) provides a theoretic foundation for hedonic price analysis, resulting in a broad methodology with a wide variety of applications for pricing housing amenities such as open spaces Blomquist and Worley (1981), homeowner's associations Clarke and Freedman (2019), and school quality Yinger (2015).

Establishing that grocery stores raise property values also relates to the literature on food deserts, which are low-income areas that have limited access to healthy, affordable foods. Bitler and Haider (2011) provide a good overview on food deserts from an economics perspective. They note that researchers have not been able to convincingly document the presence or absence of food deserts on a national scale, most likely due to shortcomings in data. In addition to a lack of convincing studies on the causes of food deserts, Bitler and Haider (2011) provide many examples of initiatives to eliminate food deserts, yet little research exists evaluating the effects of these initiatives. One study by Allcott et al. (2019) finds in a nationwide event study that the opening of a grocery store does not significant alter the nutritional quality of goods consumed by households. If these initiatives fail their primary goal of eliminating nutritional inequality, as suggested

by Allcott et al. (2019), then at the very least, there are additional benefits to these policies in the form of increased property values.

Lastly, the findings also relate to the literature on gentrification. This is the first paper to document in a rigorous causal framework the Whole Foods Effect, a term that describes how property values rise in response to anticipated community change signaled by the start of food retailers marketing more sustainable, healthy products.[1]. Glaeser et al. (2018) document the association between cafes and house prices using Yelp data, finding that an additional Starbucks is associated with a 0.5% increase in a housing price index, but make no causal claim. Their study also finds a positive correlation for grocery stores. Based on this paper, it is possible that simply providing incentives to open grocery stores leads to higher property values, such that discussing the Whole Foods Effect as a causal relation is no longer far-fetched.

Section 2 discusses the context for FRESH, Section 3 describes the data and methods used in this paper, Section 4 presents the results, Section 5 explores the mechanisms behind the estimated effects, and Section 6 concludes.

2 Background

Grocery stores have a long history in NYC. An article on real estate by *The New York Times* depicts the small mom-and-pop grocery stores as the linchpin of the local community.[2] Despite its perceived importance, the article states that family-owned grocers of less than 7,000 square feet are on the decline: between 2005 and 2015, there was a decline of 8% in the number of family-owned grocers. In real terms, there was about 300 store closures, two-thirds of which occurred in arguably less affluent areas outside of Manhattan. High rents and increased competition are claimed to be factors behind the closures. In a similar discussion, *The Atlantic* highlights shifting trends in consumer spending, noting that the Consumer Expenditure Survey, conducted by the Bureau of

[1]Discussion on the Whole Foods Effect in the media available at `https://medium.com/@daliakramirez/the-whole-foods-effect-foodie-culture-and-culinary-gentrification-acaf7ebbba49`

[2]`https://www.nytimes.com/2016/11/06/realestate/new-york-city-small-supermarkets-are-closing.html`

Labor Statistics, exhibits a general increase in expenditures on food away from home (i.e. eating out) as a share of total food expenditures.[3] Essentially, *The Atlantic* concludes that grocery stores are unsurprisingly closing because overall, people are spending less money at grocery stores. Even though 300 store closures might not seem dramatic for NYC, these stores are thought to be heavily interconnected with the local community, so one closure can have major impacts on the local residents. Hence, there has been a longstanding concern at the local level about a shortage of grocery stores.

The Food Retail Expansion to Support Health (FRESH) program was introduced in 2009 in New York City (NYC) as a response to a 2008 study, *Going to Market*,[4] initiated by the Mayor's Office of NYC and conducted by the NYC Food Policy Coordinator, the NYC Economic Development Council (EDC), and the NYC Department of Health. Constituents raised concerns over a shortage of supermarkets due to neighborhood grocery store closures despite an increase in population. *Going to Market* finds that approximately 3 million New Yorkers lived in areas dubbed as areas in high need of fresh food purveyors, based on neighborhood characteristics such as population, household incomes, and the prevalence of diet-related diseases.

The rhetoric in *Going to Market* heavily emphasizes supply-side constraints as the main reason for a lack of access to fresh produce. Land constraints are identified as the factor that limits the expansion of existing supermarkets and the creation of new grocery stores. FRESH addresses these land constraints by providing two types of incentives to developers and current grocery store operators to either build or renovate retail space for the purpose of providing fresh groceries. The first is a financial incentive, similar to that already provided by the Empire Zones Program. Examples of financial benefits include fixed building taxes for the next 25 years, land tax abatement for the next 25 years, and waived sales tax on materials used for the construction or renovation of the grocery store. The second type of incentive is a zoning incentive, examples of which

[3] https://www.theatlantic.com/business/archive/2016/11/millennials-groceries/506180/

[4] A PDF of the report is available at https://www1.nyc.gov/assets/planning/download/pdf/plans/supermarket/supermarket.pdf
A PowerPoint presentation is available at https://www1.nyc.gov/assets/planning/download/pdf/plans/supermarket/presentation_2008_10_29.pdf

include additional square footage of residential floor area permitted for every square foot of grocery space in mixed-use buildings, an increase in the maximum building height, and reduced requirements for the provision of parking space.

Figure 1 delineates FRESH areas and superimposes the delineation on a map of NYC's census tracts as of 2010. Both maps are provided to the public by NYC on its data repository, BYTES of the BIG APPLE. Relative to zoning incentives, the financial incentives are the most widely available in terms of area, but receipt of these benefits is discretionary. The NYC Industrial Development Agency, a subgroup of the NYC EDC, determines awards based on a number of factors. Generally, financial incentives are awarded if the size of the proposed grocery store is at least 5000 square feet, and the estimated economic impact of the proposed grocery store suits the surrounding neighborhood. In contrast to the financial incentives, the zoning benefits are awarded as-of-right if the grocery store meets certain criteria, such as providing a minimum of 6000 square feet in retail space, at least 500 of which is dedicated to providing fresh foods, and displaying a sign designating the store as a FRESH beneficiary. Zoning benefits are managed by the NYC Department of City Planning.

FRESH boundaries do not exactly follow census tract boundaries. Rather, the boundaries are drawn based on a mix of census tract and community district boundaries, the latter of which can be thought of as a region similar to a ZIP code. Because the incentives are managed by different groups, different criteria determine which incentives are available in any given area. The zoning incentives closely follow the Supermarket Needs Index (SNI), developed by Smith et al. (2011) for *Going to Market*. The SNI is high if an area exhibits high population density, low household incomes, and a low share of fresh food retail. Instead of relying on the SNI, the state's general municipal law determines where the financial incentives are offered.[5] Specifically, census tracts or block numbering areas are deemed highly distressed areas if the poverty rate and unemployment rate, according to the most recent American Community Survey 5-year estimate, exceed certain thresholds. Developers eyeing highly distressed areas, or tracts adjacent to highly distressed

[5] Article 18-A, Title 1, Section 854, #18 at `https://www.nysenate.gov/legislation/laws/GMU/854`

areas, and grocery store operators seeking to renovate in these areas, are eligible to apply for FRESH financial incentives.

Going to Market provides no evidence to support the claim that the lack of access to fresh groceries is caused by barriers-to-entry on the supply-side. Furthermore, no evidence is provided to suggest that addressing barriers-to-entry for grocery stores will even improve health outcomes. Nevertheless, *Going to Market* claims several economic benefits to improving access to fresh produce. One of those economic benefits is an increase in property values, which this paper directly addresses in a causal framework. Prior research is unable to establish a causal relationship between grocery stores and property values because of the endogeneity between where households locate and where grocery stores locate. The most recent estimate uses Yelp data to measure the change in the number of grocery stores for zip codes in 5 major metropolitan areas. The working paper then regresses this measure on the percentage point change in a housing price index provided by the Federal Housing Finance Agency (Glaeser et al. 2018). Controlling only for time effects, the estimate implies that an additional grocery store is associated with a 0.33 percentage point growth in the housing price index.

Because of the sudden introduction of FRESH to NYC, the program presents a strong case for estimating the value of grocery stores. If grocery stores are a local amenity, its value will be capitalized into surrounding property values so that a comparison between similar homes differing only in FRESH eligibility will isolate the change in property values due to grocery stores. Although this estimate might not generalize to all neighborhoods since FRESH applies only to highly distressed areas, this paper sheds light on a longstanding phenomenon associated with gentrification, which primarily concerns low-income areas.

3 Data and Methodology

Correspondence with FRESH staff at the NYC Department of City Planning has resulted in a list of addresses approved for zoning benefits. However, to obtain information on

stores receiving financial benefits, the name, street address, and year of approval are collected from a map on the NYC EDC website.[6] Verification of the information provided on the NYC EDC website is done by cross-referencing the addresses with those listed in a policy brief on the limitations of the FRESH program (Cohen 2018), in a city council committee report (Baker et al. 2018), and in a dataset of retail food stores made available by the state.[7] The result of cross-referencing among these sources is not only a verification of addresses, but also a list of entities that had applied for FRESH benefits and the year in which the entities were approved to receive benefits. Unfortunately, the year in which the grocery store opens for business is not necessarily the same as the year in which benefits were approved.

Further verification of FRESH grocery stores is done by comparing the names of establishments to proprietary data between 2005 and 2018. Data Axle, formerly InfoGroup, collects information on businesses in their ReferenceUSA Historical Business dataset. ReferenceUSA includes addresses, self-reported SIC classification, the number of employees, and the sales for each establishment in a given year. The information is verified by a phone interview. Addresses that are found in ReferenceUSA verify the store's existence. If the name of the establishment matches that of a FRESH grocery store, then the FRESH grocery store is deemed in operation. Thus, 33 locations receiving either financial or zoning benefits are verified to exist, out of which a total of 15 FRESH grocery stores are determined to be in operation by 2018. The remaining 18 stores are not operating for unobservable reasons, presumably because the stores are still under development.

In addition to business data, assessed property values are provided by BYTES of the BIG APPLE in the Primary Land Use Tax Lot Output (PLUTO) dataset. PLUTO provides insight on all tax lots in NYC between 2005 and 2018 by classifying each tax lot under a specific land use category and collecting information such as the building's year of construction, building area, lot area, and geographic coordinates. PLUTO enables the

[6]Available at `https://edc.nyc/fresh-supermarkets-zoning-boundaries`, accessed on June 14, 2021.

[7]The retail food stores dataset can be found at `https://data.ny.gov/Economic-Development/Retail-Food-Stores/9a8c-vfzj`. However, this dataset is constantly updating. The data was accessed on June 9, 2021.

construction of a balanced panel of tax lots because it is updated yearly.

Neighborhood characteristics are obtained from the American Community Survey (ACS) 5-year estimates for the corresponding study period. Because the ACS pools data from each year in the 5-year interval, every 5-year interval is time invariant—the estimated characteristics are assumed to not vary within each 5-year interval.[8]

3.1 Stylized Facts

The data must establish several key facts, the first being whether FRESH had an impact on the number of grocery stores. Up to now, the definition of a grocery store has remained ambiguous. FRESH benefits can be granted to any food store that meets program requirements. Food stores are defined by land use regulations as convenience retail or service establishments including supermarkets, grocery stores, meat markets, or delicatessens.[9] Indeed, the SIC codes corresponding to the 15 FRESH grocery stores in operation reflect the definition of food stores, save for 2 which represent wholesale food products and wholesale grocers. Henceforth, grocery stores refer to food stores defined in the zoning regulation as well as the additional two wholesale categories. This definition ensures a consistent measure of grocery stores across all of NYC; any business by this definition is considered a grocery store.

Given that only 15 FRESH grocery stores in all of NYC have begun operation since the program was introduced in 2009, FRESH might seem to be limited in its impact. However, correspondence with FRESH staff suggest an alternate avenue for impact: some developers interested in applying for benefits ultimately decide not to pursue the benefits for various reasons. Unfortunately, there is no record of developers who ultimately choose not to pursue the benefits, but this anecdote suggests that FRESH piques developers' interest in these areas. *The New York Times* reiterates this sentiment by quoting an executive vice president of a real estate brokerage who said that FRESH made opening a grocery store really attractive for developers. Not taking benefits does not necessarily

[8] All dollar values are in terms of 2018 dollars. Dollar values are adjusted using the average CPI-U for New York-Newark-Jersey City, with 1982-1984 as the base.

[9] See use group 6 in the NYC zoning regulations: Article III, Chapter 2, 32-15

preclude the developers from building, meaning that development of grocery stores still could have occurred.

Evidence for this story can be found using ReferenceUSA. Every address in the data is geocoded using the Census Geocoder in conjunction with New York City's geocoding service, GeoSearch, to ensure that every establishment is accurately assigned to one of the 3 distinct regions of FRESH benefits, or to non-FRESH areas. The number of grocery stores within each region is then graphed against the number of grocery stores in areas that receive no benefits. Figure 2 shows that the number of grocery stores in non-FRESH areas exceeds that in any of the 3 FRESH regions, adding credibility to the concern over a shortage of supermarkets in areas of high need.[10] It also shows common time trends as a result of city-wide factors. Namely, there is a sharp decline in grocery stores across all regions starting in 2015. This decline coincides with anecdotes provided by *The New York Times* about closures due to increasingly high rents and competition. For example, The Great Atlantic & Pacific Tea Company, a large grocery store chain, filed for bankruptcy in 2015, signifying difficulties in the grocery industry for even the most established businesses. Nonetheless, the trends in the number of grocery stores seem to be similar before the introduction of FRESH, but they diverge after 2009. The divergence is in the expected direction: FRESH areas experience an increase in grocery stores compared to what non-FRESH areas experience. Since Figure 2 does not condition on the uptake of benefits, the divergence in trends supports the notion that FRESH piques developers' interest in building grocery retail in FRESH areas.

3.2 Empirical Strategy

This paper is most interested in the effect on non-commercial property values. *Going to Market* ambiguously claims that property values will increase. Given that the main purpose of FRESH is to improve the quality of life for residents in program areas, there should be an observable improvement in local amenities. Improvements to local amenities are thought to be capitalized into property values because when a neighborhood becomes

[10]The count is rather large because it encompasses various store types as previously defined. The definition ensures a proper comparison of establishments between FRESH areas and non-FRESH areas.

more desirable, more residents will move in, driving non-commercial property values higher. Hence, the analysis will focus primarily on non-commercial property values.

The first empirical strategy must establish that grocery stores are local amenities. Local is taken to mean a neighborhood, which is well approximated by a census tract. Suppose that grocery stores are not considered local amenities. Then an increase in the number of grocery stores should either lead to no significant effect on property values, or it will lead to a negative effect on property values if grocery stores are alternatively viewed as a disamenity. A positive and statistically significant regression coefficient for the number of grocery stores in a census tract is therefore evidence that grocery stores are local amenities. The ideal experiment would randomly assign a number of grocery stores to each census tract, then regress the assessed property value for a parcel on the number of grocery stores in the parcel's census tract. The endogeneity between where people live and where grocery stores operate precludes this ideal specification. Hence, an instrument is required for grocery store counts in a census tract.

FRESH is a reasonable instrument for the number of grocery stores in a census tract. Figure 2 establishes the connection between FRESH and the number of grocery stores. It seems that areas offering any sort of FRESH benefits experience a growth in grocery stores relative to areas that do not offer any FRESH benefits. Stated differently, treating areas with FRESH has an impact on the number of grocery stores.

Furthermore, because program benefits apply only to grocery stores, it is unlikely that other actors in the non-commercial real estate market can take substantial actions in response to the provision of benefits. Such actions would require predicting where a grocery store will locate, but given NYC's land constraints in addition to competition from other developers, it seems unreasonable to believe that other actors in the non-commercial real estate market would purchase or build properties in anticipation of a nearby grocery store opening. The exclusion restriction thus seems reasonable.

Formally, let $NumGroceryStore_{ct}$ be the count of grocery stores in census tract c using ReferenceUSA data between year $t = 2005$ to $t = 2018$. The first-stage of a TSLS model regresses the count of grocery stores on an indicator, $FRESH_{ct}$ representing whether the

tract offers any sort of FRESH benefit. In the second-stage, the logged assessed value for a panel of individual parcels i between 2005 and 2018 in the census tract is regressed on an estimate for the count of grocery stores in the parcels' respective census tracts, controlling for tract characteristics obtained from the ACS, several parcel characteristics obtained from PLUTO, individual parcel fixed effects, and time effects:

$$NumGroceryStore_{ct} = \pi_0 + \pi_1 FRESH_{ct} + \pi_2 X_{ict} + Lot_i + Year_t + \nu_{ict} \tag{1}$$

$$Log(AssessedValue)_{ict} = \beta_0 + \beta_1 \widehat{NumGroceryStore}_{ct} + \beta_2 X_{ict} + Lot_i + Year_t + \epsilon_{ict}\,, \tag{2}$$

where X_{ict} captures the tract and parcel characteristics, Lot_i is the individual parcel fixed effects, and $Year_t$ represents time effects. Standard errors are clustered by census tracts to account for common neighborhood factors.

Once grocery stores are established as a local amenity, it would be prudent to examine an intent-to-treat effect of having more grocery stores on property values. For cities like NYC, developing retail space for groceries can be unappealing. Land constraints lead to high building costs, assuming a suitable space is found in the first place, and consumer tastes seem to be moving away from purchasing groceries for dining in, as discussed in *The Atlantic*. Cities can offer incentives like FRESH benefits to build grocery stores, but these incentives are not always taken.

A difference-in-difference model establishes the intent-to-treat effect of FRESH on property values. Figure 2 indicates parallel trends, at least for the number of grocery stores. Plotting average logged property values for non-commercial properties in Figure 4 also indicates parallel trends. Namely, pre-trends in all 3 regions of FRESH incentives seem similar up until 2009, after which trends in assessed values for properties in FRESH areas begin to diverge from that in non-FRESH areas. Either the gap widens, as in the case for areas offering only financial incentives, or the gap closes, as in the case for areas offering both incentives. The differences in trends is formalized in a difference-in-difference model for a panel of properties between 2005 and 2018:

$$Log(AssessValue)_{ict} = \beta_0 + \beta_1 Post_{it} \times Treat_{ic} + \beta_2 Tract_c + \beta_3 Year_t + \beta_4 X_{ict} + \epsilon_{ict}\,, \quad (3)$$

where i again indexes properties, c census tracts, and t years. The coefficient of interest is β_1, which reflects the effect of having more grocery stores on non-commercial property values. Equation 3 controls for time effects $Year_{it}$, tract fixed effects $Tract_{ic}$, and time-varying neighborhood and property characteristics X_{ict}. The identifying variation is therefore changes in price over time within each census tract.

4 Results

Table 1 reports the results from implementing a TSLS model on a panel of non-commercial property parcels. Column 1 shows that FRESH satisfies the assumption of relevance—the number of grocery stores in a tract is positively associated with being in a FRESH area, although the interpretation does not have an intuitive meaning in real terms. The instrument is also weak, exhibiting an F-stat of about 7.29. Nonetheless, the second stage reported in Column 2 shows a positive association between the number of grocery stores and non-commercial property values. The coefficient in Column 2 indicates that property values increase by 6.8% with an additional grocery store in the census tract.

Since a positive association between grocery stores and assessed property values is observed in Table 1, it seems reasonable that simply providing incentives to build grocery stores could have an effect on property values. Table 2 estimates a difference-in-difference model following Equation 3. Column 1 captures the average effect of offering FRESH by comparing properties in any FRESH area to properties that are in non-FRESH areas. A positive and statistically significant coefficient here shows that FRESH raises property values. Columns 2 through 4 break down the overall effect by type of incentive offered. Irrespective of which incentives are offered, property values increase by at least 1%. The strongest effect is observed in Column 3, which focuses on areas that offer both incentives. Non-commercial properties in FRESH areas that offer financial and zoning incentives

experience an increase in property value of 4.12%. Comparing the effect between financial incentives and zoning incentives in Columns 2 and 4, respectively, suggests that most of the increase in property values is a result of zoning incentives.

A 2015 report[11] by the Healthy Food Retail Action Network on the impact of FRESH highlights that developers were initially hesitant to apply for benefits. The cited reason for hesitancy is deeply ingrained perspectives on working with city government. This obstacle was overcome by active outreach and information sessions with community and industry stakeholders. Replacing the interaction term in Equation 3 with an interaction between treatment and a dummy for each individual post-treatment year allows the model to estimate the impact of FRESH over time.

Table 3 estimates the modified difference-in-difference model. Similar to before, Column 1 captures the average effect of offering FRESH and proceeds to break down the effect by incentive type in subsequent columns. Irrespective of the incentives offered, FRESH raises property values, and this effect generally strengthens over time, matching the observed hesitancy in uptake. In accordance with Table 2, the strongest effects remain in areas that offer both financial and zoning incentives. Additionally, a comparison of Columns 2 and 4 in Table 3 reinforces the notion that zoning incentives have a stronger impact than financial incentives, even over time.

One issue with estimating an effect for non-commercial properties is that it muddies the effect on residential properties because the inclusion of mixed-use lots possibly introduces the effect of FRESH on commercial property values. If offering benefits to build piques enough interest, increased demand for commercial property suitable for grocery stores will artificially drive up commercial property values. To address this issue, Equation 3 is estimated for commercial properties and residential properties separately, so that neither set of properties contains mixed-use properties. Only Columns 1 and 3 of Table 4 show statistical significance. Hence, the overall increase in commercial property values is a result of FRESH increasing commercial property values in areas that offer both financial and zoning incentives. This observed effect coincides with a recent update from NYC

[11] Available at `https://healthyfoodretailnyc.org/wp-content/uploads/2018/04/FRESH-Food-Retail-Expansion-to-Support-Health-Program-Impact-Report.pdf`

Department of City Planning[12], the entity that manages zoning benefits, saying that future plans to expand FRESH areas should take into consideration the concentration of existing FRESH stores.

In contrast, Table 5 shows statistical significance in every column, except for Column 2. Upon closer inspection, the coefficient in Column 2 of Table 5 is marginally insignificant—the resultant p-value for the coefficient is 0.1001. If the estimate in Column 2 is believed to be true, then Table 5 would say that FRESH indeed raises residential property values, irrespective of incentives offered, so that Table 2 reflects the effect of FRESH on residential property values more so than the effect on commercial properties.

5 Indirect Effects

A justification for the FRESH program in *Going to Market* suggests an indirect effect behind the increase in property values. *Going to Market* specifically claims that full-line food stores are high-value magnets that attract complementary stores and services. In this way, a grocery store has the potential to indirectly improve local amenities, thereby indirectly increasing property values, because of spillover effects from the grocery industry into the hospitality industry. One such local amenity is eating and drinking places, which includes bars, cafes, and restaurants. For ease of discussion, eating and drinking places will henceforth be collectively referred to as restaurants.

Restaurants are often discussed in the literature on gentrification in association with property values. Glaeser et al. (2018) recently estimated correlations between the number of Starbucks and the growth in house prices using Yelp data. While not causal, the positive association indicates that an additional Starbucks is associated with a 0.5% increase in housing prices. This finding exemplifies the existence of an interaction between food retail as a local amenity and house prices. The idea that restaurants influence house prices is not new: Brueckner et al. (1999) discuss the same idea and provide a theory for how amenities determine the location choice of high-income households relative to

[12]Summary available at `https://www1.nyc.gov/assets/planning/download/pdf/plans-studies/fresh/fresh-march-2021-update.pdf`

low-income households, thereby determining house prices.

To add credence to the claim in *Going to Market*, each restaurant in the ReferenceUSA data is geocoded in the same manner as grocery stores. The difference-in-difference model, Equation 3, is applied to the panel of restaurants. Table 6 compares the concentration of restaurant employment in FRESH areas to that in non-FRESH areas. Employment concentration is estimated by taking the number of employees in each restaurant and normalizing by the restaurant's census tract population, measured in thousands of people. Focusing on employment concentration rather than employment itself eliminates the possibility that employment is high simply because of a large population (i.e. large supply of labor). Only Columns 3 and 4 show statistical significance, suggesting that FRESH increased employment concentration for restaurants by about 7 employees per 1,000 people in areas that are eligible for zoning benefits.

A similar pattern emerges in Table 7, which takes sales per employee as the dependent variable. Sales per employee accounts for the fact that larger sales could simply be a result of a large restaurant. The estimate in Column 1 is positive and statistically significant, so that FRESH increases overall sales per employee by about $98,000. However, beyond Column 1, only the estimates in Columns 3 and 4 exhibit statistical significance. The pattern is therefore similar to the results on employment concentration in Table 6: the effect is observable only for restaurants in areas that are eligible for zoning benefits.

All together, the lack of statistical significance in Column 2 in Tables 6 and 7 could be an explanation for the reduction in explanatory power for residential property values in financial-only incentive areas. Restaurant activity is simply not as strong in those areas. In contrast, it seems profitable for restaurants to locate in the other FRESH areas. Indeed, more restaurants seem to be attracted there, as hinted by an increase in sales per employee. The restaurants furthermore decide to locate in those areas, as hinted by an increase in employment concentration. Thus, there is reasonable evidence to say that the rise in residential property values is due to improved local amenities. Improvements in local amenities is primarily driven by a growth in grocery stores and restaurants.

6 Conclusion

FRESH provides financial and zoning incentives to encourage building and operating grocery stores in neighborhoods thought to lack access to fresh groceries. One stated justification for FRESH is that it increases property values. This paper tests that claim by first establishing through a panel IV regression that an additional grocery store leads to an increase of 6.77% in non-commercial assessed property values. To strengthen that finding, a difference-in-difference model finds that the average intent-to-treat effect for a property located in a FRESH area is an increase in value of 2.07%, relative to a property located in a non-FRESH area. The effect is strongest in areas that offer both financial and zoning incentives. Consistent with a hesitancy in uptake, the increase in property values strengthens over time.

The main driver behind an increase in property values is an improvement in local amenities. Not only are grocery stores inclined to locate within a FRESH area, but related retail such as restaurants are as well. Restaurants are inclined to locate in these areas because of potential profits. Restaurants in FRESH areas experience an observable increase in sales per employee relative to restaurants in non-FRESH areas. Indeed, an observable increase in restaurant employment concentration supports the idea that restaurants have responded to this incentive by locating within FRESH areas.

Potential further research in this area could include determining who benefits from the increase in property values and if so, by how much. It would also be prudent to see if these results hold in other cities with similar programs, such as Philadelphia's (eventually all of Pennsylvania) Fresh Food Financing Initiative. In 2010, the Obama administration introduced the Healthy Food Financing Initiative nationwide. These programs are opportunities to assess how food systems influence the urban landscape.

7 Tables and Figures

Table 1: Grocery stores increase property values

	(1)	(2)
	First Stage	Second Stage
VARIABLES	# Grocery Stores	Logged Assessed Value
FRESH area	0.2540***	
	(0.0941)	
# of Grocery Stores		0.0677**
		(0.0312)
% White	0.0005	0.0001
	(0.0039)	(0.0003)
% College Grad	0.0127**	-0.0022***
	(0.0051)	(0.0006)
% Vacant Housing	0.0094*	-0.0005
	(0.0057)	(0.0006)
% Rental Housing	0.0033	-0.0004
	(0.0044)	(0.0004)
% Unemployed	0.0045	-0.0006
	(0.0063)	(0.0005)
Logged Income per Capita	0.0377	0.0806***
	(0.2103)	(0.0164)
Constant	3.4486	8.7432***
	(2.1994)	(0.1898)
Observations	8,401,785	8,401,785
# Property Lots	662,365	662,365
Individual FE	YES	YES
Year FE	YES	YES
Clusters	1922	1922

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Notes: Coefficients on year built, lot area, and building area are not reported in the table. Column 1 reports a weakly significant instrument, with an F-stat of about 7.29. Nonetheless, Column 2 reports a positive association between the number of grocery stores in a census tract and non-commercial assessed property values. The statistically significant controls all have intuitive signs.

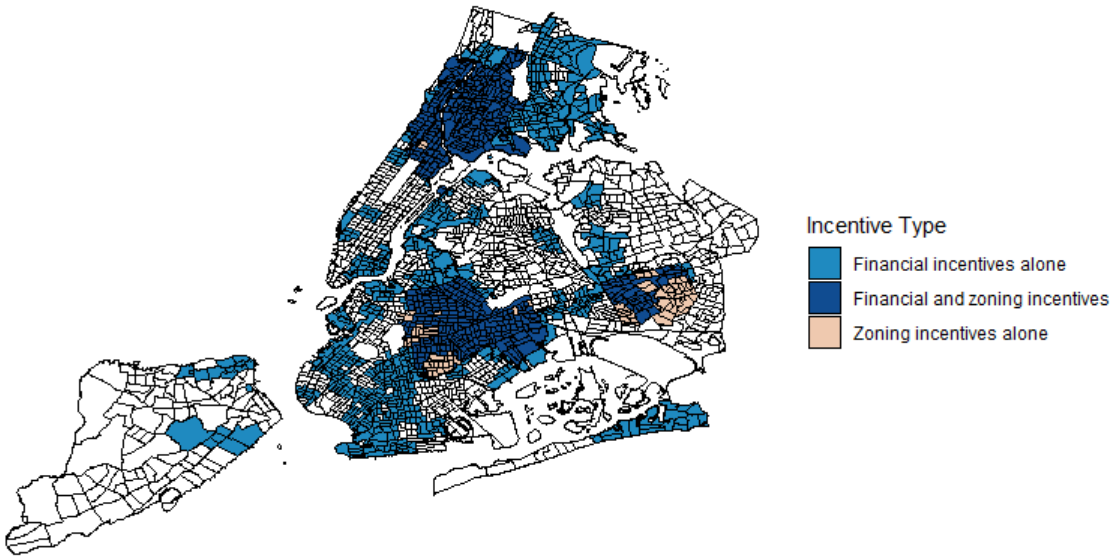

Figure 1: FRESH areas superimposed on 2010 census tracts for NYC.

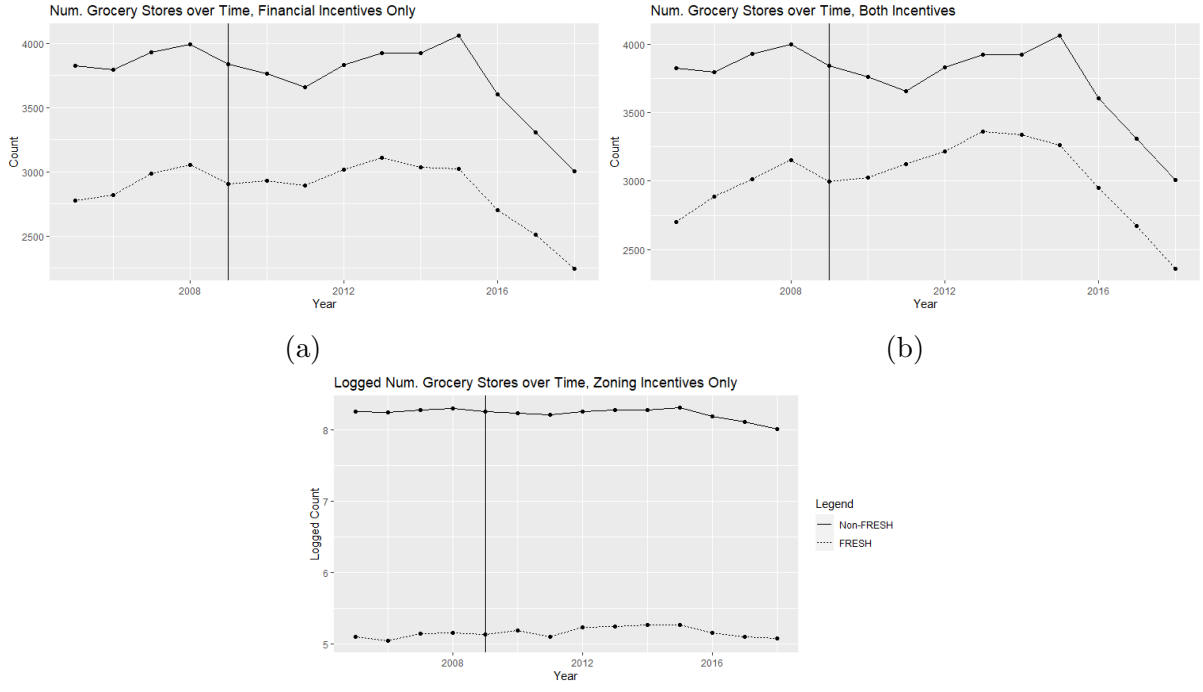

Figure 2: Plots of trends in the number of grocery stores for each incentive area versus areas that never receive any FRESH benefits. Exhibits A and B show similar pre-trends before the implementation of FRESH in 2009 (vertical black line). However, the number of grocery stores seems to increase in FRESH areas versus that in non-FRESH areas. Exhibit C plots the logged number of grocery stores to highlight trends. A similar pattern to Exhibits A and B emerges.

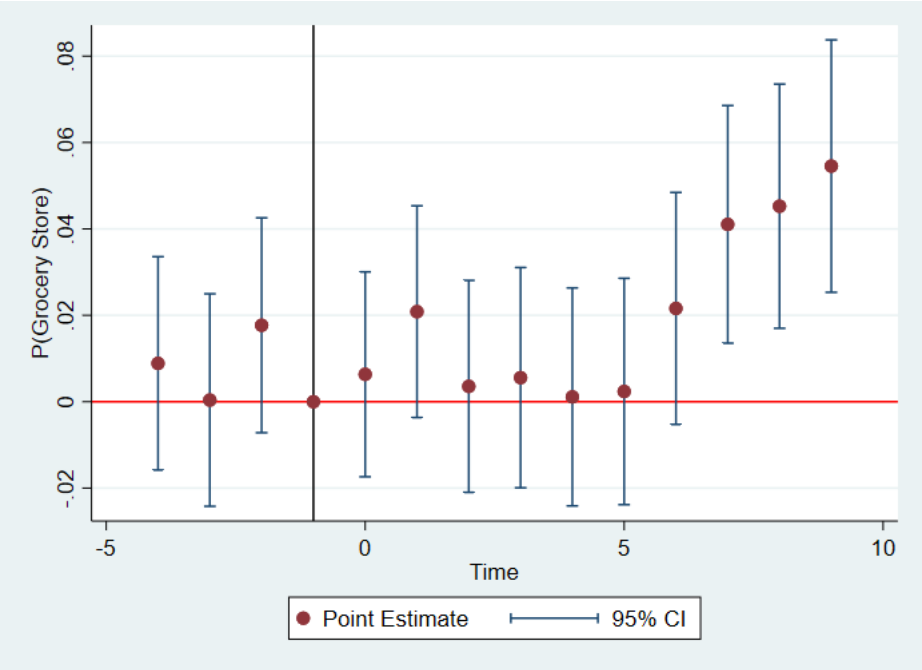

Figure 3: An event study capturing the effects of FRESH on the probability a grocery store operates in FRESH areas. The event study regresses an indicator taking the value of one if a business is a grocery store, versus being a general merchandise store, on leads and lags of the FRESH treatment variable. Stores in FRESH areas are compared to stores in non-FRESH areas. It seems there is no discernible difference in the likelihood of a business being a grocery store until 6 years after the introduction of FRESH, consistent with anecdotes of a delay in the uptake of FRESH benefits because of mistrust between developers and the city government. Nevertheless, FRESH increases the likelihood of a retail business operating as a grocery store.

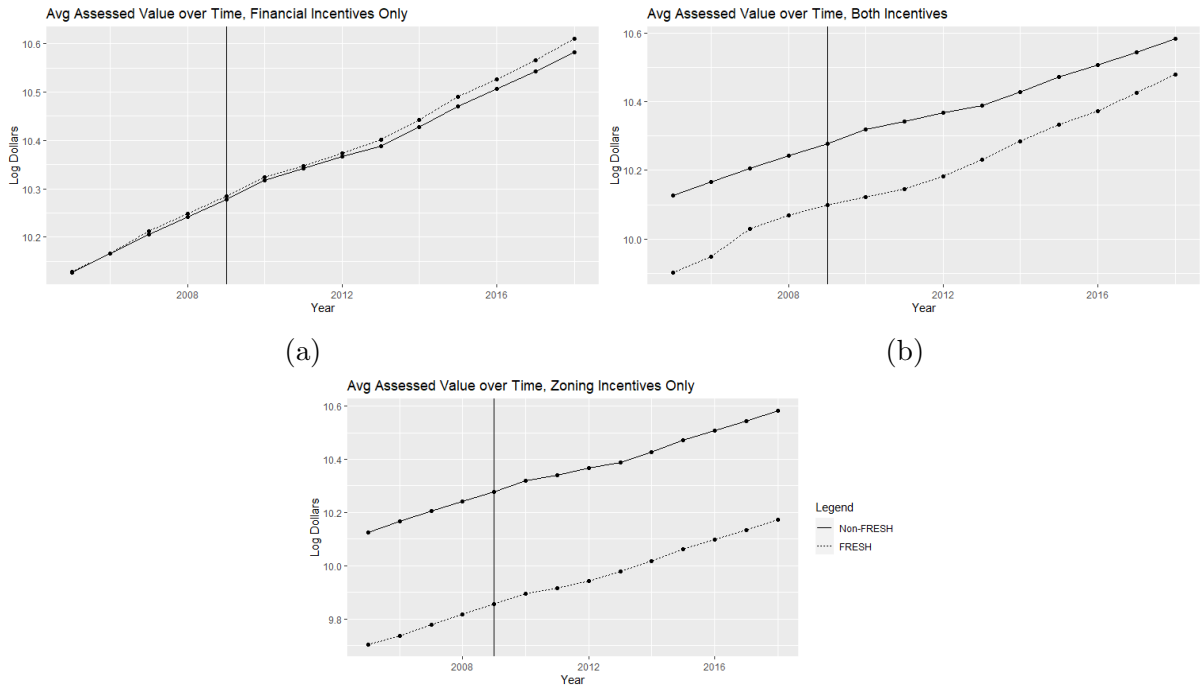

Figure 4: Plots of trends in house prices for each incentive area versus areas that never receive any FRESH benefits. Pre-trends all seem similar until the introduction of FRESH. After FRESH, trends in house prices for FRESH areas begin to diverge from the trend in house prices for non-FRESH areas, either widening the gap (Exhibit A), or closing the gap (Exhibit B) in prices.

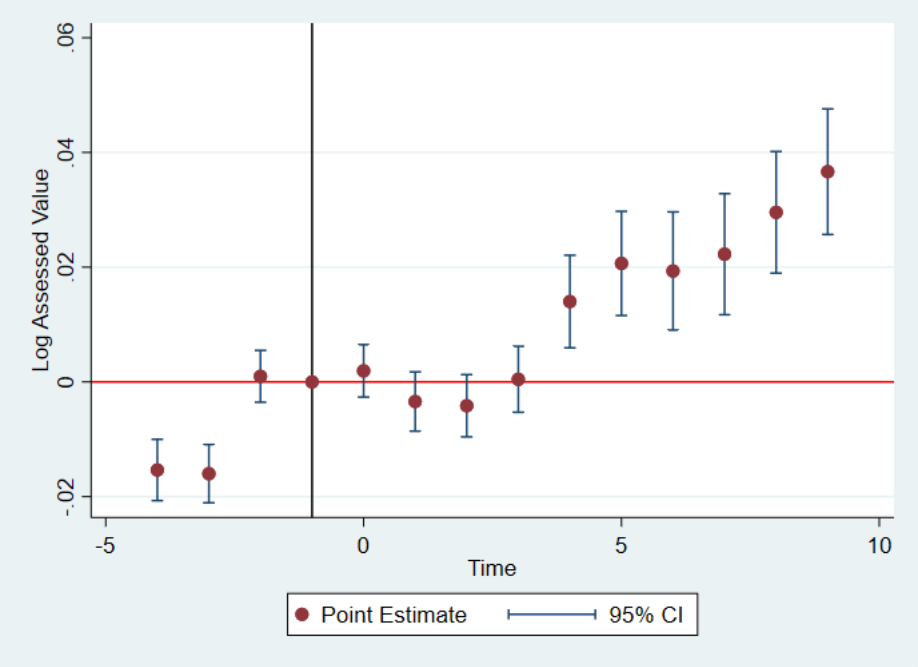

Figure 5: An event study capturing the effects of FRESH on logged assessed property values in FRESH areas. The event study regresses the logged assessed value of a non-commercial property on leads and lags of the FRESH treatment variable. Non-commercial properties in FRESH areas are compared to Non-commercial properties in non-FRESH areas. It seems there is no discernible difference in log assessed value prior to and immediately after the introduction of FRESH. However, an positive and statistically significant difference appears 4 years after the introduction of FRESH and beyond, consistent with anecdotes of a delay in the uptake of FRESH benefits because of mistrust between developers and the city government. However, a negative and statistically significant effect for the first two leads is inconsistent with the parallel trends assumption.

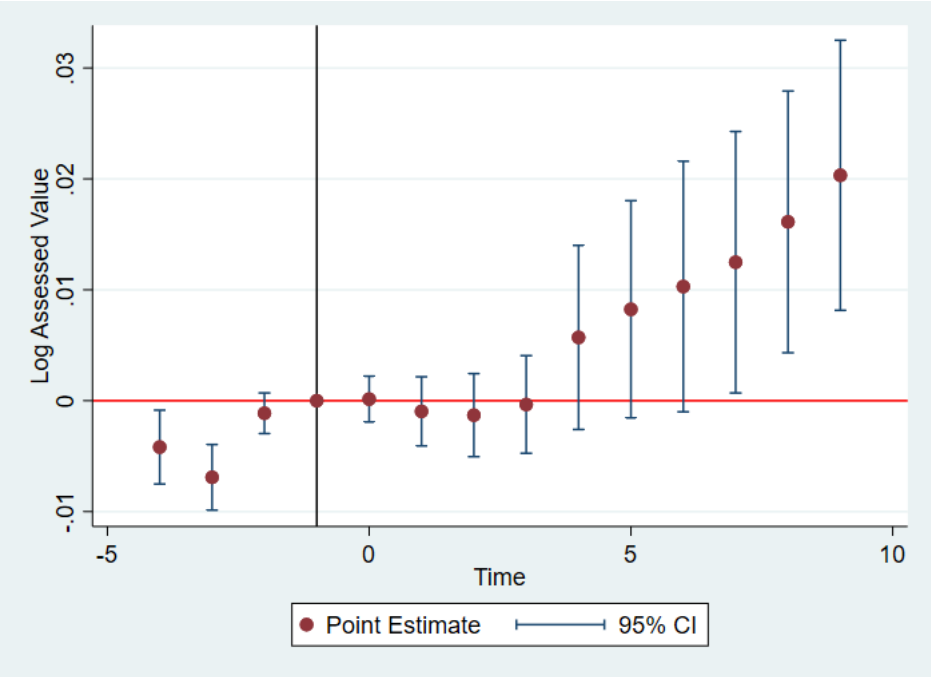

Figure 6: A similar story to that in Figure 5 appears for non-commercial properties in financial-only incentive areas, with an even longer delay in the increase in property values.

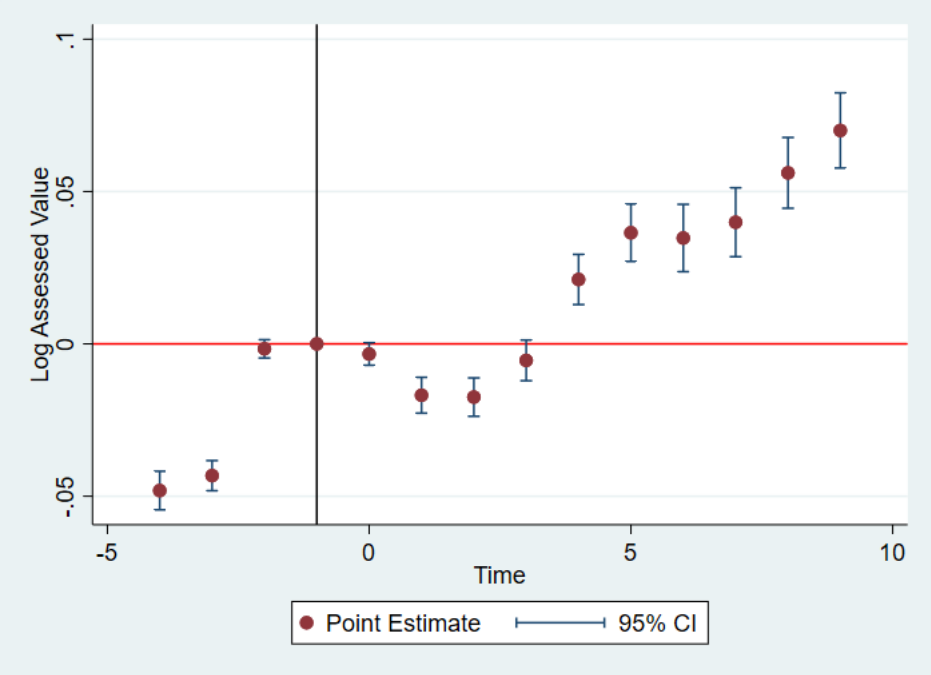

Figure 7: A similar story to that in Figure 5 appears immediately before and after the introduction of FRESH for non-commercial properties in areas offering both incentives. However, there is a noticeable decrease in property values in the first two years after introducing the program before property values begin to rise. It is unclear why this pattern appears.

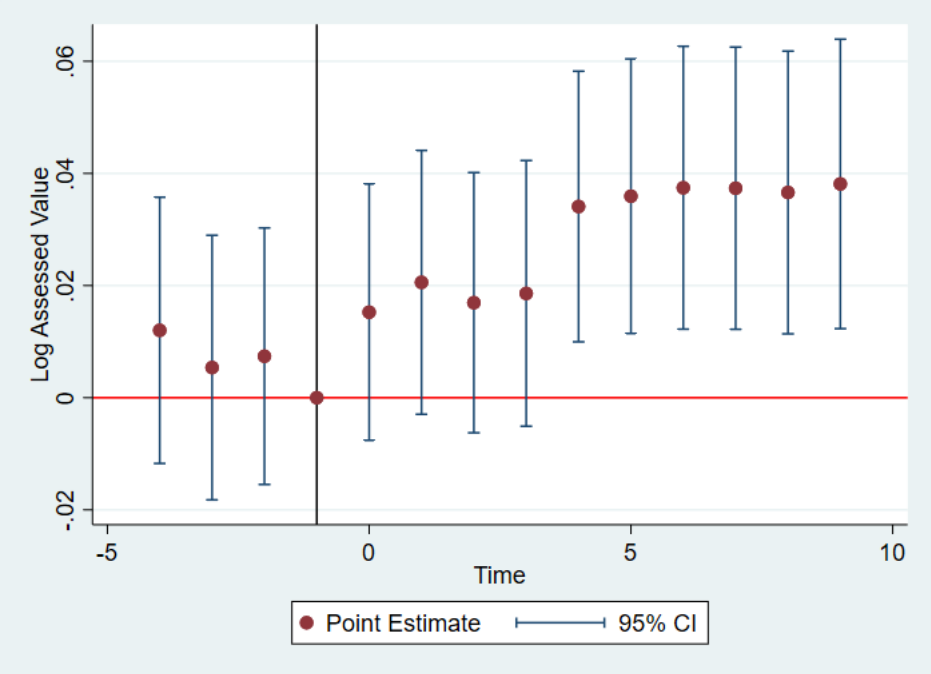

Figure 8: When comparing non-commercial properties in zoning-only incentive areas to those in areas that offer no FRESH incentives, the event study displays no discernible pre-trends, providing evidence for the parallel trends assumption. Similar to the event study for grocery stores in Figure 3, there is a delayed positive and statistically significant effect on assessed property values. This comparison offers the strongest evidence for the difference-in-difference specification, and it is interpreted as evidence suggesting that assessed non-commercial property value experiences a delayed increase due to FRESH.

Table 2: FRESH raises non-commercial property values

VARIABLES	(1) Overall Logged Assessed Value	(2) Financial-Only Incentives Logged Assessed Value	(3) Financial and Zoning Incentives Logged Assessed Value	(4) Zoning-Only Incentives Logged Assessed Value
Diff-in-Diff	0.0207***	0.0101***	0.0412***	0.0231***
	(0.0033)	(0.0039)	(0.0039)	(0.0053)
% White	0.0001	-0.0004**	0.0002	-0.0002
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
% College Grad	-0.0010***	-0.0015***	-0.0012***	-0.0015***
	(0.0002)	(0.0002)	(0.0002)	(0.0003)
% Vacant Housing	0.0001	0.0005*	-0.0001	0.0004
	(0.0002)	(0.0003)	(0.0003)	(0.0003)
% Rental Housing	0.0001	-0.0001	0.0001	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
% Unemployed	-0.0006**	-0.0003	-0.0007**	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Logged Income per Capita	0.0814***	0.0724***	0.0783***	0.0658***
	(0.0080)	(0.0097)	(0.0092)	(0.0110)
Constant	6.4871***	6.7410***	6.5173***	6.8103***
	(0.1560)	(0.1692)	(0.1888)	(0.2035)
Observations	10,104,505	8,277,733	7,145,050	6,153,670
Adjusted R-squared	0.5749	0.6173	0.6074	0.6665
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Clusters	2102	1568	1429	1012

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Notes: Coefficients on year built, lot area, and building area are not reported in the table. Every specification compares properties in a FRESH area to properties in non-FRESH areas within census tracts. Irrespective of which incentives are offered, FRESH raises non-commercial property values.

Table 3: FRESH raises property values over time

FRESH raises property values over time

VARIABLES	(1) Overall Logged Assessed Value	(2) Financial-Only Incentives Logged Assessed Value	(3) Financial and Zoning Incentives Logged Assessed Value	(4) Zoning-Only Incentives Logged Assessed Value
Diff-in-Diff x 2009	0.0094***	0.0032***	0.0199***	0.0095**
	(0.0013)	(0.0011)	(0.0019)	(0.0039)
Diff-in-Diff x 2010	0.0041**	0.0021	0.0064**	0.0148***
	(0.0016)	(0.0015)	(0.0028)	(0.0043)
Diff-in-Diff x 2011	0.0033*	0.0018	0.0058*	0.0112**
	(0.0019)	(0.0019)	(0.0030)	(0.0044)
Diff-in-Diff x 2012	0.0079***	0.0027	0.0178***	0.0129***
	(0.0023)	(0.0024)	(0.0033)	(0.0048)
Diff-in-Diff x 2013	0.0215***	0.0088**	0.0444***	0.0284***
	(0.0038)	(0.0044)	(0.0043)	(0.0056)
Diff-in-Diff x 2014	0.0281***	0.0113**	0.0597***	0.0302***
	(0.0044)	(0.0052)	(0.0050)	(0.0062)
Diff-in-Diff x 2015	0.0268***	0.0133**	0.0580***	0.0317***
	(0.0051)	(0.0059)	(0.0058)	(0.0067)
Diff-in-Diff x 2016	0.0298***	0.0155**	0.0631***	0.0316***
	(0.0052)	(0.0062)	(0.0060)	(0.0069)
Diff-in-Diff x 2017	0.0371***	0.0192***	0.0793***	0.0309***
	(0.0053)	(0.0062)	(0.0063)	(0.0072)
Diff-in-Diff x 2018	0.0441***	0.0234***	0.0933***	0.0324***
	(0.0055)	(0.0065)	(0.0067)	(0.0078)
Observations	10,104,505	8,277,733	7,145,050	6,153,670
Adjusted R-squared	0.5750	0.6173	0.6075	0.6665
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clusters	2102	1568	1429	1012

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Notes: Controls suppressed in output for brevity. Irrespective of which incentives are offered, FRESH increases property values, and this effect generally strengthens over time.

Table 4: Commercial property values rise

VARIABLES	(1) Overall Logged Assessed Value	(2) Financial-Only Incentives Logged Assessed Value	(3) Financial and Zoning Incentives Logged Assessed Value	(4) Financial-Only Incentives Logged Assessed Value
Diff-in-Diff	0.0289**	0.0182	0.0599***	-0.0349
	(0.0115)	(0.0131)	(0.0157)	(0.0358)
Observations	274,925	222,472	185,890	143,253
Adjusted R-squared	0.6872	0.7042	0.7051	0.7297
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clusters	1861	1380	1247	870

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Notes: Controls suppressed for brevity. The observed increase in overall commercial property values (Column 1) is a result of an increase in commercial property values for areas that offer both financial and zoning incentives (Column 3).

Table 5: Residential property values rise

VARIABLES	(1) Overall Logged Assessed Value	(2) Financial-Only Incentives Logged Assessed Value	(3) Financial and Zoning Incentives Logged Assessed Value	(4) Zoning-Only Incentives Logged Assessed Value
Diff-in-Diff	0.0159***	0.0061	0.0349***	0.0202***
	(0.0032)	(0.0037)	(0.0036)	(0.0051)
Observations	9,462,394	7,799,093	6,720,323	5,852,924
Adjusted R-squared	0.5698	0.6105	0.6436	0.6837
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clusters	2091	1556	1422	1006

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Notes: Controls suppressed for brevity. Every coefficient, save for the coefficient reflecting financial-only incentive areas, is positive and statistically significant, as expected. Upon closer inspection, the coefficient in Column 2 is marginally insignificant. Its p-value is 0.1001.

Table 6: Restaurant employment per capita rises

VARIABLES	(1) Overall	(2) Financial-Only Incentives	(3) Financial and Zoning Incentives	(4) Zoning-Only Incentives
	Employees per 1000 People			
Diff-in-Diff	-1.0416	-3.3166	7.5295**	6.8486**
	(3.8802)	(5.3734)	(3.0247)	(2.8777)
Observations	290,858	240,215	209,256	166,413
Adjusted R-squared	0.0922	0.0921	0.0939	0.0937
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clusters	2009	1556	1544	1171

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Controls are suppressed for brevity. An increase in restaurant employment per 1000 people is observed only in areas that offer both incentives and that offer only zoning incentives. Employment in restaurants for FRESH areas is compared to employment in restaurants for non-FRESH areas in each column.

Table 7: Sales per employee in restaurants increase

	(1)	(2)	(3)	(4)
	Overall	Tax-Only Incentives	Tax and Zoning Incentives	Zoning-Only Incentives
VARIABLES	Sales (1000s Dollars) per Employee			
Diff-in-Diff	97.898*	84.646	146.416**	113.986**
	(51.364)	(55.916)	(63.174)	(55.711)
Observations	289,979	239,412	208,552	165,781
Tract FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clusters	2009	1556	1544	1170

Standard Errors clustered by census tracts in parenthesis
*** p<0.01, ** p<0.05, * p<0.10

Controls are suppressed for brevity. An increase in restaurant employment per 1000 people is observed only in areas that offer both incentives and that offer only zoning incentives. Employment in restaurants for FRESH areas is compared to employment in restaurants for non-FRESH areas in each column.

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