BRICKS, BATS, AND REALTY STATS: THE TALE OF TRUIST PARK AND THE BATTERY ATLANTA'S IMPACTS ON HOUSE PRICES

by

ADRIANA GARCIA

(Under the Direction of Patryk Babiarz)

ABSTRACT

This dissertation examines the impact of Truist Park and The Battery Atlanta, an innovative sports, retail, and entertainment complex that opened in 2017, on residential property values in Cobb County, Georgia. By focusing on the new genre of developments that enhance community engagement by integrating sports and various commercial elements, this research fills a gap in the existing literature on the determinants of residential real estate values. Moreover, it contributes to understanding the market's heterogeneity by examining the venue's differential effect on the values of detached single-family houses versus townhouses and condominiums. Sports complexes are known to produce a mix of both positive and negative externalities, which creates theoretical uncertainty regarding their overall influence on nearby property prices. Guided by Rosen's Hedonic Pricing Model and employing the 2010-2020 data from Multiple Listing Services in the Atlanta metropolitan area, this study estimates difference-in-difference regressions to identify the impact of the stadium's announcement and inauguration on residential property prices. Properties in the stadium's proximity were classified into three treatment groups, defined by 1-mile intervals, and their sales prices observed during the study period were compared to those of properties situated beyond the three-mile radius. Results

revealed significant variations in house price trajectories following the venue's inauguration, with homes within two miles of the stadium experiencing higher price inflation relative to homes situated in the control area. Additional analyses of market segments indicated that, while the presence of Truist Park slowed the price appreciation for detached homes located within a one-to-three-mile radius, it accelerated value growth for attached properties in the stadium's proximity. The robustness of findings was confirmed in estimations that adjusted for potentially divergent temporal price trends and further validated by fixed effects estimations conducted with a subset of properties sold twice during the study period. Findings are expected to guide policymakers by highlighting how such sports and commercial developments might influence neighborhood demographics, tax revenues, local business landscapes, and community cohesion. Additionally, the research offers predictive insights for homebuyers and real estate investors about the localized economic effects of sports venues, empowering them to make more informed property transactions.

INDEX WORDS: Housing Prices, Sports Venues, Difference-in-Differences, Externalities, Real Estate Market Subsegments, Property Types

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DEDICATION

In loving memory of my grandparents, America and Jose, wherever you are, I love you.

I am grateful for your unconditional love and wisdom.

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CHAPTER 1

INTRODUCTION

Investments in the construction and retrofitting of stadiums and arenas in the United States have surpassed $42 billion over the previous two decades (Drukker et al., 2020). These construction projects included at least fifty-seven stadiums and arenas across more than twenty-five states, catering to professional sports, such as baseball, basketball, football, hockey, and soccer (Drukker et al. 2020). In an attempt to answer the question of whether governments should fund such projects, existing academic literature on the effects of stadium construction primarily focuses on the fiscal impact and economic development of the neighborhoods. The discourse surrounding public funding has largely converged upon the consensus that there are no significant economic benefits for counties and cities in financing the construction of sports venues and the public money could be better spent on other priorities (Bradbury et al., 2022; Matheson, 2019; Propheter, 2020; Wassmer et al., 2016). Yet, public funding and private-public partnerships (P3) for the development of sports venues do not seem to slow down. For example, Willets Point in New York City is set to have a new soccer stadium and 2,500 apartments, thanks to a public-private partnership (Bubny, 2021;NYC.gov, 2022), the new Aloha Stadium Entertainment District in Hawaii has been approved for development through a P3 agreement (Wolfe, 2022; Huff, 2022), and in Las Vegas Nevada the Allegiant Stadium was completed in 2020 as a $1.8 billion P3 between Las Vegas Stadium Authority and The Raiders (Akers, 2018). The present study seeks to expand the stream of literature about the effect of sports venues on residential property prices by analyzing how the temporal and spatial shock created by building a

new stadium with an adjacent entertainment complex affects consumers' willingness to pay for housing in proximity to the stadium.

This dissertation makes several contributions to the literature on the impact of sports venues on residential property prices. The first contribution pertains to the presentation of a new case study. Specifically, this study focuses on the case of Truist Park and The Battery Atlanta, which is unique as it involves the relocation of a professional sports team from an existing stadium in the city to a new stadium in the suburbs. Truist Park is different from other new sports venue construction projects in that it features an adjacent entertainment district, The Battery Atlanta, which offers an enhanced experience for fans, residents, and the community. This combination of an arena or stadium with a mixed development featuring retail, dining, entertainment, and shopping exemplifies a new trend in how some professional sports franchises enhance fan engagement and both diversify and expand their revenue streams. Truist Park is among the first to execute such a new concept of a “mallpark”.

The second major contribution of this research pertains to the heterogeneity analysis, which involves the measurement of how the effect of Truist Park varies across different subsegments of the real estate market. Specifically, this study differentiates between the impacts of the new facility on the prices of detached single-family homes versus attached single-family homes, including townhouses and condos. Thus, this project provides a more in-depth examination of the impact of sports venues on residential property values, offering a reconciliation of mixed results produced by previous studies. Specifically, the results provided herein provide a plausible explanation for why property value increases brought about by new sports facilities may not lead to increased property tax revenue for local municipalities (Bradbury, 2022).

Most of the existing studies on the impacts of stadium construction on the real estate markets are case studies (i.e., Chikish et al., 2019; Dehring et al., 2007; Feng & Humphreys, 2018; Keeler et al., 2021; Tu, 2005) or cross-sectional designs that compare variation in home prices in localities with new facilities to other locations, often using survey data such as the American Housing Survey (AHS). The specifics of research questions that can be addressed in such studies are constrained by the availability of residential property data, given that each municipality collects housing units data tailored to its needs thereby limiting the existence of a uniform set of variables across different geographies. In the present study, Multiple Listing Service data provided information about the property type for each market subsegment such as single-family detached homes, condominiums, and townhouses. The area surrounding the new stadium already comprised some lots with multifamily apartments.

After the 19-year tenure at Turner Field within the Atlanta city limits (Turner Field was built as Centennial Olympic Stadium in 1996), the Atlanta Braves announced in 2013 that they would move to a new location in Cobb County, just northwest of the city limits (see Figure 1). The new stadium site was surrounded by office and commercial properties. Also, this location was and continues to be close to other established destinations like the Cumberland Mall, the Galleria Mall (retail, dining, and conferences venue), several hotels, and the Cobb Performing Arts Center. Thus, the selected stadium site was already a well-developed area with convenient access to interstate freeways (I-285 and I-75) and state highway 41 (see Figure 2).

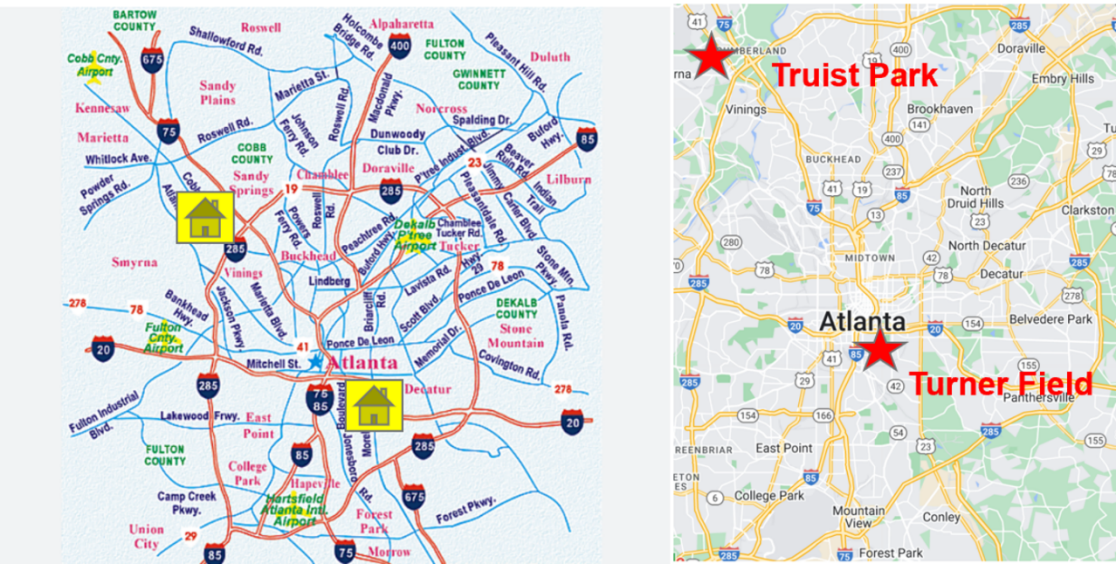
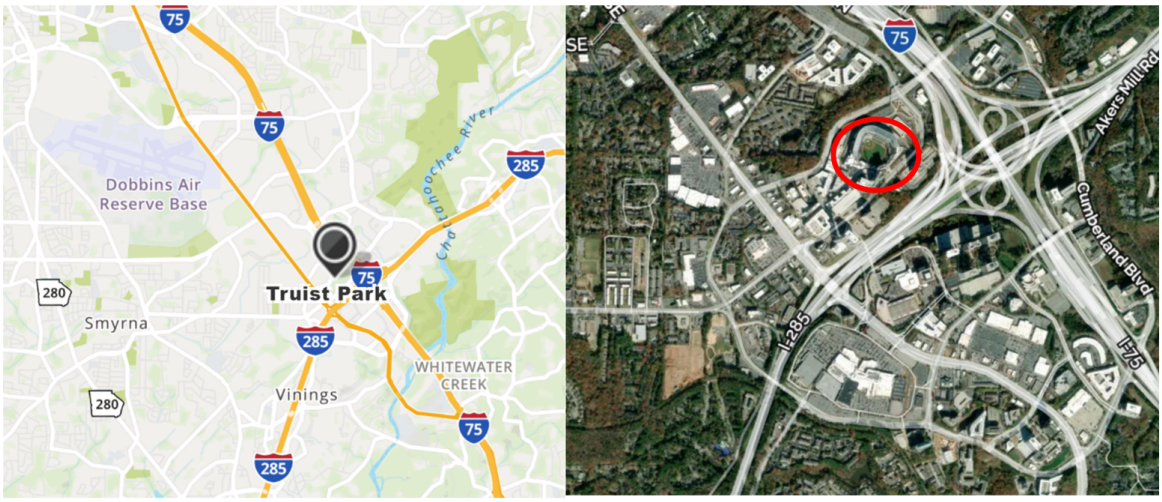


Figure 1

Turner Field and Truist Park Locations



Map view Truist Park location. Satellite view Truist Park location.

Figure 2

Truist Park Location

Professional sports organizations view new stadiums as a means of generating additional revenue. Specifically, team owners anticipate diversification of revenues for their franchises when adding commercial development that helps build the team's brand presence. The impact of such new sports facilities on nearby residential properties is theoretically ambiguous since new sports facilities may create both positive and negative externalities for their neighbors. On the one hand, they may be viewed as a desirable amenity that attracts additional commercial and residential investments, implying that owners and tenants might be willing to pay more to be closer to the new venues. On the other hand, these venues can also bring more traffic, noise, pollution, and crime that negatively affect the sales values of surrounding properties. Since the direction and magnitude of the net effect on surrounding house prices is difficult to conceptualize, it must be estimated via empirical tests. While most studies examining the effects of new sports venues on property prices focus on changes in tax revenues to gauge potential benefits, this project seeks to examine the willingness of consumers to pay for properties in proximity to these new facility developments.

There are several reasons why the construction of a new stadium in Cobb County in Georgia presents an ideal setting for studying the effects of new sports venues on local real estate markets. First, any impact resulting from “civic pride” shared by the residents of Atlanta will remain unchanged because the new stadium hosts the same team that has played in Atlanta for years. This minimizes the potential for contamination of the estimates with the confounding effect of a new team coming to town. Second, Truist Park was constructed on a vacant lot in a commercial area surrounded by office buildings and retail corridors. Therefore, any potential real estate price changes do not reflect significant new elements of such nature introduced to the area. Lastly, the availability of high-quality geolocated transaction data paired with the timing of the

stadium opening allows for the use of a quasi-experimental difference-in-difference spatial identification strategy for effect estimation. This strategy mitigates the endogeneity problem that often arises in empirical investigations of the relationship between locational amenities and property prices.

Problem Statement and Research Questions

The main objective of this research is to investigate the effect of the construction of Truist Park on residential property prices in the surrounding areas. Truist Park, the home of the Atlanta Braves of Major League Baseball, opened in 2017 and has since been a major attraction for fans and visitors alike. Despite its popularity among fans and visitors, the impact of this development on the local real estate market remains uncertain and evolving, and the existing evidence on the matter is mixed.

Understanding the effect of the construction of Truist Park on residential property prices is important for several reasons. First, it can inform policymakers and urban planners about the potential socio-economic impact of such large-scale developments on the local community, including potential changes in neighborhood demographics, tax revenues, the makeup of local businesses, and community cohesion. Second, it can provide valuable information for prospective homebuyers or real estate investors in the area. Knowing the extent to which the construction of Truist Park has affected residential property prices can help individuals make informed decisions about buying or selling property in the area. Third, it can provide insight to sports franchises regarding the potential for mixed-use developments and revenue generation opportunities. Furthermore, investigating whether the impact varies by market segment, such as single-family detached homes versus attached homes, can contribute to the understanding of

housing market dynamics surrounding sports venues, an area that has been only sparsely explored in previous research. Residents and community groups can utilize this knowledge to advocate for their interests, whether it be in seeking compensation, voicing concerns, or endorsing potential benefits.

There are sound conceptual reasons why the direction and magnitude of the effect of the construction of Truist Park (or any other sports venue) on residential property prices may depend on the composition of the real estate market in the surrounding areas. For example, if the majority of the properties in the area are single-family detached homes, the construction of the stadium may have a different effect on residential property prices relative to a situation where the majority of the properties are attached homes, such as condos and townhomes. Consumers looking to live in single-family detached dwellings are likely to place more value on privacy and may prefer fewer crowds in shared areas; therefore, these consumers may value the externalities of a sports and entertainment venue differently. On the other hand, consumers in the market for an attached home, condominium, or townhouse may prefer to live in more vibrant and active communities surrounded by more people. Additionally, due to the size and price of the housing units, these consumers may have smaller families and be younger or earlier in their homeownership lifecycle. Moreover, the age and condition of the surrounding properties, as well as the presence of other amenities and attractions in the area, may also influence the impact of the stadium construction on residential property prices. An in-depth exploration of these factors can lead to a more comprehensive understanding of how the construction of a major sports facility affects the local housing market and better inform future development decisions.

In summary, this study seeks to answer the following these research questions:

RQ_1 What is the effect of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices?

RQ_2 How does the effect of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices vary with distance to the venue?

RQ_3 Do the effects of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices vary by market segment – single-family detached homes versus attached homes (condos and townhomes)?

Research Plan and Dissertation Organization

To estimate the net effect of the positive and negative externalities created by the construction of Truist Park on residential property prices, I first set up a difference-in-difference hedonic regression model for the entire real estate market surrounding the new stadium area. Next, I conduct the heterogeneity analysis by measuring the differential effects in two real estate market segments: single-family detached homes and attached homes, such as condos and townhomes. Additionally, to ensure the validity of my conclusions, I conduct a robustness check using a sub-sample of repeated sales of the same properties. This exercise offers the advantage of better controlling for unobserved and time-invariant property characteristics that could influence the property value. Overall, by utilizing multiple methods of analysis and exploring various market segments, I can thoroughly evaluate the impact of Truist Park's construction on the local housing market and generate detailed insights into the complex relationship between large-scale sports/entertainment developments and residential property prices.

This dissertation is organized into five sections. In the introduction, I provide an overview of the research topic, lay out the research questions and objectives, and outline the scope of the study. The second section comprises the literature review and provides an in-depth synthesis of existing publications on the effect of sports venue construction on residential property prices. It also includes background information about Truist Park and The Battery Atlanta. The third section, methodology, describes the details of the research design and methods used to assemble and analyze the dataset. The fourth section, results, presents the main findings of the research, as well as the results from heterogeneity analysis conducted to explore the detached and attached real estate market subsegments. The fifth section is the discussion, which interprets the results in light of the research questions and objectives, and compares the findings to those found in the existing literature. The final section offers conclusions and summarizes the key findings and implications of the research, along with suggested directions for future research.

CHAPTER 2

LITERATURE REVIEW

This study seeks to assess the net effect of the externalities generated by the construction and opening of Truist Park and The Battery Atlanta (TP&TBA) on surrounding residential properties. Accordingly, this literature synthesizes existing research on the effects of sports venues on residential property prices, detailing: (i) a chronological overview of the key past studies, (ii) an evaluation of the strengths and weaknesses of their research designs, and (iii) identified gaps in the literature in the current knowledge.

This literature review focuses on the effects of the construction of new stadiums on residential property prices, which is a subset of the broader body of literature that delves into sports venues' role in urban redevelopment, governments' return on investment, and various other externalities. Predominantly, past studies have addressed venues' fiscal contributions via impacts on consumer expenditures (e.g., Baade et al., 2008; Crompton and Howard, 2013; Propheter, 2021), as well as their capacity to catalyze urban redevelopment and renewal (e.g., Cantor and Rosentraub, 2012; Chapin, 2004; Propheter, 2012). Additionally, the extant literature amply documents that sports venues may be associated with negative externalities such as traffic, crime, noise, light, and air pollution (Block, 2021; Humphreys & Pyun, 2018; Locke, 2019; Mares & Blackburn, 2019; Pyun & Hall, 2019).

My research does not probe the fiscal implications of TP&TBA to Cobb County or the isolated effects of any specific externalities such as crime, business permits, sales, traffic, school quality, etc. Instead, this dissertation addresses the aggregated net effect of both positive and

negative externalities created by the construction of TP&TBA on residential property prices near the venue. It also extends the analysis to different real estate market segments, considering the distinct effects on the values of single-family detached homes and attached homes.

The literature review is organized into four sections. This first section reviews background information on the research topic and contextualizes the relevance of the project's research questions. The second section presents a chronological synthesis of previous studies highlighting similarities and differences between extant literature and this project. The third section identifies some limitations of previous studies and gaps in the knowledge that the current research aims to address. Finally, in the last sub-section of the review, I provide an overview of Truist Park and The Battery Atlanta to familiarize the reader with details about this sports and entertainment venue.

Background

Literature about how the construction of new sports venues impacts the surrounding residential property prices mainly suggests that property prices increase after the opening of the venues, and the effect diminishes with distance to the new facility. However, there are some inconsistencies; for example, Hyun (2022) observed real estate prices decrease while Bradbury (2022) noted stagnant property tax revenues in areas that welcomed new sports venues.

Sports venue constructions significantly reshape the built environment and influence the appeal of residing proximate to these landmarks. Specifically, residents of areas where sports venues plan to move to may face the decision of *do I stay or do I move out.* An influx of new residents attracted to the area may transform the composition and character of the neighborhoods surrounding the stadium. On the positive side, an increase in property prices will benefit

residents if they plan to sell. On the other hand, an upsurge in property values can strain affordability due to elevated property taxes. Low-income consumers may be forced out of the neighborhood by increased taxation and/or monetary offers from real estate developers interested in the urban changes happening near the venues.

The momentum behind investments in stadiums remains unabated. As professional sports leagues are created or expanded, as is the case for Major League Soccer, a need arises for new or augmented sports venues (Love et al., 2013). Additionally, many team owners and local governments are considering proposals for new stadiums and arenas to address technological and functional obsolescence (Axios, 2022; Badenhausen, 2023; Sports Business Journal, 2022). Recent examples of facility updates, expansions, or constructions of new venues include Soldier Field in Chicago, Kansas City Chief Stadium in Missouri, and Tennessee Titans Stadium in Nashville.

There are several reasons why it is important to assess how the development of TP&TBA has impacted residential property prices. First, such knowledge equips policymakers and urban planners with insights into community responses to major infrastructural ventures. Second, it can assist sports franchises in assessing the area's potential for mixed-use developments and the prospects for additional revenue generation. Third, it can be a valuable source of information for prospective homebuyers or real estate investors in the region. Understanding how TP&TBA construction has influenced residential property prices can enable individuals to make informed decisions about purchasing or selling property in the area. Furthermore, investigating whether the effects differ based on the market segment, such as single-family detached homes versus attached homes, enriches the understanding of housing market dynamics in the vicinity of sports venues. This aspect of my contribution has not been thoroughly studied in previous research.

Recent Empirical Evidence on the Link Between Sports Venues and Surrounding Residential Real Estate Prices

Several recent papers attempted to measure empirically the association between a new sports venue construction/opening and the values of surrounding real estate. In the seminal study, Tu (2005) examined the influence of a professional football team's relocation to the new suburban FedEx Field stadium in Prince George's County, Maryland, on local house prices. The author used property values assessed for tax purposes as the primary outcome variable, arguing for its efficacy in representing true property values. The study's dataset contained observations of sales of single-family residences, both attached (townhomes constituting about 8% of the sample) and detached properties. However, Tu's analysis did not differentiate between market segments or property types. The study found that, before the stadium construction announcement, single-family dwellings close to the proposed site sold at a lower price than houses located up to three miles away. Following the announcement, houses within one and two miles of the site increased in value at a higher rate than those situated two to three miles away. To identify the causal effect of stadium construction, Tu (2005) used the hedonic pricing model in conjunction with a difference-in-differences approach. The impact areas were determined to be three miles from the stadium with the effect becoming insignificant beyond that range. These features of Tu's framework served as the template for the current study. Similarly to Truist Park, FedEx Field is a suburban stadium. However, in contrast to the Truist Park site, FedEx Field is located in what previously was an economically depressed area. The 236-acre lot housing FedEx Field had been unused for several years prior to the stadium development. In contrast, the 57-acre lot designated for Truist Park in Cobb County, Georgia, had already been a scenic park-like

setting featuring a pond against a backdrop of office buildings in a commercial district. The absence of previous development on this site was attributed to an underlying gas pipe. Rerouting this pipe necessitated a $13 million upfront investment, which rendered the potential development economically unfeasible for smaller-scale projects (Green, 2017).

Dehring et al. (2007) investigated the impact of three successive announcements, spanning four months, related to the prospective construction of a new NFL stadium intended for the Dallas Cowboys' relocation to Arlington, Texas. The specific announcements under examination included the mayor's revelation of negotiations with the NFL team, the city council's subsequent endorsement of a ballot initiative for stadium financing, and the final notification of the initiative's outcome. Although the individual announcements did not appear to trigger significant housing price changes, their cumulative effect manifested in a 1.5% decrease in Arlington's residential property values compared to properties outside Arlington, but within a 20-mile radius of the proposed stadium site. This decrease in home values was roughly equivalent to the expected increase in household sales tax burden required by the ballot initiative, suggesting that the average expected amenity effect of hosting the Cowboys in Arlington lacked statistical significance. Notably, the study focused solely on the property price implications, omitting effects related to actual construction or post-inauguration of the stadium.

Feng and Humphreys (2012) analyzed survey data from the Census 1990 and 2000 Long Forms and found that median house prices decrease as the distance to the sports venues increases. Their study included 126 NFL, NBA, MLB, and NHL facilities across 45 cities between 1990 and 2000. The findings suggested that stadiums created positive externalities that were reflected in the values of owner-occupied residential properties.

Studies from other countries have also examined the interplay between sports facilities and residential property prices. For instance, after London was named the host city for the 2012 Summer Olympics, Kavetsos (2012) found that property prices in the Olympics-host boroughs exceeded those in non-host boroughs by 2.1% to 3.2%. Employing a distance-based, difference-in-differences approach centered on the proposed Olympic Stadium site, he determined that properties within a three-mile radius commanded a 5% premium. However, between three and nine miles from the stadium site, property prices dropped by about 2%, and beyond the nine-mile radius, the stadium announcement appeared to have no discernible impact on property values.

Ahlfeldt and Kavetsos (2014) used the difference-in-difference approach to examine shifts in residential property prices within a 5-kilometer radius of the New Wembley Stadium and the nearby Emirates Stadium in London. The New Wembley Stadium was a successor to a preceding stadium of similar size. Following the announcement of the New Wembley construction, prices of houses in close proximity to the future new stadium surged up to 17%. Moreover, after the stadium's opening in 2002, properties within the 5-kilometer zone observed a 13.5% cumulative average price increase compared to comparable properties farther away. The authors argued that the "iconic" architectural design of the stadium, marked by a 436-foot arch visible far from the stadium, generated positive externalities reflected in property prices similar to the effects of distinct design elements characterizing some historic residential buildings.

Using micro-geographical transaction data, Feng and Humphreys (2018) explored how the inauguration of two new stadiums in Columbus, Ohio, affect property values. The Nationwide Arena for professional hockey (NHL) that opened in 2000 is an inner-city stadium with adjacent mixed-use development. The Columbus Crew Stadium (MLS) for soccer that opened in 1999 is located on the grounds of the Ohio Expo and the State Fairgrounds (in 2021

the Crew moved to a yet newer stadium, Lower.com Field located near the Nationwide Arena). The study found that proximity to both stadiums, but especially to the Nationwide Arena in the city's core, correlated positively with housing sales prices.

Chikish et al. (2019) investigated the influence of the Chesapeake Energy Arena, a multipurpose sports venue in downtown Oklahoma City, on single-family and condominium transaction prices within a 10-mile radius. The arena initially hosted a minor league hockey team, but it subsequently became home to two professional basketball teams (NBA). This sports facility was part of a four-year inner-city revitalization plan, which also encompassed a minor league baseball stadium. Employing a difference-in-difference approach and hedonic price regressions with repeat sales, the study revealed that both the new arena and the arrival of permanent and temporary NBA teams generated increases in local residential real estate prices, with the strongest impacts observed in treatment areas between two and four miles out.

Keeler et al. (2021) analyzed the effect that the Staples Center - home to professional basketball (NBA) and hockey teams (NHL) in inner-city Los Angeles, had on house prices during the period spanning two years before its announcement to six years post-opening. Employing a local polynomial regression, the authors determined the treatment distances for their difference-in-difference model and found that houses sold after the arena’s inauguration fetched a premium of 5-6%. Results also indicated that both the 1997 announcement and the 1999 opening led to a surge in neighboring house prices, especially within a one-mile radius of the facility. Furthermore, the authors identified a significant anticipation effect with house sales prices rising 6-11% following the venue’s location announcement.

More recently, in a study based in South Korea, Hyun (2022) investigated the effect on residential property prices of the construction and opening of the Gwangju-Kia Championship

Field, a new baseball stadium with 27,000 total capacity located in the city of Gwangju, Republic of Korea. The facility was built adjacent to an existing stadium in a densely populated urban area. Drawing on transaction data for apartments, the author compared before- and after-opening prices and observed that properties within 400 meters of the stadium experienced about a 7% price dip. The negative effect decayed with distance, with apartments 1.6 kilometers away from the stadium registering a 4% reduction in value.

Analysis of Literature Deficiencies

The impact of sports venues on surrounding property values has been a topic of interest for scholars and policymakers alike. However, there are notable gaps in the existing literature in this field. First, most extant studies overlook the effects of the construction of new sports venues with adjacent mixed-use developments and entertainment districts, particularly in the case of Major League Baseball (MLB) stadiums. Second, studies that explore the effect of sports venues on residential prices often fail to complete the heterogeneity analyses to explore the distinct impacts in real estate sub-markets, e.g., if and how different types of properties (single-family homes vs. condominiums) are differentially affected by the presence of sports facilities. Such heterogeneity analyses are important because the result of no significant effect of venue construction documented in several previous studies might mask potentially offsetting price adjustments among different types of properties. This dissertation seeks to fill these specific gaps in the literature by examining the construction of a new MLB stadium with an entertainment district and exploring the heterogeneity of real estate sub-markets surrounding the venue.

Understudied Projects: New Sports Venues with Adjacent Entertainment Districts

Previous studies based in the U.S. similar to this research focused predominantly on NFL, NBA, and NHL stadiums, or multipurpose arenas. The effect of Major League Baseball stadiums on property prices has not been extensively studied. Four MLB teams built or retrofitted their stadiums in the past twelve years: (1) GlobeLife Park in Arlington, Texas, which opened in 2020; (2) Truist Park in Cobb County, Georgia, which opened in 2017; (3) LoanDepot Park in Miami, Florida, opened in 2012; and (4) Target Field in Minneapolis, Minnesota, opened in 2010. The two most recent stadium openings are suburban parks, while the other two align with the more traditional model of an urban ballpark. Both suburban stadiums in Texas and Georgia represent a move from an already established team site to a new and improved facility. Both projects were also developed as public-private partnerships, promising the development of an integrated entertainment complex, Texas Live, and The Battery Atlanta. While the former Texas Rangers' stadium remains operational (used as a football and soccer facility) adjacent to the new GlobeLife Park stadium, the Atlanta Braves moved 22 miles north of their old home field within the city of Atlanta. Bradbury (2022) recently studied the effects of Truist Park's opening on the local real estate market using a synthetic control method and assessing Cobb County's sales tax receipts and property tax revenues. His findings suggest that, in comparison to other Atlanta-metro counties, Truist Park neither significantly elevated the sales tax receipts nor the property tax revenues post its announcement and inauguration. Nevertheless, a subsequent report commissioned by the Atlanta Braves and authored by Zimbalist (2022) criticized Bradbury's data

quality. Zimbalist also challenged several foundational assumptions in Bradbury's work, casting doubt on its conclusions.

Historically, research into the impact of new sports venues on local economies has predominantly centered on facilities that didn't incorporate expansive multi-purpose entertainment districts. Furthermore, the bulk of these investigations, spanning from 1970 to 2010, found that when the average public funding exceeded 70%, cities should not anticipate significant boosts in employment or per capita income due to the construction of stadiums or arenas. However, as the average public contribution decreased to below 50% during the 2010s, it's plausible to hypothesize that fiscal and economic outcomes could fare better. This premise aligns with the Truist Park scenario, where public funding accounted for less than 45%, a detail further explored in the following section dedicated to the Truist Park and The Battery Atlanta project.

Overlooked Dynamics: Lack of Market Segment Analyses in Evaluations of Stadium Effects on Residential Property Values

The existing literature concerning the effect of sports venues on residential property prices often neglects to account for differences across real estate submarkets. Historically, studies have treated housing units homogeneously, without delving into heterogeneity in the estimated impacts based on property types or other distinguishing factors within submarkets. Such oversights could potentially be attributed to data limitations in earlier studies, preventing the differentiation between property types or the isolation of effect estimates for specific market segments. In certain locations, there might simply not be sufficient data points available for analysis across diverse segments. For example, Hyun’s (2022) exclusively used apartment data in his research, reflecting the high-rise apartment-dominated landscape around the studied stadium.

In the case of Tu (2005), data come from the tax assessor, and there was no distinction between property types.

Moreover, many studies deliberately limit the scope of their analyses. For example, Keeler et. al (2021) narrowed their focus to single-family homes when examining the Staples Center in Los Angeles, intentionally excluding non-single-family residences located in mixed residential areas to the east of the development. Similarly, Humphreys and Novak (2017) examined the impact of professional teams' departures from their home stadiums on nearby residential property prices, tailoring their focus to specific types of properties. In their investigation of NBA team departures from Seattle and Charlotte, they sourced data for all property transactions but honed in on single-family home sales only in Charlotte and condominium sales only in Seattle. This decision was informed by the observation that condominiums constituted a mere 10% of Charlotte's transactions, prompting the exclusion. Conversely, in Seattle, where condominium sales represented 20% of the total and were distributed uniformly around the arena due to the city's denser population, the study was centered on this property type. Their spatial hedonic difference-in-difference estimation revealed a positive price surge for single-family detached homes in Charlotte following the team's exit. However, in Seattle, the team departure's influence on condominium prices in close proximity to the arena was statistically negligible.

In a separate but related segment of the literature exploring externality effects within real estate markets, Atkinson-Palombo (2009) identified distinct capitalization effects of light rail transit on detached single-family homes versus condos in Phoenix, Arizona. The author suggested that public transit amenities could induce “location sorting”, where individuals who value such amenities might gravitate closer to transit stations and would be willing to pay a

premium. He also highlighted the potential shortcomings of models that fail to discriminate by housing type, underscoring the significance of understanding the varying impacts of public amenities across different market segments:

> "Overall, the results suggest that, in the process of location sorting, neighbourhoods that experience the strongest capitalisation benefits are those most likely to evolve into transit-oriented development (TOD) communities that focus on walkable neighbourhoods and mixed use, and that condos within these neighbourhoods may be more sought-after than single-family houses."

Description of Truist Park and The Battery Atlanta

In November 2013, the Atlanta Braves Major League Baseball Team announced their relocation from Turner Field in inner-city Atlanta to Cumberland in suburban Cobb County. The team inaugurated their new venue with an exhibition game on March 31, 2017. The relocation situated the team closer to their core fan base and replaced a 25-year-old facility with a new 41,000-seat stadium. The new location also featured enhanced parking and an adjacent contemporary mixed-use development, The Battery Atlanta, consisting of a hotel, apartments, office buildings, shops, bars, and restaurants. Currently, Truist Park and The Battery Atlanta are popular year-round all-day destinations rather than a traditional ballpark.

The 57-acre previously vacant site is situated on the eastern side of the county, bordered by frontage roads flanking the interstate highways to the east and south (see Figure 3). The adjoining land primarily serves office, strip retail, and multifamily residential purposes, with an enclosed shopping mall positioned directly south across the highway. Dobbins Air Force Base is located three miles northwest, and the Chattahoochee River National Recreation Area is

positioned southeast, near the interstate junction. Single-family residential neighborhoods are primarily located westward, just beyond the arterial road, and to the north, across the interstate.

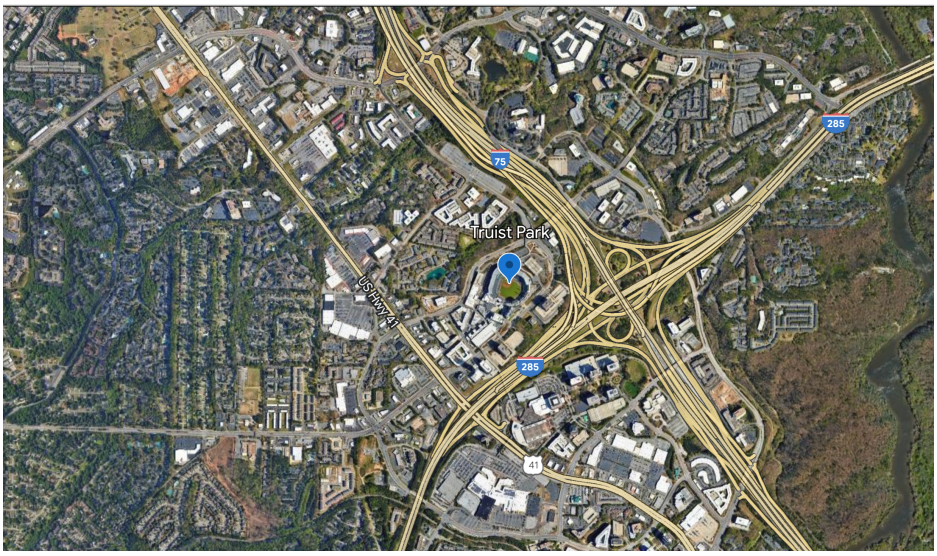


Figure 3

Aerial View of Truist Park and Surrounding Areas

The mixed-use complex named The Battery Atlanta on the western half of the site was 50% operational by the end of 2017 (Gargis, 2017). That year saw the opening of 531 rental apartments, a collection of office buildings housing, among other tenants, the regional headquarters of Comcast, as well as several retail outlets, bars, restaurants, and a movie theatre. The complex also contains multiple parking decks with additional parking spaces available in nearby surface lots, some connected to the main entertainment district via pedestrian bridges. The area offered limited public transportation consisting of two circular bus lines connecting The Battery Atlanta to other areas in Cumberland, as well as the Metropolitan Atlanta Rapid Transit Authority's bus line to Midtown Atlanta.

The Truist Park project had an initial budget of $672 million. The financing for the stadium was arranged via a public-private partnership for which Atlanta Braves was responsible

for $372 million, and the Cobb-Marietta Coliseum & Exhibit Hall Authority contributed the remaining $300. The Braves subsequently invested an additional $452 million for the development of The Battery Atlanta, which adds up to over $1.1 billion in the combined expenditure for the stadium and the adjacent mixed-use district. To finance the public's share, Cobb County issued municipal bonds and adjusted the tax rate for all real estate properties, including single-family units, by an additional .33 mills. Other supplementary taxes and fees were subsequently imposed on commercial properties but exempted residential ones, generating more funds for debt servicing and operations (Bradbury, 2021).

CHAPTER 3

METHODOLOGY

The decision to purchase a home extends beyond the physical characteristics of the dwelling itself; it encompasses a range of locational attributes such as, for example, the convenience of commuting to work, access to shopping hubs, the quality of nearby schools, and proximity to parks and recreation. The hedonic pricing model, first presented by Rosen (1974), serves as the seminal theoretical framework that articulates the value consumers assign to various structural and locational characteristics inherent to houses and their neighborhoods. Rosen's model revolutionized the understanding of how differentiated products are priced in the market. By disaggregating a product or service into its integral elements, the hedonic pricing model can identify the separate value of each of these features, allowing one to better discern consumer preferences and the valuation of market goods. Although the model is most frequently utilized in the literature on housing, it has found diverse applications beyond real estate, extending to environmental economics, labor economics, transportation research, or any attempt at an assessment of the value of intangible goods.

This methodology chapter is organized into four sections. The first section provides the conceptual description of Rosen's hedonic pricing model, estimation methods and the data. The second section describes the hedonic models for the analysis, a baseline, and a difference-in-differences model to answer the research questions. It also describes the data and variables used in the study. The third section describes the methods used to understand the stadium effect for each real estate submarket in the heterogeneity analysis. Then, the fourth section provides the

description and equations for estimating anticipation effects and conducting a repeated sales analysis.

Hedonic Pricing Model and Conceptual Discussion of the Effect of Sports Venues on Surrounding Residential Real Estate Values

Rosen's (1974) hedonic pricing model provides an insightful framework to dissect pricing mechanisms and consumer preferences within differentiated product markets. Recognizing that many goods, like houses, possess heterogeneous characteristics, the theory emphasizes that a house price observed in the market provides limited insight into the dynamics of demand and supply for specific attributes. However, by decomposing a product's price into its distinct attributes, the model enables a nuanced understanding of each feature's contribution to the total price. Grounded in equilibrium principles, the model delineates two perspectives: (1) from the demand side, where consumers seek to maximize utility within budgetary constraints by selecting among varied house attributes, and (2) from the supply side, where industry offers products, balancing the costs of added features with their respective market prices. Below, I briefly review the consumer, i.e., the demand side of Rosen's theory.

The hedonic pricing model posits that houses or any diverse goods in markets are characterized by a vector, Z, representing their utility-bearing attributes. Formally, the set of n attributes can be expressed as $Z = (z_1, z_2, \dots, z_n)$. For housing, such attributes might encompass structural elements (e.g., room count), local services (e.g., quality of nearby schools), and proximity to amenities (e.g., distance to entertainment venues like a sports stadium). Therefore, the market price of the i-th house can be expressed as the function of attributes, i.e., $P_i = P(z_{i1}, z_{i2}, \dots, z_{1n})$. The partial derivative with respective to the j-th attribute, $\partial P / \partial z_j$, represents its marginal implicit price. As an illustration, if the j-th attribute quantifies the distance between

a house and a sports venue in miles, this derivative gauges the marginal price adjustment a consumer is prepared to make for the house located an additional mile from that stadium, all other attributes being constant.

The market relationship between house prices and a specific attribute is embodied in the hypothetical hedonic price schedule (HPS). This relationship arises from the equilibrium interplay between consumer demand and producer supply. The model operates under the assumption of competitive markets where consumers transact over a single dwelling at the prevailing market rate. Consumer utility, u, is a function of a composite good X and the set of housing attributes: $u = u(X, Z)$. After normalization of the composite good's price to one, the accompanying budget constraint can be succinctly represented as $I - P - X = 0$, where I denotes income.

Given the utility function presented above, a consumer maximizing her utility, subject to the budget constraint, will choose a house with the level of individual characteristics such that the ratio of marginal utility derived from a particular characteristic z_j to the marginal utility from the composite good X is equal to the marginal price of that characteristic, i.e., $\left(\partial U/\partial z_j\right)/(\partial U/\partial x) = \partial P/\partial z_j$. This relationship signifies that the marginal willingness to pay for z_j aligns with its marginal cost in the market, and that the marginal dollar spent on a house with an additional unit of characteristic z_j must provide an equal amount of extra utility as the marginal dollar spent on the composite good.

Substituting the budget constraint into the initial utility function yields the indirect utility function: $u = u(I - P, z_{i1}, z_{i2}, \dots, z_{1n})$. Inverting this equation while keeping all characteristics constant except for z_j leads to an expenditure function, i.e., the mathematical expression of willingness to pay for house attribute z_j: $E_j = E_j\left(I - P, z_j, \overline{Z_{-j}}, \bar{u}\right)$, where $\bar{u}$ is the highest level

of utility attainable given the budget constraint and $\overline{Z_{-J}}$ is the vector of the optimal quantities of characteristics other than z_j. The plot of this equation is the indifference curve between house price and attribute z_j.

Heterogeneity in individual indifference curves (often referred to as bid functions in implementations of hedonic models) arises from differential preferences and income levels between consumers, leading to disparities in the selected quantities of various house characteristics. Figure 4 below illustrates this by plotting the hypothetical HPS and indifference curves for the specific attribute z_j (proximity to the stadium) and housing prices of two consumer types: #1 and #2. While there are potentially numerous types of consumers, each possesses an indifference curve tangent to the HPS, and each indifference curve is characterized by a decreasing marginal rate of substitution between z_j and X (since $X = I - P$). In the depicted example, both consumers opt for housing locations where their marginal willingness to pay for z_j aligns with the market's marginal implicit price, which is evident at z_j^1 and z_j^2, respectively. Given the prevailing market prices, these consumers would attain suboptimal utilities in locations characterized by greater or shorter distances to the stadium relative to the depicted equilibria.

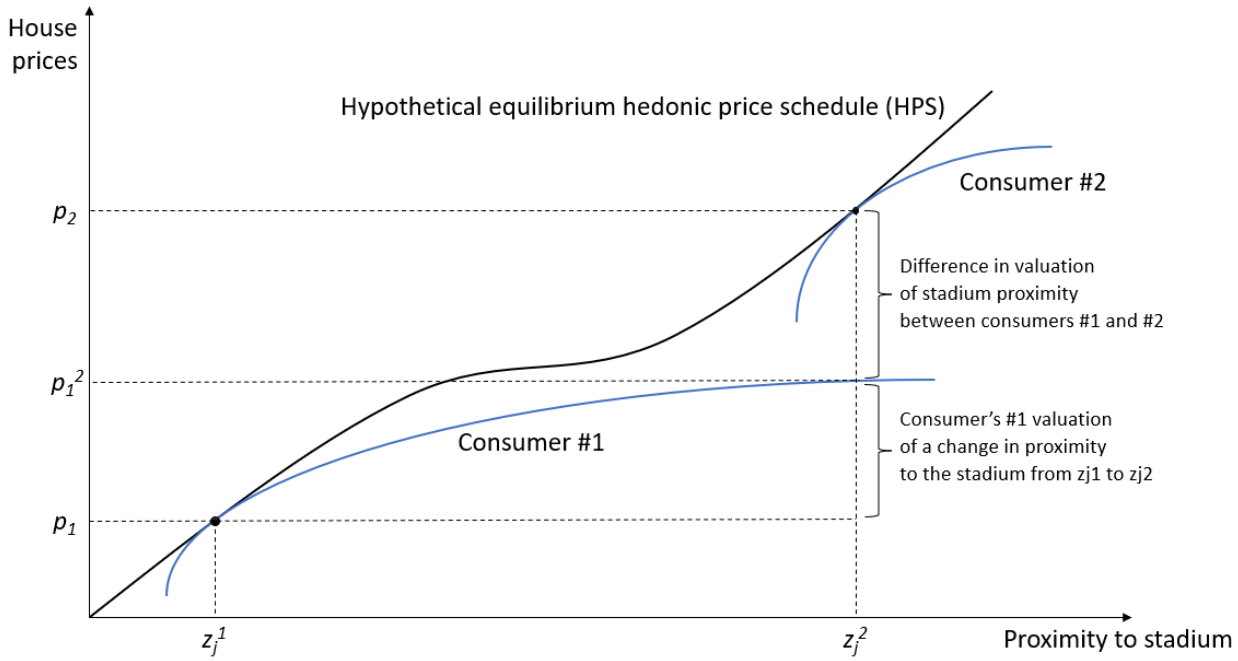


Figure 4

Hypothetical Equilibrium HPS in a Hedonic Market for Proximity to a Sports Stadium

The plotted HPS emerges from tangencies between consumer indifference curves and supplier offer functions (the derivation of the latter remains outside the scope of this discussion). At every point on the HPS, the marginal price of distance to the stadium matches a consumer's marginal willingness to pay for that house characteristic (and a supplier's corresponding marginal production cost). From a consumer's viewpoint, the HPS gradient relative to a stadium's proximity denotes the equilibrium differential compensating consumers for enduring potential disutilities (like heightened noise or traffic) inherent in residing closer to a sports venue.

The theory presented above helps to explain why different consumers would be willing to pay different prices for identical homes located at varying distances from a sports stadium. However, the theory does not provide an unambiguous prediction of whether the reduced distance between a residence and a sports venue enhances or diminishes utility. For illustrative

purposes, the figure above arbitrarily assumes a certain feature of consumer utility functions, resulting in an upward-sloping HPS between housing prices and stadium proximity. In reality, the proximity to sports venues might be seen as a benefit due to ease of access to entertainment, potential boosts in neighborhood prestige, and related amenities. Conversely, negative externalities, such as traffic, noise, or even security concerns related to large event days, might depreciate the value of nearby homes. Ultimately, gauging the precise impact of stadium proximity on residential real estate prices requires a transition from theoretical conjecture to an empirical investigation, which is the primary objective of this study.

Kavetsos (2012) outlines three possible outcomes concerning consumers' willingness to pay for housing close to sports venues: (1) consumers like to live closer to the stadium and are willing to pay more, boosting housing sales prices; (2) consumers dislike the negative externalities associated with living close to the stadium and would pay less to live closer to the stadium, or (3) consumers are indifferent to the amenities and disamenities created by the proximity to the stadium and have no incentive to pay more or less to be close to the stadium. Should consumers appreciate the convenience brought about by proximity to the services and amenities of a venue, constructing a new stadium would positively impact housing prices in the stadium vicinity. In contrast, if perceived disadvantages such as amplified noise, pollution, crime, and traffic associated with adjacent sports facilities outweigh the benefits, nearby housing prices might decline. While the impact of sporting venues may be pronounced for properties in immediate proximity, the effects could wane over distance. However, it is not clear, a priori, how the net effect varies with distance. Thus, this study seeks empirical answers to the following set of questions:

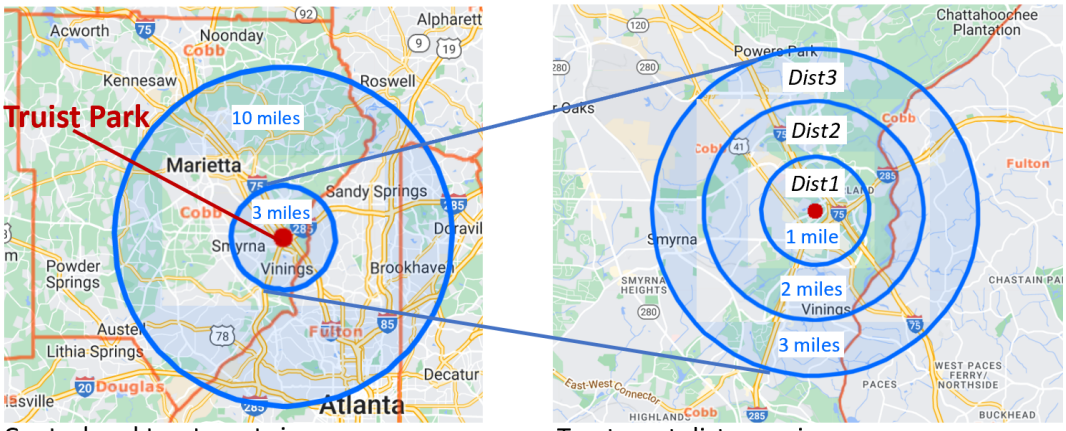
RQ_1 What is the effect of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices?

RQ_2 How does the effect of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices vary with distance to the venue?

RQ_3 Do the effects of the construction of Truist Park and The Battery Atlanta on nearby residential real estate property prices vary by market segment – single-family detached homes versus attached homes (condos and townhomes)?

Identifying the neighborhood impacts of stadiums is challenging, primarily because venue sites might not be randomly chosen. Ahlfeldt and Kavetsos (2012) noted that correctly identifying proximity effects depends on the ability to separate sports facility effects from other observable and unobservable locational characteristics. My basic strategy to address that challenge relies on a hedonic regression model with a difference-in-difference approach. Hedonic regression models are implementations of the theory reviewed above and explain a property's sales price as a function of its structural characteristics and its neighborhood surroundings. I compare the sales prices of properties within designated distance rings from the stadium to those of comparable properties outside the set distance rings. Then, I compare the magnitude of this difference before and after the stadium is opened. This "difference-in-difference" in property sales prices is my measure of stadiums' impact on neighborhood residential prices. Thus, my study implements a quasi-experimental design that exploits a temporal shock to better "difference" away time-invariant omitted variables before and after two specific events — the stadium’s construction announcement and the subsequent opening.

Hedonic models estimate the house price as a function of a bundle of characteristics. The data for this model includes the price of the house, house characteristics, and neighborhood characteristics. The dependent variable is the price of the home, and the primary independent variable in this analysis is the distance to TP&TBA. Following existing literature, I created distance rings around the stadium of a one-, two-, and three-mile radius centered in the stadium location, and defined three corresponding treatment groups. The control group comprises the houses farther away from the stadium in an outer ring starting beyond three miles from the stadium and up to ten miles away (see Figure 5).



Control and treatment rings

Treatment distance rings

Figure 5

Control and Treatment Groups

Data and Variables

Data for my analysis of residential sales comes from the First Multiple Listing Service (FMLS). The FMLS database contains proprietary data about residential properties listed for sale, promoting cooperation between agents representing both buyers and sellers. It includes information on all transactions initiated by property owners hiring a real estate agent to sell their houses. My estimation sample includes all FMLS sales transactions in Cobb County, Georgia

from 2010 to 2020. I extracted detailed transaction records, including closing dates and sales prices, as well as a comprehensive list of housing and community amenities.

I matched the transaction data from the FMLS with Cobb County tax assessor records to enhance the precision of the living area measurements for each house. In addition, I obtained census block-level measures of neighborhood demographic characteristics, occupancy, and vacancy statistics from the 2010-2014 and 2015-2019 American Community Survey. I matched the census data to my FMLS data set of closed transactions using a geospatial join function in ArcGISPro software. The Euclidean distance from Truist Park to each sold house was calculated with R statistical programming software using the longitude and latitude for each property and the stadium's coordinates. Observations missing a valid tax ID, those located more than 10 miles from Truist Park, and any records that contained obvious data entry errors were removed. Consequently, the refined analysis sample encompasses 69,852 residential units, all within a 10-mile radius of the stadium, listed with FMLS and sold in Cobb County between 2010 and 2020.

The model covariates include both property and neighborhood characteristics, census tract controls, time controls, and the indicators of ring distances to TP&TBA (see Table 1). Informed by previous research on house price determinants (e.g., Sirmans et al., 2005) the list of variables included in model specifications to control for property characteristics encompass square footage, number of bedrooms, number of full and half bathrooms, and the presence of a fireplace. The dataset contains indicators for property types that classify the housing units as single-family residences (detached), townhouses (attached), or condominiums. These property type indicators are the main variables for identifying real estate subsegments. Additionally, other variables associated with quality and structure characteristics include indicators of recent renovations, whether the home is newly built, and the age of the house.

The variables measuring neighborhood characteristics include indicators of shared amenities associated with each house's specific community or subdivision. These amenities comprise a community clubhouse, pool, tennis court, and playground, and whether the community is gated. In addition, the census block area covariates included in all estimated models are median income, racial composition, the proportion of housing units occupied by renters, and rental vacancy rate at the block level (Gabe et al., 2022). The time controls are dummy variables indicating the year in which each house was sold. The primary independent variable of focus in this study is the distance to TP&TBA. Following the existing literature, three distance ring indicators were defined based on the calculated Euclidean distance between the longitude and latitude of the stadium and the coordinates of each house in the dataset.

Table 1

Variable Definitions

Variable	Definition
Sales Price	Sales price
SFLA	Living area in square feet
Bedrooms	Number of bedrooms
Full_bath	Number of full bathrooms
Half_bath	Number of half bathrooms
Fireplace	Fireplace in unit: 1 if any fireplaces; 0 if no fireplaces
SingleFamilyRes	Single-family detached unit: 1 if detached; 0 if not detached
Townhouse	Single-family Townhouse unit: 1 if townhouse; 0 if not townhouse
Condominium	Single-family Condominium unit: 1 if condominium; 0 if not condominium
Age	Age of unit in years at time of rental
Renovated	Renovated: 1 if advertised as renovated; 0 if not
NewC	Newly built: 1 if built same year as sold;) if not
Dist to Atlanta	Distance to Atlanta (Central Business District) in miles
Comm Clubhouse	Community clubhouse: 1 if clubhouse in community: 0 if no clubhouse
Comm Pool	Community pool: 1 if pool in community; 0 if no pool
Comm Playground	Community playground: 1 if playground in community; 0 if no playground

Variable	Definition
Comm Tennis	Community tennis court: 1 if tennis court in community; 0 if no tennis court
Comm Gated	Gated community: 1 if community is gated; 0 if not gated
Median_income	Census block household median income
Black	Proportion of census block population Black
Asian	Proportion of census block population Asian
Other_race	Proportion of census block population multiracial or other race
Hispanic	Proportion of census block population Hispanic
Owner_occupied	Proportion of census block housing units owner-occupied
Vacant	Proportion of census block housing units vacant
Dist1	Unit located in Ring 1: 1 if unit within 1 mile of Truist Park; 0 otherwise
Dist2	Unit located within Ring 2: 1 if unit more than 1 mile up to 2 miles from Truist Park; 0 otherwise
Dist3	Unit located within Ring 3: 1 if unit more than 2 miles up to 3 miles from Truist Park; 0 otherwise
PreAnn	Whether sales transaction occurred before stadium announcement (November 11, 2013)
Const	Whether sales transaction occurred during construction of the stadium announcement (November 12, 2013 to March 31, 2017)
Post	Whether sales transaction occurred after stadium opened (April 1, 2017)

Estimation Strategy and Empirical Model Specifications

I begin by estimating the following baseline hedonic regression model specification:

$$\ln(Price_{ict}) = \gamma \mathrm{X}_{it} + \eta \mathrm{N}_{it} + \rho \mathrm{W}_{c} + \tau I_{t} + \beta_0 Dist1_i + \theta_0 Dist2_i + \Phi_0 Dist3_i + \varepsilon_{ict} \quad (1)$$

where

$\ln(Price_{ict})$ is the natural logarithm of the price of property *i* in census block *c* sold in year *t.*

X_{it} is a vector of property characteristics specific to each house *i.*

N_{it} represents a vector of neighborhood characteristics.

W_{c} is a series of census tract fixed effects that help control for unobserved, time-invariant features of different neighborhoods.

I_t is a series of dummy variables indicating the year when the house was sold, which controls for distinct time trends in home prices.

ε_{ict} is an error term assumed to be random.

The variables of primary interest are the ring variables (*Dist1*, *Dist2*, and *Dist3*), which capture the proximity to Truist Park. *Dist1* a dummy variable is equal to 1 if the property is located within a one-mile radius; *Dist2 and Dsit3* are equal to 1 for the houses situated within a radius exceeding one mile but not surpassing two miles, and for those located more than two miles but within three miles from the stadium site, respectively. Coefficient estimates on these variables reveal the direction and magnitude of differences in average prices of homes located in these respective areas during the 2010-2020 period.

While the basic hedonic model's parameter estimates provide insights into average home price variations in the stadium's vicinity, they shouldn't be viewed as true causal effects linking stadium construction to residential property values. These estimates are likely to suffer from omitted variable bias as unobservable factors not accounted for in the model may affect the sale prices of houses closer to the stadium. Examples of such variables include new commercial development, shifts in traffic patterns, or changes in higher crime rates, whether actual or perceived by potential buyers. The spatial difference-in-difference regression model presented below helps, to some degree, alleviate concerns about the omitted variable bias.

In the spatial difference-in-difference hedonic regression, the impact of stadium construction is identified by evaluating the average temporal change in home prices pre- and post-stadium inauguration, adjusting for covariates. This is first done separately within control and treatment property groups, and subsequently, the statistical significance of the difference in temporal price changes between these groups is assessed. In my implementation of the spatial

hedonic difference-in-difference regression, I define three treatment groups consisting of properties sold closer to the stadium, i.e., those within (1) one mile, (2) one to two miles, and (3) two to three miles of the stadium. The control group comprises residential units sold in the same county, but farther away from Truist Park (3-10 miles from the stadium within Cobb County as illustrated in Figure 4). The size of the distance rings in my analysis is consistent with previous research on stadium impact on house prices (Keeler et al., 2021; Tu, 2005). The spatial difference-in-difference hedonic regression is of the following form:

$$\ln(Price_{ict}) = \gamma \mathrm{X}_{it} + \eta \mathrm{N}_{it} + \rho \mathrm{W}_c + \tau I_t + \beta_0 Dist1_i + \theta_0 Dist2_i + \Phi_0 Dist3_i + \varphi_0 Post_{it} + (\beta_1 Dist1_i + \theta_1 Dist2_i + \Phi_1 Dist3_i) Post_{it} + \varepsilon_{ict} \quad (2)$$

The main difference between this model and the baseline model is that it includes $Post_{it}$, a dummy variable equal to 1 for transactions occurring after Truist Park opened, as well as the interaction terms between $Post_{it}$ and the distance ring indicators. The coefficient estimate on $Post_{it}$, φ_0, reveals the average difference in sale prices of homes situated in the control group (3+ miles from the stadium) before and after the opening of the stadium, while the estimated coefficients on interaction terms, i.e., β_1, θ_1, and Φ_1, reveal how the average before-after differences in sale prices of homes in rings 1, 2, and 3, respectively, deviate from those situated in the control group. In other words, the coefficient estimates on interaction terms are the difference-in-difference estimates of the impact of stadium opening on values of properties situated in each of the treatment groups. To the extent that the evolution of prices within each of the treatment groups and in the control group are not affected differentially by unobserved heterogeneity, i.e., factors not measured or accounted for in the model, these estimates are indicative of the true causal effect of stadium opening.

A standard method to evaluate potential biases from unobserved heterogeneity is the parallel lines test. This technique examines the presumption that the control group properties (those distant from the stadium) reflect the accurate counterfactual price trajectory that the treated properties (those proximate to the stadium) would have exhibited in the absence of the stadium's construction. I assess the property sale price trends for each distance ring before and after the opening of TP&TBA. To this end, I create a set of dummy variables by interacting each distance ring indicator with each year's dummies and include these interaction terms in the regression model:

$$\ln(Price_{ict}) = f(\mathrm{X}_{it}, \mathrm{N}_{it}, \mathrm{W}_c) + \beta_0 Dist1_i + \theta_0 Dist2_i + \Phi_0 Dist3_i + \sum_{j=2010}^{2015} \tau_1 \boldsymbol{I}_j + \sum_{j=2017}^{2020} \tau_2 \boldsymbol{I}_j$$
$$+ \sum_{j=2010}^{2015} \beta_{1j}(Dist1_i \times \boldsymbol{I}_j) + \sum_{j=2010}^{2015} \theta_{1j}(Dist2_i \times \boldsymbol{I}_j) + \sum_{j=2010}^{2015} \Phi_{1j}(Dist3_i \times \boldsymbol{I}_j)$$
$$+ \sum_{j=2017}^{2020} \beta_{2j}(Dist1_i \times \boldsymbol{I}_j) + \sum_{j=2017}^{2020} \theta_{2j}(Dist2_i \times \boldsymbol{I}_j) + \sum_{j=2017}^{2020} \Phi_{2j}(Dist3_i \times \boldsymbol{I}_j)$$
$$+ \varepsilon_{ict}$$

The term I_j represents a dummy variable that identifies a sales transaction occurring in the year j ($j = 2010 \ldots 2020$), with $j = 2016$, i.e., the year preceding TP&TBA inauguration, as the reference. The coefficient vectors β_2, θ_2, and Φ_2 reveal the difference-in-difference estimates of the stadium impact across the three treatment groups. Estimates of parameters within vectors β_1, θ_1, and Φ_1 serve as the test of parallel price trends before the stadium opening. A statistically significant deviation from zero in the values of β_1, θ_1, and Φ_1 would indicate disparities in average home prices pre-TP&TBA launch between a specific treatment

group and the control group. Such significant deviations would indicate a violation of the parallel lines test assumption.

When facing violations in the parallel trend assumption, a corrective approach involves introducing controls for time trends within each treatment group. Specifically, the following modification of Equation (2) that adds linear time trend controls, mitigates concerns about violations of the parallel trend assumption. This revised equation encompasses interaction terms between the treatment group membership indicators and the continuous $Year_t$ variable, effectively netting out price differences between the control and treatment groups arising from disparate average house price appreciations over time in these zones due to factors unrelated to the TP&TBA inauguration.

$$\ln(Price_{ict}) = \gamma \mathrm{X}_{it} + \eta \mathrm{N}_{it} + \rho \mathrm{W}_c + \tau I_t + \beta_0 Dist1_i + \theta_0 Dist2_i + \Phi_0 Dist3_i + \varphi_0 Post_{it} + (\beta_1 Dist1_i + \theta_1 Dist2_i + \Phi_1 Dist3_i) Post_{it} + (\beta_2 Dist1_i + \theta_2 Dist2_i + \Phi_3 Dist3_i) Year_t + \varepsilon_{ict}$$

Heterogeneity Analysis

The heterogeneity analysis aims to reinforce confidence in the results from my main estimations, as well as expand on the findings. Toward this purpose, I conduct separate tests for subsegments within the sample and compare subsegment estimation results to those obtained for the whole sample. Specifically, I estimate the distinct effects of the construction of TP&TBA on prices for detached residential units and attached units. Notably, the existing literature about the impact of sports venues on residential prices does not differentiate between these sub-market segments. Such oversight might stem from the limitations of data used in prior studies, constraining researchers' ability to segregate property types or isolate sub-market segments.

The property value data used for past studies on the U.S. real estate markets (e.g., Dehring et al., 2007; Feng & Humphreys, 2018; Keeler et al., 2021; Tu, 2005) were often sourced from the local tax assessor's offices. These data, however, tend to be tailored to the needs and resources of local governments. Consequently, local property tax databases often provide only limited classifications, distinguishing merely between commercial and residential units. The governance of property tax administration is usually the responsibility at the state level, though, in some cases, it may shift to the municipality level, leading to significant variability in rules and regulations across jurisdictions (Lutz, 2008). To the best of my knowledge, no standardized collection criteria exist for property tax assessment data, likely due to the diverse nature of property tax regulations and their enforcement. Moreover, real estate classifications can differ across regions or municipalities based on land zoning and developmental patterns.

To highlight specific examples, in Tu's (2005) analysis of the effects of FedEx Field in Maryland, data sourced from the tax assessor's office offered no differentiation in property type, resulting in a heterogeneous property sample within the county. When studying Staples Center in Los Angeles, Keeler et al. (2021, p. 808), restricted their analysis to single-family homes, excluding non-single-family homes located east of the development, which also encompassed commercial, industrial, and mixed medium residential zones. They noted scarce transactions involving single-family residences in this specific area. In contrast, Humphreys and Novak (2017) captured data from all property transactions in their analysis of two NBA team departures from Seattle and Charlotte. Despite the availability of comprehensive data, the authors focused only on single-family detached home sales in Charlotte and condo sales in Seattle.

The heterogeneity analysis component of this study elucidates the impact of TP&TBA construction on neighboring real estate sub-markets both in terms of direction and magnitude. For this purpose, I divide the sample of residential property sales within a ten-mile radius of TP&TBA into two subsamples based on the property type. Goodman and Thibodeau (1998) suggested that real estate sub-markets may be defined by structure type (e.g., single-family detached, row house, townhome, condominium), structural characteristics (property age, including new versus historical), or neighborhood characteristics. Leveraging the available data, I conduct the heterogeneity analysis by dividing the market into two segments: single-family detached homes and attached homes (townhouses and condominiums). I then estimate the baseline hedonic price regression model specification separately for each segment.

Robustness Tests

This dissertation utilizes two additional methods to ascertain the robustness of findings. First, an Anticipation Effect Analysis examines the impact of TP&TBA development at different phases of the project, including before the announcement, during construction, and after the stadium's opening. Second, I estimate a Repeated Sales Model that controls for unobservable property-specific and neighborhood-specific characteristics that may bias the primary difference-in-differences model. This estimation analyzes the changes in sales prices for each housing unit that sold at least twice during the study period. Prior literature has widely utilized both methods to establish the credibility and robustness of the results obtained via the estimations of the difference-in-differences model. Likewise, by employing multiple methods, this study provides a comprehensive analysis of the impact of TP&TBA development on housing prices in the surrounding areas, fortifying the validity of its conclusions.

Anticipation Effect Analysis

Numerous studies suggest that house prices may fluctuate in response to the announcement of a new sports venue's construction (Dehring et al., 2007; Kavetsos, 2012; Keeler et al., 2021). I study the anticipation effect by estimating the impact on housing prices during different phases of the TP&TBA's development. The Atlanta Braves announced their move to Cobb County on November 11, 2013, disclosing the exact location for the new stadium and adjacent entertainment area in Cumberland, GA. The chosen site, a previously undeveloped wooded area, welcomed the construction shortly after the announcement. The construction of the new stadium continued until March 31, 2017. On April 1, 2017, the new venue, then named SunTrust Park, hosted the opening game.

To identify the distinct anticipation and inauguration effects of TP&TBA, I estimate the following modified form of Equation (2):

$$\ln(Price_{ict}) = \gamma \mathrm{X}_{it} + \eta \mathrm{N}_{it} + \rho \mathrm{W}_c + \tau I_t + \beta_0 Dist1_i + \theta_0 Dist2_i + \Phi_0 Dist3_i + \varphi_0 Const_{it} + (\beta_1 Dist1_i + \theta_1 Dist2_i + \Phi_1 Dist3_i) Const_{it} + \varphi_1 Post_{it} + (\beta_2 Dist1_i + \theta_2 Dist2_i + \Phi_2 Dist3_i) Post_{it} + \varepsilon_{ict}$$

where $Const_{it}$ is an indicator variable that equals one for sales transactions observed after the announcement of stadium construction but before the inauguration (i.e., between November 12, 2013 and March 31, 2017), and the remaining elements are defined as before. The coefficient estimates on interaction terms, i.e., β_1, θ_1, and Φ_1, reveal how the average sale prices of homes in rings 1, 2, and 3, respectively, responded to the announcement of the new stadium relative to average sale prices of homes situated in the control group. Similarly, coefficient estimates on interaction terms, i.e., β_2, θ_2, and Φ_2, reveal how the average sale prices of homes in rings 1, 2,

and 3, respectively, differed after the inauguration of the new stadium relative to average sale prices of homes situated in the control group and compared to the pre-announcement period.

Repeated Sales Models

In the final data exercise, I estimate the impact of TP&TBA by utilizing the repeat sales approach, i.e., a method that identifies the effect of interest based on variation over time in prices of properties that sold at least twice during the study period. The advantage of estimating the effects based on variation in price for the same property (i.e., the within-variation) is that the estimation process can now fully eliminate the confounding influence of all time-invariant factors. Some unobservable property-specific or neighborhood-specific characteristics that could be correlated with distance to TP&TBA may otherwise bias the estimates in the baseline difference-in-differences model. In within-variation estimations, all independent variables that remain constant at the observation level between sale and re-sale are canceled out from the regression equation (McMillen, 2012). Although repeated sales regression (RSR) estimations place a higher demand on the sample size (since they need repeated measurements on the same observations), their rigor lies in the more effectual exploitation of the dataset's panel structure, positioning such methods as a useful robustness test in the relevant housing economics literature (Humphreys & Nowak, 2017; Chikish et al., 2019).

Repeated sales are defined as transactions in the dataset for which a sale and re-sale of the same property occur during the study period. My implementation of RSR uses a sub-sample of houses that sold twice between 2010 and 2020. Identifying such sales may sometimes be challenging in MLS listings due to data accuracy issues, i.e., when condominium units within buildings share the same geographical coordinates. Moreover, the dataset's size may pose challenges if it lacks a sufficient number of repeated sales in the target area. To pinpoint these

sales, I combined location, property type, and tax identification markers. The area closest to TP&TBA, especially within a mile, has a relatively small number of residential transactions (see Table 2). As expected, the numbers of repeated sales in each treatment area (one-, two-, and three-mile radius from the stadium) are relatively small. However, the dataset contains a sufficient cumulative count of repeated sales to analyze the combined effect of the three-mile radius treatment area.

Table 2

Number of Repeated Sales by Distance

Distance to TP&TBA	All Properties	Detached	Attached
Dist1	67	4	63
Dist2	667	120	547
Dist3	584	344	240
Treatment (0 to 3 miles)	1318	468	850
Control (3 to 10 miles)	6722	5463	1259

I estimate a parsimonious specification of the repeated sales regression of the following form:

$$lnP_{it} - lnP_{is} = \varphi(\ Post_{it} - Post_{is}) + \beta[TREADist_i \times (Post_{it} - \ Post_{is})] + \tau(\boldsymbol{I}_t - \boldsymbol{I}_s) + \ \varepsilon_{ict}$$

where the dependent variable is the difference between the natural logarithm of closing prices (P) for property i that sold in time s and re-sold in time t (where $s < t$), $TREADist_i$ is the binary indicator of properties located within the 3-mile radius of TP&TBA, and the remaining

elements are defined as in previous equations. The coefficient estimate φ identifies the average appreciation in prices of homes in the control group (3+ miles from the stadium) that were first sold before the stadium opening and re-sold after the inauguration, while the coefficient estimate β reveals how the equivalent price appreciation differs for homes that belong to the treatment group, i.e., homes located up to three miles from TP&TBA. The set $(\boldsymbol{I}_t - \boldsymbol{I}_s)$ includes dummy indicators for each pair of sale-re-sale year permutations present in the estimation sample and is included to control for time effects. Properties sold and re-sold within the same year are considered atypical and excluded from the analysis sample.

CHAPTER 4

RESULTS

This chapter presents the results from descriptive and inferential statistical analysis of data as outlined in the methodology chapter. I first show the descriptive statistics for the entire analysis sample, as well as separately for each market subsegment (detached versus attached homes). Next, I describe the results of estimations of the parameters of the baseline hedonic regression model and the difference-in-difference hedonic regression. The last two subsections of the chapter cover the outcome of the heterogeneity analysis and the robustness tests.

Descriptive Statistics

Descriptive statistics for the observations of home sale transactions used in the analysis are presented in Table 3. The numbers are arranged into columns that present the data on sales of residential properties located within each distance band of Truist Park. Columns 1, 2 and 3 describe the observation within rings that make up the treatment group, and column 4 describes observations in the control group. Column 1 describes houses located in the ring up to 1 mile from the stadium ($Dist1_i = 1$), column 2 describes the group of houses in the second ring, more than 1 mile up to 2 miles from the stadium ($Dist2_i = 1$), column 3 includes the group of houses located in the third ring, more than 2 miles up to 3 miles from the stadium ($Dist3_i = 1$), and column 4 includes the houses located more than 3 miles away.

Table 3

Summary Statistics for Residential Sales Transactions for Each Distance Band of Truist Park and The Battery Atlanta

	<=1 Mile (n = 732)		>1 -2 Miles (n = 4,951)		>2 -3 Miles (n = 5,261)		>3 Miles (n =58,850)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sales Price*	225.073	130.042	297.343	252.310	383.142	260.022	313.090	215.574
Bedrooms	2.508	.844	2.618	1.002	3.425	1.07	3.632	.987
Full_bath	2.098	.712	2.182	.850	2.644	1.021	2.486	.938
Half_bath	.637	.859	.523	.552	.639	.530	.597	.556
SFLA	1478.684	463.419	1758.205	890.257	2296.334	1023.081	2210.709	954.306
Age	23.38	14.273	25.313	16.461	25.652	19.253	28.108	18.382
Renovated	.111	.314	.136	.342	.148	.355	.153	.360
Fireplace	.709	.455	.73	.444	.796	.403	.824	.381
SingleFamilyRes	.052	.222	.189	.392	.587	.492	.806	.396
Townhouse	.542	.499	.285	.451	.236	.425	.132	.338
Condominium	.406	.491	.526	.499	.176	.381	.062	.242
TownCondo	.948	.222	.811	.392	.413	.492	.194	.396
Dist to Atlanta	10.981	.413	10.941	1.072	11.322	1.538	14.698	3.516
Comm Clubhse	.329	.470	.350	.477	.205	.404	.187	.390
Comm Pool	.597	.491	.597	.491	.425	.494	.365	.481
Comm Playgrnd	.037	.189	.078	.268	.162	.368	.178	.383
Comm Tennis	.270	.445	.286	.452	.198	.399	.258	.438
Comm Gated	.421	.494	.241	.428	.136	.343	.056	.231
Median_income	44.133	30.984	52.270	39.720	68.235	60.007	59.162	52.861
Black	.326	.117	.323	.149	.217	.153	.256	.195
Asian	.143	.146	.104	.092	.069	.081	.058	.060
Other_race	.039	.108	.036	.062	.032	.058	.03	.052

	<=1 Mile (n = 732)		>1 -2 Miles (n = 4,951)		>2 -3 Miles (n = 5,261)		>3 Miles (n =58,850)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Hispanic	.245	.162	.073	.066	.066	.064	.122	.126
Owner_occupied	.236	.091	.392	.224	.674	.228	.724	.218
Vacant	.101	.045	.108	.062	.076	.070	.064	.057
PreAnn	.221	.415	.223	.416	.24	.427	.273	.446
Const	.301	.459	.335	.472	.308	.462	.315	.465
Post	.478	.500	.443	.497	.452	.498	.412	.492

Note. *: Sales Price in 2020 Inflation-Adjusted U.S. dollars using the “National Shelter CPI”. The "National Shelter CPI" refers to the Consumer Price Index (CPI) component that measures changes in the cost of housing and related shelter expenses at the national level. CPI is a widely used economic indicator that tracks the average price changes of a basket of goods and services over time, reflecting the inflation or deflation in an economy. Source: https://fred.stlouisfed.org/series/CUSR0000SAH1

The dataset used for the analysis contains 732 residential sales transactions within 1 mile of TP&TBA sold between 2010 and 2020, an additional 4,951 between 1 and 2 miles, 5,261 in the third ring up to 3 miles distant, and 58,850 in the control group. The study sample contains a total of 69,794 observations of residential property sales in Cobb County within the 10-mile radius of Truist Park, from 2010 to 2020. On average, the sold residential units closer to the stadium (within 1 mile) tend to be smaller than those farther away. They are also more likely to be attached units (condominiums and townhouses), located in gated communities with community pools, and less likely to be in neighborhoods with tennis facilities and playgrounds. There are considerable differences in the population's racial composition, socio-economics, and housing tenure across the different distance rings. Residential areas closer to the stadium house a more diverse population with a higher proportion of Blacks, Hispanics, and Asians, predominantly in renter-occupied units. The median income is the lowest among households near the stadium. On average, sales prices over the study period are the lowest in the band of properties closest to TP&TBA.

Descriptive Statistics by Subsegment: Detached Versus Attached Homes

Table 4 provides descriptive statistics of the observations segmented by property type: attached and detached single-family homes. Further, a detailed breakdown of descriptive statistics for each subsegment by distance rings can be found in Tables 3A and 3B. About 26% of the sales were detached homes.

Table 4

Summary Statistics for Residential Sales Transactions by Subsegment

	Detached Homes (n =51,484)		Attached Homes (n=18,310)	
Variables	Mean	SD	Mean	SD
Sales Price*	346.733	236.578	230.842	145.401
Bedrooms	3.853	.921	2.634	.761
Full_bath	2.571	1.007	2.196	.651
Half_bath	.553	.555	.715	.549
Square footage	2355.389	1012.98	1673.527	542.726
Age	30.592	18.849	19.474	13.701
Renovated	.171	.376	.095	.293
Fireplace	.819	.385	.800	.400
Dist to Atlanta	14.771	3.328	12.357	3.426
Comm Clubhse	.165	.371	.305	.460
Comm Pool	.315	.465	.593	.491
Comm Playgrnd	.194	.395	.097	.296
Comm Tennis	.263	.44	.234	.423
Comm Gated	.026	.161	.228	.420
Median_income	60.403	55.789	55.816	41.941
Black	.235	.190	.326	.173
Asian	.059	.060	.074	.084
Other_race	.031	.053	.029	.057
Hispanic	.115	.122	.116	.120
Owner_occupied	.749	.213	.530	.234
Vacant	.064	.058	.082	.060
PreAnn	.286	.452	.213	.409
Const	.315	.465	.317	.465
Post	.399	.490	.471	.499
Dist1	.001	.027	.038	.191
Dist2	.018	.134	.219	.414
Dist3	.060	.238	.119	.323

Note. *: Sales prices are inflation adjusted to 2020 U.S. dollars using the “National Shelter CPI”.

Single-family detached homes, on average, are 50% more expensive than attached homes ($346,773 versus $230.842). This price differential can be attributed to the 41% larger living area in the detached homes (2,355 sqft) relative to attached ones (1,674 sqft), along with more

bedrooms (3.853 vs. 2.634) and bathrooms (2.571 vs. 2.196). Attached homes are newer with an average age of about 20 years compared to 31 years for detached houses. However, a higher proportion of detached homes (17%) have undergone renovations compared to attached homes (10%). In terms of neighborhood amenities, attached homes are more commonly found in gated communities equipped with clubhouses and communal pools. In contrast, detached homes tend to be situated within non-gated communities, frequently accompanied by amenities like playgrounds. These observations suggest a certain pattern in consumer preferences: buyers of attached homes may prioritize community-shared amenities over individual living space, whereas those opting for detached homes seem to value spacious interiors and family-centric amenities such as playgrounds or tennis courts.

Detached Versus Attached Homes Within the Treatment and Control Areas

The columns in Tables 5 and 6 present the data on single-family detached and attached residential property sales, respectively, for homes located within each distance band of Truist Park. Columns 1, 2, and 3 describe the rings within the treatment group and column 4 describes the control group. Column 1 describes houses located in the ring up to 1 mile from the stadium ($Dist1_i = 1$), column 2 describes the group of houses in the second ring, more than 1 mile up to 2 miles from the stadium ($Dist2_i = 1$), column 3 includes the group of houses located in the third ring, more than 2 miles up to 3 miles from the stadium ($Dist3_i = 1$) , and column 4 includes houses located more than 3 miles away. Table 5 summarizes the single-family detached homes subsegment and Table 6 presents the summary statistics for single-family attached homes.

Table 5

Summary Statistics for Residential Sales Transactions for Each Distance Band of Truist Park – Single Family Detached Homes

	<=1 Mile (n = 38)		>1 -2 Miles (n = 937)		>2 -3 Miles (n = 3,090)		>3 Miles (n =47,419)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sales Price(Adj)*	258.521	149.598	468.937	347.927	489.319	270.029	335.098	227.703
Bedrooms	3.395	.495	3.88	.899	3.991	.922	3.844	.921
Full_bath	2.158	.638	2.731	1.186	3.005	1.059	2.539	.993
Half_bath	.421	.552	.607	.593	.588	.559	.550	.554
SFLA	1388.600	460.243	2501.385	1332.610	2745.801	1064.257	2328.031	996.718
Age	35.342	21.782	32.605	22.027	27.818	21.08	30.729	18.607
Renovated	.184	.393	.167	.373	.166	.372	.171	.377
Fireplace	.211	.413	.662	.473	.831	.374	.822	.383
Dist to Atlanta	11.197	.169	10.711	.850	11.13	1.508	15.091	3.249
Comm Clubhse	0	0	.122	.327	.148	.355	.167	.373
Comm Pool	.158	.370	.208	.406	.294	.455	.319	.466
Comm Playgrnd	0	0	.153	.360	.177	.381	.196	.397
Comm Tennis	0	0	.138	.345	.187	.390	.271	.444
Comm Gated	.158	.370	.162	.369	.046	.210	.022	.148
Median_income	31.787	24.191	53.091	45.251	75.027	67.490	59.618	55.004
Black	.371	.096	.287	.154	.177	.144	.237	.193
Asian	.086	.038	.140	.123	.073	.078	.056	.055
Other_race	.025	.033	.043	.075	.036	.064	.030	.051
Hispanic	.300	.141	.066	.068	.064	.061	.120	.125
Owner_occupied	.263	.063	.443	.233	.729	.213	.757	.207
Vacant	.080	.035	.098	.070	.079	.075	.062	.057
PreAnn	.316	.471	.251	.434	.261	.439	.288	.453

	<=1 Mile (n = 38)		>1 -2 Miles (n = 937)		>2 -3 Miles (n = 3,090)		>3 Miles (n =47,419)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Const	.263	.446	.306	.461	.313	.464	.316	.465
Post	.421	.500	.443	.497	.426	.495	.397	.489

*Sales prices are inflation adjusted to 2020 U.S. dollars using the “National Shelter CPI”.

Consistent with the suburban character of Cobb County, single-family detached homes dominate in the sample. Proximity-based distributions of sales of such residences around TP&TBA during the study period are as follows: 38 houses within a 1-mile radius, 937 homes in the second ring (between 1 to 2 miles), 3,090 in the third distance ring (between 2 to 3 miles), and 47,419 houses in the control group (more than 3 miles and up to 10 miles away from TP&TBA).

The average sales prices for the detached homes, adjusted to 2020 dollars, were $259,000 in ring 1; $469,00 in ring 2; $489,000 in ring 3; and $335,000 in the control group. In the distance ring closest to TP&TBA, houses that sold between 2010 and 2020 were the oldest, most compact, generally lacking community amenities, and located in racially diverse areas. A typical house sold in this band was 35 years old, with a living area of 1,377 square feet, lacking a community clubhouse, a tennis court, or a playground. The racial composition of a typical neighborhood where such a house was located was 37% Black, 9% Asian, and a notable Hispanic concentration of 30%, higher than in any other ring. Only 16% of these properties were located in a community with a pool. In contrast, detached houses that sold in ring 3 were newer and larger, with good access to communal amenities, and situated in relatively less demographically diversified areas. Specifically, these houses were, on average, 28 years old with 2,746 square feet of living area. About 30% of homes that sold in band 3 were located in communities with amenities – 15% with clubhouses, 29% with pools, 18% with playgrounds, and 19% with tennis courts. Demographically, the neighborhoods where these houses are located comprised 18% Blacks, 7% Asians, and 6% Hispanic populations.

Table 6

Summary Statistics for Residential Sales Transactions for Each Distance Band of Truist Park – Single Family Attached Homes

	<=1 Mile (n =694)		>1 -2 Miles (n =4,014)		>2 -3 Miles (n =2,171)		>3 Miles (n =11,431)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sales Price (Adj)*	223.242	128.758	257.287	204.476	232.019	145.570	221.793	117.585
Bedrooms	2.46	.833	2.323	.768	2.62	.680	2.756	.735
Full_bath	2.095	.716	2.054	.690	2.132	.694	2.264	.612
Half_bath	.648	.871	.503	.540	.713	.476	.793	.519
SFLA	1483.3	463.444	1585.151	636.696	1662.824	489.518	1718.55	513.475
Age	22.725	13.464	23.611	14.344	22.568	15.804	17.236	12.513
Renovated	.107	.309	.128	.335	.123	.329	.077	.267
Fireplace	.736	.441	.746	.436	.745	.436	.833	.373
Dist to Atlanta	10.969	.419	10.994	1.111	11.597	1.539	13.064	4.066
Comm Clubhse	.347	.476	.404	.491	.288	.453	.271	.445
Comm Pool	.621	.485	.687	.464	.612	.487	.555	.497
Comm Playgrnd	.039	.194	.060	.238	.14	.347	.106	.307
Comm Tennis	.285	.452	.321	.467	.214	.410	.204	.403
Comm Gated	.435	.496	.259	.438	.264	.441	.198	.398
Median_income	44.809	31.187	52.078	38.317	58.568	45.664	57.274	42.796
Black	.323	.118	.331	.146	.275	.146	.334	.187
Asian	.147	.150	.095	.081	.065	.084	.064	.076
Other_race	.040	.111	.034	.058	.026	.047	.028	.054
Hispanic	.242	.163	.075	.065	.068	.067	.132	.13
Owner_occupied	.235	.093	.379	.221	.596	.226	.588	.208
Vacant	.102	.046	.110	.060	.073	.061	.072	.058
PreAnn	.216	.412	.216	.412	.211	.408	.212	.409

	<=1 Mile (n =694)		>1 -2 Miles (n =4,014)		>2 -3 Miles (n =2,171)		>3 Miles (n =11,431)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Const	.303	.460	.341	.474	.300	.459	.312	.463
Post	.481	.500	.443	.497	.489	.500	.476	.499

*Sales prices are inflation adjusted to 2020 U.S. dollars using the “National Shelter CPI”.

Single-family attached homes - townhouses and condominiums - represent 26% of the study sample. There were 694 attached homes sold within one mile of TP&TBA, 4,014 homes sold in the second ring, 2,171 sold in the third distance ring, and 11,431 houses sold in the control group (more than 3 miles and up to 10 miles away from TP&TBA).

Similarly to the case of the detached houses in ring 1, attached homes closest to TP&TBA have the smallest living area (1,483 square feet) compared to homes further away from the stadium. However, attached homes sold between 2010 and 2020 are newer relative to detached homes in all treatment and control groups, with an average age ranging from 17 to 24 years. Moreover, communities housing attached residences consistently offer more amenities compared to communities where detached homes are located. Additionally, neighborhoods with attached residences tend to be more diverse demographically and have a higher renter occupancy, compared to areas predominantly featuring detached homes.

Hedonic Regression Models

The baseline hedonic regression model, introduced in Equation (1) above, explains a property's sales price as a function of distance to the stadium, its structural characteristics (such as number of bedrooms and bathrooms, square footage, and age), community amenities, and neighborhood characteristics. Table 7 presents the results of the estimation of parameters of the baseline hedonic regression model. The dependent variable is the natural logarithm of the house's inflation-adjusted sales price, and the independent variable of interest is the set of binary indicators of distance to TP&TBA. The coefficient estimates on variables Dist1, Dist2, and Dist3, show how the sales prices of properties within TP&TBA's three designated distance rings differed relative to those of comparable properties sold outside the set distance rings. The model

parameters were estimated using the ordinary least squares method and with a sample of all residential sales transactions recorded in the FMLS data between January 1, 2010, and December 31, 2020, for homes situated within 10 miles of TP&TBA. The regression also controlled for year and census tract fixed effects.

Baseline Model

Table 7

House Sales Price Hedonic Baseline Model Results

	Coefficient		t
Dist1	-0.201	***	-10.012
Dist2	0.006		0.645
Dist3	-0.011		-1.604
Bedrooms	0.055	***	28.218
Full Baths	0.102	***	48.386
Half Baths	0.069	***	29.533
Has fireplace	0.066	***	20.466
Square footage	0.000	***	100.390
Age	-0.007	***	-78.251
Renovated	0.125	***	40.319
Attached (Town&Condo)	-0.335	***	-80.647
Comm Clubhse	0.041	***	11.909
Comm Pool	0.042	***	11.197
Comm Playgrnd	0.051	***	14.386
Comm Tennis	-0.050	***	-12.564
Comm Gated	0.111	***	23.210
Median income	0.000	***	-51.868
Black	-0.342	***	-25.868
Asian	-0.608	***	-22.577
Other race	0.545	***	16.306
Hispanic	-0.257	***	-16.245
Renter Occupied	-0.241	***	-20.602
Vacant	-0.109		-0.4578
Dist to Atlanta	-0.050		-21.463
Time-year FE	YES		
Census Tract FE	YES		
Observations	68,818		

	Coefficient	t
R^2	0.835	

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

The coefficient estimate on the Dist1 variable reveals that residential properties within 1 mile of TP&TBA sold at a price approximately 20% lower (p<.01) than those situated beyond 3 miles from the stadium during the period 2010-2020. This result aligns with the pronounced differences in average property valuations observed in the descriptive statistics between properties in the first distance ring and those in more distant regions. The sale prices of homes located within 1 to 2 miles from TP&TBA (coefficient on Dist2) did not differ from those of control properties (b=.006, t=.645). Finally, the coefficient on Dist3, representing properties located 2 to 3 miles from TP&TBA, reveals that these homes were about 1% cheaper than homes located further away. However, the standard error of this estimate was just too large to render the estimate statistically significant (b=-.011, t=-1.604).

In line with results observed in other studies, variables such as the number of bedrooms, full baths, half baths, and the presence of a fireplace were found to positively influence prices. Also, renovated houses sold for 12.5% more than non-renovated ones. The presence of community amenities also commanded premium sales prices. Conversely, higher percentage of renter-occupied residences in the area or greater proportion of ethnic minority populations were generally associated with reduced sales prices. Importantly, attached residential units (condominiums and townhouses) transacted at prices approximately 34% lower than single-family detached homes.

Baseline Model by Property Type

The existing literature on the impact of sports venues on residential prices overwhelmingly ignores the possibility that the effects are heterogeneous by submarket segments. Table 8 summarizes the results of the baseline hedonic model estimations conducted separately for samples representing two distinct segments of the real estate market, detached and attached units. The first three columns present the estimation results for the sample of single-family detached properties, and the following three columns show the estimation results of the model for the subsegment of attached properties (townhouses and condominiums).

Table 8

House Sales Price Hedonic Baseline Model Results by Submarket Single Family Detached and Attached

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Dist1	-0.211	***	-3.988	-0.082	***	-3.782
Dist2	-0.063	***	-3.753	0.058	***	4.499
Dist3	0.033	***	3.749	0.008		0.668
Bedrooms	0.040	***	18.964	0.024	***	5.994
Full Baths	0.110	***	49.156	0.073	***	16.072
Half Baths	0.060	***	23.123	0.034	***	7.688
Has fireplace	0.097	***	25.843	0.031	***	6.005
Square footage	0.000	***	91.444	0.000	***	71.493
Age	-0.005	***	-56.477	-0.016	***	-71.264
Renovated	0.136	***	41.84	0.099	***	15.559
Comm Clubhse	0.021	***	4.975	0.044	***	9.207
Comm Pool	0.009	*	1.762	0.059	***	11.897
CommPlaygrnd	0.041	***	10.519	0.047	***	6.589
Comm Tennis	0.045	***	8.686	-0.066	***	-11.409
Comm Gated	0.112	***	13.577	-0.004	***	-0.703
Median income	0.000	***	-49.103	0.000	***	-20.818
Black	-0.286	***	-18.839	-0.369	***	-16.114

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Asian	-0.427	***	-12.828	-0.309	***	-7.249
Other race	0.721	***	18.319	0.175	***	3.295
Hispanic	-0.351	***	-19.098	-0.025		-0.916
Renter Occ	-0.248	***	-17.721	-0.094	***	-5.064
Vacant	-0.084	***	-3.272	-0.126	***	-2.943
Dist to Atlanta	-0.043	***	-16.799	-0.052	***	-9.727
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	50,840			17,978		
R^2	0.843			0.865		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Single-family detached homes within 1 mile of TP&TBA sold for 21% less (p<.01), and detached homes sold for 8% less (p<.01), on average, than comparable homes in the control group. Detached homes located more than 1 mile and up to 2 miles from TP&TBA sold for 6% less (p<.01) while attached homes sold for 6% more (p<.01) than homes in the reference group. Among properties located in the outer ring, i.e., within 2 to 3 miles away from TP&TBA, detached homes transacted for 3% more (p<.01) than homes in the control group, while the equivalent price differential for detached homes was negligible and statistically non-significant. Overall, the estimates revealed more pronounced differences in sales prices by distance from the stadium in the subsegment of detached homes as compared to the attached units. The coefficients on control variables are generally similar in both models, in terms of direction, magnitude, and statistical significance. For example, the number of bedrooms, full baths, half baths, and the presence of a fireplace positively influence prices while the location of homes in higher renter-occupied areas and in areas with a higher proportion of ethnic minorities negatively affect prices of both detached and attached homes.

Difference-in-Differences Hedonic Model

The results of the least squares estimation of hedonic difference-in-difference (DID) model parameters are reported in Table 9. The sample used in this estimation included all residential sales transactions within 10 miles of Truist Park listed in the FMLS database between January 1, 2010, and December 31, 2020. As before, in addition to the TP&TBA distance indicators and a rich set of property and neighborhood characteristics control variables, the regression included year and census tract fixed effects to net out the influence of temporal trends in home prices as well as unobserved neighborhood-specific heterogeneity. The main difference between this model and the baseline model (Table 7) is that the DID model includes $Post_{it}$, a binary variable equal to 1 for sales transactions occurring after the inauguration of Truist Park. The model also includes interaction terms of the variable *Post* with the distance rings *Dist1*, *Dist2*, and *Dist3*. Coefficient estimates on these interaction terms are of primary interest as they identify the differential impacts of the stadium opening on home prices by distance to the venue. Table 9 reports the estimation results of two specifications of the DID model, with and without a control variable for the property type variable.

Table 9

House Sales Price Hedonic Difference-In-Differences Model Results (Without Property Type Versus Controlling for Property Type)

Variable	Coefficient		t	Coefficient		t
Dist1	-0.320	***	-13.622	-0.230	***	-10.22
Dist2	-0.042	***	-3.859	-0.011		-1.10
Dist3	-0.009		-1.069	-0.009		-1.13
Post	0.052	***	6.093	0.055	***	6.78
Dist1*Post	0.072	***	3.268	0.061	***	2.85

Variable	Coefficient		t	Coefficient		t
Dist2*Post	0.044	***	4.986	0.039	***	4.55
Dist3*Post	-0.003		-0.373	-0.006		-0.73
Bedrooms	0.117	***	62.385	0.055	***	28.25
Full Baths	0.062	***	28.807	0.102	***	48.39
Half Baths	0.029	***	12.253	0.069	***	29.61
Has fireplace	0.064	***	19.107	0.066	***	20.45
Square footage	0.000	***	121.759	0.000	***	100.41
Age	-0.005	***	-54.955	-0.007	***	-78.34
Renovated	0.129	***	39.807	0.125	***	40.38
Attached	-	-	-	-0.334	***	-80.67
Comm Clubhse	0.024	***	11.95	0.041	***	11.95
Comm Pool	-0.005		11.18	0.041	***	11.18
Comm Playgrnd	0.081	***	14.42	0.051	***	14.42
Comm Tennis	-0.033	***	-12.65	-0.050	***	-12.65
Comm Gated	0.081	***	23.16	0.111	***	23.16
Median income	0.000	***	-51.01	0.000	***	-51.01
Black	-0.376	***	-25.92	-0.342	***	-25.92
Asian	-0.655	***	-22.97	-0.621	***	-22.97
Other race	0.552	***	16.81	0.565	***	16.81
Hispanic	-0.313	***	-16.23	-0.257	***	-16.23
Renter Occupied	-0.230	***	-20.22	-0.237	***	-20.22
Vacant	-0.123	***	-4.74	-0.113	***	-4.74
Dist to Atlanta	-0.034	***	-21.41	-0.050	***	-21.41
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	68,818			68,818		
R^2	0.820			0.835		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

The coefficient on *Dist1* suggests that, during the 2010-2016 period, before the inauguration of TP&TBA, homes situated within 1 mile of the stadium traded at an average markdown of 32% (p<.01) relative to homes positioned 3-10 miles away. Additionally, compared to the same reference group, properties within the second distance band (1-2 miles from Truist

Park) commanded approximately a 4% ($p<.01$) discount during the same timeframe, as suggested by the coefficient on *Dist2*. In contrast, homes in the third band (2-3 miles from the stadium) did not demonstrate any significant price deviation, as evidenced by the coefficient on *Dist3*.

The coefficient on *Post* reveals that, after the TP&TBA inauguration in the years between 2017 and 2020, there was a 5.2% ($p<.01$) average surge in prices for homes in the control group when compared with the prices from the years between 2010-2016. More importantly, the coefficients on interaction terms between *Post* and the initial two distance ring indicators (*Dist1* and *Dist2*) are positive and statistically significant. This implies that the inauguration of the stadium bolstered price appreciation for properties within these proximities more markedly than for those in the control group. For instance, after the stadium's inauguration, homes within a 1-mile radius of the venue were priced 12.4% higher (0.052+0.072) compared to pre-inauguration pricing of homes in the same distance area, which represents 7.2 percentage points ($p<.01$) faster price appreciation of the properties closest to the stadium relative to control properties (coefficient on *Dist1*Post*). Furthermore, homes within the second distance band (1-2 miles from the stadium) sold for 9.6% higher price (0.052+0.044) than the pre-opening average of similar homes in the same distance band, which represents 4.4 percentage points ($p<.01$) faster home value inflation attributable to stadium's inauguration relative to the control group properties (coefficient on *Dist2*Post*). However, the analysis did not identify any significant stadium-induced price appreciation disparity between homes in the third distance band (2-3 miles from Truist Park) and those in the control group.

Expectedly, the coefficient estimate for the property type indicator, *Attached*, demonstrated that condominiums or townhouses, when compared to standalone single-family residential properties, sold for an approximately 33% ($p<.01$) lower average price during the

analysis period. Interestingly, the addition of this control variable did not change the overall pattern of results. However, it did temper the estimated magnitudes of the impact of the stadium's inauguration. Based on the estimates presented on the right-hand side of Table 9, when keeping the property type constant, homes located within a 1-mile radius of the stadium experienced a post-inauguration price surge of 11.6% (0.055+0.061). This signifies a price acceleration faster by 6.1 percentage points ($p<.01$) compared to control properties. Analogously, homes within the second distance band experienced a price appreciation of 9.4% (0.055+0.039) relative to the pre-inauguration period. This corresponds to a 3.9 percentage point ($p<.01$) higher inflation rate compared to properties in the control group. The attenuation of the estimated stadium's impacts on prices of homes in its proximity upon incorporating a control for property type indicates that the effects attributed to the stadium's inauguration may be intertwined with shifts in residential real estate market composition. In other words, one of the mechanisms of how the stadium affects prices in the residential real estate market is via the induced changes in the market structure.

Overall, the results presented above point to a statistically significant and quantitatively sizable positive effect of stadium opening on the values of houses up to 2 miles from the stadium. Notably, prices of houses within a mile of TP&TBA were significantly depressed before the stadium's opening compared to prices in the control group. However, the houses closest to the venue registered the most substantial uptick in sales prices after the stadium's opening. Drawing a parallel, Tu's (2005) study on the FedEx stadium in Maryland revealed that properties closer to the stadium fetched lower prices before its construction, indicating lower desirability for the locale. This suggests that buyers were less inclined to pay a premium for immediate access to the pre-existing amenities in both the area surrounding FedEx Filed and the predominantly

commercial vicinity earmarked for Truist Park's future establishment. In both Tu's (2005) and my study, a consistent pattern emerges: post the respective stadium openings, consumers demonstrated preferences for residences within a mile of these venues, translating to pronounced positive price differentials. The positive effect on house sales prices, however, attenuates with the distance to the stadiums. In line with these findings, Keeler et al., (2021) found that house prices post-opening of the Staples Center in Los Angeles increased by 5-6% for the houses closest to the sports facility. The authors also found a significant anticipation effect as housing units within a mile of the arena sold for 15% more after the announcement of future development.

When comparing Truist Park's effect on consumers' willingness to pay for the surrounding housing to the results of studies on the effects of sports facilities built in other countries, outcomes vary. In a recent study, Hyun (2022) found that apartments closest to the new stadium, Gwangju-Kia Championship Field, in South Korea, sold at a 7% discount after the stadium's opening. In contrast, results from Ahlfeldt and Kavetsos (2014) suggest that consumers in London were willing to pay up to 15% more for housing units close to the New Wembley soccer stadium. The authors argue that the "iconic" design of the structure (a 436-foot tall arch over the structure), which replaced the old stadium in the same location, generated positive externalities extending to housing units up to 5km from the stadium.

Heterogeneity Analysis

The results presented thus far revealed the positive influence of TP&TBA on residential property values within its vicinity. However, this effect appeared attenuated when controlling for property type in the estimations, implying a shift in the real estate market composition following

the stadium's inauguration. The heterogeneity analysis aims to determine whether the impact of TP&TBA on residential property valuations varied across distinct real estate submarkets. By exploring the heterogeneity of estimated effects by submarkets, I hope to provide a comprehensive understanding of the nuanced dynamics characterizing different segments of the broader real estate market and their respective reactions to the establishment of a new sports and entertainment venue.

DID Model by Property Type

Table 10 shows the results of the estimation of DID models separately for each real estate submarket. The first three columns on the left present the coefficients, p-values, and t-statistics for the detached family homes subsegment. The following columns on the right show the equivalent results for the attached homes submarket.

Table 10

House Sales Price Hedonic Difference-In-Differences Model Results by Submarket Single Family Detached and Attached

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Dist1	-0.302	***	-4.496	-0.094	***	-3.996
Dist2	-0.048	***	-2.625	0.046	***	3.385
Dist3	0.060	***	6.136	-0.015		-1.133
Post	0.057	***	6.235	0.060	***	4.582
Dist1*Post	0.201	**	2.229	0.031		1.596
Dist2*Post	-0.031	*	-1.731	0.033	***	3.676
Dist3*Post	-0.065	***	-6.402	0.053	***	4.644
Bedrooms	0.040	***	19.017	0.024	***	6.001
Full Baths	0.110	***	49.145	0.073	***	16.076
Half Baths	0.061	***	23.180	0.033	***	7.462
Has fireplace	0.097	***	25.807	0.031	***	5.956
Square footage	0.000	***	91.472	0.000	***	71.590

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Age	-0.006	***	-56.618	-0.016	***	-71.286
Renovated	0.136	***	41.876	0.099	***	15.597
Comm Clubhse	0.021	***	4.980	0.043	***	9.118
Comm Pool	0.009	*	1.764	0.059	***	11.915
CommPlaygrnd	0.040	***	10.487	0.048	***	6.706
Comm Tennis	0.045	***	8.680	-0.067	***	-11.514
Comm Gated	0.113	***	13.731	-0.004		-0.780
Median income	0.000	***	-48.462	0.000	***	-20.745
Black	-0.285	***	-18.809	-0.367	***	-16.022
Asian	-0.424	***	-12.728	-0.318	***	-7.437
Other race	0.711	***	18.010	0.196	***	3.672
Hispanic	-0.358	***	-19.476	-0.014		-0.513
Renter Occ	-0.245	***	-17.510	-0.094	***	-5.034
Vacant	-0.090	***	-3.495	-0.142	***	-3.298
Dist to Atlanta	-0.043	***	-16.815	-0.052	***	-9.585
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	50,840			17,978		
R^2	0.844			0.865		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Before the opening of TP&TBA, detached houses prices in the treatment areas were lower than the prices of houses in the control group, with the exception of houses in distance ring 3. Conversely, while attached homes in distance ring 1, situated closest to TP&TBA, were also priced lower than their counterparts in the control group, attached homes in distance band 2 commanded a price premium when compared to the reference group. To elaborate, before the stadium inauguration, detached houses closest to the stadium transacted for 30% less, on average, compared to detached homes in the control group. Within the same distance, attached properties traded at a 9% discount relative to detached homes in the control group. However, in distance band 2, while attached homes fetched prices 5% higher, detached homes sold for 5% less than those in the control group. Meanwhile, in distance ring 3, detached house prices before

the stadium's opening were 6% higher than those in the reference group. However, attached homes in this ring were priced about 2% lower, a difference that was not statistically significant.

After the opening of TP&TBA, both attached and detached homes in the control group experienced a 6% price appreciation. However, the post-inauguration price effects varied in both magnitude and direction across different subsegments within the treatment distance rings. Specifically, detached homes located within a mile of the stadium saw a substantial and statistically significant price increment in the magnitude of about 26%, which implies about 20 percentage points ($p<.05$) higher price inflation relative to the price increase of similar homes in the control group. In the same distance band, attached homes increased in value by about 9%, but this increase was only about 3 percentage points greater (a statistically non-significant differential) than the price increase for properties in the houses in the reference group. Interestingly, beyond the one-mile boundary of TP&TBA, difference-in-difference estimates, represented by coefficients on interaction terms, reveal contrasting price dynamics. Detached house prices after the stadium's inauguration increased at a notably slower pace than those in the control group. Conversely, attached homes within the 1-2 mile and 2-3 mile radii saw price inflations that were 3 ($p<.01$) and 5 ($p<.01$) percentage points more rapid, respectively, than the price inflation of similar homes in the control area.

To study the overall combined impact of the stadium's inauguration across market sub-segments, I estimated models that consolidated the three distance bands into a single ring encompassing all houses sold within 3 miles of TP&TBA, segregated by property type. Findings are presented in Table 11, and a corresponding table summarizing results for all properties is provided in the Appendix. Before the stadium's inauguration, detached houses within the consolidated treatment zone were priced 5.3% higher ($p<.01$) than their counterparts in the

control group. After the opening, while detached homes in the control group appreciated by 5.8% ($p<.01$), the increase in value of houses within 3 miles of the stadium was lower by 5.6 percentage points ($p<.05$), translating to a meager inflation of 0.2%. In contrast, attached homes demonstrated a different trend. Before the stadium's opening, their prices in the treatment area were on par with those in the control group. Post-inauguration, attached homes in the control group experienced a 6.2% value uptick ($p<.01$). However, attached homes near the stadium saw an even greater surge, increasing by a total of 9.9% — a net gain of 3.7 percentage points ($p<.01$) over the control group.

Table 11

House Sales Price Hedonic Difference-In-Differences Model with One Treatment Group Results by Submarket Single Family Detached and Attached

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Dist1to3miles	0.053	***	5.540	0.013		1.059
Post	0.058	***	6.310	0.062	***	4.750
Dist1to3miles*Post	-0.056	**	-6.186	0.037	***	4.854
Bedrooms	0.040	***	18.895	0.022	***	5.601
Full Baths	0.110	***	49.139	0.073	***	16.142
Half Baths	0.061	***	23.200	0.032	***	7.414
Has fireplace	0.097	***	25.922	0.029	***	5.710
Square footage	0.000	***	91.438	0.000	***	71.890
Age	-0.006	***	-56.912	-0.016	***	-71.581
Renovated	0.136	***	41.889	0.098	***	15.516
Comm Clubhse	0.021	***	4.955	0.045	***	9.544
Comm Pool	0.008	*	1.676	0.061	***	12.290
CommPlaygrnd	0.041	***	10.510	0.043	***	6.050
Comm Tennis	0.045	***	8.703	-0.065	***	-11.125
Comm Gated	0.111	***	13.444	-0.007		-1.250
Median income	0.000	***	-48.603	0.000	***	-20.454
Black	-0.291	***	-19.215	-0.362	***	-15.778
Asian	-0.418	***	-12.537	-0.356	***	-8.499

	Detached Homes			Attached Homes		
	Coeff.		t	Coeff.		t
Other race	0.716	***	18.170	0.186	***	3.483
Hispanic	-0.362	***	-19.704	-0.039		-1.441
Renter Occ	-0.246	***	-17.578	-0.083	***	-4.482
Vacant	-0.090	***	-3.514	-0.142	***	-3.303
Dist to Atlanta	-0.042	***	-16.724	-0.052	***	-9.605
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	50,840			17,978		
R^2	0.843			0.864		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Parallel Trends Tests

The difference-in-differences models are used to estimate the causal effect of an event, in this case, the construction of TP&TBA, by comparing the changes in outcomes, i.e., property sale prices, over time between two groups: the treatment group consisting of properties closer to the stadium, and a control group comprising properties further away but in the same general area. A critical assumption of DID models is that of the parallel trends. The parallel trends assumption states that, in the absence of the intervention, the trends in the outcome variable for both the treatment and control groups would have mirrored each other. In other words, it means that any differences in the outcome between the two groups, present before the intervention, would have remained consistent over time in the absence of the treatment, i.e., had the stadium never been built.

If the parallel trend assumption holds, it substantiates the claim that any differences in the outcome between the treatment and control groups after the intervention arise directly from the intervention itself. However, if this assumption is violated, the estimated treatment effect may be biased. Then, it becomes challenging to isolate the true causal impact of the intervention from the

impacts of other confounding factors that may be driving the observed differences. Several methods could be applied to validate the parallel trends assumption and implement potential remedial measures. A formal assessment of the parallel trends assumption requires statistical tests of the differences in house price trends before the opening of the stadium. If the assumption doesn't hold, alternative modeling approaches that net out the asymmetries in price trends are needed. Additionally, including control variables that capture time-varying confounding factors can help strengthen the validity of the DID estimates.

To test the parallel trends assumption, I included in the regression model the interaction terms between the treatment variables and year indicators. Using the three distance rings as the treatment groups, this method produced thirty interaction terms (each year's interaction with Dist1, Dist2, and Dist3). Ideally, to affirm the parallel trends assumption, coefficients on interaction terms for years before TP&TBA's opening (i.e., the year 2017) should not exhibit statistical significance. Tables detailing the coefficient estimates on these interaction terms are included in the Appendix. However, the findings are somewhat ambiguous. While no evident pattern of statistical significance emerges for interaction term coefficients before the stadium's inauguration, some estimates reveal fluctuations in the average price difference between control and treatment group properties relative to 2016 (the year preceding the opening), particularly for properties located within the 1-mile radius of the stadium. It is possible and likely that the multicollinearity from the multitude of interaction terms inflates standard error estimates, muddling the test's clarity. To simplify the procedure and further validate the results, I repeat the parallel trends test using the consolidated treatment group with ten interaction terms (again, the year 2016 is the omitted category).

Table 12 reports the parameter estimates from the model which includes interaction terms between the dummy indicator for properties within the consolidated treatment group and year dummies. Findings generally align with the hypothesis of consistent price trends for properties near and far from the stadium prior to TP&TBA's opening. Out of the six interaction term coefficients before the stadium's inauguration, only two years (2010 and 2012) hint at possible price trend disparities between treatment and control properties. These deviations in price trends are relatively small in magnitude. Moreover, they could be attributed to market disruptions following heightened foreclosure rates for single-family residences in the Atlanta metro during the apex of the 2007-2009 economic downturn. The coefficients on interaction terms for years after the stadium's inauguration align with anticipated patterns in both sign and statistical significance.

Table 12

Parallel Trends Test for One Treatment Group with All Interaction Terms (Main Coefficients)

	Coefficient		t
Distto3miles	-0.023	**	-1.970
d1t3_2010 (Pre-Opening)	0.059	***	3.420
d1t3_2011 (Pre-Opening)	-0.027		-1.630
d1t3_2012 (Pre-Opening)	-0.033	**	-2.170
d1t3_2013 (Pre-Opening)	0.007		0.510
d1t3_2014 (Pre-Opening)	-0.002		-0.130
d1t3_2015 (Pre-Opening)	0.009		0.680
d1t3_2017	0.030	**	2.310
d1t3_2018	0.026	**	2.030
d1t3_2019	0.034	***	2.590
d1t3_2020	0.001		0.060
y2010	-0.581	***	-67.270
y2011	-0.758	***	-91.240
y2012	-0.714	***	-87.430
y2013	-0.509	***	-62.640
y2014	-0.424	***	-52.310
y2015	-0.056	***	-10.280

	Coefficient		t
y2017	0.042	***	7.900
y2018	0.096	***	18.350
y2019	0.116	***	22.180
y2020	0.166	***	31.440
House Characteristic	YES		
Neighborhood Char.	YES		
Time-year FE	YES		
Census Tract FE	YES		
Observations	68,818		
R^2	0.819		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

To address potential biases arising from differences in long-term trends in house prices between the treatment and control groups, I incorporated controls for linear time trends in the DID model specifications. These controls aim to isolate the effect of TP&TBA from gradual shifts in real estate prices over time in both treatment and control areas, even if these trends are influenced by unobserved factors. In the regression models, I added a year variable, capturing the linear time trend in control group house prices, and its interaction terms with treatment group indicators. These interactions absorb the differential impact of the linear price time trend specific to the treatment groups. The outcomes are presented in Table 13. Estimations of model specifications with three treatment areas led to results that generally corroborate the positive impact of the stadium's inauguration on properties within the 1-3 mile radius of TP&TBA. However, a significant effect isn't observed for properties within a 1-mile radius. This could stem from the limited number of properties in the stadium’s immediate proximity, compounded by multicollinearity due to several time-related regressors compromising the estimate's reliability. As a remedial and supplementary test, I again merged the three distance rings, forming a single treatment group comprising houses within a 3-mile radius of TP&TBA. Estimations of models with separate linear trend controls for this combined treatment and reference groups confirmed

the finding of the positive impact of the TP&TBA on house values. Adjusted for long-term trends, the models suggest that the stadium's opening led to a 3.3 percentage point ($p<.01$) higher house price inflation for properties within 3 miles of the venue compared to properties situated further away.

Table 13

Parallel Trends Test for One Treatment Group and Three Distances Treatment Groups with Lineal Year Trend Term (Main Coefficients)

	One Combined Distance			Three Distance Groups		
	Coeff.		t	Coeff.		t
Dist1to3miles	6.995		1.79	-		
Dist1	-			-67.723	***	-4.930
Dist2	-			-7.526		-1.350
Dist3	-			30.125	***	5.600
Post	-0.045	***	-9.860	-0.045	***	-9.800
Dist1to3miles*Post	0.033	***	2.900	-		
dist1_post	-			-0.078		-1.930
dist2_post	-			0.039	*	2.450
dist3_post	-			0.048	**	3.020
year	0.076	***	79.190	0.076	***	78.980
Dist1to3miles*year	-0.003	*	-1.800	-		
dist1_year	-			0.033	***	4.910
dist2_year	-			0.004		1.340
dist3_year	-			-0.015	***	-5.600
Neighborhood Char.	YES			YES		
House Characteristic	YES			YES		
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	68,818			68,818		
R^2	0.804			0.805		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

To confirm the distinct impacts of TP&TBA on various subsegments of the real estate market, I utilized triple-difference models. These models incorporated three-way interactions among the treatment group indicator, post-stadium opening period indicator, and an indicator distinguishing attached properties, like townhouses or condos. In contrast to the estimation results based on isolated sub-samples reported above, the triple-difference models offer a direct assessment of the statistical significance of differential effects of the stadium by market subsegment. Results reported in Table 14 show that the inauguration of TP&TBA led to an approximate 13% decline ($p<.01$) in the prices of detached homes in the integrated treatment zone compared to control area house prices. Conversely, for attached properties within the 3-mile radius, the stadium's introduction led to around an 8% price increase (0.210-0.132). Notably, the change in prices of attached houses surpassed that of detached houses by a significant 21 percentage points ($p<.01$).

Table 14

Three-Way Interaction with Attached Homes (Towncondo) for One Treatment Group with Lineal Year Trend Term (Main Coefficients)

	One Combined Distance		
	Coeff.		t
dist1to3m	0.077	***	8.140
postopening	0.221	***	70.290
dist1to3m_post	-0.132	***	-12.870
towncondo	-0.301	***	-62.130
dist1to3m_towncondo	-0.167	***	-16.890
dist1to3m_post_towncondo	0.210	***	16.870
Neighborhood Char.	YES		
House Characteristic	YES		
Time-year FE	YES		

	One Combined Distance	
	Coeff.	t
Census Tract FE	YES	
Observations	68,818	
R^2	0.800	

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$. *=p<0.10; **=p<0.05; ***p<0.01

To rigorously assess the nuanced impacts of TP&TBA across varied segments and distances, I performed an analogous triple-difference estimation, maintaining the initial categorization of treatment group properties into three distinct distance rings. The results presented in Table 15 reveal curious dynamics. Detached homes in the control area experienced an average price increase of about 20% (p<.01) post-stadium inauguration. Conversely, their counterparts within distance bands 1, 2, and 3 experienced price changes of +35% (p<.01), -4% (p<.05), and -15% (p<.01) respectively, relative to the pre-opening phase. In contrast, attached homes in the control region underwent a price reduction of around 13% (0.204-0.335) in the period after TP&TBA's inauguration. The attached properties located within distance bands 1, 2, and 3 experienced average price increases of 29% (0.204+0.346+0.079-0.335), 29% (0.204-0.041+0.079+0.045), and 34% (0.204-0.145+0.079+0.199) respectively, post-stadium opening. Importantly, as judged by the test of coefficients on the three-way interactions, the stadium-induced relative changes in prices of attached houses were significantly lower in the 0-1 mile radius, and significantly higher in 1-3 mile radius from the equivalent relative price adjustments of detached houses. These findings highlight the complex interplay between housing type, distance, and the post-opening period in influencing residential sales prices.

Table 15

Three-Way Interaction with Attached Homes (Towncondo) for Three Distances Treatment Groups with Lineal Year Trend Term (Main Coefficients)

	Three Distance Treatment Groups		
	Coeff.		t
dist1	-0.294	***	-4.010
dist2	0.038	**	2.190
dist3	0.088	***	8.840
postopening	0.204	***	59.130
dist1_post	0.346	***	3.320
dist2_post	-0.041	**	-2.000
dist3_post	-0.145	***	-12.350
towncondo	-0.335	***	-58.770
dist1_towncondo	0.063		0.860
dist2_towncondo	-0.038	**	-2.260
dist3_towncondo	-0.207	***	-15.290
post_towncondo	0.079	***	12.000
dist1_post_towncondo	-0.335	***	-3.130
dist2_post_towncondo	0.045	*	1.930
dist3_post_towncondo	0.199	***	10.680
Neighborhood Char.	YES		
House Characteristic	YES		
Time-year FE	YES		
Census Tract FE	YES		
Observations	68,818		
R^2	0.801		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Robustness Checks

Anticipation Effects

Testing the differential effects of the announcement and opening of the stadium on the residential property sales prices serves as an additional validation for the results presented thus far. This assessment also helps in determining if there was an anticipation effect manifested by

an increase in house prices after the disclosure of the construction plans for Truist Park and The Battery Atlanta. The Truist Park official announcement by the Atlanta Braves included details about a $400 million entertainment complex designed to provide shopping and dining year-round, including on non-game days.

I augmented my regression models by incorporating variables to account for the different phases of the stadium construction process. Specifically, my refined model encompassed a dummy time indicator and a set of interaction terms for property sales closings between the construction announcement and the inauguration of TP&TBA. The dummy variable *AfterAnnBeforeOpen* is assigned the value of 1 for houses sold after the announcement (11/12/2013) and before the stadium's opening (4/1/2017). The interaction terms between the distance indicators and *AfterAnnBeforeOpen* facilitate the estimation of the house price effect during the construction phase of TP&TBA relative to the pre-announcement period. The tabulated results of these estimations are presented in Table 16.

Table 16

Summary of Estimation Results of Difference-in-Difference Hedonic Residential Sales Pricing Models in Pre-Announcement, Construction, and Post-Opening of TP&TBA

Variable	Estimate		t-value
Pre-Announcement			
Dist1	-0.329	***	-11.818
Dist2	-0.021	.	-1.702
Dist3	0.002		0.163
After Announcement (during stadium construction)			
AfterAnnBeforeOpen	0.051	***	4.517
Dist1*AfterAnnBeforeOpen	0.178	***	6.031
Dist2*AfterAnnBeforeOpen	0.015		1.306
Dist3*AfterAnnBeforeOpen	-0.019	.	-1.692
After Opening			

Variable	Estimate		t-value
Post Opening	0.107	***	7.718
Dist1*PostOpening	0.163	***	6.018
Dist2*PostOpening	0.049	***	4.411
Dist3*PostOpening	-0.017		-1.612
R^2	0.848		

Note: Dependent variable log of monthly rent in US$. *=p<.10; **=p<.05; ***p<.01. The announcement date was November 11, 2013. Pre-announcement corresponds to all closed sales transactions within ten miles of Truist Park closed between 1/1/2010 and 11/11/2013. Construction includes all sales transactions closed between 11/12/2013 and 3/31/2017 (between announcement and opening). Post-Opening includes all sales transactions closed between 4/1/2017 and 12/31/2020. To save space only the variables of interest are presented in this table.

Before the Atlanta Braves announced the move to their future site in Cobb County, home buyers were willing to pay 33% less (p<.01) for homes located within one mile of the future stadium site. The coefficient estimate on the dummy indicator *AfterAnnBeforeOpen* is also statistically significant, indicating that the average prices of houses in the control area increased by about 5% (p<.01) after the announcement of construction plans. However, the residential units situated within a mile of the Truist Park site saw an increase in price greater in magnitude by 17.8 percentage points (p<.01) after the announcement was made, amounting to the increase in price by about 23% (0.051+0.178). Houses in the other two treatment areas remained unaffected by the announcement. After the stadium's opening, compared to the pre-announcement period, houses in the control area traded at an average price higher by about 11% (p<.01). The price inflation observed for houses in the distance bands 1 and 2 was greater in magnitude by 16 (p<.01) and 5 (p<.01) percentage points, resulting in average price surges of approximately 27% (0.107+0.163) and 16% (0.107+0.049), respectively, in comparison to the pre-announcement phase. To summarize, consumers were willing to pay more for housing closest to the stadium in anticipation of the construction of the stadium. That anticipation effect extended to houses up to two miles from the stadium after the opening of Truist Park.

The finding of TP&TBA's anticipation effect is consistent with some past studies. Keeler et al. (2021) found that the Staples Center generated positive valuation impacts close to the sports venue before it opened. A similar anticipation effect was also uncovered by Ahlfeldt and Kavetsos (2014) in residential properties closer to the New Wembley in England. These authors argue that announcing the construction of large sports venues serves as a strong market signal, and the effects become apparent immediately once the market absorbs this information.

Table 17 presents a comprehensive summary of the analogous analysis of anticipation effects conducted separately for sub-samples of single-family detached and attached homes. The results provided in the table offer valuable insights into the nuanced effects experienced by these market segments in response to major stadium-related occurrences.

Table 17

Summary of Estimation Results of Difference-in-Difference Hedonic Residential Sales Pricing Models of Truist Park by Subsegment Single Family Detached and Attached

	Detached Homes n=51167			Attached Homes n=18138		
Variable	Coeff.		t	Coeff.		t
Pre-Announcement						
Dist1	-0.505[1]	***	-5.759	-0.145	***	-4.665
Dist2	-0.059	*	-2.453	0.104	***	6.011
Dist3	0.069	***	5.284	0.000		0.022
After Announcement (during stadium construction)						
AfterAnnBeforeOpen	0.040[1]	**	3.034	0.099	***	4.488
Dist1*AftAnnBefOpen	0.539[1]	***	4.401	0.158	***	5.323
Dist2*AftAnnBefOpen	0.024		0.942	-0.006		-0.464
Dist3*AftAnnBefOpen	-0.038	**	-2.652	0.037	*	2.071
After Opening						
Post Opening	0.091	***	5.572	0.157	***	5.982
Dist1*PostOpening	0.345[1]	**	3.157	0.128	***	4.646
Dist2*PostOpening	-0.044	.	-1.850	0.039	**	2.943
Dist3*PostOpening	-0.091	***	-6.794	0.069	***	4.159

	Detached Homes n=51167		Attached Homes n=18138	
Variable	Coeff.	t	Coeff.	t
R^2	0.835		0.852	

Note: Dependent variable log of sales price in US$. *=p<.10; **=p<.05; ***p<.01. The announcement date was November 11, 2013. Pre-announcement corresponds to all closed sales transactions within ten miles of Truist Park closed between 1/1/2010 and 11/11/2013. Construction includes all sales transactions closed between 11/12/2013 and 3/31/2017 between announcement and opening). Post-Opening includes all sales transactions closed between 4/1/2017 and 12/31/2020. To save space only the variables of interest are presented in this table.

(1) The coefficients for detached homes in Dist1 cannot be interpreted due to the small sample size for each relevant period, as there are only 38 detached homes within Dist1 in the ten years of data.

Before the announcement of the construction of Truist Park (between 2010 and 2013), houses within a mile of the vacant site sold at a discount compared to those in the control group. However, the price dynamic differed for housing units sold more than a mile away and up to 3 miles (Dist2 and Dist3) from the site by market subsegment. Before the stadium's announcement, detached houses in Dist2 sold at a 6% discount (p<.1) and detached houses in Dist3 at a 7% premium (p<.01) compared to the control area, while attached homes sold for a premium of 10% (p<.01) in Dist2 and at a similar price in Dist3 as in the control group. After the announcement and during the construction period, a positive anticipation effect in the form of faster price inflation relative to the control group was evident in Dist1 for both detached (54 percentage points, p<.01) and attached homes (16 percentage points, p<.01)[1]. The results for the detached properties, however, should be interpreted carefully as they are estimated with a relatively small sample of only 38 detached houses sold within a 1-mile radius of the stadium during the studied 10-year period. Interestingly, in Dist3, the impact on prices was positive for attached homes (4 percentage points, p<.05) and negative for detached homes (-4 percentage points, p<.1) during the construction period, and there was no statistically significant effect on prices in Dist2 for either subsegment. After the stadium's opening, attached houses in all treatment areas appreciated in value more than houses in the control area, while detached homes

were generally characterized by the opposing trend. Overall, the results reveal nuanced variations in the effects of Truist Park on detached and attached homes across different study periods, reflecting important differences in their respective pricing trends in response to stadium-related developments.

Repeated Sales Regression

To further assess the validity and robustness of my study's results, I follow the examples of previous research (Humphreys & Nowak, 2017; Chikish et al., 2019) and estimate the repeated sales regression models (RSR). This RSR estimation considers instances where the same property is sold and resold during the study period, mitigating the effect of potential unobservable factors. Identifying instances of repeated sales could present some data challenges, particularly in cases of housing units within buildings that share the same longitude and latitude coordinates. Additionally, finding a sufficient count of properties with repeated sales within the designated study area could pose an additional difficulty and potentially limit the application of this methodology (Chikish et al., 2019). In my study sample, there seem to be enough repeated sales in the combined treatment area (see Tables 16 and 17). However, the analysis using the three distance rings may be affected by a small sample size, particularly for Dist1, where only 67 transactions (4 detached and 63 attached homes) were repeated sales. Of those observations, only 37 properties were first sold before the opening of TP&TBA and then re-sold after the opening. Results of estimations of the RSR model using the three distance rings are presented in Table 18. I again combined the three treatment areas into a single treatment area to ensure enough variation in the repeated sales for the treatment group for each property type. The results of estimations of the model with a single treatment group are presented in Table 19.

Table 18

Number of Repeated Sales by Distance to TP&TBA and by Property Type

Distance to TP&TBA	All Properties	Detached Homes	Attached Homes
Dist1	67	4	63
Dist2	667	120	547
Dist3	584	344	240
Treatment (0 to 3 miles)	1318	468	850
Control (3 to 10 miles)	6722	5463	1259

Table 19

Number of Repeated Sales by Distance to TP&TBA and by Property Type - First Sale Occurred Before and Second Sale After Truist Opening

Distance to TP&TBA	All Properties	Detached	Attached
Dist1	37	2	36
Dist2	377	67	310
Dist3	350	218	132
Treatment (0 to 3 miles=Dist1+Dist2+Dist3)	764	287	478
Control (3 to 10 miles)	3569	2847	722
Total (Treatment + Control)	4333	3134	1200

Table 20 shows the results of the RSR for all properties, including detached and attached homes, by the three distance rings. The first two columns show all properties, and the last columns in the table exclude properties that were identified as new construction for the repeat (second sale). The first sale for such a property was likely motivated by the objective of modifying or replacing the house after the purchase, and the second sale was for a new or substantially refurbished house built on the same lot. For the entire sample of repeated sales, there were seven properties in the treatment area identified as new homes in the second sale, and there were 23 of these types of properties in the control group. Only the coefficients of interest are shown in this table.

Table 20

Repeated Sales Regression Model for All Properties with One Sale and One Resale

	All Properties			Excludes New Construction		
	Coeff.		t	Coeff.		t
Prepost	-0.032	***	-4.720	-0.028	***	-4.240
Dist1_prepost	0.160	***	3.530	0.147	***	3.270
Dist2_prepost	0.098	***	6.500	0.099	***	6.760
Dist3_prepost	0.038	**	2.440	0.032	**	2.120
Includes Time FE	YES			YES		
Observations	8,040			8,010		
R^2	0.062			0.063		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

The RSR results in Table 20 confirm the previous results from the DID models. Overall, the opening of TP&TBA had a positive impact on property prices. Houses with one repeated sale in the three treatment rings (Dist1, Dist2, and Dist3) sold at a higher price after the venue's opening, with the magnitudes of average price increases of 15%, 10%, and 3%, for distance bands 1, 2, and 3, respectively, relative to houses in the control group. Table 21 shows results from similar estimations conducted separately for samples partitioned by property type but with the combined treatment area. Results indicate that the stadium inauguration-induced change in sale prices of detached homes within a 3-mile radius did not differ significantly from the change in sale prices of houses in the control group. At the same time, the change in prices of attached homes situated in the combined treatment area after TP&TBA's inauguration increased at a 15 percentage points faster pace compared to the post-inauguration change in prices of houses located in the control group. In conclusion, the RSR estimations not only corroborate the findings initially evidenced by the estimations of DID models but also reinforce the narrative of the nuanced array of impacts that the construction and opening of TP&TBA experienced in different segments of the residential real estate market.

Table 21

Repeated Sales Regression Model for Detached and Attached Properties with One Sale and One Resale

	Detached All/Excludes New Const.			Attached All/Excludes New Const.		
	Coeff.		t	Coeff.		t
Prepost	-0.054/-0.049	***	-6.800/-6.32	-0.028/	***	-4.240
Dist1to3miles_prepost	0.002/-0.008		0.120/-0.45	0.147	***	3.270
Includes Time FE	YES			YES		
Observations	5,904/5,931			8,010		
R^2	0.069/0.068			0.063		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Summary of Results

The construction of Truist Park and The Battery Atlanta resulted in substantial property value recalibrations within the residential real estate market of northern metro Atlanta. Results from the estimation of the hedonic difference-in-differences model provide valuable insights into the impact of Truist Park's inauguration on the pricing of residential properties within its immediate vicinity. My analysis utilized data from all residential sales transactions within a 10-mile radius of Truist Park between 2010 and 2020, and the estimations incorporated a rich set of control variables, including property and neighborhood characteristics, year fixed effects, and census tract fixed effects.

Before Truist Park's inauguration (2010-2016), houses located within 1 mile of the stadium traded at a discount of 32%, while those in the 1-2 mile radius traded at a discount of 4%, compared to properties in the control group, i.e., those situated 3-10 miles away. These results highlight a significant pre-existing variation in house prices based on proximity to the future location of the stadium. Importantly, post-inauguration of the new sports venue (2017-

2020), there was a notable 5.2% average increase in house prices in the control group compared to the pre-inauguration period (2010-2016). However, residences within 1 mile of Truist Park saw a significantly higher price surge of 12.4%, indicating a pronounced positive effect that the stadium opening exerted on the prices of houses in its immediate vicinity. When compared to houses in the control area, houses in the 1-2 mile radius also experienced a significantly higher value appreciation of 9.6%. These findings align with findings of similar studies on stadium effects, where proximity to the venue was associated with significant price differentials. Consumers appear to exhibit preferences for residences within a mile of the stadium, translating into pronounced positive price changes. However, the positive effect on house prices diminished with increasing distance from the stadium, consistent with previous research.

In order to address the understudied price dynamics within different real estate market subsegments and assess how market subsegments responded to the construction of TP&TBA, I extended the DID analysis by including a control variable for property type. The estimation of the augmented model revealed that condominiums or townhouses sold for approximately 33% less, on average, than standalone single-family houses. Although the inclusion of this control variable did not change the overall pattern of results, it did moderate the estimated impact of the stadium's inauguration, suggesting that the stadium's effects might be intertwined with shifts in the residential real estate market composition.

I conducted nuanced heterogeneity analyses to shed light on the distinctive dynamics in the housing market surrounding Truist Park and The Battery Atlanta. Toward this purpose, I estimated the difference-in-difference models separately for subsamples of single-family detached and attached houses, as well as the triple-difference models to test the statistical significance of the differential price variations by market segment. My findings highlighted pre-

existing disparities in residential property prices across different areas, as well as divergent reactions to the inauguration of the venue. For example, the impact of TP&TBA on the prices of single-family detached homes in a 1-3 mile radius of the stadium predominantly served to decelerate price appreciation. Conversely, the impact on the prices of attached units was to enhance value inflation. The observations of varied impacts were substantiated by the triple difference estimations, affirming the differential responses in the distinct housing categories.

I employed repeated sales regressions (RSR) to confirm the validity and robustness of the findings, a method often used in past studies (Humphreys & Nowak, 2017; Chikish et al., 2019). The RSR approach focuses on instances where the same property is sold and resold during the study period, aiming to mitigate the influence of unobservable factors. Results from the RSR estimations confirmed the findings from the DID models, indicating a positive impact on property prices after the opening of TP&TBA. Houses in the treatment area within specific distance rings saw stadium-induced price increases higher by 3-15 percentage points relative to the price increases for properties in the control area, with the highest price acceleration within 1 mile of the stadium. Furthermore, results stratified by property type showed that price adjustments to detached homes remained at a similar level to houses in the control group, while price adjustments to attached houses were 15 percentage points higher in the treatment distance compared to the control group. The RSR models provided additional validation of the nuanced effects observed in different market segments, as initially revealed by the DID models.

CHAPTER 5

CONCLUSIONS

The analysis of the impact of Truist Park and The Battery Atlanta on residential property prices has uncovered a complex dynamic that extends beyond the typical narrative surrounding sports and entertainment venue developments. By estimating Difference-in-Differences Hedonic Models, Anticipation Effects Hedonic Models, Repeated Sales Regressions, as well as several heterogeneity analyses and robustness checks, this study has shed light on the intricate interplay between property type, distance from the stadium, and stadium-related events in influencing residential property prices.

This study addresses two gaps in the existing literature concerning the impact of sports and entertainment venues on residential property prices. Its primary objective was to understand how Truist Park and The Battery Atlanta, a sports venue with an adjacent entertainment district, influenced residential property values. The second objective was to uncover the nuanced dynamics associated with real estate market subsegments, i.e., to assess if and how the effect of proximity to the stadium differed for single-family detached and attached residential units. The preliminary findings of this study revealed that, before the opening of TP&TBA, residential property prices near the venue were lower compared to the control properties located more than three miles away. However, the inauguration of the stadium allowed local property prices to experience some level of recovery or "catch-up." More specifically, post the 2017-2020 opening of Truist Park, houses near the stadium, particularly those within a 2-mile radius, witnessed average price appreciation significantly exceeding the price inflation of residential properties

situated 3 or more miles away. Furthermore, the heterogeneity analysis, segmenting by property type, documented more intriguing patterns regarding residential property pricing. While the rate of price increase for detached houses within 1 mile of the stadium surpassed that of control properties, the inauguration of the stadium tempered the value increase of free-standing houses located 2-3 miles away compared to analogous properties in the control group. In contrast, the pace of stadium-induced price inflation for attached houses within the same range (1-2 miles) experienced significant acceleration compared to similar properties located further away.

The results of this study hold implications for various groups of stakeholders, including real estate developers, consumers, investors, policymakers, and urban planners. They provide critical insights into the complex interplay between proximity to sports venues, property type, and the influence of stadium-related events on residential property prices. Understanding these dynamics can aid in more informed decision-making when it comes to real estate investments and urban development projects. For instance, this study underscores how large-scale infrastructure investments leading to property price surges may not invariably translate into significant increases in tax revenues for local municipalities, particularly if the house value appreciations are counterbalanced by alterations in the makeup of local real estate markets. Moreover, the findings contribute to the broader literature on urban economics and the impact of large-scale entertainment developments on local communities. In conclusion, this research constitutes a novel and valuable contribution to the existing body of knowledge and encourages further exploration of the intricate relationships between sports venues, real estate markets, and urban development.

While this study has shed light on several crucial aspects of the relationship between sports venues and property prices, it is essential to acknowledge some of its limitations. One

limitation pertains to the geographic scope of the research, which focused solely on the case of Truist Park and The Battery Atlanta. A single case study may never be fully generalizable even to seemingly analogous contexts. Future research could expand this investigation to encompass a wider spectrum of sports and entertainment infrastructure projects across diverse geographical locations. Exploring the long-term sustainability of price changes and their effects on housing affordability in rapidly developing urban areas could be a fruitful avenue for further research endeavors. Furthermore, the influence of other contextual factors, such as transportation infrastructure and local amenities, warrants examination to provide a comprehensive understanding of residential property price dynamics in response to sports and entertainment venue developments. Finally, further research should explore the distribution of benefits from such projects across different demographic segments, focusing perhaps more intensely on underprivileged populations who are often the most affected by urban gentrification. By addressing these limitations and building upon the insights gained in this study, future research can continue to advance our understanding of this complex and multifaceted phenomenon.

Future Research

As I conclude this investigation into how the establishment of combined sports and entertainment venues impacts residential real estate markets, multiple promising avenues for future research are worth mentioning. One such pathway involves conducting a comparative study of new stadium projects across different cities and regions. By analyzing the experiences of various communities, researchers can identify common trends and unique factors that influence the effects of stadiums on real estate markets. Given that several case studies (similar to my research) have been published recently, perhaps a meta-analysis comparing, contrasting,

and synthesizing the results of different studies could help in resolving remaining uncertainties and in building a more robust, nuanced understanding of how sports venues influence residential real estate values.

Another desired direction for future research is the exploration of temporal evolution and durability of the effects of new stadium construction. A longitudinal analysis, spanning multiple years, perhaps even decades following the inauguration of a new sports venue, could promote the understanding of the sustainability of both its positive and negative externalities, offering a more comprehensive view of the stadium's legacy. Examining such long-term impacts of new stadium construction on local residential real estate prices could offer substantive, tangible insights into sustained economic and social effects on communities, beyond the initial market reactions. For instance, analyzing long-term effects can reveal whether the construction of such venues leads to consistent property value appreciation in surrounding areas, thereby potentially altering tax revenues and affecting municipal budgets in the long-time horizon. A sustained increase in property values could lead to enhanced community services and infrastructural developments, benefiting the local population. Conversely, understanding whether these effects diminish over time can help municipalities anticipate potential declines in property tax revenues and make informed fiscal and policy decisions. By probing deeper into these long-term impacts, municipalities, urban planners, and policymakers can optimize community development strategies, housing policies, and urban regeneration projects, ensuring balanced and equitable urban growth and community welfare.

Various aspects of real estate investor behavior and the impacts observed in short-term rental markets represent another intriguing area for research with the potential to generate actionable insights that can guide property investment strategies and development projects.

Exploring the motivations and strategies of real estate investors who purchase properties near sports and entertainment venues to convert them into short-term rentals can shed light on the dynamics of the short-term rental market. Moreover, future analyses could aim to identify how the knowledge of property value trajectories in the stadium vicinity aids in investment risk assessment or real estate developers' portfolio optimization (e.g., investments in different property types, such as single-family homes vs. multi-family units).

Another research avenue is understanding gentrification processes in the context of new stadium construction. A detailed long-term analysis of the stadium's effects could clarify whether the presence of a stadium contributes to gentrification trends, affecting housing affordability and demographic compositions of neighborhoods. The area closest to TP&TBA was lower income and more racially diverse than farther away. Researchers can explore how different demographic groups are affected by gentrification and potential displacement, providing insights that can guide policies to mitigate adverse consequences for vulnerable populations. Additionally, community impact assessments can examine broader socio-economic effects, including changes in local businesses, schools, and public services. Qualitative research methods, such as surveys, interviews, and focus groups, offer opportunities to capture public opinion and stakeholder perspectives on stadium relocations. These insights can help policymakers make informed decisions about stadium financing and development, considering the views and concerns of residents, businesses, and local authorities.

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APPENDIX

PARALLEL TRENDS

Table A.1

*Three Treatment Groups and Distance*Year Interaction Terms*

Variables	(1) Parallel Regular All Homes	(2) Parallel Regular Detached Homes	(3) Parallel Regular Attached Homes
dist1	-0.232***	0.00252	-0.0565
	(0.0430)	(0.267)	(0.0381)
dist2	-0.0436***	-0.112***	0.0454***
	(0.0154)	(0.0327)	(0.0174)
dist3	-0.0290**	0.0322*	-0.00590
	(0.0147)	(0.0174)	(0.0204)
d1_2010	-0.138**	-0.437	-0.0885
	(0.0630)	(0.326)	(0.0541)
d1_2011	-0.174***	-0.0831	-0.0905*
	(0.0572)	(0.307)	(0.0492)
d1_2012	-0.301***	-0.553*	-0.186***
	(0.0628)	(0.297)	(0.0547)
d1_2013	-0.119**	-0.884***	-0.0478
	(0.0575)	(0.307)	(0.0493)
d1_2014	-0.0549		0.0288
	(0.0558)		(0.0470)
d1_2015	-0.00136	0.0136	-0.00805
	(0.0514)	(0.287)	(0.0439)
d1_2017	-0.0229	0.0645	0.00508
	(0.0489)	(0.326)	(0.0412)
d1_2018	0.00307	-0.136	-0.00732
	(0.0482)	(0.282)	(0.0411)
d1_2019	-0.00155	-0.0877	-0.00686
	(0.0490)	(0.307)	(0.0414)
d1_2020	-0.0297	-0.175	-0.00499
	(0.0504)	(0.307)	(0.0426)
d2_2010	0.0746***	0.132***	0.0148
	(0.0255)	(0.0479)	(0.0266)
d2_2011	-0.0561**	0.00466	-0.00568
	(0.0240)	(0.0490)	(0.0244)

Variables	(1) Parallel Regular All Homes	(2) Parallel Regular Detached Homes	(3) Parallel Regular Attached Homes
d2_2012	-0.0637***	0.0793*	-0.0193
	(0.0208)	(0.0429)	(0.0217)
d2_2013	0.0415**	0.0561	0.0427**
	(0.0195)	(0.0417)	(0.0202)
d2_2014	0.000568	0.0563	-0.0131
	(0.0201)	(0.0439)	(0.0205)
d2_2015	0.00386	0.119***	-0.0116
	(0.0187)	(0.0409)	(0.0188)
d2_2017	0.0405**	0.0363	0.0301*
	(0.0173)	(0.0380)	(0.0174)
d2_2018	0.0540***	0.00125	0.0420**
	(0.0177)	(0.0374)	(0.0179)
d2_2019	0.0574***	0.0463	0.0443**
	(0.0182)	(0.0398)	(0.0182)
d2_2020	0.0285	0.0474	0.0242
	(0.0179)	(0.0388)	(0.0180)
d3_2010	0.0807***	0.0670**	0.0411
	(0.0234)	(0.0263)	(0.0343)
d3_2011	0.0361	0.0901***	-0.00805
	(0.0228)	(0.0271)	(0.0300)
d3_2012	0.0272	0.0707***	-0.0246
	(0.0209)	(0.0246)	(0.0282)
d3_2013	-0.00326	-0.00692	-0.0774***
	(0.0200)	(0.0229)	(0.0283)
d3_2014	0.0107	-0.00394	-0.00451
	(0.0200)	(0.0231)	(0.0276)
d3_2015	0.0255	0.0351	0.00347
	(0.0189)	(0.0222)	(0.0252)
d3_2017	0.0293	0.000923	0.0490**
	(0.0183)	(0.0219)	(0.0237)
d3_2018	0.0171	-0.0281	0.0376
	(0.0183)	(0.0220)	(0.0235)
d3_2019	0.0295	-0.0457**	0.0508**
	(0.0181)	(0.0218)	(0.0233)
d3_2020	-0.00842	-0.0673***	0.0391
	(0.0183)	(0.0218)	(0.0239)
y2010	-0.578***	-0.602***	-0.593***
	(0.00865)	(0.00885)	(0.0170)
y2011	-0.755***	-0.764***	-0.808***
	(0.00832)	(0.00855)	(0.0160)
y2012	-0.711***	-0.727***	-0.759***
	(0.00817)	(0.00840)	(0.0158)
y2013	-0.506***	-0.527***	-0.514***

Variables	(1) Parallel Regular All Homes	(2) Parallel Regular Detached Homes	(3) Parallel Regular Attached Homes
	(0.00814)	(0.00838)	(0.0155)
y2014	-0.422***	-0.451***	-0.383***
	(0.00813)	(0.00839)	(0.0154)
y2015	-0.0558***	-0.0561***	-0.0668***
	(0.00541)	(0.00552)	(0.00988)
y2017	0.0416***	0.0415***	0.0652***
	(0.00525)	(0.00540)	(0.00926)
y2018	0.0962***	0.0954***	0.141***
	(0.00523)	(0.00538)	(0.00925)
y2019	0.116***	0.116***	0.177***
	(0.00523)	(0.00538)	(0.00931)
y2020	0.166***	0.170***	0.223***
	(0.00528)	(0.00541)	(0.00950)
Total.Bedrooms	0.117***	0.0397***	0.0239***
	(0.00187)	(0.00209)	(0.00393)
Total.Full.Baths	0.0618***	0.110***	0.0723***
	(0.00214)	(0.00223)	(0.00453)
Total.Half.Baths	0.0291***	0.0603***	0.0327***
	(0.00238)	(0.00261)	(0.00438)
HAS_FIREPLACE	0.0641***	0.0964***	0.0316***
	(0.00335)	(0.00375)	(0.00515)
SFLA	0.000264***	0.000205***	0.000411***
	(2.17e-06)	(2.24e-06)	(5.75e-06)
AgeFMLS	-0.00497***	-0.00551***	-0.0159***
	(9.05e-05)	(9.72e-05)	(0.000224)
renovatedR	0.129***	0.136***	0.0982***
	(0.00324)	(0.00325)	(0.00633)
Comm_Clubhouse = 1	0.0234***	0.0206***	0.0432***
	(0.00356)	(0.00423)	(0.00474)
Comm_Pool = 1	-0.00509	0.00870*	0.0593***
	(0.00381)	(0.00495)	(0.00500)
Comm_Tennis = 1	-0.0328***	0.0451***	-0.0667***
	(0.00412)	(0.00516)	(0.00582)
Comm_Playground = 1	0.0807***	0.0404***	0.0474***
	(0.00370)	(0.00386)	(0.00713)
Comm_Gated = 1	0.0806***	0.115***	-0.00397
	(0.00498)	(0.00826)	(0.00540)
median_incomeFcpi	-2.65e-06***	-2.82e-06***	-2.51e-06***
	(5.71e-08)	(5.90e-08)	(1.23e-07)
per_asianF	-0.661***	-0.423***	-0.312***
	(0.0285)	(0.0334)	(0.0430)
per_blackF	-0.376***	-0.285***	-0.367***
	(0.0138)	(0.0152)	(0.0229)

Variables	(1) Parallel Regular All Homes	(2) Parallel Regular Detached Homes	(3) Parallel Regular Attached Homes
per_OtherRF	0.569***	0.707***	0.215***
	(0.0357)	(0.0398)	(0.0541)
per_hispF	-0.313***	-0.358***	-0.00960
	(0.0166)	(0.0184)	(0.0276)
prenter_ocuF	-0.227***	-0.244***	-0.0931***
	(0.0123)	(0.0140)	(0.0188)
pvacantF	-0.125***	-0.0927***	-0.141***
	(0.0243)	(0.0257)	(0.0437)
DtAtMilesl	-0.0338***	-0.0426***	-0.0518***
	(0.00243)	(0.00253)	(0.00539)
Constant	12.15***	12.50***	12.52***
	(0.0436)	(0.0460)	(0.0951)
Observations	68,818	50,840	17,978
R-squared	0.820	0.844	0.865
Census tracts FE	applied	applied	applied

Table A.2

House Sales Price Hedonic Difference-In-Differences Model with One Treatment Group for All Properties

	Without Towncondo			With Towncondo		
	Coefficient		t	Coefficient		t
Dist1to3miles	-0.021	***	-2.737	-0.016	**	-2.150
Post	0.053	***	6.281	0.056	***	6.930
Dist1to3miles*Post	0.022	***	3.452	0.017	***	2.860
Bedrooms	0.118	***	62.841	0.055	***	28.230
Full Baths	0.061	***	28.648	0.102	***	48.230
Half Baths	0.029	***	12.236	0.069	***	29.620
Has fireplace	0.063	***	18.835	0.065	***	20.220
Square footage	0.000	***	121.704	0.000	***	99.690
Age	-0.005	***	-54.757	-0.007	***	-78.190
Renovated	0.129	***	39.751	0.125	***	40.270
Attached (Town&Condo)	-		-	-0.336	***	-81.010
Comm Clubhse	0.023	***	11.909	0.041	***	12.060
Comm Pool	-0.004		11.197	0.042	***	11.470
Comm Playgrnd	0.081	***	14.386	-0.050	***	-12.770
Comm Tennis	-0.034	***	-12.564	0.051	***	14.280
Comm Gated	0.081	***	23.210	0.111	***	23.260
Median income	0.000	***	-51.868	0.000	***	-51.830
Black	-0.377	***	-25.868	-0.613	***	-22.690
Asian	-0.638	***	-22.577	-0.340	***	-25.760
Other race	0.545	***	16.306	0.556	***	16.490
Hispanic	-0.330	***	-16.245	-0.269	***	-17.000
Renter Occupied	-0.228	***	-20.602	-0.234	***	-20.000
Vacant	-0.113	***	-0.4578	-0.103	***	-4.440
Dist to Atlanta	-0.033	***	-21.463	-0.050	***	-21.390
Time-year FE	YES			YES		
Census Tract FE	YES			YES		
Observations	68,818			68,818		
R^2	0.819			0.835		

Note: Dependent variable Log of Sales Prices in (CPI Shelter) inflation-adjusted 2020 US$.
*=p<0.10; **=p<0.05; ***p<0.01

Table A.3

Parallel Trends Test for One Treatment Group with All Interaction Terms (All Coefficients)

Variables	(1) Parallel One Treatment
dist1to3m	-0.0226**
	(0.0115)
d1t3_2010	0.0590***
	(0.0172)
d1t3_2011	-0.0268
	(0.0164)
d1t3_2012	-0.0325**
	(0.0150)
d1t3_2013	0.00732
	(0.0142)
d1t3_2014	-0.00193
	(0.0144)
d1t3_2015	0.00917
	(0.0135)
d1t3_2017	0.0296**
	(0.0128)
d1t3_2018	0.0261**
	(0.0129)
d1t3_2019	0.0335***
	(0.0130)
d1t3_2020	0.000837
	(0.0130)
y2010	-0.581***
	(0.00864)
y2011	-0.758***
	(0.00831)
y2012	-0.714***
	(0.00816)
y2013	-0.509***
	(0.00812)
y2014	-0.424***
	(0.00811)
y2015	-0.0558***
	(0.00543)
y2017	0.0416***
	(0.00526)
y2018	0.0962***
	(0.00524)
y2019	0.116***

Variables	(1) Parallel One Treatment
	(0.00524)
y2020	0.166***
	(0.00529)
Total.Bedrooms	0.118***
	(0.00187)
Total.Full.Baths	0.0616***
	(0.00215)
Total.Half.Baths	0.0292***
	(0.00238)
HAS_FIREPLACE	0.0633***
	(0.00335)
SFLA	0.000265***
	(2.18e-06)
AgeFMLS	-0.00496***
	(9.07e-05)
renovatedR	0.129***
	(0.00325)
Comm_Clubhouse = 1	0.0229***
	(0.00356)
Comm_Pool = 1	-0.00420
	(0.00382)
Comm_Tennis = 1	-0.0340***
	(0.00413)
Comm_Playground = 1	0.0810***
	(0.00370)
Comm_Gated = 1	0.0814***
	(0.00499)
median_incomeFcpi	-2.70e-06***
	(5.62e-08)
per_asianF	-0.638***
	(0.0283)
per_blackF	-0.377***
	(0.0138)
per_OtherRF	0.548***
	(0.0356)
per_hispF	-0.328***
	(0.0166)
prenter_ocuF	-0.227***
	(0.0123)
pvacantF	-0.113***
	(0.0243)
DtAtMilesl	-0.0334***
	(0.00243)
Constant	12.15***

Variables	(1) Parallel One Treatment
	(0.0436)
Observations	68,818
R-squared	0.819
Census tracts FE	applied

Table A.4

Parallel Trends Test for One Treatment Group with All Interaction Terms All Properties and by Property Type (All Coefficients)

Variables	(1) Parallel One Treatment All properties	(2) Parallel One Treatment Detached Homes	(3) Parallel One Treatment Attached Homes
dist1to3m	-0.0226**	0.0219	0.0197
	(0.0115)	(0.0160)	(0.0154)
d1t3_2010	0.0590***	0.0775***	0.00366
	(0.0172)	(0.0233)	(0.0219)
d1t3_2011	-0.0268	0.0647***	-0.0235
	(0.0164)	(0.0239)	(0.0198)
d1t3_2012	-0.0325**	0.0596***	-0.0348*
	(0.0150)	(0.0215)	(0.0186)
d1t3_2013	0.00732	-0.000110	0.000952
	(0.0142)	(0.0203)	(0.0176)
d1t3_2014	-0.00193	0.00729	-0.00967
	(0.0144)	(0.0207)	(0.0175)
d1t3_2015	0.00917	0.0520***	-0.00835
	(0.0135)	(0.0197)	(0.0160)
d1t3_2017	0.0296**	0.00806	0.0317**
	(0.0128)	(0.0193)	(0.0149)
d1t3_2018	0.0261**	-0.0267	0.0286*
	(0.0129)	(0.0191)	(0.0151)
d1t3_2019	0.0335***	-0.0275	0.0354**
	(0.0130)	(0.0193)	(0.0152)
d1t3_2020	0.000837	-0.0440**	0.0214
	(0.0130)	(0.0192)	(0.0153)
y2010	-0.581***	-0.603***	-0.588***
	(0.00864)	(0.00885)	(0.0170)
y2011	-0.758***	-0.766***	-0.803***
	(0.00831)	(0.00855)	(0.0160)
y2012	-0.714***	-0.728***	-0.754***
	(0.00816)	(0.00839)	(0.0158)
y2013	-0.509***	-0.528***	-0.509***
	(0.00812)	(0.00838)	(0.0155)
y2014	-0.424***	-0.452***	-0.378***
	(0.00811)	(0.00838)	(0.0154)
y2015	-0.0558***	-0.0561***	-0.0672***
	(0.00543)	(0.00552)	(0.00992)
y2017	0.0416***	0.0416***	0.0648***
	(0.00526)	(0.00541)	(0.00929)

Variables	(1) Parallel One Treatment All properties	(2) Parallel One Treatment Detached Homes	(3) Parallel One Treatment Attached Homes
y2018	0.0962***	0.0954***	0.141***
	(0.00524)	(0.00539)	(0.00929)
y2019	0.116***	0.117***	0.177***
	(0.00524)	(0.00538)	(0.00935)
y2020	0.166***	0.170***	0.224***
	(0.00529)	(0.00541)	(0.00953)
Total.Bedrooms	0.118***	0.0395***	0.0223***
	(0.00187)	(0.00209)	(0.00393)
Total.Full.Baths	0.0616***	0.110***	0.0729***
	(0.00215)	(0.00224)	(0.00455)
Total.Half.Baths	0.0292***	0.0605***	0.0327***
	(0.00238)	(0.00261)	(0.00438)
HAS_FIREPLACE	0.0633***	0.0968***	0.0298***
	(0.00335)	(0.00375)	(0.00516)
SFLA	0.000265***	0.000205***	0.000414***
	(2.18e-06)	(2.24e-06)	(5.76e-06)
AgeFMLS	-0.00496***	-0.00554***	-0.0160***
	(9.07e-05)	(9.72e-05)	(0.000224)
renovatedR	0.129***	0.136***	0.0984***
	(0.00325)	(0.00326)	(0.00635)
Comm_Clubhouse = 1	0.0229***	0.0206***	0.0449***
	(0.00356)	(0.00423)	(0.00473)
Comm_Pool = 1	-0.00420	0.00838*	0.0614***
	(0.00382)	(0.00496)	(0.00500)
Comm_Tennis = 1	-0.0340***	0.0450***	-0.0648***
	(0.00413)	(0.00516)	(0.00582)
Comm_Playground = 1	0.0810***	0.0405***	0.0424***
	(0.00370)	(0.00386)	(0.00711)
Comm_Gated = 1	0.0814***	0.111***	-0.00634
	(0.00499)	(0.00823)	(0.00539)
median_incomeFcpi	-2.70e-06***	-2.83e-06***	-2.46e-06***
	(5.62e-08)	(5.85e-08)	(1.22e-07)
per_asianF	-0.638***	-0.415***	-0.356***
	(0.0283)	(0.0333)	(0.0420)
per_blackF	-0.377***	-0.291***	-0.363***
	(0.0138)	(0.0151)	(0.0230)
per_OtherRF	0.548***	0.712***	0.194***
	(0.0356)	(0.0395)	(0.0536)
per_hispF	-0.328***	-0.362***	-0.0359
	(0.0166)	(0.0184)	(0.0274)
prenter_ocuF	-0.227***	-0.245***	-0.0819***
	(0.0123)	(0.0140)	(0.0187)

Variables	(1) Parallel One Treatment All properties	(2) Parallel One Treatment Detached Homes	(3) Parallel One Treatment Attached Homes
pvacantF	-0.113***	-0.0928***	-0.146***
	(0.0243)	(0.0257)	(0.0434)
DtAtMilesl	-0.0334***	-0.0424***	-0.0523***
	(0.00243)	(0.00253)	(0.00540)
Constant	12.15***	12.50***	12.52***
	(0.0436)	(0.0460)	(0.0953)
Observations	68,818	50,840	17,978
R-squared	0.819	0.843	0.864
Census tracts FE	applied	applied	applied

Table A.5

Parallel Trends Test for One Treatment Group and Three Distances Treatment Groups with Lineal Year Trend Term (All Coefficients)

Variables	(1) Lineal Year One Combined Distance	(2) Lineal Year Three Distances
impact1m		-67.72***
		(13.72)
More1m_less2m		-7.526
		(5.582)
More2m_less3m		30.12***
		(5.380)
PostOpening	-0.0454***	-0.0450***
	(0.00461)	(0.00460)
Dist1_Post		-0.0781*
		(0.0405)
Dist2_Post		0.0386**
		(0.0158)
Dist3_Post		0.0481***
		(0.0159)
YEAR	0.0760***	0.0757***
	(0.000960)	(0.000959)
dist1_year		0.0335***
		(0.00682)
dist2_year		0.00371
		(0.00277)
dist3_year		-0.0150***
		(0.00267)
Total.Bedrooms	0.117***	0.116***
	(0.00195)	(0.00194)
Total.Full.Baths	0.0598***	0.0601***
	(0.00223)	(0.00223)
Total.Half.Baths	0.0280***	0.0283***
	(0.00248)	(0.00248)
HAS_FIREPLACE	0.0647***	0.0653***
	(0.00349)	(0.00348)
SFLA	0.000264***	0.000264***
	(2.26e-06)	(2.26e-06)
AgeFMLS	-0.00508***	-0.00510***
	(9.42e-05)	(9.41e-05)
renovatedR	0.135***	0.135***
	(0.00337)	(0.00337)

Variables	(1) Lineal Year One Combined Distance	(2) Lineal Year Three Distances
Comm_Clubhouse = 1	0.0194***	0.0198***
	(0.00370)	(0.00370)
Comm_Pool = 1	0.00229	0.00139
	(0.00397)	(0.00396)
Comm_Tennis = 1	-0.0369***	-0.0359***
	(0.00429)	(0.00429)
Comm_Playground = 1	0.0810***	0.0808***
	(0.00384)	(0.00384)
Comm_Gated = 1	0.0832***	0.0829***
	(0.00519)	(0.00518)
median_incomeFcpi	-7.23e-07***	-6.69e-07***
	(4.29e-08)	(4.32e-08)
per_asianF	-0.357***	-0.391***
	(0.0289)	(0.0290)
per_blackF	-0.326***	-0.327***
	(0.0143)	(0.0143)
per_OtherRF	-0.0623*	-0.0214
	(0.0349)	(0.0351)
per_hispF	-0.286***	-0.274***
	(0.0172)	(0.0173)
prenter_ocuF	-0.0997***	-0.0969***
	(0.0125)	(0.0125)
pvacantF	-0.316***	-0.332***
	(0.0249)	(0.0248)
DtAtMilesl	-0.0324***	-0.0328***
	(0.00252)	(0.00252)
dist1to3m	6.995*	
	(3.901)	
dist1to3m_post	0.0329***	
	(0.0113)	
dist1to3m_year	-0.00348*	
	(0.00194)	
Constant	-141.4***	-140.7***
	(1.932)	(1.930)
Observations	68,818	68,818
R-squared	0.804	0.805
Census tracts FE	applied	applied

Table A.6

Three-Way Interaction with Attached Homes (Towncondo) for One Treatment Group and Three Distance Treatment Groups with Lineal Year Trend Term (All Coefficients)

Variables	(1) 3-Way One Combined Distance	(2) 3-Way Three Distances
dist1		-0.294***
		(0.0733)
dist2		0.0377**
		(0.0172)
dist3		0.0883***
		(0.00999)
PostOpening	0.221***	0.204***
	(0.00314)	(0.00345)
Dist1_Post		0.346***
		(0.104)
Dist2_Post		-0.0413**
		(0.0206)
Dist3_Post		-0.145***
		(0.0117)
TownCondo	-0.301***	-0.335***
	(0.00485)	(0.00571)
dist1_towncondo		0.0634
		(0.0737)
dist2_towncondo		-0.0379**
		(0.0167)
dist3_towncondo		-0.207***
		(0.0135)
post_towncondo		0.0787***
		(0.00656)
dist1_post_towncondo		-0.335***
		(0.107)
dist2_post_towncondo		0.0455*
		(0.0236)
dist3_post_towncondo		0.199***
		(0.0187)
Total.Bedrooms	0.0560***	0.0564***
	(0.00214)	(0.00214)
Total.Full.Baths	0.101***	0.102***
	(0.00232)	(0.00232)
Total.Half.Baths	0.0711***	0.0722***
	(0.00257)	(0.00256)

Variables	(1) 3-Way One Combined Distance	(2) 3-Way Three Distances
HAS_FIREPLACE	0.0735***	0.0750***
	(0.00352)	(0.00352)
SFLA	0.000218***	0.000218***
	(2.38e-06)	(2.38e-06)
AgeFMLS	-0.00647***	-0.00642***
	(9.91e-05)	(9.89e-05)
renovatedR	0.146***	0.146***
	(0.00341)	(0.00340)
Comm_Clubhouse = 1	0.0413***	0.0401***
	(0.00375)	(0.00375)
Comm_Pool = 1	0.0519***	0.0504***
	(0.00406)	(0.00405)
Comm_Tennis = 1	-0.0581***	-0.0587***
	(0.00435)	(0.00434)
Comm_Playground = 1	0.0500***	0.0524***
	(0.00391)	(0.00390)
Comm_Gated = 1	0.117***	0.118***
	(0.00526)	(0.00526)
median_incomeFcpi	1.06e-06***	1.11e-06***
	(3.80e-08)	(3.82e-08)
per_asianF	-0.0864***	-0.0844***
	(0.0290)	(0.0291)
per_blackF	-0.238***	-0.241***
	(0.0145)	(0.0145)
per_OtherRF	-0.559***	-0.522***
	(0.0347)	(0.0348)
per_hispF	-0.187***	-0.171***
	(0.0174)	(0.0174)
prenter_ocuF	0.0221*	0.0126
	(0.0126)	(0.0126)
pvacantF	-0.508***	-0.498***
	(0.0251)	(0.0250)
DtAtMilesl	-0.0503***	-0.0498***
	(0.00256)	(0.00256)
dist1to3m	0.0774***	
	(0.00951)	
dist1to3m_post	-0.132***	
	(0.0102)	
dist1to3m_towncondo	-0.167***	
	(0.00991)	
dist1to3m_post_towncondo	0.210***	
	(0.0125)	
Constant	12.12***	12.11***

Variables	(1) 3-Way One Combined Distance	(2) 3-Way Three Distances
	(0.0460)	(0.0459)
Observations	68,818	68,818
R-squared	0.800	0.801
Census tracts FE	applied	applied