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Analysis of the Economic Impact of Constructing a NBA Arena on the Host City

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Abstract

Using economic data collected from 24 different Metropolitan Statistical Areas in the US, this thesis investigates the impact of constructing a new National Basketball Association (NBA) arena on the host city's economy. When a simplistic model is implemented, which does not control for other economic factors or individual subject heterogeneity, significantly positive economic impacts of arena construction are observed. However, when a more appropriate model specification is implemented that controls for economic activity and individual heterogeneity, these effects are no longer statistically significant. This comparative analysis ultimately highlights the importance of appropriate model specification and supports the conclusion that new NBA arenas, by themselves, are not significant catalysts of urban economic development.

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I. Introduction

Over the course of the past century professional sports have become an increasingly popular and appreciated component of American society. As America's major urban centers have grown and developed, and as the number of franchises in professional sports leagues has increased, more and more cities have been successful in becoming a host for a professional team. Hosting a professional franchise offers many potential benefits to a city – national recognition as a "premiere city", increased tourism from fans traveling to attend games, and most importantly, increased economic activity in the metropolitan area. Less often considered though is the enormous cost required to recruit a major sports teams to a city. This cost arises most notably from the need to construct a major-league caliber stadium, which is a massive project that requires years of labor and hundreds of millions of dollars. The issue of concern is that, in recent years, more and more of these new stadiums have been fully or at least partially funded by local municipal governments using taxpayer money. The fact that public funds are being used to finance this construction begs the question – is building a professional sports stadium really worth it for the surrounding community? Do the projected economic benefits for a city generated from constructing a new professional stadium justify the project's enormous cost? In the hopes of answering this essential question, this thesis undertakes an empirical analysis of the economic conditions in twenty-four American cities which presently host an NBA franchise and have constructed a new arena since 1990, in order to investigate the economic impact of the new arena on the surrounding metropolitan area.

In the United States, there are four leagues which dominate the professional sports market: Major League Baseball (MLB), the National Football League (NFL), the National

Hockey League (NHL), and the National Basketball Association (NBA). Economic research focused on these "Big Four" professional sports leagues is justified by the fact that these franchises have developed into large-scale, revenue generating, American businesses. In 2016 the North American sports market size; comprised of ticket revenues, media rights contracts, sponsorships and merchandising; totaled to $67.3 billion, and is projected to increase to $78.5 billion by 2021 (PwC. (n.d.)). Currently these four major leagues are made up of 123 teams which inhabit 42 cities across United States. This high concentration of teams in a relatively small number of locations leaves many cities across the US without a professional sports franchise, even though they may have suitable economic conditions and the existing sports infrastructure to support one.

This low supply of professional franchises is, however, an intentional decision made by the owners of the professional sports leagues. The leagues strive to have fewer teams than the number of suitable cities, keeping the supply of professional franchises well below the demand, in order to create competition amongst cities (Siegfried & Zimbalist, 2000). This competition sets off a bidding war between cities as to which one is willing to provide the most financial support so as to attract a professional franchise, most commonly in the form of subsidies to support the construction of a new stadium. In many ways, the leagues' control over the location of professional teams is a form of monopoly power. The team owners hold the majority of the bargaining power during negotiations, which in turn enables these franchises to extract a larger financial subsidy from a community than they would have if the market was perfectly competitive (Siegfried & Zimbalist, 2000).

The practice of funding professional sports stadium constructions with public money is relatively new. In fact, before 1953, most every professional sports stadium that

was constructed was paid for exclusively by private spending (Siegfried & Zimbalist, 2000). This was due in large part to the fact that stadiums back then were more modest, and simply did not cost as much to construct. However, as the professional sports leagues expanded in the second half of the twentieth century, spending on new stadiums skyrocketed and so too did the proportion of public money used to fund the construction.

The most common argument made by team owners when advocating for the construction of a new stadium for their team is that the current stadium is "inadequate". This inadequacy commonly does not pertain to the stadium's seating capacity, structural integrity, or sightlines to the action, but rather to the fact that the stadium's luxury amenities are outdated. These amenities include luxury boxes, club seats, and other opportunities to generate substantial cash flow from the high-income fans. In other words, "although the existing facilities are not physically obsolete, they are economically obsolete" (Siegfried & Zimbalist, 2000). These same concerns were voiced by the (formerly) San Diego Chargers owner, Dean Spanos, who had been seeking a deal with the city of San Diego to build a new stadium for the past fifteen years. San Diego, however, was not willing to offer public funds to aide in the construction effort. In a November 2016 referendum, 56% of voters rejected a proposal to fund the $1.8 billion stadium by raising taxes on local hotels (Schrotenboer, 2017). Without the financial support of the city, Spanos exercised the NFL's monopoly power and announced that he was moving the Chargers to play in Los Angeles. This example illustrates how much bargaining power the owners of professional sports franchises have in negotiations with municipalities, and the result is that franchises are able to select their host city based on wherever they receive the most financial support.

For much of the twentieth century, the professional sports landscape was dominated by two of the major leagues: the NFL and the MLB. These two leagues have been the most popular amongst fans for many years, and for a long time the conversation about the costs and benefits of stadium construction was centered around building baseball and football stadiums. The issue with applying academic research on the economic impact of baseball and football stadium constructions to the rest of the pro leagues is that the types of venues used for the NBA and NHL are inherently different, and these arenas could potentially have a drastically different economic impact. For one, it costs a lot more to build an NFL or MLB stadium than it does to build an NBA or NHL arena. Since the year 2000, the average stadium construction cost in the NFL was $777.5 million, and in the MLB the average cost was $683.6 million. Conversely, NBA arena construction costs since 2000 have been, on average, $426.6 million (Brookings Institution, (n.d.)). The design of these arenas is flexible enough so that in many cases, NBA and NHL franchises hosted in the same city will often share tenancy of the same arena. Additionally, due to the fact that for the most part NFL and MLB stadiums are outdoors, these stadiums cannot be used year-round to generate economic benefits for the city. NBA arenas are indoors, they are cheaper to build, and can be utilized year-round by non-professional sports events such as concerts, tradeshows, and conventions. Thus, an investigation into the economic impact of constructing an NBA arena offers the best opportunity for observing positive economic development in a host city.

In my analysis, I employ a fixed effects regression model in order to investigate the impact of constructing a new NBA arena on the surrounding economy, specifically the effect on per capita personal income. The model I employ controls for other outstanding

economic factors, including unemployment, new private housing units built, and the number of construction employees. I will contrast the results of this fixed effects model with a more naive pooled regression, which does not control for other economic variables or individual heterogeneity.

The motivation for undertaking such a comparative analysis is that the less sophisticated econometric model, even though it is not appropriate given the structure of the balanced panel data set, produces statistically significant positive results – suggesting that constructing a new stadium is significantly beneficial to the surrounding economy. These kinds of analyses may be cherry-picked by biased researchers attempting to justify a new stadium construction. However, my analysis demonstrates that when a more appropriate model is employed which controls for relevant economic factors, the economic impact of arena constructions is no longer statistically significant, and the impact trend on personal income is in fact negative. This analysis ultimately emphasizes the importance of utilizing the appropriate econometric specification, controlling for outstanding economic factors and individual observation heterogeneity, so as not to arrive at misleading conclusions about the impact of a newly constructed professional sports arena.

II. Literature Review

The 1980s and early 1990s in the United States ushered in an unprecedented boom in professional sports stadium construction, and the ripple effect in academia was a wave of economic research in the late 1990s that was focused exclusively on the urban economic impact of this construction. One of the first of such studies was carried out by Robert Baade, who compared the local economic performance of cities with and without stadiums. Baade's model controlled for other variables that affect local economic conditions, and his

results found no significant difference in personal income growth from 1958 to 1987 (Baade, 1994). In his research, Baade ultimately came to the conclusion that "The idea that sports are a catalyst for economic development just doesn't hold water." (Wolla, 2017). Other studies undertaken during this period also found that higher high school graduation rates and more spending on police are what encouraged economic growth, while the presence of a major league sports team actually put a drag on the local economy (Walden, 1997). Further research conducted in this area found mixed results between individual cities, some positive while others negative, but found the net effect of new sports stadiums to be near zero (Santo, 2005). By the early 2000s, the majority of these studies came to the conclusion that there was no statistically significant positive correlation between sports facility construction and economic development (Siegfried & Zimbalist, 2000).

These academic studies, however, stand in direct contrast to many of the promotional studies carried out by consulting firms under the hire of sports leagues which supported facility development based on the projected economic benefits. The proponents often claim that subsidizing sports stadiums is justified because of the economic impact it will have on the community. Firstly, the construction of a stadium is a massive project which requires years of intensive labor. Some analysts have compared the modern sports stadium construction to the construction of cathedrals in the Middle Ages in their attempt to dominate the skyline and inspire civic pride. This surge of construction generates jobs in the surrounding community, which lowers unemployment and increases personal income. For example, the proposed stadium for the Los Angeles Rams and the Chargers in Inglewood, California, was predicted to cost $3 billion and add 22,000 construction jobs to the economy of Los Angeles (Wolla, 2017).

Even though the jobs created during a stadium's construction are only short-term, once the games begin, so too does the consumer spending. For example, over the course of the 2015 baseball season, the St. Louis Cardinals attracted more than 3.5 million fans to their games at Busch Stadium (the second-highest home game attendance in Major League Baseball that year) (Wolla, 2017). In addition to the revenue generated from ticket sales, fans who attended these games also paid for parking, ate in restaurants, and purchased food and drink at the ballpark. The combination of all of that economic activity generated increased revenue and created more jobs in the surrounding community. As each of those restaurant and stadium workers benefited from increased income, they too spent more of their wealth in the city as the money circulated again through the economy. Economists refer to this concept as the multiplier effect, whereby one dollar of spending creates more than one dollar in economic activity. Analysts have estimated the multiplied economic impact of those millions of people who attended St. Louis Cardinals home games in 2015 was $343.9 million (Wolla, 2017).

Furthermore, a potential new stadium also comes with the promise of new development taking root nearby, in the form of new restaurants and bars as well as condominiums and office space. As interest in the area grows, the value of existing commercial and residential property is likely to improve. Similarly, a new stadium can serve as one aspect of a larger economic-development initiative by choosing to build in a blighted or underdeveloped area in the hopes that the new economic activity and increased foot traffic will lead to a revitalization of that area (Wolla, 2017).

Finally, the most common argument made by proponents of new stadium construction is that professional sports and new stadiums help to inspire civic pride. A

flashy new stadium can serve as a beneficial marketing tool for the city's image, as people around the country watch games televised from the new stadium. As professional sports continue to rise in popularity, many believe that the presence of a professional team is a sort of status symbol that is essential in order to be considered a first-tier city.

In spite of all of these theoretical economic arguments, economists in general are opposed to the idea of using public money to subsidize professional sports stadiums. In a 2017 poll, 83 percent of the economists surveyed agreed that "Providing state and local subsidies to build stadiums for professional sports teams is likely to cost the relevant taxpayers more than any local economic benefits that are generated." (Wolla, 2017). The consensus in academia is that the promotional studies, being prospective rather than retrospective, have adopted a number of unrealistic assumptions which have led them to fail to consider important components of urban economic analysis.

The first economic principle that these promotional studies fail to incorporate is most commonly referred to as the substitution effect. Based on the assumption that the vast majority of consumers have a relatively inflexible leisure consumption budget, in the presence of a sports team or a team with a new stadium, the money one spends taking the family to a game is typically money that is not spent at other local entertainment attractions (Siegfried & Zimbalist, 2000). This substitution of consumption renders the net effect on spending in the metropolitan area to near zero. Therefore, a new stadium may rearrange economic activity in an urban area, but it is not likely to add much to it.

The promotional studies also are problematic in that ignore the fact that if a local government were to provide a large-scale subsidy to a sports team, that government would be less effective in continuing urban development as a result of its budgetary constraints

(Siegfried & Zimbalist, 2000). Thus, the second economic principle that the promoters of new stadiums ultimately fail to accurately incorporate into their analyses are the opportunity costs: the opportunities for economic development that are given up by deciding to construct a new stadium. For example, taxpayer money that is used to fund a new stadium could instead be spent on essential infrastructure such as roads, airports or schools, which may in fact produce greater economic development in a city than a stadium. When the substitution effect and opportunity costs are taken into account, as they have been in the retrospective academic research studies, the net economic impact of a new sports stadium has generally been found to be not significantly positive (Santo, 2005), and in some cases even negative (Baade, 1994).

As academic research in this field progressed through the first decade of the twenty-first century, more nuanced approaches emerged, and the results of these studies were less consistently opposed to the prospect of constructing new sports stadiums. One such study, undertaken by Geoffrey Propheter in 2012, extended the traditional model used by past researchers (Baade, 1994 & Santo, 2005) to data ranging through the year 2009. The results of Propheter's study for the most part aligned with past research in that the broad level effects of arena construction were found to be negative. However, Propheter's analysis offered a new line of insight into this discussion. His results showed that in the cities where basketball is the only major league sports team, more of a positive economic impact was experienced. In multi-sport cities, however, the trend was more negative (Propheter, 2012). The implication of these findings is that the citizens living in a single-sport city derive a greater benefit from new arena construction, and thus may attend more events at the arena and generate more revenue for the city than would citizens living in multi-sport cities.

A particularly illustrative example of Propheter's conclusions can be seen in the city of Sacramento, home to the Kings and the newly constructed Golden 1 Center. The Kings are the only professional franchise that resides in Sacramento. Since the new arena was unveiled at the start of the 2016 NBA season, new economic-impact reports suggest that the city of Sacramento has already started experiencing great economic benefits as a result. According to a recent analysis by the Downtown Sacramento Partnership (DSP), in just its first year the arena hosted 1.6 million guests, who spent more than $71 million downtown while attending events. Since construction of the arena began, employment in downtown Sacramento has grown by 38 percent (Sisson, 2018). The new arena has helped boost pedestrian traffic in the immediate area by 10 percent and has contributed $3.5 million to the region's farm and food providers by exclusively sourcing vendors within 150 miles of the stadium. Additionally, the arena has set off a wave of construction projects in the Downtown Commons (DoCo) which have amounted to nearly $2 billion in urban investments since 2015. New apartments have multiplied downtown: 235 units are complete, 1,862 are under construction, and an incredible 17,627 are in some stage of planning. These new apartments have generated $200 million in property sales in the year 2017 alone, making Sacramento one of America's most attractive real-estate markets (Sisson, 2018).

Robert Wassmer, a local economist who runs the urban land development program at Sacramento State University, has publicly praised the Kings for their development efforts in the downtown area. Wassmer says about the construction of Golden 1 Center, "This was smart-growth urbanism. You want to build downtown and force visitors to interact with the urban core. The plaza was moribund before [the Kings] came. Now

visitors are stopping at restaurants and bringing their dollars into the community." (Sisson, 2018). However, it is important to realize that Sacramento's economic success in recent years was not solely the result of building a new basketball arena. Golden 1 Center was just one part of a broader plan for Sacramento's urban redevelopment. Investment in the city's medical industry, from key players such as Kaiser Permanente, brought in the jobs that became early catalysts in driving more interest downtown (Sisson, 2018). Additionally, more and more residents are flocking to the Sacramento area in search of lower costs of living, relative to other California cities like San Francisco. So even though the Golden 1 Center may have acted as a catalyst for city growth, it was far from the only catalyst.

A particularly influential academic study undertaken by Arthur Nelson supports this notion that overall downtown redevelopment in combination with a new professional sports stadium plays an important role in realizing positive economic returns. Nelson hypothesized that new stadiums constructed as a part of the city's central business district (CBD) would have a more positive economic impact because fans attending the game would have greater access to patronize other businesses also located in the CBD. Conversely, stadiums located farther away from the CBD are less accessible to pedestrians, and have less accessible shopping and restaurant opportunities, and therefore are less integrated with their surrounding area, theoretically leading to lower levels of economic impact. The results of this study revealed that the stadiums located within a city's CBD demonstrated a positive (though insignificant) correlation with the city's share of regional income, whereas stadiums located farther away from the CBD were significantly negatively correlated (Nelson, 2001). The ultimate takeaway from Nelson's research is that

the location of a newly constructed sports stadium is essential in determining its economic impact, and that stadiums that are well integrated within a city's central district are more likely to generate positive returns. In the case of Sacramento, the Golden 1 Center was constructed directly in the city center and is just one aspect of the city's broad redevelopment effort, which may be one of the reasons why its positive impact is already so apparent.

While much of the academic research conducted around the topic of the economic impact of professional sports stadiums has focused on the arrival of franchises and new stadium construction, important lessons can also be learned when a franchise departs their host city. In 2017, economists Humphreys and Nowak undertook an analysis of the trends in nearby residential property values in two cities, Seattle and Charlotte, in the years directly following the departure of their respective NBA franchises. Both arenas continued to operate after the teams left, so these departures represented a natural experiment to identify the net effects of a sports team separately from the effect of a facility and other events that take place in the facility. Results from the researchers' repeat sales regression model and hedonic price model indicated that the departure of the teams was associated with excess appreciation of condo prices near Key Arena (Seattle) and single-family home prices near Charlotte Arena (Humphreys & Nowak, 2017). These results show that the presence of a professional team actually generated disamenity effects in these local economies, perhaps reflecting the negative impact of traffic, trash, crime, crowds, or other negative aspects associated with professional sports events (Humphreys & Nowak, 2017).

The conclusions put forth in Humphreys and Nowak's analysis suggest that much can be learned about a metropolitan area's economic development by attending to changes

in the private housing market. While Humphreys and Nowak specifically focused on changes in the price of existing housing units, I also think it is imperative to pay attention to changes in the supply of housing – or the number of new private housing units being constructed. Economists typically quantify the impact of new housing in terms of jobs, spending, and tax revenue created. For new houses, these effects are typically experienced in two phases: when the housing is constructed, and during occupancy (Adams & Barber, 2011). During construction, new housing units produce increased employment among the local construction companies and firms affiliated with the project. Similar to the multiplier effect discussed earlier, as more construction workers earn wages and raise their level of personal income, they are able to spend more money buying groceries and other consumer goods in the surrounding community. Once the housing unit is constructed, families are able to move in and bring their additional consumption spending to the metropolitan area (Adams & Barber, 2011). Therefore, new house construction in a city has the potential to be a significant driver of economic growth.

In reviewing the existing relevant literature, it is clear that the general consensus in academia is that the economic impact on a city of a major league sports stadium construction is generally negative, or at least not significantly positive. Even if a new stadium does generate a positive impact in the surrounding area, when the opportunity costs and substitution effects are taken into account, the net economic impact is near zero. However, much of the analysis centered around this question is outdated, as it has mostly been focused on construction projects that occurred during the 20th century (Baade, 1994). The analyses that have been conducted in the last fifteen years have produced much less conclusively negative results (Propheter, 2012; Nelson, 2001) For stadiums located within

a city's central business district, or in cities that only have one professional sports team, the impact of constructing a new arena has been shown to be more positive. Additionally, not enough attention has been paid to specifically NBA arenas, which are less expensive to build and can be utilized to generate economic benefits for a greater portion of the calendar year.

In light of this apparent gap in the academic research, my thesis specifically investigates the economic trends associated with NBA stadium constructions using the most up to date available data (through the year 2017). Inspired by the work of Geoffrey Propheter, I apply a fixed effects econometric model to the most current economic data in order to investigate whether or not the most recent wave of NBA arena constructions have produced a significant economic impact. Like Propheter, my model will also control for relevant economic measures. Further, in a subsequent specification, I will also extend this model to investigate how the NBA franchise's performance could drive the results.

III. Data

In my analysis of the economic impact of building a new NBA arena, I investigate the 24 different arena construction projects that have occurred between the years 1990 and 2017 in the United States, which are home to 25 different NBA franchises (the Lakers and Clippers both play home games at Staples Center in Los Angeles). Arenas for three NBA franchises (the Bucks, Knicks, and Wizards) were excluded from the data set because they were constructed in the years before 1990, and a comprehensive set of economic data is unavailable before 1990. Capital One Arena, home to the Washington Wizards, was also excluded because Washington D.C. is an exceptionally large metropolitan area. Unlike the other cities considered in this analysis, Washington D.C. is an area subject to its own sphere

of economic factors, in large part due to the Federal government's presence there. Past research in this field has set the precedent of excluding this area from their analysis for this reason (Propheter, 2012). Finally, the Air Canada Centre, home to the Toronto Raptors, was also excluded from the analysis because it is located outside of the United States. See Table A.1 (Appendix) for a comprehensive list of the professional arenas used in this analysis, and their associated NBA team and cost of construction.

Each stadium included in the analysis is located in a major American city. They are each a part of a Metropolitan Statistical Area (MSA), which is defined by the US Census Bureau as a geographic area of high population density, with significant overlap of economic activity between cities and, in some cases, counties. Metropolitan Statistical Areas provide the best geographic base for analyzing the economic impact of a new arena for multiple reasons. First and foremost, fans of the franchise do not only reside within the city limits. Rather they inhabit a wide-ranging area around the city center, and many fans travel long distances to attend games. This suggests that a new stadium construction would impact much of the area surrounding the city. However, the further away from the stadium, the less likely there is to be an economic impact. Investigating data at the MSA level offers a balance between capturing a professional franchise's far reaching fan base support and measuring realistic economic impacts. MSA's are also attractive because they allow the analysis to capture not only the direct, but also the indirect expenditures that result from the presence of a new stadium. Lastly, individuals who gain employment as a result of a new stadium come not only from the city hosting the stadium, but from the surrounding communities as well. This fact makes MSA's the appropriate level at which to investigate measures of employment and personal income.

In my research, I have collected a balanced panel data set of the relevant economic data for the years 1990-2017 for the 24 MSAs included in my analysis. Such data measures for each year include: per capita personal income (PCPI), the unemployment rate, new private housing units authorized for construction, an economic conditions index, and the number of employees working in the construction industry. The economic data for each MSA was collected from the FRED (Federal Reserve Bank of St. Louis) online database. In order to code for when a franchise constructed a new arena, I implement a dummy variable that equals 0 in all years before the new stadium opened and equals 1 for the year of construction and all years thereafter. If an arena has been renovated since its initial construction, I also include two other dummy variables (renovation and update) to record the subsequent renovations event taking place. A dummy variable is also included to signify if the NBA franchise shares tenancy of the arena with another professional sports franchise. The data set also includes measures of the NBA team's performance as measured by their regular season win percentage, and two binary variables signifying a playoff berth and a championship. Additionally, I have included a binary time variable to control for the effects of the 2008 recession. The effects of this financial crisis were so influential and widespread that it would be impossible to ignore its impact in any economic analysis of the early twenty-first century.

In addition, the same economic measures of PCPI, unemployment, new houses and construction workers were collected for the state in which the NBA arena resides. The rationale for collecting economic data at the state level is that each state has a distinct set of laws, taxes, and regulations which may drastically shape the impact that a new arena may have on the surrounding MSA. State level data is incorporated into the analysis in

order to control for these individual differences between states. This controlling process is facilitated by the use of ratios (as in Propheter, 2012). In my analysis, each economic variable is expressed as the ratio of the MSA to State level data. Thus, when the ratio is greater than 1 in the case of PCPI, it suggests that the citizens living within the MSA generally have a relatively higher personal income than the state average. In the case of unemployment, a ratio of less than 1 suggests that rates of unemployment in the MSA are less than in the rest of the state.

In my regressions, the main dependent variable of interest is the ratio of the MSA's level of per capita personal income divided by the state's. In past research where this variable has been employed, it is commonly referred to as the MSA's regional share of PCPI (Propheter, 2012).

Unfortunately, as is the problem in most research in this field, variables that measure economic development are usually subject to simultaneity bias. In other words, the rate of unemployment likely affects per capita income and vice versa. In order to resolve this potential simultaneity issue, I lag the economic control variables (unemployment, construction workers, and new housing units) by 1 index year. These lagged economic ratio measures will be used as control variables in my analysis.

Table 1 below displays average measures of the major economic variables – per capita personal income, unemployment, and new houses built – collected for each of the 24 MSAs included in this analysis. In addition to the average over the total period (1990-2017), the table presents measures for the periods before and after each city's respective arena construction was completed.

Table 1. Average Economic Variable Measures for each MSA: Before Construction (BC), After Construction (AC), and for the Total Period 1990-2017

City	Average Personal Income per Capita ($)			Average Unemployment (%)			Average New Houses Built (thousands)		
	BC	AC	Total Period	BC	AC	Total Period	BC	AC	Total Period
*Detroit, MI	34,320	n/a	34,320	7.40	n/a	7.30	1,048	n/a	1,040
Sacramento, CA	36,079	51,370	34,438	6.81	4.90	6.67	888	688	874
Brooklyn, NY	40,370	62,351	44,440	6.38	6.27	6.35	3,169	3,969	3,341
Orlando, FL	26,329	36,459	28,956	5.03	6.99	5.59	1,738	1,213	1,588
Charlotte, NC	25,951	42,162	33,156	4.48	7.22	5.75	1,410	1,290	1,354
Memphis, TN	25,264	38,185	31,485	4.96	7.06	6.01	678	424	551
Houston, TX	26,660	45,595	36,478	5.61	5.89	5.76	2,342	4,075	3,271
San Antonio, TX	21,472	36,018	29,553	4.81	5.28	5.08	642	921	802
Oklahoma City, OK	21,679	38,273	30,898	3.98	4.52	4.29	375	517	456
Dallas, TX	25,859	41,845	35,332	4.75	5.62	5.28	2,908	3,614	3,337
New Orleans, LA	21,020	38,138	32,432	7.52	5.93	6.44	284	323	310
Miami, FL	25,634	41,841	36,439	7.22	5.89	6.32	1,788	1,687	1,719
Los Angeles, CA	24,647	42,884	36,805	7.30	6.92	7.04	1,775	2,112	2,004
Indianapolis, IN	24,055	39,411	34,292	3.77	5.37	4.85	967	870	901
Denver, CO	26,379	45,121	38,874	4.08	5.16	4.81	1,173	1,376	1,311
Atlanta, GA	24,562	39,186	34,311	4.67	6.01	5.58	3,314	3,409	3,378
Philadelphia, PA	24,355	43,554	39,288	6.40	5.66	5.82	1,355	1,228	1,255
Portland, OR	21,765	37,089	34,251	5.34	6.19	6.04	1,119	1,099	1,103
Boston, MA	26,491	50,350	45,932	6.74	4.70	5.06	664	848	815
Cleveland, OH	22,282	36,200	34,138	6.33	5.26	5.41	545	424	441
Chicago, IL	23,771	40,645	38,145	7.38	6.43	6.56	2,566	2,503	2,512
Phoenix, AZ	18,883	31,538	30,600	4.80	5.15	5.12	1,170	2,769	2,655
Salt Lake City, UT	16,312	30,602	30,072	3.90	4.19	4.18	308	625	614
**Minneapolis, MN	n/a	39,016	39,016	n/a	4.16	4.16	n/a	1,339	1,339
Total Averages	25,397	41,210	35,152	5.64	5.68	5.64	1,401	1,623	1540

Note: BC= Avg. in years before arena construction, AC = Avg. in years after construction
Note: See table A.1 (Appendix) for the name of the MSA that corresponds with each City
*Little Caesar's Arena (Detroit) opened in 2017, thus Avg. measures AC are not applicable
**Target Center (Minneapolis) opened in 1990, thus Avg. measures BC are not applicable

In broadly examining this raw data, it is clear that over the course of the examined period per capita personal incomes generally increased. The average PCPI in the years after construction for all MSAs is nearly fifteen thousand dollars larger than it was for the period before construction. Also evident from the data is that the average number of new homes built in the MSA generally increased for the period after arena constructions. While this is

not true for every MSA included in the analysis, the average value for all 24 MSAs combined does increase. However, it is difficult to say whether or not these increased measures of personal income and new houses are the direct result of the NBA arena constructions, or whether they have more to do with the general trend of economic growth that occurs over time. In order to determine whether the impact of a new arena construction does have a significant impact on the surrounding economy, an econometric model needs to be employed which controls for other outstanding economic conditions over time.

IV. Empirical Strategy and Results

The overarching empirical strategy of this analysis will be to compare the results from a series of three regressions. The first regression is an intentionally unsophisticated model, whose purpose is to demonstrate the misleading conclusions one can come to if they do not apply the appropriate model specifications. Even though this naive model produces significant results, it fails to control for other essential economic factors, as well as individual heterogeneity between observations.

The second and third regressions employed are fixed-effects models, which more appropriately fit the requirements of the balanced panel data set. The second regression controls for outstanding economic factors, and the third regression additionally controls for the NBA franchise's performance. This analysis contrasts the results of the naive regression with the other two models, ultimately emphasizing the importance of econometric controls and model specification when drawing conclusions about the catalysts of urban development.

The first regression used in the analysis will be a simple pooled regression, estimated by Ordinary Least Squares (OLS):

$$Y_{it} = \alpha + X'_{it}\beta + \epsilon_{it} \quad .$$

In this model the dependent variable, Y_{it}, is the MSA's regional share of per capita personal income. The independent variables, represented as X'_{it} in the above model, include a series of dummy variables used to signify the time at which a new NBA arena was constructed, renovated, and updated (a second renovation). The only control variable included in this analysis is a binary indicator of the 2008 recession. The β term represents the parameters for each of these dummy variables. Finally, the ϵ term in this model represents the residual error term.

The results of this simplistic, pooled regression are displayed in Table 2. The most important implication of these results is the significantly positive coefficient associated with the "New Arena" variable. This result suggests that when a new arena is constructed in a major city, the surrounding MSA benefits from a 3% increase in per capita personal income, relative to the state average level. This positive impact suggests that the construction of a new arena generates significantly greater levels of economic activity in the metropolitan area.

Table 2. OLS Pooled Regression on Per Capita Personal Income ratio (MSA/State)

Variables	Coefficient	(Standard Error)
New Arena	.030478	(.006176)***
Renovation	.020853	(.008878)***
Update	-.022024	(.014966)
Recession	-.035654	(.007035)***
Constant	1.072592	(.004345)

R-square = 0.0618

Additionally, stadium renovations had a significantly positive impact on the MSA's economy, suggesting that improvements made to stadiums also generate increased economic activity. As expected, the coefficient associated with the recession indicator

variable was significantly negative. Considering just these results, an individual could ultimately conclude that NBA arenas constructed since 1990, overall, have had a significantly positive impact on their respective metropolitan economies. This sort of analysis could be handpicked by consulting agencies tasked with promoting new stadium construction in the future.

Drawing these sorts of economic conclusions, however, is inappropriate given the constraints of the above model. One major flaw of this pooled regression is that is fails to consider other economic control variables into its analysis. Surely measures of personal income are impacted by other economic factors. Failing to incorporate measures such as the metropolitan area's rate of unemployment and number of new houses constructed leaves this model subject to omitted variable bias. The other major flaw of the model is its failure to control for individual heterogeneity of the 24 observations followed from 1990-2017. Therefore, in order to come to more realistic conclusions about the impact of new NBA arena constructions, a more statistically appropriate methodology is necessary.

To construct a more appropriate model, I employ the fixed effects methodology. This methodology is more appropriate for this data set because its structure controls for individual observation heterogeneity. Additionally, this model specification adopts the assumption of heteroscedasticity and allows for clustered standard errors, in order to control for potential issues of within MSA autocorrelation. The model is displayed as:

$$\boldsymbol{Y_{it} = X'_{i,t-1}\beta_1 + W'_{it}\beta_2 + \alpha_i + \epsilon_{it}} \quad .$$

In this model, the main variable of interest, $\boldsymbol{Y_{it}}$, remains the MSA's regional share of PCPI. The first vector of independent variables, $\boldsymbol{X'_{i,t-1}}$, represents a series of lagged, economic control variables for each MSA. These economic control variables include ratio

measures (MSA/State) of unemployment, construction employees, an economic index measure, new private housing units authorized for construction, and a recession indicator. The parameter for each of these terms is represented as $\boldsymbol{\beta_1}$. Further, in this model $\boldsymbol{W'_{it}}$ represents a series of time indicator variables, which represent the years when a new arena was constructed, renovated, or updated. Also included in this vector are variables indicating whether or not the arena has another professional team acting as a cotenant. Additionally, indicator variables representing the novelty of the new stadium (0 for all years, except for when stadium is constructed), and the short-term impact (0 for all years, except for the 5 years after construction) are included. The variable $\boldsymbol{\alpha_i}$ represents the fixed effects in the model, and $\boldsymbol{\epsilon_{it}}$ is the error term. The model is estimated by OLS, and the results are presented in Table 3.

The results of this more sophisticated fixed-effects model have a number of important implications. First and foremost, when a model which controls for lagged economic factors is employed, the significance of the impact of a new arena disappears. Where before in the simple regression the results displayed a significantly positive impact of new stadium construction, this more sophisticated model tells a much different story. In fact, the trend direction of the new arena variable coefficient is negative, suggesting that stadiums generally have a negative impact on the surrounding economy. The variable signifying an arena renovation also loses its statistical significance in this second specification. The only arena variable that does carry statistical significance in this model is the indicator representing an arena update – when a stadium is renovated for a second time. The trend of this variable though is negative, suggesting that subsequent improvements to an arena generate negative effects for the surrounding MSA economy.

Overall, these results align with past academic research in that they find the net economic impact of building a new arena to be near zero.

Table 3. Fixed Effects Regression on Per Capita Personal Income ratio (MSA/State)

Variables	Coefficient	(Clustered Robust Standard Error)
New Arena	-.003728	(.005432)
Renovation	.002409	(.005823)
Update	-.015579	(.00884)*
Unemployment	-.047355	(.025212)*
New Private Houses	.078196	(.026458)***
Construction Employees	.0053703	(.003906)
Economic Conditions Index	-.0004602	(.000499)
Recession Indicator	-.014255	(.004733)***
Arena Cotenant	.00894	(.005351)
Novelty Effect	-.004671	(.004082)
5 Years after Construction	.0000952	(.006733)
Constant	1.095845	(.023079)***

R-square overall = 0.1247

Important implications can also be drawn from this model in reference to the vector of economic control variables implemented. The trends of the lagged control variables, for the most part, align with expectations, but these results ultimately shed light on what really drives urban economic development. For one, the results show that the lagged unemployment rate has a statistically significant negative relationship with per capita personal income. This relationship suggests that when unemployment rates decrease within a metropolitan area, and more citizens are earning wages, in time the overall level of personal income increases. Secondly, the number of new private housing units authorized for construction has a statistically significant relationship with personal income, suggesting that when more houses are built within a city, incomes generally increase. These results align with economist's general understanding of how new private housing units can serve as a driver of urban development (Adams & Barber, 2011). The recession indicator variable

also had a significantly negative relationship with personal income, as expected. The trend of the ratio of construction employees in the MSA relative to the state did not carry statistical significance, however it was positive.

Other important implications of this model include the fact that the indicator variable signifying the years when the NBA franchise shared tenancy of the arena with another professional sports franchise was positively related, though insignificantly, with MSA personal income. Even though the trend is statistically insignificant, the result aligns with the expectation that an arena that is utilized more often by professional teams will generate more of a positive impact on the local economy. Also of note is the negative coefficient associated with the novelty indicator variable, which equaled 0 in all years except for the year the NBA arena was constructed. This coefficient is not statistically significant, but the negative trend suggests that any positive economic impact of the construction was not experienced in the first year that the arena was built. However, when considering the short term (5 year) impact of the construction, the trend of the coefficient does become slightly positive. This 5-year impact variable suggests that arena constructions are positively related with levels of personal income, but it does take a few years for the positive impacts to manifest.

In order to further extend this analysis, I also constructed a third model specification in the hopes of investigating the relationship between economic outcomes and the performance of the NBA franchise. This third specification employs the same fixed effects methodology used in the previous analysis, controlling for individual heterogeneity. The model is estimated by OLS, and is presented as:

$$\boldsymbol{Y_{it} = X'_{i,t-1}\beta_1 + W'_{it}\beta_2 + P'_{it}\beta_3 + \alpha_i + \epsilon_{it}} \quad .$$

This model builds off of the previous analysis employing the same dependent variable, $\boldsymbol{Y_{it}}$, defined as the MSA's regional share of per capita personal income. The model also implements the same independent variable vectors for $\boldsymbol{X'_{i,t-1}}$ and $\boldsymbol{W'_{it}}$ that were used in the second model specification. The novel aspect of this specification is the vector of performance variables included, represented as $\boldsymbol{P'_{it}}$. This vector includes a team performance variable, defined by the franchise's regular season win percentage for each year. Also included in the vector are indicator variables signifying the years in which the franchise achieved a playoff berth, and if that franchise won the NBA championship.

Table 4. Fixed Effects Regression on Per-Capita Personal Income – Team Performance Specification

Variables	Coefficient	(Standard Errors)
New Arena	-.003596	(.00436)
Renovation	.002108	(.003186)
Update	-.016814	(.005132)***
Unemployment	-.048214	(.011078)***
New Private Houses	.078297	(.013483)***
Construction Employees	.005406	(.003432)
Recession Indicator	-.013608	(.002654)***
Arena Cotenant	.008722	(.003873)**
Novelty	-.003773	(.005085)
5 Year Impact	.00599	(.003013)
Season Win Percentage	.001744	(.008464)
Playoff Berth	.000286	(.002775)
NBA Championship	-.009875	(.004852)**
Constant	1.09496	(.012814)***

R-square overall = 0.1213

The results of this third specification, displayed in Table 4 above, for the most part align with the conclusions drawn in the previous analysis. When metrics of team performance are incorporated into the regression, the economic impact of constructing an NBA arena is not statistically significant. In fact, as was the case in the second model specification, the direction of the insignificant coefficient is negative. The negative impact

of subsequent stadium renovations, defined as the "update variable", also takes on a greater level of statistical significance at the one-percent level. The indicator variables signifying co-tenancy and the short-term impact of the arena also align with the conclusions drawn in the previous analysis.

The vector of NBA franchise performance variables included in this third specification carries little statistical significance. The team's regular season win percentage was not significantly correlated with the host city's personal income, however the trend of the associated coefficient is positive. This trend suggests that when a franchise is more successful and wins more games, a larger portion of fans are drawn to attend games and spend more of their money downtown, thereby generating economic benefits for the surrounding economy. The variable that codes for the years when the franchise makes the playoffs has a similar positive impact. When a team makes the playoffs, the result is extra opportunities to attend professional basketball games, which marginally increases the potential benefit the stadium can have on the surrounding economy, though not at a statistically significant level. Surprisingly, the relationship between the years when a NBA franchise wins a championship and the city's per capita personal income is significant, and the trend of the associated coefficient is negative. This result is surprising because achieving an NBA championship only occurs after the franchise has played the entirety of the postseason, which offers the host venue the maximum number of games played in a season. Logic implies that more games should generate a greater economic benefit to the surrounding community. However, this result likely arose due to the fact that only 11 teams have won an NBA championship since 1990. Since such a small number of franchises have won a championship during this period, and since this analysis estimates the data for 25

separate franchises, the true impact of winning a championship may have been watered down. Further analysis into this question should isolate only the cities that have won a championship in order to estimate the true impact.

The lagged economic control variables also interact with the metropolitan area's share of personal income as expected. The MSA's relative level of unemployment and the recession indicator both have a statistically significant negative impact on per capita personal income, as was the case in the second model specification. The distinct aspect of the results from this third specification has to do with the measure of new private houses constructed. In this model, the positive coefficient associated with the new houses variable carries statistical significance at the one percent level. These results support the notion that new private housing construction is an essential driver of economic development.

V. Conclusion

In this analysis, I extend the work of previous researchers in order to answer the essential question: what is the urban economic impact of constructing a new professional sports arena? Prior work in this field, which was for the most part targeted specifically at investigating the impact of constructing new stadiums for teams in the NFL and MLB, has come to the conclusion that the net economic impact is near zero and insignificant. However, less often considered in past research is the economic impact created by constructing a sports arena for teams in the NBA and NHL. These arenas are cheaper to construct than NFL and MLB stadiums, and since they are indoors, can be utilized year-round to generate economic benefits for the surrounding community. Thus, an investigation into the economic impact of constructing specifically NBA arenas offers the best chance of finding a positive effect.

In my analysis, I compare the results of three different econometric specifications. In the first model, I implement a pooled regression to investigate what effect NBA arena construction had on the Metropolitan area's regional share of per capita personal income. The results of this regression suggest that constructing a new arena has a significantly positive effect on the surrounding metropolitan area, in that it produced a 3% increase in the MSA's share of personal income, relative to the state. However, this simplistic model is inherently flawed. Its structure does not control for other outstanding economic variables, nor does its econometric method control for individual heterogeneity between observations. These failures in the model leave its results subject to both omitted variable bias and heterogeneity bias.

I attempt to address these concerns in the second model specification, incorporating the fixed effects methodology and also adding a vector of economic control variables into my analysis. When these aspects of the model are included, the impact of constructing a new NBA arena is no longer statistically significant. In fact, the associated trend of the coefficient suggests that the new arena construction actually has a negative impact on the surrounding economy. In the third model specification I extend this same model to incorporate measures of the NBA franchise's success, in the hopes of discovering a relationship between the team's success and economic variables. However, the results of this third specification also proved to be statistically insignificant.

The major implication of this comparative analysis is that any research conducted in this field must be sure to use the appropriate econometric specification and to control for other economic factors. Failing to do so, as illustrated by the first model specification, will produce misleading results. City officials who are charged with deciding whether or

not to pay for the construction a new stadium with taxpayer money must be weary of economic analyses that claim a statistically significant positive impact. Unless these economists employed the appropriate econometric specification and incorporated the most relevant economic control variables, the results of these prospective studies should not be considered to be valid.

Even though the results of this analysis did not reveal a statistically significant relationship between new NBA arena construction and the economic well-being of a metropolitan area, it does carry a number of implications of how a city can best position itself for economic improvement. These implications can be drawn from the relationship between the economic control variables and the dependent variable of interest. The results of the second and third model specification show that these lagged economic control variables are significantly related to measures of per capita income. Therefore, the best way for a city to raise its overall standard of living would be to construct policies which are aimed at improving these other economic factors. As an example, in both the second and third model specifications, the lagged measure of the city's new private housing units constructed was significant and positively related to the current year's per capita income. Thus, one way a city could hope to improve their economy would be to construct more homes in the downtown area, generating increased employment in the construction sector and bringing more consumption into the region. Even if constructing a new professional stadium is not, in itself, a major catalyst of economic development, if the stadium is built as one aspect of a greater metropolitan area redevelopment effort, there is a much larger opportunity for that city to experience economic growth.

The most recent example of this sort of "smart growth" urbanism can be found in the case of Sacramento. Since the Kings new Golden 1 Center opened in 2016, the city of Sacramento has experienced great economic benefits as a result. However, the implication is not that Sacramento's improved economy resulted directly from the arena being built. Rather, the urban redevelopment in the past two years was the result of a massive transformation in the downtown area as a whole. City officials had a vision for how they could improve their urban center, and Golden 1 Center was just one small part of this broader redevelopment effort. Therefore, the ultimate conclusion of this analysis is that in order for a new professional sports stadium to generate positive economic returns for a city, that stadium must be accompanied by a plan for how to most effectively integrate that stadium within a newly transformed urban space.

In relation to this topic, future research could be conducted which investigates the relationship between professional team performance and urban economic impact. The results of the third specification included in this analysis did not find significant relationships between team success and economic outcomes, however, the trends of the coefficients did suggest more successful teams have a marginally positive economic impact. Future research could conceive of a method which is more specifically targeted towards team performance measures, in the hopes of finding significant relationships.

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Appendix

Table A.1. Arenas and Corresponding Metropolitan Statistical Area Used in Analysis

NBA Franchise	Arena	Metropolitan Statistical Area	Opening Year	Construction Cost (Millions of 2017 USD)
Timberwolves	Target Center	Minneapolis-St. Paul-Bloomington, MN-WI	1990	195
Jazz	Vivint Smart Home Arena	Salt Lake City, UT	1991	167
Suns	Talking Stick Resort Arena	Phoenix-Mesa-Scottsdale, AZ	1992	157
Bulls	United Center	Chicago-Naperville-Elgin, IL-IN-WI	1994	289
Cavaliers	Quicken Loans Arena	Cleveland-Elyria-Mentor, OH	1994	165
Celtics	TD Garden	Boston-Cambridge-Newton, MA-NH	1995	257
Trailblazers	Moda Center	Portland-Vancouver-Hillsboro, OR-WA	1995	421
76ers	Wells Fargo Center	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1996	328
Hawks	Phillips Arena	Atlanta-Sandy Springs-Roswell, GA	1999	314
Nuggets	Pepsi Center	Denver-Aurora-Lakewood, CO	1999	275
Pacers	Bankers Life Fieldhouse	Indianapolis-Carmel-Anderson, IN	1999	269
Lakers & Clippers	Staples Center	Los Angeles-Long Beach-Anaheim, CA	1999	551
Heat	American Airlines Arena	Miami-Fort Lauderdale-West Palm Beach, FL	1999	313
Pelicans	Smoothie King Center	New Orleans-Metairie, LA	1999	167
Mavericks	American Airlines Center	Dallas-Fort Worth-Arlington, TX	2001	580
Thunder	Chesapeake Energy Arena	Oklahoma City, OK	2002	154
Spurs	AT&T Center	San Antonio-New Braunfels, TX	2002	253
Rockets	Toyota Center	Houston-Sugar Land-Baytown, TX	2003	313
Grizzlies	FedEx Forum	Memphis, TN-MS-AR	2003	324
Hornets	Spectrum Center	Charlotte-Concord-Gastonia, NC-SC	2005	326
Magic	Amway Center	Orlando-Kissimmee-Sanford, FL	2010	546
Nets	Barclay's Center	New York-Newark-Jersey City, NY-NJ-PA	2012	1,000
Kings	Golden 1 Center	Sacramento–Roseville–Arden-Arcade, CA	2016	558
Pistons	Little Caesar's Arena	Detroit-Warren-Dearborn, MI	2017	863
			Average NBA Arena Construction Cost (1990-2017) = 366 million (2017 USD)	