# Compensating Differentials and the Social Benefits of the NFL

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**Abstract**

We use hedonic rent and wage equations to measure compensating differentials in central cities and metropolitan areas with franchises of the National Football League. Rents are about 8 percent higher in the central cities, but this impact may not carry over to broader geographical areas. Wages are about 2 percent lower in areas with teams, but the standard error on this parameter is large. The central city results indicate that sports franchises appear to be a public good. Once these quality-of-life benefits are included in the calculus, the large public expenditure on new stadiums appears to be a good investment for cities and their residents.

## 1. Measuring the Impact of Sports Franchises

Cities have often spent large sums of money attempting to lure or retain professional sports franchises. These incentives are not direct payments; they usually take the form of an agreement to subsidize construction or renovation of a new stadium or arena, and/or a leasing arrangement that provides substantial amounts of the revenue generated by the stadium to the team itself. New stadiums and arenas are always under construction. Keating [13] estimates the total cost of the 29 sports facilities opening during the period 1999-2003 was expected to be around $9 billion. Of this $9 billion in anticipated costs, around $5.7 billion, or 64 percent, came from state or local governments. The leasing contracts between these publicly funded facilities and team owners often yield substantial benefits to the owners by providing them with generous shares of the revenue from parking and concessions. A striking example, noted in Leeds and von Allmen [15], is the case of Eli Jacobs, former owner of the Baltimore Orioles, who, in his bankruptcy proceedings, listed the Orioles stadium lease as his most valuable asset.

What do cities hope to gain in exchange for such concessions? Civic boosters and city officials often think of professional sports as a way of boosting both civic pride and economic activity within a city. A typical statement expressing these sentiments comes from Philadelphia's mayor, John Street:

> "We are incredibly fortunate to be the home of great professional sports franchises. They enrich our community, fortify our tax base, and provide major support for the region's future economic growth. And then there are the intangible benefits: These Phillies, if we give them our full support, will bring us together; solidify a sense of community with civic pride as they drive toward the pennant." (Street [21])

It is fair to say that economists have cast a skeptical eye on the claim that professional sports franchises contribute to the economic health of the surrounding area, regardless of how that surrounding area is defined. Baade and Sanderson [3] and Coates and Humphreys [6] examine employment and income, respectively, in metropolitan areas and find that the presence of professional sports teams induces substitution across leisure activities rather than stimulating new expenditure within the cities. The multiplier effects appear to be small. Professional sports franchises are, after all, a set of relatively small firms that directly employ a rather small number of people who, while very highly paid, very often do not live year-round in the community.

Even at a more micro-level, employment benefits in the immediate location of the stadium seem fairly minimal. A number of studies in Noll and Zimbalist [16] address this issue and find this to be the case (see, for example, Austrian and Rosentraub [2].

Yet city boosters and politicians continue to try to make the case for professional sports and the beneficial role they might play in the community. If this beneficial role does not arise from Keynesian-type impacts, it must be because benefits accrue to those who consume the output of professional sports. Alexander, Kern, and Neill [1] attempt to measure the demand and, by extension, the consumer surplus that attendees receive from paying admission to sporting events. One might justify subsidization if the surplus exceeds the city's subsidization of the team. However, these authors do not find that to be the case; the surplus is less than the subsidies.[1]

In arguing the case against the impact of sports teams, our view is that all of these studies miss one basic point: professional sports are, at some level, a nonexcludable public good. It is possible that people obtain benefits from having a sports team even if they never go to see a game. They root for the local athletes, look forward to reading about their success or failure in the newspaper, and share in the city-wide joy when the home team wins a championship.[2] The

[1] Since most goods generate consumer surplus, why should professional sports teams be singled out for public subsidies? Under this argument, local government should subsidize (say) movie theaters, since they generate consumer surplus for many of their customers.
[2] Though not, hopefully, in the riots that have become all too common on such occasions.

words of Mayor Street quoted above speak to the "civic pride" that can result from a successful franchise, such that one ought to think of a professional sports team in the way one thinks of a new art museum or new symphony hall or indeed an environmental resource like an old-growth forest — a commodity from which one receives utility just by having it around. Indeed, the interest that professional sports franchises generate suggests that it is far more important than these other public goods. In the words of Art Modell, controversial owner of the Cleveland Browns-Baltimore Ravens franchise: "The pride and the presence of a professional football team is far more important than 30 libraries" (quoted in Leeds and von Allmen [15]).

This paper contends that these benefits are measurable via compensating differentials — in the same way that people are willing to pay for other contributors to the quality of life in the area, such as clean air (Kiel and Zabel [14], Gyourko and Tracy [9]). If people like having a professional sports franchise in their community, they are presumably willing to pay for it, if not directly through the purchase of season tickets, then indirectly through an increased willingness to pay for housing in the area, and through an increased willingness to accept marginally lower wages.

The idea that compensating differentials might provide a basis for the social benefit of sports teams was first broached by Hamilton and Kahn [11], who argue that while such differentials may exist, correlations between the presence of sports teams on the one hand and wages and rents on the other will surely be confounded with the correlation between these variables and city size (and perhaps other city-specific characteristics) in any econometric analysis.[3] Johnson, Groothuis and Whitehead [12], hereafter JGW, thus try to circumvent this issue by using a contingent valuation analysis of the public good value of the Pittsburgh Penguins franchise to Pittsburgh residents. Their results indicate that there is indeed a positive willingness-to-pay for professional teams, but not enough to (say) build a new arena. JGW report that the aggregate value of this amenity, using the upper bound estimate, is $5.3 million annually, or $48.3 million in present value terms. However, they note that even the upper bound estimate is not sufficient to fully fund a new arena costing about $180 million. There are several caveats, however. The present value of $48.3 million may simply reflect the *marginal* increase in the public good benefit derived from the new stadium; the *total* public benefit to hosting the Penguins would be much larger. In addition, many cities construct new arenas for both hockey and basketball, and the combined public good generated by both teams may be sufficient to cover the hosting city's share (often far less than the entire cost) of a new arena. More important, it is likely that the public good benefit from hosting a football or baseball franchise is significantly larger than that associated with major league hockey. Hockey continues to be the least popular of the four major league sports. According to Rappaport and Wilkerson [18] nine of the 24 teams (38 percent) in 2001 did not have local network television contracts. Rappaport and Wilkerson [18] also point out that ratings on NHL games that are televised are only half that of NBA games.

Whatever the value of contingent valuation surveys, it is desirable to have a market-based measure of the value that people place on their local teams. We confront the issues raised by Hamilton and Kahn in a number of ways. In this paper we focus our attention on NFL football franchises in the 1990s, since there was movement and expansion of NFL teams in both second-tier cities (Jacksonville, Nashville, and Charlotte) and exit of franchises in larger metropolitan areas such as Los Angeles and Houston, the nation's second and fourth largest metropolitan areas, respectively. This should weaken the correlation between city size and NFL teams sufficiently to facilitate estimation of an NFL effect. Additionally, we rely on a two-period panel of individual (households or workers) data and use city fixed effects to control for

[3] Also see Rappaport and Wilkerson [18].

all city-specific, time-invariant characteristics that contribute to wage and rent determination, including, but not limited to, city size. In the context of a hedonic wage or rent regression, the compensating differential effect of a professional sports franchise is measured by the coefficient of a dummy variable indicating the presence of a franchise in the particular city and year. Given the existence of fixed city effects, the identification of this NFL effect then comes from league expansion and franchise movements into and out of cities over the years between the two panel observations.

Our two dates are 1993 and 1999. Besides the movement to second-tier cities, we focus our attention on NFL football franchises, for two more obvious reasons. The first is the pre-eminent attention the NFL receives among all sports in the United States. If any professional sport has a measurable compensating differential, football is likely to be the one. Moreover, the most serious rival for that attention, Major League Baseball, has had very little expansion in recent years and no franchise movements since the early 1970s. The NFL on the other hand has had a bit more expansion and substantially more franchise movement. Perhaps more important, the location of NFL franchises probably has less to do with city-specific characteristics than in any other major sports league. Most of an NFL franchise's revenue comes from an egalitarian split of the national TV contracts, and even locally generated stadium ticket revenue is split more equitably than in other leagues. In contrast, baseball team revenue is far more heavily weighted toward local sources, particularly local TV contracts.

We construct hedonic rent and wage equations at the individual level, using data from the *Annual Housing Survey* for the former and the *Current Population Survey* for the latter. We control (as noted) for city fixed effects, time fixed effects, a large number of time-varying city characteristics, a large number of individual characteristics, and in the case of the Annual Housing Survey rent equation, a random effect that controls for individual time-invariant characteristics. Despite all of these (and other) controls, we find that the presence of an NFL franchise raises annual rents by approximately 8 percent in central cities and approximately half that amount when the entire metropolitan area is under consideration.

The corresponding coefficient from the wage equation indicates that wages in metropolitan areas that host NFL teams fall approximately 2 percent; however, the coefficient is not significant at the usual levels. Our overall conclusion, nevertheless, is that NFL franchises do contribute to the quality of life.

A cost-benefit analysis suggests that once the quality-of-life benefits are included in the calculus, the seemingly large public expenditure on new stadiums appears to be a good investment for cities and their residents.

**2. Rents and Football**

Our basic hypothesis is that cities that gain an NFL team have higher quality of life than cities that don't, and this translates into higher rents. Table 1 presents some raw, though appropriate, comparisons of average rents in cities that did and did not have a change in their football status over the 1990s. We provide average rents from our sample of two years in the *American Housing Survey* (about which more later) for three pairs of cities. The first instance is a comparison of Dallas and Houston; in 1994 the city of Houston lost its NFL franchise (the Oilers) to Tennessee, while Dallas retained the Cowboys. In 1993 the two cities had roughly the same average rent, but by 1999 rents in Dallas had outpaced rents in Houston by a substantial margin. The second comparison is between the two Florida cities of Jacksonville and Tampa. Tampa was the location of the NFL Buccaneers team throughout the 1993-99 period, while Jacksonville gained an expansion franchise (the Jaguars) only in 1998. In 1993, before it became a franchise city, Jacksonville had lower rents than Tampa, but by 1999 its rents were higher. The final natural comparison is between Kansas City and St. Louis. St. Louis had previously lost the NFL Cardinals franchise to Arizona, so that in 1993 it was without a team, but in 1995 the Rams moved there from Southern California. In the meantime Kansas City always had the Chiefs. The evidence from this comparison is the weakest for our case, as the two cities had roughly the same rise in rents. But St. Louis's raw increase is slightly larger, and on a percentage basis, there is a more substantive difference.[4]

These raw comparisons provide striking, though limited, evidence that football location may have a roll to play in determining rents through their effect on the quality of life. But the evidence is limited, clearly, because a large number of factors can influence a city's housing market. An obvious example, alluded to in the introduction, is the role of raw population growth. This may be correlated with both rents and NFL location. While we argue elsewhere that local growth factors have a more limited role to play in NFL locations than in other major professional sports (and St. Louis is a case in point), it is undoubtedly clear that it is necessary to control for the various city-wide and unit-specific influences on rent, in order to obtain a credible measure of the NFL effect on rents. And so we turn to the econometric model.

We assume that rents for household (i) in city (j) at time (t) can be represented by the following semi-log form:

$$\log R_{ijt} = \alpha_i + \beta_1 X_{ijt} + \beta_2 Z_{jt} + NFL_{jt} + D_j + T + \mu_{ijt} \qquad (1)$$

Where:

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[4] These results are mirrored in an entirely different data source. The Office of Federal Housing Enterprise Oversight's (OFHEO) metropolitan housing price indexes (www.ofheo.gov) for owner-occupied housing indicate a greater increase in housing prices between 1993:Q1 and 1999:Q1 for Jacksonville than for Tampa, and for Dallas than for Houston. The unconditional rate of increase for Kansas City was a bit higher than for St. Louis, however.

$\log R_{ijt}$ = log of monthly rent paid by household i in city j at time t.

$X_{ijt}$ = a vector of housing characteristics for household i in city j at time t.

$Z_{jt}$ = a vector of time-varying city characteristics j.

$NFL_{jt}$ = dummy variable indicating the presence of an NFL team in city j in year t. Coded with the value 1 if city j had a team in year t; if it did not, the value is zero. (Note: this is a single variable.)

$D_j$ = dummy variable for each city coded 1 for a specific city, zero otherwise.

$T$ = time dummy variable coded 1 if the observation is 1999, zero if 1993.

$\mu_{ijt} = \alpha_{ijt} + \varepsilon_i$, where $\alpha_{ijt} \sim N(0, \sigma_\alpha^2)$, $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$.

The error term has two components. The component $\alpha_{ijt}$ is the traditional error term unique to each observation and is taken to be uncorrelated across observations and uncorrelated through time. The component $\varepsilon_i$ is the random disturbance characterizing the ith observation and is constant through time.

Table 2 shows the 32 cities that had an NFL team in either 1993 or 1999. Eight of these cities had a change in NFL team status between 1993 and 1999. Six cities (Baltimore, Charlotte, Jacksonville, Nashville, Oakland, and Saint Louis) did not have an NFL franchise in 1993 but had gained one by 1999. Three cities (Houston, Los Angeles, and Anaheim (Orange County MSA)) hosted an NFL team in 1993, but did not do so in 1999. Twenty-four cities hosted an NFL team in both 1993 and 1999.[5]

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[5] The Titans played in Memphis in the Liberty Bowl in 1997. They played in Nashville in 1998 and 1999.

*2.1. Data*

We elected to use rental units in the central cities and metropolitan areas of the 60 largest MSAs for two time periods: 1993 and 1999. The 60 largest metropolitan areas are chosen because they are the ones most likely to already have or to be in the running for an NFL team. Data for rent and housing characteristics are taken from the *American Housing Survey* (AHS). The observations refer to specific rental units, not individuals. To maximize the total number of rental units in our sample, we do not require that the same units appear in both time periods. As a result, only 22.4 percent of the rental units in our sample show up in the 1993 sample and again in the 1999 sample. However, for some of these MSAs, the AHS either did not report observations for any households or the number of household observations was insufficient to be included in our sample. Thus, our sample consists of rental units in 53 of the 60 largest areas for which AHS data are available. Unfortunately, data are not available for two areas that currently have an NFL team: Buffalo and Charlotte. Data are also not available for Green Bay, Wisconsin, which is a unique city among NFL hosts anyway. Table 3 shows the areas used in the study ranked by population. The New York CMSA is the largest metropolitan area, containing over 20,000,000 people, while the Providence MSA is the smallest, with just under 1,000,000 people in 1999. The mean population size for these metropolitan areas is just under 3,000,000 people.

We perform our analysis at three levels of geographic aggregation: the city, the metropolitan statistical area (MSA) and the consolidated metropolitan statistical area (CMSA). The primary reason for allowing the data to have different geographic definitions is that we are unsure about the scope of fandom for NFL football. It is likely that these feelings are most intense in the central city; the team is usually named after the city itself, and the stadium is located there, and this geographic proximity may contribute to the higher quality of life in central cities in the same way that other kinds of cultural activity do (Glaeser, Kolko, and Saiz

[7]).[6] The central city may also have the most financial investment in the subsidies that gained or retained a team. The larger areas may also provide a significant fan base for the team so it is sensible to expand the sample in that way. For some cities the number of suburban observations was fairly small so we do not perform a separate analysis on the suburb-only sample.

Our dependent variable is the monthly contract rent. While we believe that similar phenomena apply to housing values, we use rent as the measure of housing prices for two compelling reasons. The first is that the *American Housing Survey* is a survey of the occupants of a housing unit. For owner-occupiers they ask about the value of the house, but this is only an estimate on the part of the owners, and not a market-based measure. Renters are asked about the rent they are currently paying, and we believe that this is a more accurate reflection of current housing prices. Moreover, rent is measuring the flow of services that arise from the house and the wider community. Property value is measuring the discounted flow of such services into the future. Since our identification strategy relies on the timing of city entry into the NFL, it is important to have current measures of the flow. If residents of, say, Jacksonville anticipated in 1993 that they would have a team in a few years, then housing values would go up prior to the actual location of the team. Rents, which are more reflective of current service flows, will go up only upon the arrival of the team.

Housing is essentially a bundle of characteristics: bedrooms, bathrooms, local amenities, etc. There is a vast literature on hedonic models applied to housing markets to estimate the implicit prices of the various characteristics.[7] We assume that the systematic portion of rent is determined by a rental unit's physical characteristics and characteristics of the city in which the

[6] One modification of the regression specification we present below was to account for differences in the NFL effect when the team's stadium was outside the central city. About a half-dozen of the 32 teams, including both New York City teams, have suburban stadiums, and the Washington Redskins moved from a DC location to one in Maryland between 1993 and 1999. Accounting for different stadium locations had no impact on the results

rental unit is located. As indicated, the data for rents, $R_{ijt}$, and housing characteristics, $X_{ijt}$, are taken from the AHS. In addition, a number of quality-of-neighborhood variables, found in the AHS, are included in the regressions. These include residents' opinion about neighborhood crime and street noise and whether there are abandoned buildings and junk in the neighborhood. Fixed effects (the $D_j$'s in the model) are used to capture the effects on rents of city-specific characteristics that are time invariant, e.g., climate or ocean proximity. In addition, a number of time-varying central city characteristics, $Z_{jt}$, are included in the model. These include population size, population growth, unemployment rate, violent crimes per capita, an air quality index (AQI), central city spending per capita, central city tax per capita, and per capita income.[8]

If the NFL placed teams in relatively fast growing metropolitan areas, our NFL dummy variable could be upwardly biased. Four of the six MSAs that gained an NFL franchise between 1993 and 1999 had growth rates of their metropolitan population exceeding the national average of 9.6 percent during the period 1990-99 (Charlotte at 22 percent, Nashville at 19 percent, Jacksonville at 16.5 percent, and Oakland at 11.4 percent). Still, two cities that gained an NFL team between 1993 and 1999 had metropolitan population growth rates well below the national average during the period 1990-99 (St. Louis at 3.1 percent and Baltimore at 4.6 percent). In addition, two cities that lost an NFL franchise between 1993 and 1999 had metropolitan

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[7] Sheppard [20] provides a thorough review of hedonic analysis of housing markets.

[8] Population growth between 1980 and 1990 is used for the 1993 observations. Population growth between 1990 and 1996 is used for the 1999 observations. Violent crimes per capita are as reported by the U.S. Federal Bureau of Investigation. The U.S. Environmental Protection Agency (EPA) calculates the AQI for metropolitan statistical areas (MSAs). The EPA measures five major air pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, the EPA has established national air quality standards to protect against harmful health effects. The index used in the empirical model of this paper reports on the number of days in 1993 and 1999 that the AQI for a given MSA was greater than 100. Data for both central city spending per capita, central city tax per capita, and per capita income were found in the C*ity and County Data Book*.

population growth rates exceeding the national average (Houston at 20.7percent and Los Angeles 10.4 percent). Further, the owners' greatest economic incentive is to seek out not the city with the most robust economy but the one offering the best stadium deal, since the NFL shares its television and merchandising revenue equally among all teams, and the ordinary ticket revenue is shared almost equally between the home team and the visitors. Only the luxury box revenue and concessions and parking revenue are not shared. The Rams' move from Los Angeles to St. Louis was motivated by the Anaheim Stadium's unwillingness to renegotiate these items. Nevertheless, population level and growth are included as regressors in the specifications that follow to control for the possibility that NFL expansion and movement have some tendency to locate in relatively fast growing metropolitan areas. As it turns out, the NFL and MSA growth variables are negatively correlated (correlation coefficient of –0.1833). Similarly, a relatively low correlation is found between the presence of an NFL team and MSA population size (correlation coefficient of 0.2884).

Table 4 shows the means and standard deviations for all of the variables in the regressions, at the central city level, with the exception of the city-specific dummy variables. For example, the average unit was almost 47 years old. The table shows that 67 percent of the households in our sample resided in a city that had an NFL team in either 1993 or 1999.

*2.2. Central City Sample*

We begin our analysis of the effect of hosting an NFL team on rents by looking at the least geographically aggregated definition used in this study, the central city. A pooled cross-section time-series model consisting of 7275 observations forms the basis of the regression analysis for the central city regressions. In Table 5 we present some representative estimates for the central city rental hedonic model. The second column in Table 5 presents the results from the OLS regression. In general, the results are as expected, though a few do not accord with prior expectations. For example, the coefficient on the crime variable is positive and significant, suggesting that rents are higher in cities having a greater crime rate, which is counter to our expectation. We found that per capita public spending and per capita taxes are highly correlated with a simple correlation coefficient of 0.9770, making it hard to separately identify the effects of each of the variables on rent. Therefore, we included a single variable defined as the difference between the log of spending per capita and the log of taxes per capita (which means that this variable can be interpreted as transfers from higher levels of government). We also find that this local fiscal variable has the wrong sign in that it is negative and significant, indicating that rents decrease as local public spending increases relative to local taxes. In some ways this anomaly is not too surprising, since local fiscal variables are notoriously hard to measure. Moreover, recall that we have included fixed effects for every city in the sample; to the extent that these city-specific variables are moving slowly over time or growing at the same rate over time across all cities, they may be highly collinear with the city dummies and possibly our time dummy variable as well. The vast majority of the individual and neighborhood level variables have the anticipated sign and many are highly significant. Most important is the finding that the coefficient on the NFL dummy variable is positive, as expected, and significant at the usual level of significance (t = 2.14), suggesting about an 8 percent rental premium, on average, in cities hosting an NFL team. [9]

The pooled OLS estimates of equation (1) assume homoskedasticity of the error term, $\alpha_{ijt}$. The error term may, however, have nonconstant variance. To account for this possibility, the third column of Table 5 reports the findings using the robust errors procedure (White [22])

[9] We assume that the coefficient of the NFL dummy variable, multiplied by 100, gives the percentage effect of a change in NFL status on rent. Halvorsen and Palmquist [10] show that for relatively small values of the dummy variable coefficients (such as those obtained for the NFL coefficient in our estimations), the percentage effect interpretation is quite reasonable.

Importantly, the coefficient on the NFL variable remains significant at the 5 percent level after correcting the standard errors.

One problem with both the OLS and robust estimations is that they restrict the constant term (the $\alpha_i$ 's ) to be identical across individuals in the sample. Since we are already controlling for fixed effects at the city level, we assume the individual-specific component is characterized by a random effect.[10] Nonetheless, the results for the robust random-effects specification, reported in the fourth column of Table 5, are very similar to the results for the previous regressions reported in the first two columns of the table. Most important for our purposes is that the estimated coefficient on the NFL dummy variable is only slightly lower than found in previous regressions, suggesting about a 7 percent rent premium in cities that host an NFL team.

Another issue is that our parameter of interest centers on a city-specific variable but our data set is composed of individuals. Therefore, the sample sizes from the various cities may unduly influence the standard errors of the coefficients. In particular, observations from Los Angeles comprise almost 15 percent of all rental units in our sample and obviously will comprise a plurality of observations in cities that contribute to the identification of the NFL effect (i.e., gained or lost a team). The fifth column in Table 5 corrects the standard errors for this cluster sampling, as well as for heteroskedasticity. The coefficient on the NFL dummy variable is unchanged from those reported in columns 2 and 3 of Table 5 (as expected) and continues to be highly significant.

Some states may have engaged more actively in economic development policies than other states. These states may have been successful in landing an NFL team as well as other types of activity, such as convention centers or business in general. Since these types of state

[10] We perform a Breusch-Pagan LM test for the existence of person-specific random effects. The null of no random effects is strongly rejected. (See Greene [8])

policies affect local growth and local rents, part of the correlation between our NFL variable and rent may be due to a common state effect. To control for this, a state level dummy variable was interacted with the time dummy variable and added to the regression.[11] We also corrected the standard errors for cluster sampling, as well as for heteroskedasticity. The results for this regression are given in the final column of Table 5. The findings for this version of the model are consistent with other versions reported in the table. The coefficient on the NFL variable is positive and highly significant, and the value on this coefficient is actually slightly higher (10.0 percent as opposed to 7.9 percent) than found in the previous regression.

*2.3. MSA and CMSA Samples*

We turn now to the broader geographic samples. To this point we have limited our analysis of the quality-of-life benefit to the central city. Obviously, many of the city's suburban residents derive benefits from living in a metropolitan area that's home to a team. This may justify the subsidies given to NFL teams by state governments or by the formation of special districts to fund teams through subsidies. Therefore, we estimated additional regressions, adding to our sample residents of the sample MSAs outside the central city. This gives us an additional 4741 suburban observations for a total sample of 12,016 households in 53 MSAs.[12] We refer to this as the MSA sample. Additionally, in an experiment to broaden the geographic scope of the "fan areas" of some teams from larger areas, we combined 11 of the MSAs to form five consolidated metropolitan statistical areas, CMSAs, producing a sample of 47 metropolitan areas used in the regressions.[13] This sample consisting of the five CMSAs plus the remaining 42

[11] The fact that we already have city fixed effects prevents us from simply adding a state binary variable to the regression.

[12] A few of the MSAs in our sample, because of the geography of the city, have virtually no suburban observations. Jacksonville, one of the important cities in our sample, is a prime example. On that account we do not estimate a model with only suburban observations.

[13] The following MSAs were combined to form the five CMSAs used in the wage study: Dallas and Ft. Worth; New York, Newark, and Passaic; Los Angeles and Riverside; Miami and Ft. Lauderdale; and San

MSAs is referred to as the CMSA sample. The regressions for the MSA and CMSA samples are similar to those for central cities, except that we added a dummy variable that equals unity when the rental unit is located in the suburbs of an MSA or a CMSA and equals zero when it is located in the central city.[14]

We repeated the regression used in the central city on these two samples. The outcome is summarized in Table 6 for the MSA sample and in Table 7 for the CMSA sample. The results are not as strong as in the city sample. In the MSA sample the NFL effect virtually disappears. Its coefficient is zero, and its significance fails to pass any standard test. In the CMSA sample the coefficient is positive, but at a value of between 3 and 4 percent, rather lower than that obtained in the city sample. The prob-values of the coefficients is also lower; the t-statistics are around 1.3 and 1.4, which is significant only at relatively generous levels of allowable type I error. The exception is when the state-time interactions are included; in this specification the NFL effect increases in both size and precision.

Given the fragility of the NFL estimate as we alter the geographic scope of the sample it seems good to investigate its fragility in other ways. In Tables 8a, b, and c, for City, MSA and CMSA samples, respectively, we present some evidence on this score. Since the NFL is a city-wide characteristic, the best evidence of its fragility will be to re-specify the city-level characteristic list in the regression. We experiment both with additions and subtractions. In the first column of Table 8 we remove all of the city characteristics except for the NFL variable (and the fixed effects); the NFL parameter estimate is then given for each of the five econometric specifications listed in the previous tables. We then proceed to add to the area-characteristic list

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Francisco and San Jose. Thus this sample consists of the remaining 49 MSAs plus the five CMSAs, for a total of 54 metropolitan areas.

[14] We interacted the suburban dummy with the NFL dummy in an attempt to isolate the differential quality-of-life benefit suburban residents receive from the presence of an NFL team. Unfortunately, this

by adding in column 2 the population and population growth rates of the area. In the next column, retaining the other variables, we add average income, then in the fourth column the unemployment rate, crime rate, and our tax-spending ratio variable. In the fifth column, our measure of air quality is added; this is the specification that was presented in the previous three tables. In the next column we add a baseball dummy variable. This is specified in the same way as the NFL variable; it equals one if the city had a Major League Baseball team in the year in question and zero if not. Because of baseball's limited changes in this regard, it is not particularly well-identified. Only two cities gained a team during this period, and no city lost a team through franchise movement. If, however, football and baseball are correlated because some cities have a taste for sports or a taste for economic expansion through sports, this baseball variable can potentially control for it. In the next column is the estimate of the baseball coefficient for this regression. Finally, we add the square of the population growth to try to account for nonlinearities in the effect of population growth on rents.[15]

We summarize the results of this table accordingly:

1) The most important finding is that the effect of NFL location on rents in **central cities** is robust to any re-specification of the regression. It remains between 6 percent and 10percent throughout and significant at all the usual levels of Type 1 error; it is even higher in regressions with state-specific time trends.

2) Surprisingly, the NFL effect is positive and significant in the **MSA and CMSA** regressions, at magnitudes similar to those observed in the city regression under many regression specifications. With no other city variables included, the NFL effect is about 7.5 percent to 8 percent in the MSA and CMSA tables. That coefficient is reduced by half when

variable was highly collinear with the NFL dummy variable, precluding the use of both variables in the regressions simultaneously.

income is included in the regression, in both. In the MSA model, the total absence of an NFL effect occurs only when air quality is included in the list of regressors. Thus collinearity between NFL and air quality appears to be responsible for the insignificance of both.

3) The inclusion of baseball does not change the magnitude or significance of the NFL effect in city regressions and is itself only significant in the cluster sample regressions, although its magnitude is in line with that of the NFL coefficient. A similar finding occurs in the MSA model.

Interestingly, though, the baseball coefficient is significant, with a magnitude of around 7 percent in the CMSA equation (while football retains its t-statistic of about 1.4). Thus baseball appears to have more appeal to those on the edge of major metropolitan areas than does football. Football is more of a central city amenity.

### 3. The Effect of NFL Franchises on Wages

The theory of compensating differentials suggests that any amenity that increases the quality of life and pushes up the cost of housing will have a similar, though opposite, effect on wages. A rise in quality of life will (as before) attract new residents and therefore push the labor supply curve to the right. If the demand for labor in the city is downward sloping, this will cause wages to fall, although in the short to medium run, the demand for labor is perhaps more elastic than the supply of housing, and this may tend to ameliorate the effect. In addition, as Roback [19] notes, if the amenity is productive, the demand for labor could also be moved to the right, and the effect on wages is ambiguous. It is, in any case, of interest to measure the effect of NFL franchises on city wages as well.

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[15] This was at the suggestion of a referee.

Previous research on the relationship between income and the existence of professional sports franchises has in fact found that the correlation is weak, or even negative, although it has been based on time series, aggregate data rather than the individual observations used here. Coates and Humphreys [5] generally find a negative relation between the existence of teams and personal income and discuss the possibility that this arises from compensating differentials. However, in Coates and Humphreys [6], they state that the key to this negative relationship is substitution across different recreational activities: "spending on sports activities substitutes for spending on other goods and services."

Our methodology is similar to that employed in the rent equations above. In this analysis we employed the 1993 and 1999 March supplements to the *Current Population Survey* (CPS) and collected information on respondents who live in one of the 60 largest MSAs. The CPS does not report whether the place of work is within the central city, so we do not use central city samples in this section. We do, however, use the CMSA aggregation, as in the previous section. The data, summarized in Table 9, include a number of indicators on the individual demographic and employment characteristics, including binary variables for sex, ethnic group, attainment of a college degree, and veteran status. We also included a large number of dummy variables for employment in various industries and various job classifications. Finally, we also included all of the various area characteristics and dummy variables used in the rent equation above. Wages were measured by taking the individual's annual earnings (as reported in the CPS) and dividing by the number of "usual hours worked."[16]

We estimated the wage equations for four versions of the model (pooled OLS, robust standard errors, clustered corrected standard errors, and state/time interaction with clustered

[16] Only a small minority of respondents report an hourly wage. Because of this, we elected to use the above measure of the implicit hourly wage.

corrected standard errors). The results, presented in Table 10, indicate that metropolitan areas with NFL franchises have lower wages. In general, there is less than a 2 percent discount to wages in such areas. However, the estimates are not precise enough to warrant the rejection of the null hypothesis that there is no effect at the usual levels of significance — the largest t-statistic on the NFL variable is –0.72 in the robust estimator cluster correction version of the model. In the version that adds state/time interactions, the NFL coefficient is positive but not significant—a t-statistic on the NFL variable is 0.14. Other specifications, including sub-sample regressions with just central city residents or just suburban observations or just male or just female observations, had slightly higher or slightly lower t-statistics.

While these results are certainly not confirmation of an NFL impact on wages, we view them as mildly encouraging in the following sense. It might be thought that the NFL dummy variable did not represent the effect of NFL teams, *per se,* but some unobserved characteristic correlated with overall growth or economic climate — this despite our fairly careful attempts to control for such unobservables. If this were the case, one might expect such a force to have a positive effect on wages, since the growth probably raises the cost of living or the productivity of labor. The fact that the true value of the parameter is more likely to be negative than positive is one small sign against this interpretation and in favor of our interpretation that it represents a true amenity effect.

**4. Are Subsides to Teams a Bad Deal for Cities?**

To address the issue of whether policies like stadium subsidies are efficient, we perform an approximate cost-benefit analysis wherein we compare the present value of the implied amenity benefits of hosting an NFL team with the public subsidies that local governments provide to teams. Since our estimates reflect the total implicit value of the public good associated with hosting an NFL team, our analysis serves as a useful guide only for judging whether building a stadium either to attract or retain an NFL team potentially passes the cost/benefit test. It is important to note that our analysis does not provide an estimate of the *increase* in the implicit value of the public good generated by subsidizing a new stadium in cities that currently host an NFL team (e.g., Heinz Field in Pittsburgh and Lincoln Financial Field in Philadelphia).

We perform the cost-benefit analysis based on rents (and eschewing the role of wage reductions) in central cities, since central city governments make up the bulk of local government subsidies to NFL teams and have the strongest NFL effect. Table 11 provides the relevant calculations. The central column provides a rough approximation of the potential tax increase that results from NFL location. In the calculation we assume that capitalization of the NFL premium in property values is identical to the rent effect. That is, for any given city it is assumed that the capitalization rate is constant so that the percentage increase in rents resulting from the NFL premium leads to the same percentage increase in housing prices. Three things go into this calculation: (1) the assumed 8 percent increase in all property values (actually in assessed property values); (2) the number of housing units; and (3) the property tax rate. Obviously, property tax revenue increases with all three variables. The values shown in the table assume that the median house value in each city has been reassessed to fully reflect the premium associated with hosting an NFL franchise.

How do the estimates of the amenity value of hosting an NFL team compare with the subsidies? In examining 25 sports facilities built between 1978 and 1992, Quirk and Fort [17] calculate the annual subsidy to professional sports teams, including investment subsequent to the original cost, averaged $20 million in 1989 dollars (or $27 million in 1999 dollars). [17] The

[17]Interestingly, Alexander, Kern, and Neill [1] estimate that the annual stadium debt was in the range of $22 million to $29 million in 1995 dollars.

annual quality-of-life benefit of $139 million found for the representative central city in our study is substantially larger than the annual subsidy, suggesting that these subsidies were good investments for the typical city.[18]

Table 11 shows the cities ranked in terms of the present value of the potential increase in property tax revenue. The present value of the potential increase in property tax revenue is largest in New York City, at about $7.1 billion. Third largest is Los Angeles, at little over $2.0 billion, underscoring the desirability of an NFL team in the area. Among cities that host an NFL team, the present value of the potential increase in property tax revenue is smallest in the city of Tampa, at $117.2 million.

The final column of Table 11 shows all sources of public subsidies (state and local) provided to NFL teams for the construction of new stadiums in 1999 dollars, obtained from the National Conference of State Legislators, in a report called "Playing the Stadium Game" dated April 1998.[19] The subsidy exceeds the present value of the potential increase in property tax revenue in only 3 of the 24 cities that provided subsidies (New Orleans, Pittsburgh and St. Louis). In a number of cities, the present value of the potential increase in property tax revenue is only slightly larger than the subsidy (Atlanta, Cincinnati, Kansas City, and Nashville). The escalating costs of recent stadium construction suggest that the average subsidy has surely grown over time, potentially putting more cities on the unfavorable side of the cost-revenue analysis.[20,21]

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[18]For any given city it is assumed that the capitalization rate is constant so that the percentage increase in rents resulting from the NFL premium leads to the same percentage increase in housing prices.

[19]Information was found at the National Conference of State Legislators' web site www.ncsl.org/programs/fiscal/lfp106tb.htm.

[20] The use of tax increment financing to subsidize franchises would doubtless make the tax-subsidy comparison look more favorably on using such subsidies.

[21] One caveat pointed out by a referee is that the hedonic approach does not allow for transactions costs associated with household relocation. As a result, the estimated premium associated with any amenity, such as nice weather or the presence of an NFL team, will be overestimated. Still, given the magnitude of

**5. Conclusion**

We find that the presence of an NFL franchise raises annual rents approximately 8 percent in central cities (but not so much in expanded geographic areas) and that the standard error on the coefficient allows rejection of the usual null hypothesis at any standard level of type I error.  This is large enough to perhaps justify the provision of subsidies to retain NFL teams, especially in larger cities.

It important to note that while these estimates of the benefit may appear to be large, they are consistent with estimates of amenity benefits found in other studies. For example, Gyourko and Tracy [9] find that the annual value for just ***one*** extra sunny day is $7 per year per household, and Blomquist et al. [4] find an annual value of $12.[22] Based on these studies, Rappaport and Wilkerson [18] estimate that a metropolitan area with 2 million people should be willing to pay between $14 million and $24 million per year for just one additional sunny day. While direct comparisons are always difficult, this suggests that the addition of an NFL franchise makes up for a week or so of cloudy days.

Rapppaport and Wilkerson [18] also point out that the actions of most cities that lost an NFL franchise tend to place a high valuation on hosting a team. They point out that of the six cities that have lost NFL teams since 1980, "[a]ll but Los Angeles subsequently allocated considerably more public financing to attract a new NFL team than it would have cost to keep their old team." For example, voters in St. Louis approved $280 million in public funds to build a new football stadium after the Cardinals departed for Arizona in 1987. St. Louis voters declined to allocate $120 million toward a new stadium when the Cardinals were playing in St. Louis.

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our estimates for the NFL effect, it is unlikely that any adjustment for transactions costs would change the basic conclusion of the analysis, although a few broader-line central cities (Atlanta, Cincinnati, Kansas

Rapppaport and Wilkerson take this, and similar increases in cities willingness to increase public funding for new NFL stadiums after losing a team, as evidence that the quality-of-life benefits associated with hosting an NFL team may justify the seemingly large public expenditures.

It seems that the evidence provided in our study, the high valuation placed on other quality-of-life characteristics found in other studies, and the increased willingness to increase public funding for new NFL stadiums after losing a team are substantial evidence that the quality-of-life benefits associated with hosting an NFL team may justify the seemingly large public expenditures. Still, assessment of benefits and cost associated with sports teams is a complex problem. Despite our careful attempt to control for the many local factors that could affect rents, it's possible that our estimate of the implicit price of NFL amenity is overstated because we failed to control for some factor that is positively correlated with the both the presence of an NFL team and rents. If this is the case, then our estimate of the benefits used in the cost-benefit analysis is overstated.

However, it is clear that omitting the amenity value of sports franchises from the cost-benefit analysis can vastly understate the economic impact that franchises have on their communities.

City, and Nashville) may no longer pass the cost-benefit test.

[22] The annual values are expressed in 1999 dollars.

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**Table 1: Intracity Comparisons of Rents**

| | 1993 Rent | 1999 Rent |
|---|---|---|
| Dallas | 440 | 602 |
| Houston | 435 | 529 |
| Jacksonville | 382 | 540 |
| Tampa | 425 | 511 |
| Kansas City | 433 | 503 |
| St. Louis | 353 | 429 |

| Table 2: NFL CITIES in 1993 and 1999 | | |
|---|---|---|
| City | Yes If City Had an NFL Team in 1993 | Yes If City Had an NFL Team in 1999 |
| Arizona (Phoenix) | YES | YES |
| Atlanta | YES | YES |
| **Baltimore** | **NO** | **YES** |
| Buffalo | YES | YES |
| **N. Carolina (Charlotte)** | **NO** | **YES** |
| Chicago | YES | YES |
| Cincinnati | YES | YES |
| Cleveland | YES | YES |
| Dallas | YES | YES |
| Denver | YES | YES |
| Detroit | YES | YES |
| Green Bay (Milwaukee) | YES | YES |
| **Houston** | **YES** | **NO** |
| Indianapolis | YES | YES |
| **Jacksonville** | **NO** | **YES** |
| Kansas City | YES | YES |
| **Los Angeles** | **YES** | **NO** |
| Miami | YES | YES |
| Minneapolis | YES | YES |
| **Nashville** | **NO** | **YES** |
| New England (Boston) | YES | YES |
| New Orleans | YES | YES |
| New York | YES | YES |
| **Oakland** | **NO** | **YES** |
| Philadelphia | YES | YES |
| Pittsburgh | YES | YES |
| **Saint Louis** | **NO** | **YES** |
| San Diego | YES | YES |
| San Francisco | YES | YES |
| Seattle | YES | YES |
| Tampa Bay | YES | YES |
| Washington, DC | YES | YES |

| Table 3: MSA in Study | | |
|---|---|---|
| | 1999 Metropolitan Area Population | 1999 Central City Population |
| New York | 20102875 | 7428162 |
| Los Angeles | 16036587 | 3633591 |
| Chicago | 8885919 | 2799050 |
| Philadelphia | 5999034 | 1417601 |
| Boston | 5901589 | 555249 |
| Detroit | 5469312 | 965084 |
| Washington, DC | 4739999 | 519000 |
| Houston | 4493741 | 1845967 |
| Atlanta | 3857097 | 401726 |
| Seattle | 3465760 | 537150 |
| Dallas | 3280310 | 1076214 |
| Riverside | 3200587 | 188924 |
| Phoenix | 3013696 | 1211466 |
| Cleveland | 2910616 | 501662 |
| Minneapolis | 2872109 | 353395 |
| San Diego | 2820844 | 1238974 |
| St. Louis | 2569029 | 333960 |
| Baltimore | 2491254 | 632681 |
| Denver | 2417908 | 499775 |
| Oakland | 2348723 | 365210 |
| Pittsburgh | 2331336 | 336882 |
| Tampa | 2278169 | 290973 |
| Miami | 2175634 | 369253 |
| Cincinnati | 1960995 | 330914 |
| Newark | 1954671 | 263087 |
| Kansas City | 1755899 | 437764 |
| Sacramento | 1741002 | 406899 |
| San Francisco | 1685647 | 746777 |
| Milwaukee | 1648199 | 572424 |
| San Jose | 1647419 | 867675 |
| Fort Worth | 1629213 | 502369 |
| San Antonio | 1564949 | 1147213 |
| Norfolk | 1562635 | 225875 |
| Indianapolis | 1536665 | 738907 |
| Fort Lauderdale | 1535468 | 154021 |
| Orlando | 1535004 | 180308 |
| Columbus | 1489487 | 671247 |
| Los Vegas | 1381086 | 418658 |
| New Orleans | 1305479 | 460913 |
| Passaic | 1296252 | 61173 |
| Salt Lake City | 1275076 | 171151 |
| Greensboro | 1179384 | 199562 |
| Nashville-Davidson | 1171755 | 506385 |
| Austin | 1146050 | 587873 |
| Hartford | 1113800 | 128367 |
| Raleigh | 1105535 | 261205 |
| Memphis | 1105058 | 606109 |
| Rochester | 1079073 | 214470 |
| Jacksonville | 1056332 | 695877 |
| Grand Rapids | 1052092 | 185009 |
| West Palm Beach | 1049420 | 76970 |
| Oklahoma City | 1046283 | 475322 |
| Providence | 907795 | 149887 |

| TABLE 4: Means and Standard Deviations of Variables | | |
|---|---|---|
| Variables from the Annual Housing Survey | | |
| Variable | Mean | Standard Deviation |
| Log of Rent | 6.19 | 0.54 |
| Level of Rent | 543.30 | 229.50 |
| Building Age | 46.69 | 24.26 |
| Percent with Garage | 0.28 | 0.45 |
| No. of Bathrooms | 1.13 | 0.39 |
| No. of Bedrooms | 1.76 | 0.87 |
| No. of Half-Bathrooms | 0.10 | 0.33 |
| Percent under Rent Control | 0.09 | 0.29 |
| Percent. Receiving Subsidy | 0.05 | 0.22 |
| Percent with Public Sewer | 0.99 | 0.08 |
| Percent Detached | 0.13 | 0.33 |
| Percent Low-rise | 0.75 | 0.44 |
| Percent High-rise | 0.05 | 0.23 |
| Percent with Central Air Conditioning | 0.31 | 0.46 |
| Percent with Holes in Floor | 0.03 | 0.18 |
| Monthly Electricity Cost | 48.74 | 31.7 |
| Percent Indicating Neighborhood Crime a Problem | 0.25 | 0.43 |
| Percent Indicating Neighborhood Street Noise | 0.28 | 0.45 |
| Percent Indicating Abandoned Buildings in Neighborhood | 0.10 | 0.30 |
| Percent Indicating Neighborhood Junk | 0.30 | 0.46 |
| CITY/METRO DATA (VARIOUS SOURCES) | | |
| Violent Crimes Per Capita | 1750 | 692 |
| Public Spending Per Capita | 2258 | 1656 |
| Taxes Per Capita | 1013 | 846 |
| Population Growth Rate Over Period | 0.008 | 0.046 |
| 1993 Population Size | 1,191,248 | 2,053,797 |
| Air Quality Index | 25.15 | 30.98 |
| Unemployment Rate | 0.079 | 0.026 |
| Percent Black | 0.22 | 0.13 |
| MSA Per Capita Income | 24600 | 4583 |
| NFL Status | 0.67 | 0.47 |
| No. of Obs. | 7275 | |

| Table 5: Central City Sample: Rent Equation | | | | | |
|---|---|---|---|---|---|
| Variable | **Pooled OLS** | **Robust Estimator** | **Random Effects Robust Estimator** | **Robust Estimator, Cluster Correction** | **State-time Interactions** |
| Time Dummy | 0.1420** | 0.1420* | 0.1465** | 0.1420* | 0.02922 |
| Building Age | -0.0058*** | -0.0058*** | -0.0064*** | -0.0058*** | -0.00601*** |
| Building Age Squared | 0.00005*** | 0.00005*** | 0.00005*** | 0.00005*** | 0.00005*** |
| Garage | 0.0816*** | 0.0816*** | 0.0736*** | 0.0816*** | 0.08402*** |
| No. of Baths | 0.1433*** | 0.1433*** | 0.1305*** | 0.1433*** | 0.1421*** |
| No. of Bed | 0.0660*** | 0.0660*** | 0.0664*** | 0.0660*** | 0.0659*** |
| No. of ½ Baths | 0.0323** | 0.0323 | 0.0333 | 0.0323 | 0.0324 |
| Unit under Rent Control | -0.0520** | -0.0520** | -0.0420** | -0.0520 | -0.0502 |
| Unit Receives Subsidy | -0.2444*** | -0.2444*** | -0.2208*** | -0.2444*** | -0.2414*** |
| NFL Status | 0.0786** | 0.0786** | 0.0704** | 0.0786** | 0.0996*** |
| Public Sewer | 0.2127*** | 0.2127 | 0.1692 | 0.2127* | 0.2144** |
| Detached | 0.0033 | 0.0033 | 0.0043 | 0.0033 | -0.0055 |
| Low-rise | -0.0049 | -0.0049 | -0.0054 | -0.0049 | -0.0012 |
| High-rise | 0.1331*** | 0.1331*** | 0.1300*** | 0.1331*** | 0.1321*** |
| Central Air Conditioning | 0.1881*** | 0.1881*** | 0.1842*** | 0.1881*** | 0.1867*** |
| Holes in Floor | -0.0853*** | -0.0853*** | -0.0724*** | -0.0853** | -0.0866** |
| Monthly Electricity Cost | 0.0009*** | 0.0009*** | 0.0009*** | 0.0009*** | 0.0008*** |
| Neighborhood Crime | -0.1872 | -0.1872 | -0.0203 | -0.1872 | -0.0176 |
| Neighborhood Street Noise | 0.1969 | 0.1969 | 0.0177 | 0.1969 | 0.0207 |
| Abandoned Buildings in Neighborhood | -0.0615*** | -0.0615*** | -0.0566*** | -0.0615*** | -0.0623*** |
| Junk in Neighborhood | -0.0762*** | -0.0762*** | -0.0706*** | -0.0762*** | -0.0770*** |
| Violent Crimes Per Capita | 0.0001** | 0.0001** | 0.0001** | 0.0001* | 0.0001 |
| City Spending relative to taxes | -0.3166*** | -0.3166*** | -0.2587*** | -0.3166*** | -0.3373** |
| Pop Growth | 0.6510*** | 0.6510*** | 0.6814*** | 0.6510*** | -0.1386 |
| Population Size | 1.63e-08*** | 1.63e-08* | 1.20e-08 | 1.63e-08* | 5.07e-08** |
| Unemployment Rate | -0.0008 | -0.0008 | 0.0028 | -0.0008 | -0.0234 |
| Air Quality Index | -0.0003 | -0.0003 | -0.0003 | -0.0003 | 0.0012 |
| MSA Income | 2.55e-06 | 2.55e-06 | 4.76e-06 | 2.55e-06 | -0.00002 |
| Constant | -3.18 | -3.18 | -3.62 | -3.18 | 7.98 |
| No. of Obs. | 7275 | 7275 | 7275 | 7275 in 53 Clusters | 7275 in 53 Clusters |
| $R^2$ | 0.2727 | 0.2727 | N/A | 0.2727 | 0.2758 |

*, **, and *** denotes significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

| Table 6: MSA: Rent Equation | | | | | |
|---|---|---|---|---|---|
| Variable | **Pooled OLS** | **Robust Estimator** | **Random Effects Robust Estimator** | **Robust Estimator, Cluster Correction** | **State-time Interactions** |
| Time Dummy | 0.082* | 0.082* | 0.079* | 0.082* | 0.044* |
| Building Age | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.006*** |
| Building Age Squared | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Garage | 0.080*** | 0.080*** | 0.075*** | 0.080*** | 0.082*** |
| No. of Baths | 0.143<br>(12.28)*** | 0.143<br>(8.09)*** | 0.134<br>(11.38)*** | 0.143<br>(7.17)*** | 0.141<br>(7.12)*** |
| No. of Bed | 0.074*** | 0.074*** | 0.074*** | 0.074*** | 0.074*** |
| No. of ½ Baths | 0.032*** | 0.032** | 0.032*** | 0.032** | 0.033** |
| Unit under Rent Control | -0.038** | -0.038** | -0.033* | -0.038 | -0.036 |
| Unit Receives Subsidy | -0.286*** | -0.286*** | -0.265*** | -0.286*** | -0.284*** |
| NFL Status | -0.005<br>(0.18) | -0.005<br>(0.20) | -0.002<br>(0.08) | -0.005<br>(0.22) | 0.027<br>(1.47) |
| Public Sewer | 0.049 | 0.049 | 0.039 | 0.049 | 0.050 |
| Detached | 0.007 | 0.007 | 0.009 | 0.007 | 0.007 |
| Low-rise | -0.011 | -0.011 | -0.012 | -0.011 | -0.004 |
| High-rise | 0.113*** | 0.113*** | 0.114*** | 0.113*** | 0.116*** |
| Central Air Conditioning | 0.166*** | 0.166*** | 0.166*** | 0.166*** | 0.163*** |
| Holes in Floor | -0.059** | -0.059** | -0.049* | -0.059* | -0.061* |
| Monthly Electricity Cost | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| Neighborhood Crime | -0.034*** | -0.034*** | -0.031*** | -0.034*** | -0.032** |
| Neighborhood Street Noise | 0.001 | 0.001 | -0.001 | 0.001 | 0.003 |
| Abandoned Buildings in Neighborhood | -0.069*** | -0.069*** | -0.065*** | -0.069*** | -0.071*** |
| Junk in Neighborhood | -0.073*** | -0.073*** | -0.069*** | -0.073*** | -0.072*** |
| Violent Crimes Per Capita | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| City Spending relative to taxes | -0.060*** | -0.060** | -0.056** | -0.060** | -0.043 |
| Pop Growth | 0.005 | 0.005 | 0.010 | 0.005 | -0.016 |
| Population Size | 0.000 | 0.000 | 0.000 | 0.000 | 0.000*** |
| Unemployment Rate | -0.018*** | -0.018*** | -0.017*** | -0.018*** | -0.023*** |
| Air Quality Index | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.002*** |
| MSA Income | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 |
| Constant | 5.660*** | 5.660*** | 5.569*** | 5.660*** | 6.118*** |
| No. of Obs. | 12016 | 12016 | 12016 | 12016 | 12016 |
| $R^2$ | 0.277 | 0.277 | | 0.277 | 0.280 |
| Number of control | | | 9327 | | |

*, **, and *** denotes significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Absolute value of t-statistics in parentheses for NFL coefficient

| Table 7: CMSA: Rent Equation | | | | | |
|---|---|---|---|---|---|
| Variable | **Pooled OLS** | **Robust Estimator** | **Random Effects Robust Estimator** | **Robust Estimator, Cluster Correction** | **State-time Interactions** |
| Time Dummy | -0.019 | -0.019 | -0.001 | -0.019 | -0.099** |
| Building Age | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.006*** |
| Building Age Squared | 0.000*** | 0.000*** | 0.000*** | 0.000** | 0.000*** |
| Garage | 0.083*** | 0.083*** | 0.078*** | 0.083*** | 0.084*** |
| No. of Baths | 0.143*** | 0.143*** | 0.134*** | 0.143*** | 0.141*** |
| No. of Bed | 0.075*** | 0.075*** | 0.075*** | 0.075*** | 0.074*** |
| No. of ½ Baths | 0.032*** | 0.032* | 0.032*** | 0.032** | 0.033** |
| Unit under Rent Control | -0.043** | -0.043** | -0.037** | -0.043 | -0.041 |
| Unit Receives Subsidy | -0.285*** | -0.285*** | -0.265*** | -0.285*** | -0.284*** |
| NFL Status | 0.033<br>(1.34) | 0.033<br>(1.40) | 0.032<br>(1.40) | 0.033<br>(1.04) | 0.091<br>(3.10)*** |
| Public Sewer | 0.048 | 0.048 | 0.038 | 0.048 | 0.047 |
| Detached | 0.005 | 0.005 | 0.007 | 0.005) | 0.006 |
| Low-rise | -0.012 | -0.012 | -0.013 | -0.012 | -0.005 |
| High-rise | 0.113*** | 0.113)*** | 0.113*** | 0.113*** | 0.116*** |
| Central Air Conditioning | 0.161*** | 0.161*** | 0.161*** | 0.161*** | 0.158*** |
| Holes in Floor | -0.059<br>(2.28)** | -0.059<br>(2.37)** | -0.050<br>(1.95)* | -0.059<br>(1.80)* | -0.062<br>(1.91)* |
| Monthly Electricity Cost | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| Neighborhood Crime | -0.034*** | -0.034*** | -0.031*** | -0.034*** | -0.033** |
| Neighborhood Street Noise | 0.002 | 0.002 | -0.000 | 0.002 | 0.004 |
| Abandoned Buildings in Neighborhood | -0.068*** | -0.068*** | -0.064*** | -0.068*** | -0.070*** |
| Junk in Neighborhood | -0.073*** | -0.073*** | -0.068*** | -0.073*** | -0.071*** |
| Violent Crimes Per Capita | 0.000* | 0.000* | 0.000 | 0.000 | 0.000 |
| City Spending relative to taxes | -0.089*** | -0.089*** | -0.083)*** | -0.089*** | -0.070)** |
| Pop Growth | 0.036*** | 0.036*** | 0.039*** | 0.036*** | 0.020* |
| Population Size | 0.000 | 0.000 | 0.000 | 0.000 | 0.000** |
| Unemployment Rate | -0.022*** | -0.022*** | -0.020*** | -0.022*** | -0.028*** |
| Air Quality Index | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 |
| MSA Income | 0.000*** | 0.000*** | 0.000*** | 0.000** | 0.000** |
| Constant | 4.996*** | 4.996*** | 4.975*** | 4.996*** | 5.313*** |
| No. of Obs. | 12016 | 12016 | 12016 | 12016 | 12016 |
| $R^2$ | 0.275 | 0.275 | | 0.275 | 0.277 |
| Number of control | | | 9327 | | |

*, **, and *** denotes significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Absolute value of t-statistics in parentheses for NFL coefficient

| Table 8a: City Rent Equations: Robustness Checks | | | | |
|---|---|---|---|---|
| Regression | NFL (No City Variables) | NFL (+ Pop Size and Growth Rate) | NFL (+Per Capita Income) | NFL (+T?G, Crime, U-Rate) |
| OLS | 0.0807*** | 0.09570*** | 0.0625** | 0.0669** |
| Robust | 0.0807*** | 0.09570*** | 0.0625** | 0.0669** |
| Random Effects | 0.0773** | 0.09058*** | 0. 0581** | 0.0619** |
| Cluster | 0.0807** | 0.09570*** | 0.0625* | 0.0669*** |
| Cluster/State | 0.0756*** | 0.08020** | 0. 0801** | 0.1184*** |
| | | | | |
| Regression | NFL (+AQI) | NFL (+Baseball) | Baseball | NFL (+pop growth$^2$) |
| OLS | 0.0786** | 0.077** | 0.061 | 0.077** |
| Robust | 0.0786** | 0.077** | 0.061 | 0.077** |
| Random Effects | 0.0704** | 0.069** | 0.058 | 0.066** |
| Cluster | 0.0786** | 0.077*** | 0.061** | 0.077** |
| Cluster/State | 0.0996*** | 0.106*** | 0.114*** | 0.125*** |

| Table 8b: MSA Rent Equations: Robustness Checks | | | | |
|---|---|---|---|---|
| Regression | NFL (No City Variables) | NFL (+ Pop Size and Growth Rate) | NFL (+Per Capita Income) | NFL (+T?G, Crime, U-Rate) |
| OLS | .0771935*** | .076632*** | .0355695* | .0462929** |
| Robust | .0771935*** | .076632*** | .0355695* | .0462929** |
| Random Effects | .0761036*** | .0751004*** | .0341291** | .0430128** |
| Cluster | .0771935* | .076632* | .0355695 | .0462929 |
| Cluster/State | .0753805 | .0960248*** | . 085436 | .0944985*** |
| | | | | |
| Regression | NFL (+AQI) | NFL (+Baseball) | Baseball | NFL (+pop growth$^2$) |
| OLS | -.00461 | -.004 | .053 | -.010 |
| Robust | -.00461 | -.004 | .053 | -.010 |
| Random Effects | -.0017926 | -.001 | .054 | -.006 |
| Cluster | -.00461 | .-.004 | .053 | -.010 |
| Cluster/State | .0252424 | .026 | -.019 | .031 |

| Table 8c: CMSA Rent Equations: Robustness Checks | | | | |
|---|---|---|---|---|
| Regression | NFL (No City Variables) | NFL (+ Pop Size and Growth Rate) | NFL (+Per Capita Income) | NFL (+T?G, Crime, U-Rate) |
| OLS | 0.0750*** | 0.0777*** | 0.0378** | 0.0521*** |
| Robust | 0.0750*** | 0.0777*** | 0.0378** | 0.0521*** |
| Random Effects | 0.0770** | 0.0790*** | 0. 0401** | 0.0525*** |
| Cluster | 0.0750* | 0.0777* | 0. 0378 | 0.0522** |
| Cluster/State | 0.0764*** | 0.10340*** | 0. 0761*** | 0.0914*** |
| | | | | |
| Regression | NFL (+AQI) | NFL (+Baseball) | Baseball | NFL (+pop growth$^2$) |
| OLS | 0.0329 | 0.030 | 0.071*** | 0.026 |
| Robust | 0.0329 | 0. 030 | 0.071*** | 0.026 |
| Random Effects | 0.0315 | 0.029 | 0.069*** | 0.026 |
| Cluster | 0.0329 | 0.030 | 0.071** | 0.026 |
| Cluster/State | 0.0914*** | 0.092*** | 0.081*** | 0.094*** |

*, **, and *** denotes significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

| Table 9: Means and Standard Deviations of Variables in Wage Regression | | |
|---|---|---|
| Variables from the Current Population Survey | | |
| Variable | Mean | Standard Deviation |
| Executive | 0.148477 | 0.355578 |
| Professional | 0.155571 | 0.362453 |
| Tech | 0.03467 | 0.182946 |
| Sales | 0.115465 | 0.319587 |
| Administration | 0.162511 | 0.368924 |
| Private | 0.006695 | 0.081547 |
| Protection | 0.019531 | 0.138383 |
| Service | 0.114636 | 0.318587 |
| Precision | 0.102015 | 0.302672 |
| Machine Operator | 0.055214 | 0.228402 |
| Transport | 0.03553 | 0.185118 |
| Handlers | 0.038417 | 0.192203 |
| Farm | 0.01127 | 0.105563 |
| Government | 0.142089 | 0.349147 |
| College Degree | 0.285561 | 0.451688 |
| =1 if Male | 0.513696 | 0.49982 |
| =1 if Veteran | 0.094184 | 0.292089 |
| INDUSTRY=agriculture | 0.011762 | 0.107812 |
| Mining | 0.001658 | 0.040689 |
| Construction | 0.056566 | 0.231014 |
| Durable Goods Manuf. | 0.089977 | 0.286153 |
| Nondurable Goods Manuf. | 0.058193 | 0.234112 |
| TPUC | 0.076066 | 0.265107 |
| Wholesale Trade | 0.041088 | 0.198498 |
| Retail Trade | 0.167148 | 0.373114 |
| FIRE | 0.074684 | 0.262884 |
| Business Services | 0.072258 | 0.258918 |
| Personal Services | 0.037096 | 0.189 |
| Entertainment | 0.020544 | 0.141855 |
| Professional Services | 0.243367 | 0.429121 |
| Public Administration | 0.049595 | 0.217109 |
| =1 if black | 0.117 | 0.321426 |
| =1 if Asian heritage | 0.044067 | 0.205247 |
| Hourly wage | 13.85284 | 11.49093 |
| METRO DATA (VARIOUS SOURCES) | | |
| Crime rate index | 1664.223 | 888.1901 |
| Air Quality index | 20.54081 | 23.85109 |
| Per capita taxes | 928.4103 | 905.0618 |
| Per capita expenditure | 2105.545 | 1656.976 |
| Unemployment rate | 4.471699 | 1.773501 |
| Population growth rate | 0.148317 | 0.79753 |
| 1993 Population | 2847815 | 2857217 |
| NFL | 0.647341 | 0.477805 |
| No. of Obs. | 32564 | |
| | | |

| Table 10: Finding for the Wage Equations | | | | |
|---|---|---|---|---|
| Variables | **Pooled OLS** | **Robust Estimator** | **Robust Estimator, Cluster Correction** | **State-time Interactions** |
| Violent Crimes Per Capita | -0.00002 | -0.00002 | -0.00001 | -0.00000 |
| Air Quality Index | 0.0006 | 0.0006 | 0.0008 | 0.0011*** |
| City Spending relative to taxes | -0.1726*** | -0.1726*** | -0.1377** | -0.1079 |
| Unemployment Rate | 0.0280** | 0.0280** | 0.0184 | 0.0183 |
| 1993 Population Size | -2.427e-09 | -2.427e-09 | -3.86e-09 | 1.16e-08** |
| Population Growth | -0.0867** | -0.0867** | -0.0423 | -0.0923 |
| Age | 0.0842*** | 0.0842*** | 0.0842*** | 0.0843*** |
| $Age^2$ | -0.00086*** | -0.00086*** | -0.00086*** | -0.0009*** |
| college degree or better | 0.2310*** | 0.2310*** | 0.2311*** | 0.2311*** |
| Male | 0.2051*** | 0.2051*** | 0.2051*** | 0.2053*** |
| Veteran | 0.0450** | 0.0450** | 0.0450** | 0.0453** |
| Black | -0.0593*** | -0.0593*** | -0.0589*** | -0.0586*** |
| Asian | -0.1008*** | -0.1008*** | -0.1008** | -0.1008** |
| NFL | -0.0137 | -0.0137 | -0.0187 | 0.0050 |
| N | 32,564 | 32,564 | 32,564 in 54 Clusters | 32,564 in 60 Clusters |
| $R^2$ | 0.2347 | 0.2347 | 0.2346 | 0.2351 |

*, **, and *** denotes significance at the 10 percent, 5 percent, and 1 percent levels respectively.

## Table11: Potential Cost and Benefit to Individual Cities for Hosting an NFL Team (Millions of 1999 dollars)

| City | Present Value of the Potential Increase in Property Taxes[a] | Subsidies[b] |
|---|---|---|
| New York | 7124.4 | 219.5[c] |
| Chicago | 2055.3 | 21.9 |
| Los Angeles | 2044.1 | |
| Houston | 1185.0 | 166.7 |
| San Francisco | 1134.4 | 138.3 |
| Detroit | 738.9 | 172.4 |
| Dallas | 662.1 | 143.9 |
| Philadelphia | 659.7 | 205.5 |
| Seattle | 642.8 | 330.8 |
| San Diego | 630.1 | 134.5 |
| San Jose | 533.6 | |
| Milwaukee | 450.2 | |
| Austin | 442.4 | |
| Phoenix | 440.8 | 5.7 |
| Columbus | 381.1 | |
| Baltimore | 375.9 | 204.4 |
| Jacksonville | 364.4 | 132.8 |
| Indianapolis | 335.4 | 76.1 |
| Boston | 334.2 | 0.0 |
| Atlanta | 331.6 | 254.1 |
| Nashville-Davidson | 328.2 | 319.2 |
| Cleveland | 327.4 | |
| Fort Worth | 291.0 | |
| Memphis | 287.1 | |
| Miami | 286.8 | 0.0 |
| New Orleans | 283.1 | 414.3 |
| Washington | 277.9 | 105.7 |
| Oakland | 243.4 | 131.2 [d] |
| Denver | 218.0 | 6.9 |
| Cincinnati | 196.8 | 188.7 |
| Minneapolis | 174.2 | 117.7 |
| Oklahoma City | 162.7 | |
| St. Louis | 155.4 | 313.7 |
| Raleigh | 142.3 | |
| Sacramento | 142.0 | |
| Las Vegas | 140.6 | |
| Fort Lauderdale | 134.9 | |
| Pittsburgh | 128.9 | 149.8 |
| Rochester | 126.4 | |
| Salt Lake City | 120.0 | |
| Kansas City | 119.2 | 85.6 |
| Tampa | 117.2 | |
| Newark | 115.0 | |
| San Antonio | 104.3 | |
| Grand Rapids | 94.2 | |
| Orlando | 87.7 | |
| Greensboro | 87.7 | |
| Hartford | 82.7 | |
| Providence | 74.4 | |
| West Palm Beach | 36.4 | |

Notes to Table

[a]Based on an estimated increase in property tax revenue resulting from an 8 percent increase in median housing price. Following James Quirk and Rodney Fort, the estimated increase in the annual stream of property tax revenue is converted into present value terms using 10 percent rate of discount and assuming a stadium life of 30 years.

[b]Source: National Conference of State Legislators.

[c]It's not clear whether the money came from NJ or NY.

[d]$131.2 million was the cost of the original stadium. $127.0 million of renovations are currently under way.