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Stadiums, Professional Sports, and Economic Development: Assessing the Reality

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About one century ago, professional sports became prominent in American public life. During its early years, the business of sports was primarily a private undertaking, financed with private money and played in private stadiums and arenas.

But state and local government subsidies to professional sports businesses have proliferated over the past few decades, and economic arguments have been crafted to justify the subsidies. These arguments typically rest on the assertion that professional sports is a significant, even unique, catalyst for economic growth. By this reckoning, stadiums and teams are "cash cows" that expand the economy and enable further public investment in other critical areas.

Public funds are increasingly scarce. We must test the argument that professional sports offer an important return on government subsidies. *The purpose of this paper is to use economic theory and empirical techniques to assess the contribution of professional sports to metropolitan area economic development in the United States.*

The study consists of five parts. Part 1 briefly reviews the economic literature on professional sports and urban development. Part 2 discusses the ways professional sports can have an economic impact on an area and explores the challenges inherent in measuring this effect through "expenditure" and "multiplier" analysis.

Part 3 briefly introduces the empirical approach the author has adopted in this study. In Part 4, the author presents a new statistical analysis of the relationship between sports and municipal economic activity. His analysis involves 48 cities and the metropolitan areas around them over a 30-year period. Included in his analysis is every U.S. city that had either a new professional sports stadium or arena, or a professional baseball, football, basketball, or hockey team during this period.

After a thorough examination of an unprecedented quantity of data related to professional sports and host area per capita personal income, the author finds no factual basis for the conventional argument that professional sports stadiums and teams have a significant impact on a region's economic growth. Part 5 is comprised of the author's summary and concluding remarks. A more detailed technical discussion of the methodology and results employed in the study appears in Appendices A and B.

PART 1

Brief Review of the Literature

Objective assessments of the impact of professional sports on urban economic development in the United States are a relatively recent phenomenon, inspired mainly by the aggressive promotion of professional sports as a solution to the fiscal crises that plague American cities. What have researchers concluded about the efficacy of pro sports as an economic development tool?

Benjamin Okner elevated the debate about sports stadium funding to a national level in a 1974 article in *Government and the Sports Business*, a book published by the Brookings Institution. <1> Having examined stadiums across the U.S., Okner concluded that most produced revenues insufficient to cover their costs.

In 1990, economist Dean Baim of Pepperdine University lent support to Okner's analysis, using standard financial principles to analyze government subsidies to fourteen sports stadiums across the country. <2> Baim found that these stadiums had a total net accumulated value of *negative* \$139.3 million. In thirteen of the fourteen stadiums studied, tax dollars "invested" by financing governments in professional sports stadiums produced a financial loss for the government unit when tax revenues from the project were compared to the tax dollars invested. <3>

In a 1992 publication, researchers James Quirk and Rodney Fort reached conclusions similar to those of Baim and Okner. For ten of the thirty-nine stadiums for which they were able to obtain data, Fort and Quirk found that stadium revenues were insufficient to cover operating expenses exclusive of debt service and depreciation. <4>

But if the history of sports stadiums is indeed "written in red ink," can it be that stadium investments produce other economic returns that justify public subsidies? In the standard "civic investment" argument, there is no necessary inconsistency between a losing private enterprise and a profitable public activity. In fact, a stadium booster will argue that it is precisely *because* the stadium produces benefits to the public but losses for a private owner that tax support of sports stadiums is justified—indeed, *essential*.

Thus, an assessment of the worthiness of stadium subsidies requires that one consider the public, opposed to merely the private, benefits and costs. Recognizing this, scholars have sought ways to measure the "externalities" or "spin-off benefits" accruing from stadium activities. Research on this issue has produced widely divergent results.

For example, a 1985 study by University of Pennsylvania researcher Edward Shils estimated that Philadelphia's professional sports teams contributed more than \$500 million to the city's economy in 1983. <5> More recently, a report by Kenneth Clark concluded that the New York Yankees contribute \$200 million annually to New York City's economy. <6> In contrast, a 1986 analysis by Baltimore researcher Hal Lancaster estimated that the Colts (now the Indianapolis Colts) generated a mere \$200,000 in additional economic activity when they played in Baltimore. <7>

These divergent results were compelled by different assumptions about spending patterns. <8> It is also worth noting that the Philadelphia study was funded by a consortium of the City's professional teams, while the Baltimore study was written shortly after the Colts had bolted for "greener pastures" in Indianapolis.

In 1987, Robert Baade performed an independent empirical study of the effect of sports stadiums and pro sports teams on a metropolitan economy. <9> Baade's examination of economic growth data for nine cities before and after the adoption of new stadiums or professional sports teams suggested that pro sports impact was not significant. In five of the nine cities analyzed, stadium renovation or construction, or a city's adoption of a professional football or baseball team had a significant negative impact on metropolitan income as a fraction of regional income. In no instance did a positive, significant correlation surface among stadiums, professional sports, and city income as a fraction of regional income. <10>

Similar research by Baade and Richard Dye in 1988 <11> and again in 1990 <12> supported Baade's earlier findings. Two recent popular books by economists—*Paydirt* and *Baseball and Billions* <13>—have demonstrated a similar skepticism regarding the unique economic impact often attributed to professional sports.

Summary. The literature concerning investment in pro sports stadiums suggests they often fail to provide a positive direct return on the money invested in them. Studies of the value of a pro sports team or stadium to an area's economy have produced widely divergent results, depending on the methods employed and the assumptions made in crafting the study. These methods and assumptions are discussed in Parts 2 and 3.

PART 2

Basic Principles, Expenditures, and Multipliers

Three Types of Economic Impact

Stadiums, arenas, and professional sports can bring three sources of economic benefits to a metropolitan area: direct expenditures, indirect expenditures, and "psychological" benefits.

Direct expenditures represent the money spent by the professional sports franchise, its employees, and its patrons. As James Quirk and Rodney Fort explain,

The procedure that is used to estimate the economic benefits provided by a team or a facility is first to estimate the direct expenditures by the team for goods and services in the city, and then to add to this expenditures by fans on goods and services (other than game tickets) purchased in the city, together with expenditures by players on purchases of goods and services in the city. The resulting sum is the amount of direct expenditure benefits to the city provided by the team. <14>

These direct expenditures—on restaurants, hotels, transportation, souvenirs, food, and the like—are received as income by metropolitan-area businesses. These businesses and their employees then spend a fraction of this income on other goods and services within the metropolitan area, and those businesses and their employees spend a fraction of their income at other metropolitan-area businesses. The process continues, and the second, third, and subsequent rounds of spending constitute the *indirect expenditures* that benefit a region.

Since direct expenditures result in indirect expenditures, the direct expenditures are said to "multiply" through the economy. Economists attempt to quantify this effect by calculating a "multiplier." For a given level of direct expenditures, higher multipliers indicate higher levels of economic impact.

In addition to direct and indirect expenditures are "psychological" benefits, which are less easily quantified. Some have suggested, for instance, that television coverage of a city's professional sports teams encourages businesses to locate there.

It is conceivable that relocating businesses may view professional sports as adding to their employees' "quality of life" at a potential new location. Speculation aside, no evidence exists to suggest that professional sports is an important factor in business location

decisions. For example, Baade and Dye <15> found no connection between professional sports and manufacturing activity in approximately 90 percent of the tests conducted for a number of cities in the United States. It is likely that other factors, such as the tax environment and the existence of a skilled labor force, determine business location to a far greater extent than the presence of professional sports.

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It is, of course, possible that hosting professional sports may have negative psychological effects that ultimately burden the economy. In any event, the empirical test employed later in this study will detect economic growth derived from any source related to the presence of professional

sports, including psychological benefits that hosting a team may induce. <16>

How Direct and Indirect Expenditures Can Become Net Benefits

In standard economic models, metropolitan economic growth comes from new "export sales" and "import substitution." Increased export sales result from attracting net new inflows of spending from outside the area. This regional increase in exports might occur if, for example, people from another region decide to attend a baseball game in the area, rather than go to their local movie theater. If, on the other hand, people from another region spend money at an area stadium rather than at a movie theater or restaurant *near* the stadium, the stadium is not increasing export sales—it is simply shifting them.

Import substitution occurs when a community keeps money that residents might have spent elsewhere. If residents choose to go to a local football stadium instead of an entertainment event outside the area, it can be said that the stadium has become an import substitute. If, however, residents spend money at the stadium rather than at other local businesses, the stadium causes only a shift in spending, and no import substitution occurs.

The net new local spending that results from increased export sales and import substitution may multiply and drive an expansion of locally produced secondary goods and services. The size of the multiplier depends on the *locus of the subsequent spending*. If the new income is likely to be spent on locally produced goods, and if *this* income is likewise likely to be spent on locally produced goods, the multiplier will be larger. If, however, the athletes and team executives spend their income outside the area, or if the concessionaires import their semifinished goods from outside the area, the multiplier will be smaller.

How high are multipliers for professional sports? The answers to this question have varied greatly. In studies supporting stadium subsidies, multipliers greater than three—suggesting a considerable economic impact, given the size of the direct

expenditures—have been estimated. <17> The recent norm for stadium multipliers, however, is two or less.

Even these lower multipliers are suspect, however, since they are based on assumptions about where each dollar is spent and would be spent in the absence of sports. Determining this information for a particular sports activity is extremely difficult. The amount of money, the number and residence of consumers, and the number of businesses involved means that tracing each individual dollar is extremely difficult. <18>

Not surprisingly, those who estimate the greatest economic impact for professional sports assume that all the direct expenditures represents a net increase in local spending. These studies imply that all sports-related spending is either new export sales or import substitution, and that much or even all of the re-spending stays inside the community. <19> Less optimistic studies, including some of the author's previous work, have suggested that sports income represents mainly a shift of metropolitan-area spending, and that there are few new export sales and little import substitution. <20>

Opportunity Cost

Any analysis of the economic impact of sports would be incomplete without an acknowledgement that a city, county, or state government forgoes other opportunities when it builds a stadium or otherwise subsidizes a sports franchise. The value of the best of these other options is defined as the "opportunity cost" of the subsidy.

A thorough assessment of the value of sports as a public investment requires not merely an examination of whether a sports subsidy would have any net impact on a metro area's economic development.

Officials must evaluate whether the subsidized sports business would have the *greatest* net impact of available alternative uses of the money. The alternative of not taxing the money from citizens in the first place should always be included in this evaluation. <21>

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All resources are scarce. Local development authorities have limited budgets; tax-exempt industrial development bonds once used for stadium finance are now restricted; <22> and receipts from gambling and lotteries are not available for schools or public transportation when used for stadiums.

The "political capital" to sell projects to those who pay the taxes or lose from the economic redistribution is also limited. Coaxing taxpayers to subsidize a stadium may mean

the defeat of higher tax levies for other projects. Public officials must inevitably ask, Which is more valuable—more money for schools, roads, airports, police, tax reduction, or stadiums?

Short-term Versus Long-term Thinking

Even if expenditure and multiplier estimates suggest that subsidized sports development is better than other options, the long-term impact of a sports strategy must still be considered. Since the presence of a stadium or sports team may change the structure of the local economy, the long-run impact may be less desirable than that suggested by the direct expenditure-multiplier approach. If money spent on sports shifts resources from the manufacturing sector, and if manufacturing sector jobs are higher-wage and more stable, then pursuit of a sports development strategy may ultimately slow a region's economic growth.

Summary

The discussion above suggests the following points:

- (i) Direct expenditures benefit a region's economy only when they represent net *new* spending through import substitution or new export sales, or when they generate re-spending (indirect expenditures) that is new to the community.
- (ii) Multiplier estimates are necessarily based on assumptions about indirect expenditures. Bias in these assumptions can substantially influence the estimates either in favor of or against the thesis that professional sports is a valuable economic development tool.
- (iii) Economic impact estimates, even when rigorously prepared, must be compared to economic impact estimates generated for other uses of scarce public funds.
- (iv) Expenditure and multiplier estimates can overlook the importance of long-term economic trends, encouraging a short-term development strategy that ultimately leaves an area lagging in long-term economic growth.

PART 3

Approaches to Testing the Economic Development Potential of Professional Sports

The Standard Model

The orthodox "impact model" of economic development uses expenditure and multiplier estimates to determine the value of sports-based development strategies. But without knowledge of the origins of direct expenditures, this type of study, which often treats all direct spending on sports as net new spending, can vastly overstate a stadium's or team's contribution to the urban economy. <23> Indirect expenditures are derived as a multiple of direct expenditures, meaning that errors in estimating net direct expenditure increases are compounded in calculating overall spending increases.

In defending the treatment of all sports expenditures as net new expenditures, some have opined that there is no alternative to doing so, since it is not feasible to identify the spending for which pro sports substitutes. While it is true that identifying the origins of sports spending and its net contribution to spending is extremely difficult, such an identification is precisely what a rigorous expenditure-multiplier appraisal of the economic impact requires. Given these difficulties with the standard impact model, this study proceeds by analyzing *empirical* evidence about the economic impact of sports. This evidence is based on a comparison of metropolitan area income before and after hosting a team or a new stadium or arena.

Empirical Comparison of "Before" and "After" Profiles

"Before-and-after" comparisons recognize the complex nature of the relationship between pro sports and economic activity. Rather than trying to calculate economic impact, the analyst observes the changes that actually occur in the urban economic landscape. If indeed sports teams or stadiums result in economic growth, there should be a measurable change from "before" to "after."

Economists typically use a statistical method called "regression analysis" to identify the degree to which a change in one characteristic influences a change in another characteristic over time. Regression analysis can thus help determine the extent to which an area's economic performance varies in conjunction with changes in the number of the area's sports teams or sports stadiums. Such an investigation can capture differences in economic

performance both over time (time-series analysis) and across similar economic units, such as cities (cross-sectional analysis).

In applying regression analysis to the question of pro sports' economic impact, the fundamental consideration is whether professional sports and sports stadiums have an economic impact that is *statistically significant*—i.e., an effect greater than what could reasonably be expected to occur by chance. This task must be performed with care, since changes in the professional sports industry are often accompanied by other important changes, such as modification of the state's tax code or the decline of key industries. If important factors are omitted from the model, the researcher may incorrectly attribute acceleration or decline in economic growth to the presence of a team or a stadium.

In Part 4, the question of whether pro sports have a statistically significant economic impact is addressed with a new analysis of the relationship between sports and municipal economic activity. A "fixed effects" model is used to help separate the effects of sports investment from those of other economic changes. The results provide data sufficient to evaluate the performance of professional sports as an economic development tool.

PART 4

Analysis of the Economic Impact of Professional Sports

Methodology

A test for the statistical significance of pro sports' economic impact should adjust for the fact that a city's pattern of economic activity mimics national, regional, and state trends even as it follows a general trend line peculiar to itself. The extent to which a city follows national, regional, state, and city secular trends may be termed the "fixed" economic effects on the city. Once these fixed effects have been factored out of changes in a city's economic activity, what remains are changes inspired by factors unique to a city. This "unique behavior" can be investigated for evidence that the presence of professional sports teams or sports stadiums has contributed significantly to an area's economy.

The empirical study conducted for this paper employs the approach described above by applying the equation given in Appendix A (page 28) to 36 metropolitan areas that hosted professional sports teams during the thirty-year period from 1958 through 1987. The equation relates the presence of pro sports or new pro sports stadiums or arenas to a metro area's real, per capita personal income growth relative to the other cities in the sample, and relative to its own growth pattern. (Because these real, per capita personal income growth figures are adjusted relative to income trends, they are referred to as "trend-adjusted" in the discussion below.)

These 36 cities were chosen because they comprise all of the U.S. metropolitan areas that hosted either a professional team in one of the four major team sports—baseball, football, basketball, or hockey—or a new professional sports stadium or arena—i.e., ten years old or less—during this period. <24> Each "metropolitan area" is represented by the city's "Metropolitan Statistical Area" (MSA) as defined by the U.S. Department of Commerce. <25>

To ensure a broader, more representative sample, 12 MSAs that have *not* hosted a professional team, ostensibly because of their size, also were included in the sample. Thus, data for a total of 48 MSAs were incorporated into the model.

This empirical investigation allows us to estimate the extent to which yearly changes in each metro area's per capita real income, adjusted for general trends in the 48 cities' economic growth, are explained by changes in either the number of new stadiums or professional sports franchises the area acquires. <26> The study includes the entire MSA,

rather than just the central city, since the entire region is more likely to capture all of the indirect expenditures that result from hosting professional sports than is the host city alone.

A technical discussion of the methodology appears in Appendix A. Key points about the model are discussed below. Throughout this discussion, the word "stadiums" will refer to both stadiums and arenas.

Possible Objections to the Model. Some analysts might argue that this model demands too much from professional sports. Since the professional sports industry is small relative to a large city's economy, <27> it is unlikely that professional sports plays a statistically significant role in determining real per capita income.

In fact, however, the model's test for statistical significance does not demand such impressive economic performance from professional sports. To establish that professional sports contributes positively to a city's economy, the model requires only that sports be significant in determining changes in real, per capita personal income that are *not explained by trends*.

It might also be argued that the model misses growth that personal income numbers do not capture. While it is true that other measures may prove to be of interest—and indeed the author himself investigates such measures elsewhere <28>—it is also true that economists generally see real income growth as the best single measurement of economic growth. Other measures of growth—such as increases in the numbers of jobs or businesses in an area—will tend to be reflected in real personal income growth.

This study focuses on a stadium's economic impact only during the years in which it is being used, not during its construction. The economic impact of the actual construction of a stadium is likely to be relatively small and of limited duration. Even if the construction of a stadium does have a significant, lasting impact on an area's economy, this effect would be measured as it persisted into the early years of the stadium's use.

A final objection to the model might be that our findings will be incomplete even if the regression analysis does not indicate a significant economic benefit for Metropolitan Statistical Areas. By this reasoning, a downtown stadium investment may not benefit an MSA as a whole, but it may change the distribution of income within the MSA by reversing flight from downtown to the suburbs. A stronger "core" area in the central city would then be the basis for long-term growth for the entire region.

This is an interesting proposition, and one deserving research. But several things may be said about it immediately. First, testing this theory empirically will be difficult. The trend over the past few decades has not been the movement of teams from the suburbs to downtown, but rather from downtown to the suburbs. Instances of movement from the

suburbs to downtown are few and recent, meaning that little valid statistical analysis can be performed at present regarding the actual outcome of such inner city "reinvestment."

Second, this theory depends in part on enough of the indirect expenditures generated by the stadium staying in the downtown region. Otherwise, net downtown spending increases may not be sufficient to offset the cost to the inner city of building the stadium. As noted in Part 2, it is quite possible that indirect expenditures occur outside the area around the stadium. This "leakage" is the reason the present study considers entire Metropolitan Statistical Areas, rather than core urban areas.

Third, if pro sports development subsidies make inner cities stronger, thus providing a firm basis for regional growth that could not otherwise occur, the model employed here should detect this fact. If those MSAs with downtown stadiums exhibit significant growth related to pro sports investment, while those with stadiums in suburban areas do not exhibit such growth, the model will provide some support for this theory of downtown sports investment. If such a trend does not emerge, the model will provide no support for the theory.

Strengths of the Model. The model employed here addresses two concerns raised by the analysis in Part 2. First, the model provides evidence of whether sports increases economic activity or simply realigns it within the metropolitan area. It is unlikely that a statistically significant relationship between sports and economic growth will emerge unless there is a net increase in economic activity.

Moreover, the model provides evidence regarding the power of a sports-development strategy relative to alternative strategies for creating economic growth. The empirical study includes data for cities that did not host professional sports, and the model likewise compares sports cities undertaking new sports investments with sports cities that are not. If sports development does not demonstrate a statistically significant impact, the results will suggest the possibility that after controlling for other trends, economic growth in areas that are making no new sports investments compares favorably with economic growth in areas that are. This suggestion would provide additional reason to question the assertion that sports development subsidies provide a unique economic stimulus. Alternatively, a consistent result of statistical significance would suggest that new sports development brings unique economic benefits not realized by sports and non-sports cities that do not undertake new sports development.

Note three other features. First, only stadiums ten years old or less are considered in the model. This restriction was adopted because research has suggested that stadiums will have less effect on sports spending, especially by fans, as the stadiums become older. In *Government and the Sports Business*, <29> Stanford University economist Roger Noll determined that a "novelty effect" influences baseball attendance after the construction of a new stadium. This effect lasts somewhere between seven and eleven years. Including only

stadiums less than eleven years old increases the chance that pro sports will attract large direct expenditures and demonstrate a significant, positive impact on metro area economic growth.

Second, no attempt has been made to focus on publicly subsidized sports teams and stadiums, or to treat such projects differently in the model. This model considers only the presence of the facilities or teams themselves. < 30 > This stipulation was also designed to favor the thesis that sports brings significant economic development.

Third, the model uses per capita personal income growth, rather than total personal income growth, to measure economic growth rates. Unlike total personal income growth, per capita figures do not prejudice the case against big city sports investment, where large total personal income is often the norm. The model should be able to detect pro sports' economic impact—if it exists—in cities of any size.

In summary, then, the model employed in this paper should capture the economic benefits, if any, of professional sports teams and stadiums. The model will also help us answer questions raised by the economic analysis earlier in the paper.

Before proceeding to the results of the regression analysis, it is important to note that this analysis is concerned only with the "special impact" hypothesis used to justify government sports subsidies. Even if the findings below do not support this hypothesis, the rationale for *private* sports investment is in no way affected. Private investment in sports teams or sports stadiums makes sense economically if the owner can turn a profit from them. A demonstration of a significant, positive economic effect on a host area should not be seen as a prerequisite for allowing private sports investment. Most investment in private businesses—even very successful ones—would fail to demonstrate this kind of impact.

Results

Table A of Appendix B (page 34) shows detailed results from the regression analysis. For the interested reader unfamiliar with econometrics, Appendix B also includes a "key" to understanding the regression results (page 33). A summary of the results of the analysis is presented below.

Impact on metropolitan areas. As noted earlier, the model includes the real, per capita income growth of 48 U.S. cities from 1958 through 1987. During this period, 36 cities hosted a professional team in one of the four major team sports (baseball, football, basketball, and hockey). The results of the tests for these 36 MSAs are recorded in Table I.

In those cases where a statistically significant impact emerged, the table also indicates whether the impact was "positive" or "negative." A positive outcome indicates that

teams or stadiums had a statistically significant and *positive* effect on the area's real, per capita income growth. A negative finding indicates that teams or stadiums had a statistically significant and *negative* effect on the area's real, per capita income growth. Although we have discussed repeatedly how professional sports might serve as an economic stimulus, it is also possible that professional sports might serve as a net economic burden.

The results presented in Table I overwhelmingly indicate that professional sports is not statistically significant in determining real, trend-adjusted, per capita personal income growth:

- **Of the 32 MSAs where there was a change in the number of sports teams, 30 MSAs showed no significant relationship between the presence of the teams and real, trend-adjusted, per capita personal income growth.** In the remaining two cases, the presence of sports teams was significantly positive once (in Indianapolis) and significantly negative once (in Baltimore).
- **Of the 30 MSAs where there was a change in the number of stadiums or arenas ten years old or less, 27 MSAs showed no significant relationship between the presence of a stadium and real, trend-adjusted, per capita personal income growth.** In all three of the remaining cases (St. Louis, San Francisco/Oakland, and Washington D.C.), the presence of a sports stadium was significantly *negative*.

Regional Impact. Although individual cities fail to exhibit a statistically significant impact, it may be that professional sports has a positive effect when a number of metro areas within a region are considered. It may be, for example, that New York, Philadelphia, and other large cities in the eastern part of the United States collectively export stadium and sports services to other regions of the country. Large conventions utilize stadiums and arenas, and super-stations and cable television broadcast games nationally, increasing the likelihood that stadiums and teams are successfully marketed to the rest of the country.

Results for tests conducted regarding the impact of stadiums and teams on regions are recorded in Table II. Detailed results from the regression analysis for each region can be found in Appendix B, Table B (page 38).

TABLE I
The Impact of New Stadiums and Professional
Sports Teams on Real, Trend-Adjusted, Per Capita Personal
Income Growth For Selected U.S. Cities (MSAs)
1958-1987

City/Result	Team Presence Statistically Significant^a	New Stadium Presence Statistically Significant^a	City/Result	Team Presence Statistically Significant^a	New Stadium Presence Statistically Significant^a
Atlanta	NO	NO	Hartford	NO	NO
Baltimore	YES NEGATIVE	N.A.	Houston	NO	NO
Boston	N.A.	NO	Indianapolis	YES POSITIVE	NO
Buffalo	NO	NO	Kansas City	NO	NO
Charlotte ^b	NO	N.A.	Los Angeles	NO	NO
Chicago	NO	N.A.	Miami	NO	NO
Cincinnati	NO	NO	Milwaukee	NO	NO
Cleveland	NO	NO	Minneapolis	NO	NO
Dallas	NO	NO	New Orleans	NO	NO
Denver	NO	NO	New York	NO	NO
Detroit	N.A.	NO	Orlando	NO	N.A.
Green Bay	N.A.	NO	Philadelphia	NO	NO

**TABLE I
(Continued)**

City/Result	Team Presence Statistically Significant ^a	New Stadium Presence Statistically Significant ^a	City/Result	Team Presence Statistically Significant ^a	New Stadium Presence Statistically Significant ^a
Phoenix	NO	NO	San Antonio	NO	NO
Pittsburgh	NO	NO	San Diego	NO	NO
Portland ^c			San Francisco/Oakland	NO	YES NEGATIVE
Sacramento	NO	NO	Seattle	NO	NO
Saint Louis	NO	YES NEGATIVE	Tampa Bay	NO	NO
Salt Lake City	NO	N.A.	Washington, D.C.	NO	YES NEGATIVE
ALL ^d	NO	NO			

^a "Statistically significant" means that the probability is five percent or less that the correlation is the result of random events.

^b The Charlotte Hornets and their stadium came on line together in 1988. Only the team is considered in the model, since the model cannot separate the economic impact of the team and the stadium when the two are introduced simultaneously.

^c It was not possible to match Portland data with the general array of teams and stadiums.

^d "ALL" includes all 48 cities in sample except Portland, Des Moines, and Waco.

"N.A." signifies that there was no change in the number of teams or new stadiums and arenas throughout the sample period.

The following 12 MSAs that did not host sports teams were included in the analysis: Anchorage, Boise, Des Moines, Duluth, Roanoke, San Jose, Santa Barbara, Savannah, Springfield, IL, Springfield, MO, Waco, and Wichita.

TABLE II
The Impact of New Stadiums and Professional
Sports Teams on Real, Trend-Adjusted, Per Capita Personal
Income Growth For the Eight Major Regions in the
Continental United States, 1958-1987

Region/Result	Team Presence Statistically Significant*	New Stadium Presence Statistically Significant*	Region/Result	Team Presence Statistically Significant*	New Stadium Presence Statistically Significant*
Far West	NO	YES NEGATIVE	Plains	NO	NO
Great Lakes	NO	NO	Rocky Mountains	NO	YES POSITIVE
Mideast	NO	NO	Southeast	NO	NO
New England	NO	YES NEGATIVE	Southwest	NO	YES POSITIVE

* "Statistically significant" means that the probability is five percent or less that the correlation is the result of random events.

The MSAs in each region are given below.

- Far West:** Los Angeles, Portland, Sacramento, San Diego, San Francisco/Oakland, San Jose, Santa Barbara, Seattle.
- Great Lakes:** Chicago, Cincinnati, Cleveland, Detroit, Green Bay, Indianapolis, Milwaukee, Springfield, IL.
- Mideast:** Baltimore, Buffalo, New York, Philadelphia, Pittsburgh, Washington, D.C.
- New England:** Boston, Hartford.
- Plains:** Des Moines, Duluth, Kansas City, Minneapolis, St. Louis, Springfield, MO, Wichita.
- Rocky Mountains:** Boise, Denver, Phoenix, Salt Lake City.
- Southeast:** Atlanta, Charlotte, Miami, New Orleans, Orlando, Roanoke, Savannah, Tampa Bay.
- Southwest:** Dallas, Houston, San Antonio, Waco.

The regression analysis used to generate Table II suggests several things worthy of note:

- **No region demonstrated a statistically significant relationship between professional sports teams and real, trend-adjusted, per capita personal income growth.** It does not appear that professional teams export their services beyond the region to an extent that matters economically.
- **Four of the eight regions demonstrated no significant relationship between sports stadiums and real, trend-adjusted, per capita personal income growth.** Of the four other regions, stadiums appear to have a significant positive impact in two (the Southwest and the Rocky Mountains), and a significant negative impact in two (New England and the Far West).
- **While there are more instances of a significant relationship between regions and stadiums than there were when teams or MSAs were tested, it should be noted that the percentage of trend-adjusted regional changes in real, per capita personal income growth explained by changes in the number of sports stadiums or teams is uniformly small.** Inspection of the adjusted correlation coefficients calculated in the regression analysis indicates that only a small percentage of the variation in regional, real, trend-adjusted, per capita personal income growth is explained by changes in the sports environment (see " R^2 " values in Appendix B, Table B). **In no case is more than five percent of the variation in growth explained.**

Discussion of the Findings

The findings summarized in Table I indicate that professional sports teams generally have no significant impact on a metropolitan economy. Only in the case of Indianapolis did teams exert a statistically significant, positive impact on the metro area economy. This positive result may be attributable to a combination of things, including the relatively small size of the Indianapolis economy, the Hoosier State's tradition of sports involvement, and the city's commitment to defining itself as America's sports capital, particularly for amateur sports. The citizens of Indianapolis appear to have embraced this sports theme. The Colts and Pacers may have a stronger state following than is usual relative to national standards.

The findings summarized in Table II indicate that professional sports teams generally have no significant impact on a region's economy. They also indicate that, to some extent, the services of stadiums and arenas are exported or imported on a national basis. In particular, the Rocky Mountains and Southwest regions are net exporters of stadium services, while the Far West and New England regions are net importers of stadium and arena services.

State governments are likely to derive little benefit from developing plans to exploit their stadium "advantage" or to ameliorate their stadium "disadvantage."

Nevertheless, after accounting for national trends, stadiums and arenas do not explain much of the variation in a region's real, trend-adjusted, per capita personal income growth. Because none of the adjusted correlation coefficients exceeds five percent (see " \bar{R}^2 " figures in Appendix B, Table B), state governments are likely to derive little benefit from developing

plans to exploit their stadium "advantage" or to ameliorate their stadium "disadvantage."

Negative Effects of Sports Stadiums. Stadium investments do appear, however, to have some economic effects. In 63 percent of the MSA tests, the correlation coefficient associated with stadiums was negative (see " β_2 " values in Appendix B, Table A, page 34). This suggests a tendency for stadiums to push rates of economic growth below the average defined by trend lines for cities nationally. In the Washington, D.C. and Oakland-San Francisco metro areas, stadiums contributed negatively to real, trend-adjusted, per capita personal income growth. It is noteworthy that both Washington, D.C. and the Bay Area have relatively high per capita incomes. In light of this, the negative results of stadium investments may be attributable to the fact that sports-related jobs pay below the metropolitan norm.

These results support a conclusion regarding professional sports and economic growth reached by the author and Robert Dye in 1990 <31>:

The impact of stadium construction or renovation on the metropolitan area's share of regional income is negative and significant. This result is consistent with the kind of economic activity that stadiums and professional sports spawn. Professional sports and stadiums divert economic development toward labor-intensive, relatively unskilled (low-wage) activities. To the extent that this developmental path diverges from less labor-intensive, more highly skilled labor (high-wage) characteristic of other economies within the region, it would be expected that the sports-minded area would experience a falling share of regional income. <32>

The types of jobs induced by stadium activity are typically low-wage and seasonal: ticket takers, ushers, vendors, restaurant and bar workers, guards, parking lot attendants, and so on. City development subsidies that concentrate on these types of jobs could lead a city to gain a comparative advantage in unskilled and seasonal labor. Long-term future growth in sports communities will be concentrated in low-income jobs.

But regardless of the type of job, wouldn't the spending still be of some economic consequence to a city? After all, sports entertainment involves spending, and it is axiomatic that one person's spending is another person's income.

As explained previously, spending spurred by sports events may represent spending that would still occur elsewhere in the area. Attending a sporting event is but one possible use of an individual's leisure time and money. It is possible that no connection between professional sports and per capita income growth emerged because sports spending simply substitutes for other forms of leisure spending.

It is possible that no connection between professional sports and per capita income growth emerged because sports spending simply substitutes for other forms of leisure spending.

Who Benefits from Sports Subsidies? If professional sports teams and stadiums have no significant economic impact, where does the money go? The data suggest that stadium subsidies and other sports subsidies benefit not the community as a whole, but rather team owners and professional athletes.

As economist Dean Baim has pointed out, teams typically receive subsidies for their fixed costs (most commonly, the cost of the stadium), and professional sports must compete with other entertainment businesses. As a consequence, "there is little likelihood that a significant amount of the subsidy will be passed on by the team" to the fan in the form of lower prices. <33>

The data suggest that stadium subsidies and other sports subsidies benefit not the community as a whole, but rather team owners and professional athletes.

The failure of professional sports to demonstrate a significant impact on economic growth suggests that either team owners and athletes spend little of their revenues in the area, or that professional sports does not generate economic growth as substantial as alternative uses of the funds invested in sports. In either event, the team, not the area, becomes the beneficiary of the subsidy.

Public Subsidies to Sports Reconsidered. This study finds no support for the notion that there is an economic rationale for public subsidies to sports teams and stadium and arena construction. Professional sports does not appear to create a flow of public funds generated by new economic growth. Far from generating new revenues out of which other public projects can be funded, sports "investments" appear to be an economically unsound use of a community's scarce financial resources.

This raises the issue of opportunity cost. Public officials have sought to fund professional sports stadiums with everything from sales taxes to seemingly innocuous means such as lotteries and taxes on gambling receipts. But even lottery and gambling revenues are limited. Using these funds for stadiums precludes their use in other projects that might better stimulate the local economy.

Scarce resources might better be targeted to industries that are more clearly engaged in export sales or import substitution. The attention of those who allocate economic development resources should be devoted to the types of jobs that are being created in alternative development scenarios. Indeed, since public expenditures on sports fail to correlate with changes in real, trend-adjusted, per capita personal income, other things unique to cities, perhaps including other public expenditures, must account for positive changes in real per capita income. These findings indicate economic development strategists in government would do well to analyze just what activities *do* account for economic growth in their communities.

A sound development strategy might simply leave these "development" funds in the private economy. Private spending has spin-off benefits of its own.

Alternatively, a sound development strategy might simply leave these "development" funds in the private economy. Private spending has spin-off benefits of its own, and there is reason to believe that private individuals and businesses often make better spending decisions in the private sector than public

officials do in the public sector. <34> If so, government investment in professional sports would be consistent with a negative economic return.

Cities should recognize that building stadiums for mediocre teams will probably add little to fan support beyond the short run.

Sports subsidies do, of course, provide a benefit to the teams themselves. But care should be taken in assessing this benefit. Some owners have suggested that a new, subsidized stadium will improve attendance. <35> While an analysis of this claim is beyond the scope of this

study, it should be noted that a new stadium probably provides only a short-term solution to a team's attendance problem. As mentioned earlier, the novelty effect of new stadiums appears to erode after seven to eleven years. <36> The author's previous research indicates that the team's on-field competitiveness is critical in determining attendance. <37> Cities should recognize that building stadiums for mediocre teams will probably add little to fan support beyond the short run.

PART 5

Summary and Concluding Remarks

For many, professional sports events are the transcendent experience in contemporary western culture. Sports is filled with myths—wonderful stories of heroic performances and courage under pressure. But increased government subsidies to sports teams and stadiums appear to have spawned an economic myth that the presence of sports teams and new sports stadiums and arenas has a significant effect on an area's economic growth. This study and others find no factual basis for this claim. *The author's examination of economic data related to sports and real income growth provides no support for the conventional argument that professional sports stadiums and teams have a significant impact on an area's economic growth.*

State and local governments now spend hundreds of millions of dollars each year to subsidize sports teams and stadiums. To the extent that an "economic investment rationale" has been cited to justify government subsidies to sports teams and stadiums, the evidence compiled here has important public policy implications.

The findings are particularly clear in suggesting that public funding of professional sports stadiums is not a sound civic economic investment. If the opportunity cost is included in cost-benefit considerations, public investments in stadiums may be more than just insignificant; they may be *negative*. Spent differently—either by public officials on different public services or by private citizens who are not taxed to subsidize sports—these large sums of money may contribute more to an area's economic growth.

The findings are particularly clear in suggesting that public funding of professional sports stadiums is not a sound civic economic investment.

For professional sports to contribute significantly to the local economy, it must induce large net increases in spending. The myth is that it does. The reality is that sports very likely do not expand spending, but serve only to realign it. The public should view promises about the economic impact of professional sports with a healthy skepticism.

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ENDNOTES

1. Benjamin A. Okner, "Subsidies of Stadiums and Arenas," in Roger G. Noll, editor, *Government and the Sports Business* (Washington D.C.: Brookings Institution, 1974), pages 325-347.
2. Dean V. Baim, "Sports Stadiums as 'Wise Investments': An Evaluation," *Heartland Policy Study* No. 32, (Chicago, IL: The Heartland Institute, November 26, 1990).
3. *Ibid.*, page 6. Of the fourteen stadiums in Baim's analysis, there was only one that had a net positive accumulated value for the subsidizing government. Los Angeles Dodger Stadium—privately built, owned, and operated—paid more in property taxes than it received from a relatively small initial government subsidy (\$4.7 million in 1958) for site grading and road construction (see page 26).
4. James P. Quirk and Rodney D. Fort, *Paydirt* (Princeton, NJ: Princeton University Press, 1992), pages 164-166.
5. Edward B. Shils, "Report to the Philadelphia Professional Sports Consortium On Its Contribution to the Economy of Philadelphia," mimeograph, June 17, 1985.
6. Kenneth R. Clark, "Threat to Move Yanks Angers N.Y.," *Chicago Tribune*, July 18, 1993, Section 1, page 17.
7. Hal Lancaster, "Tale of Two Cities: Why Football Mesmerizes Baltimore and Indianapolis," *The Wall Street Journal*, January 21, 1986, page 24.
8. For a brief discussion of the assumptions in Edward Shils's study, see Robert A. Baade, "Is There an Economic Rationale for Subsidizing Sports Stadiums?" *Heartland Policy Study* No. 13 (Chicago, IL: The Heartland Institute, February 23, 1987), page 13.
9. Robert A. Baade, *supra* note 8.
10. *Ibid.*, page 15.
11. Robert A. Baade and Richard F. Dye, "Sports Stadiums and Area Development: A Critical Review," *Economic Development Quarterly*, August 1988, pages 265-275.
12. Robert A. Baade and Richard F. Dye, "The Impact of Stadiums and Professional Sports on Metropolitan Area Development," *Growth and Change*, Spring 1990.
13. James P. Quirk and Rodney D. Fort, *supra* note 4, and Andrew Zimbalist, *Baseball and Billions*, (New York: BasicBooks, HarperCollins Publishers, 1992).
14. James P. Quirk and Rodney D. Fort, *supra* note 4, page 172.
15. Robert A. Baade and Richard F. Dye, *supra* note 11.
16. It is conceivable that some very real psychological benefits have no economic impact. Some sports enthusiasts have asserted, for instance, that a city's residents derive psychological benefits, such as a sense of pride, from building stadiums and hosting teams. This claim is part of the "deep space"

of the stadium debate, since assigning a value to such benefits is a highly subjective task.

17. See, for instance, John E. Peck, "An Economic Impact Analysis of South Bend's Proposed Class A Baseball Stadium," *Bureau of Business and Economic Research*, May 10, 1985.
18. This information is especially hard to obtain because a researcher would need to determine what *would have* happened if there were no pro sports development. There is no way to know for sure what consumers would have done with their dollars in the absence of pro sports.
19. For a good discussion of an impact study that makes such unrealistic assumptions, see James P. Quirk, "The Quirk Study: A Close Look at the Two Proposals," *St. Louis Post Dispatch*, January 18, 1987, pages 5i-8i.
20. Robert A. Baade, *supra* note 8.
21. A 1988 study by the Center for Business and Economic Research at the University of Alabama found that "a significant negative relationship has been identified and estimated between tax burden and economic growth for most states in the United States." See "A National Study on State Economic Growth, Tax Burden, and Government Expenditures: Phase 3 Final Report," University of Alabama, June 30, 1988. For a survey of the literature on the negative relationship between taxes and economic growth see Joseph L. Bast and John Beck, "Taxes and Economic Growth," in Joseph and Diane Bast, editors, *Coming Out of the Ice*, (Chicago, IL: The Heartland Institute, 1990), pages 15-32.
22. Tax exempt bonds for stadium construction in the United States expired on December 31, 1992.
23. For instance, see John E. Peck, *supra* note 17.
24. For technical reasons, regression calculations could not be made for Portland. Portland's income growth figures were included, however, in the income growth trends.
25. See U.S. Department of Commerce, Bureau of Economic Analysis, *Local Area Personal Income*, (Washington, D.C.: U.S. Government Printing Office), Various Years. Other data sources for the model are discussed in Appendix A. The boundaries of the Metropolitan Statistical Areas and other standard local areas reported on by the USDOC have changed over the years. Adjustments were made to the MSA data to make them uniform over time.
26. "First differences" for real, per capita personal incomes for individual cities were used to more completely capture the change in a city's economic activity induced by a stadium or team. Had an average of city real, per capita personal income over the sample time period been deducted from the observed level of city economic activity in year *t*, the impact of a sports change in the initial year of that change would have been diluted. Using an average would have reduced the likelihood that a sports-induced change would have been found, since the economic impact of a team or stadium in its first year would have been averaged over the stadium or team history. Therefore, the model represented by the equation in Appendix A maximizes the likelihood of statistically significant coefficients for the stadium and team variables.
27. Roger G. Noll, a Stanford University economics professor, has noted that "a typical stadium's economic impact can be compared to that of a good-sized department store." See Chris Kraul, "Fields of Dreams," *Los Angeles Times*, July 11, 1993, page D1.
28. Robert A. Baade, "What Cities Need to Know About Stadiums and Economic Development," mimeograph, November 1993.

29. Roger G. Noll, "Attendance and Price Setting," in Roger G. Noll, editor, *Government and the Sports Business* (Washington, D.C.: The Brookings Institution, 1974), pages 115-157.
30. It may be that private-sector investments in sports are more likely to bring real economic growth than public-sector sports investments. Economist Dean Baim has found that the per-seat cost for public stadiums is about 50 percent higher than for private stadiums (see Dean V. Baim, "City's taxpayers have Tiger by the tail," *The Detroit News*, December 23, 1990, page 3B). This finding suggests a higher level of economic efficiency when private dollars are used for stadium construction. The model employed in this paper, by combining private investment with (presumably less efficient) public investment, increases the likelihood that sports will look like a good civic investment.

If, on the other hand, public subsidies to sports are *more* efficient than private sports investments, the fact that there have been few private stadiums and private subsidies to sports franchises in recent years means that these weaker examples will have little effect on the better performance of the public investment. In either instance, the model gives every opportunity for the "public-investment-in-sports" rationale to prove itself.

31. Robert A. Baade and Richard F. Dye, *supra* note 12.
32. *Ibid.*, page 12.
33. Dean Baim, *supra* note 2, page 12; see also page 35, endnote 11. The important factors are the nature of the subsidy and the nature of the market demand. Most teams receive subsidies for fixed costs associated with building a stadium. This subsidy will not affect the variable cost of admitting fans to the game, and the market price that maximizes the profit realized by the sale of tickets will be unchanged. The net effect of the subsidy will be to increase the franchise's profits, since the team will not have to pay the fixed costs that were subsidized.

Even in the case where the team receives a subsidy that affects the variable cost of admitting additional fans to the stadium much of the subsidy is likely to be kept by the team, rather than passed on in the form of lower ticket prices. This result is due to the "elasticity" of the demand for sports entertainment.

"Inelastic" demand usually occurs when a firm has few competitors for the provision of a particular service. At first blush, it might seem that demand for sports entertainment would be inelastic, since a professional ball club would have few—if any—competitors for the provision of their particular type of sports entertainment. Few areas have more than one baseball team or more than one football team.

Nevertheless, it is likely that professional sports teams compete with professional teams in other sports, and with a wide range of entertainment services—movie theaters, restaurants, night clubs, and so forth. This competition means that the demand for sports services is more "elastic"—i.e., in percentage terms, that the level of quantity demanded changes more dramatically in response to small changes in price. When a firm receives a subsidy for variable costs in a market with elastic demand, it can lower its prices less than the subsidy and increase the quantity of tickets demanded sufficiently to once again maximize profits. Charging an even lower price—perhaps "passing on" the complete subsidy to the fan—will cause profits to fall, even though the quantity of tickets demanded increases.

Thus, even when there is a subsidy for variable costs, not all of the subsidy will be passed on to the fan. In a highly competitive market, little of the variable subsidy will be passed on to the fan.

34. For stadium construction in particular, Dean Baim has found that the per-seat cost for privately financed stadiums is less than that of publicly funded stadiums (see Dean Baim, *supra* note 30). This suggests that spending by private interests in a competitive stadium market are made more wisely. For a discussion of the problems with public spending versus private spending, see Joseph L. Bast, "Selective Tax Abatements and Subsidies," in Joseph and Diane Bast, editors, *Coming Out of the Ice*, *supra* note 21, pages 33-48.
35. Yankees owner George Steinbrenner, for instance, has suggested that a new (subsidized) stadium would increase attendance at Yankee's games. See Kenneth Clark, *supra* note 6.
36. Roger G. Noll, *supra* note 29.
37. Robert A. Baade, "An Analysis of Major League Baseball Attendance, 1969-1987," *Journal of Sport and Social Issues*, 1990, 14(1), pages 14-32.

APPENDIX A

Discussion of the Methodology

The Equation

This study employs a model based on the following equation:

$$(y_{i,t} - \sum_{j=1}^k y_{j,t}/k) - (y_{i,t-1} - \sum_{j=1}^k y_{j,t-1}/k) = \beta_0 + \beta_1 NT_{i,t} + \beta_2 NS_{i,t} + e_t$$

where

$y_{i,t}$ is real, per capita, personal income in MSA i at time t ;

$y_{j,t}$ is real, per capita, personal income in MSA j at time t ;

k is the number of Metropolitan Statistical Areas (MSAs) in the sample;

$NT_{i,t}$ is the number of professional, major league sports franchises (baseball, football, basketball, and hockey) in city i at time t ;

$NS_{i,t}$ is the number of stadiums and arenas ten years old or less in MSA i at time t ;

e_t is the "stochastic error" at time t ;

β_1 and β_2 are coefficients to be determined for each MSA;

and β_0 is a constant to be determined for each MSA.

The regression analysis in this paper estimates β_1 and β_2 for 36 Metropolitan Statistical Areas (MSAs) that hosted professional sports during the thirty-year period from 1958 through 1987. These 36 MSAs comprise all of the U.S. metropolitan areas that hosted either a professional team in one of the four major team sports—baseball, football, basketball, or hockey—or a new professional sports stadium or arena during this period. For technical reasons, regression calculations could not be made for Portland, which hosted sports during the time tested. Portland's income growth figures were included in the national income trends.

To ensure a broader, more representative sample, cities that have *not* hosted a professional team, ostensibly because of their size, also were included in the study. A total of 48 Metropolitan Statistical Areas were included in the analysis (a list of both sets of MSAs appears in Appendix B, page 32). The boundaries of the Metropolitan Statistical Areas and other standard local areas reported on by the USDOC have changed over the years. Adjustments were made to the MSA data to make them uniform over time.

This empirical investigation allows us to estimate the extent to which changes in each metro area's per capita real income from one year to the next, adjusted for general trends in the 48 cities' economic growth, are explained by changes in either the number of new stadiums or professional sports franchises the area acquires. In keeping with standard approaches to urban economics, the model considers economic growth for the entire MSA, rather than for the host city alone. Using the MSA increases the likelihood of capturing any positive economic impact that results from indirect expenditures that occur outside the immediate neighborhood in which the stadium is located.

Technical Discussion of the Model

Part 4 of this study discusses various aspects of the model, but for those familiar with the technicalities of modeling, a few questions might arise. First, it might appear that local and national trends are not properly included in the analysis. Shouldn't local and national income trends be *explanatory* variables, and therefore on the right-hand side of the equation with coefficients β_3 and β_4 ? If local or national trends (or both) spurred an MSA's economic growth when a stadium was introduced or a team was adopted, would the model be able to separate these effects?

For several reasons, national and local income variables should not appear as independent variables in the model. The most important reason is that the appearance of these two variables on the right-hand side of the equation leads to the problem of multicollinearity, since it is likely that local and national income variables are highly correlated. Moreover, using national and local income variables as independent variables results in another problem. Consider the following equation:

$$Y_{i,t} = \beta_0 + \beta_1 NT_{i,t} + \beta_2 \sum_{j=1}^k Y_{j,t}/k + \dots$$

The last term in this equation is the average of *all* the cities in the sample, *including* the *i*th city. Thus, the dependent variable appears on the right-hand side of the equation. In formulating the model for this paper, the restriction of $\beta_2 = 1$ is imposed on the model.

This approach also enables us to give an economic meaning to the dependent variable, since it can be interpreted as the deviation of Y from trends. By designing the independent variable such that it measures deviations from local and national trends, the model is safeguarded against mis-specification. Note that, as the question above suggests, the model does not separate the local and national impacts. The model is not designed to separate these impacts. Instead, it factors them out.

"First differences" for real, per capita personal incomes for individual cities more completely capture the change in a city's economic activity induced by a stadium or team. If, for instance, an *average* of city real, per capita personal income over the sample time period had been deducted from the observed level of city economic activity in year t , the impact of a sports change in the initial year of that change would have been diluted. Using an average would have reduced the likelihood that a sports-induced change would have been found, since the economic impact of a team or stadium in its first year would have been averaged over the stadium or team history.

The way in which trends are adjusted for in the model helps give teams and stadiums the best possible opportunity to demonstrate any positive impact they might have on economic growth. Amusement and recreation services in a large city typically account for less than 2 percent of overall economic activity. Formulating the dependent variable as a deviation from a trend maximizes the likelihood of identifying a significant relationship between the stadium and team variables and the level of economic activity. Basing the model on the above equation maximizes the likelihood of statistically significant coefficients for the stadium and team variables.

Those who do not follow professional sports might also wonder why teams and new stadiums were represented by different explanatory variables, since it would appear that each host city that has a team would need a stadium. The number of stadiums and teams can vary independently. In some cases, new stadiums were built in an MSA to accommodate teams occupying an old stadium in the area.

The null hypothesis for the model is that $\beta_1 \neq 0$ and that $\beta_2 \neq 0$, meaning that pro sports teams and new stadiums have a statistically significant economic impact. Multiple regression analysis was used, and the Cochrane-Orcutt procedure was employed to correct for autocorrelation.

Data Sources

Data for the model were taken from several sources. Information on the location of teams and new stadiums was taken from "Teams and Ball Parks" in *The 1992 Sports Almanac* (Boston: Houghton Mifflin Co., 1992), edited by Mike Meserole. Data on MSA population and nominal, per capita personal income were taken from various years of *Local*

Area Personal Income (Washington, D.C.: U.S. Government Printing Office), compiled by the Bureau of Economic Analysis, U.S. Department of Commerce. National Consumer Price Index figures for adjusting nominal income trends were taken from the *Economic Report of the President, 1992* (Washington, D.C.: U.S. Government Printing Office, June 1993).

APPENDIX B

Detailed Results of Regression Analysis for Metropolitan Statistical Areas and Regions

Detailed results from the regression analysis for the 48 Metropolitan Statistical Areas (MSAs) included in this study appear in Table A below. A "Key To Understanding the Results" is provided for the interested reader unfamiliar with econometrics.

The following is an alphabetical list of the 36 MSAs that hosted professional sports from 1958 to 1987: Atlanta, Baltimore, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Green Bay, Hartford, Houston, Indianapolis, Kansas City, Los Angeles, Miami, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Phoenix, Pittsburgh, Portland, Sacramento, Saint Louis, Salt Lake City, San Antonio, San Diego, San Francisco/Oakland, Seattle, Tampa Bay, and Washington, D.C. These 36 MSAs all appear in Table A below (and in Part 4, Table I, page 16).

The following is an alphabetical list of the 12 MSAs that did not host pro sports teams: Anchorage, Boise, Des Moines, Duluth, Roanoke, San Jose, Santa Barbara, Savannah, Springfield, IL, Springfield, MO, Waco, and Wichita. Per capita income figures for these metro areas were incorporated into the analysis of real, per capita personal income trends.

The MSAs included in each region analyzed in the study are listed below.

Far West:	Los Angeles, Portland, Sacramento, San Diego, San Francisco/Oakland, San Jose, Santa Barbara, Seattle.
Great Lakes:	Chicago, Cincinnati, Cleveland, Detroit, Green Bay, Indianapolis, Milwaukee, Springfield, IL.
Midwest:	Baltimore, Buffalo, New York, Philadelphia, Pittsburgh, Washington, D.C.
New England:	Boston, Hartford.
Plains:	Des Moines, Duluth, Kansas City, Minneapolis, St. Louis, Springfield, MO, Wichita.
Rocky Mountains:	Boise, Denver, Phoenix, Salt Lake City.
Southeast:	Atlanta, Charlotte, Miami, New Orleans, Orlando, Roanoke, Savannah, Tampa Bay.
Southwest:	Dallas, Houston, San Antonio, Waco.

Detailed results of the regression analysis for each region appear in Table B. Part 4, Table II, page 18, summarizes the results from Table B.

KEY TO UNDERSTANDING THE RESULTS

Table A presents the results of the regression analysis for each Metropolitan Statistical Area (MSA) and for the entire group of MSAs (listed under "ALL"). Table B presents the results of the regression analysis for major U.S. regions. The comments below concerning MSAs apply equally to the regions in Table B.

The first variable listed, β_0 , measures what the MSA's real, trend-adjusted, per capita personal income growth would be if there were no new stadiums or teams. This variable is a necessary part of the equation from a mathematical standpoint, but does not tell us about the economic impact of pro sport.

Of more interest are the coefficients β_1 and β_2 . These variables measure the relationship between professional sports teams and new stadiums and an MSA's real, per capita personal income growth relative to the other cities in the study and relative to its own pattern of growth. The sign of the coefficient indicates whether pro sports are related to positive or negative (though not necessarily significant) changes in trend-adjusted growth. When the "t-statistic"—the number given in parentheses below the coefficient—is greater than 1.9 or less than -1.9, the observer can be 95 percent confident that the relationship between pro sports and growth is "statistically significant" (i.e., a relationship stronger than what could be expected to occur by chance).

When β_1 is positive (negative) and the t-statistic is significant, it suggests that professional sports teams have a statistically significant positive (negative) effect on the MSA's real, trend-adjusted, per capita personal income growth. The variable β_2 and the corresponding t-statistic are interpreted in the same way, except that they measure the effect and significance of new professional sports stadiums and arenas.

Numbers in the adjusted correlation coefficient column, \bar{R}^2 , identify the percentage of variation in real, trend-adjusted, per capita personal income growth explained by changes in the sports environment.

The Durbin-Watson measurement is of interest to economists. The Durbin-Watson figures in Table A demonstrate that relationships between the variables that might bias the findings have indeed been accounted for in the analysis. In an efficient model, the Durbin-Watson figure is close to 2.

In some instances, "N.A." is entered in place of a variable value. This occurs whenever there was no change in the number of an MSA's teams or new stadiums during the test period (1958 to 1987). Computing the relevant variable in these cases is not possible.

TABLE A
The Impact of New Stadiums and Professional
Sports Teams on Real, Trend-Adjusted, Per Capita Personal
Income Growth For Selected U.S. Cities (MSAs), 1958-1987:
Regression Analysis Results

City/ Statistic	β_0 (t-statistic)	β_1 (t-statistic)	β_2 (t-statistic)	\bar{R}^2	Durbin- Watson ^a
Atlanta	-115.85 (-.17)	76.51 (.32)	-117.71 (-1.34)	.03	1.94
Baltimore	318.78 ^c (3.09)	-129.56 ^c (-2.79)	N.A.	.27	1.89
Boston	199.14 ^c (2.08)	N.A.	-196.69 (-1.44)	.32	1.86
Buffalo	41.06 (.54)	-23.2 (-.62)	-68.0 (-1.32)	.08	1.85
Charlotte	-28.38 (-.53)	2.99 (.02)	N.A.	.09	1.99
Chicago	-311.26 (-.43)	56.17 (.38)	N.A.	.07	1.95
Cincinnati	-24.31 (-.17)	2.10 (.03)	-24.86 (-.50)	.01	1.90
Cleveland	448.98 (1.15)	-180.93 (-1.28)	62.19 (.58)	-.01	1.79
Dallas	-89.21 (-1.30)	-8.15 (-.06)	158.40 (1.29)	.31	1.63
Denver	-99.42 (-.53)	39.23 (.48)	98.77 (.87)	.04	1.23
Detroit	31.33 (.19)	N.A.	-82.81 (-.63)	.04	1.16
Green Bay	-16.65 (-.40)	N.A.	12.85 (.08)	.06	1.92

TABLE A
(Continued)

City/ Statistic	β_0 (t-statistic)	β_1 (t-statistic)	β_2 (t-statistic)	\bar{R}^2	Durbin- Watson ^a
Hartford	-42.16 (-.27)	247.24 (1.46)	-95.86 (-.70)	.02	1.67
Houston	292.3 (.33)	-148.2 (-.52)	140.1 (.49)	.22	1.73
Indianapolis	-208.29 ^c (-2.73)	142.76 ^c (2.15)	-39.32 (-.59)	.12	1.86
Kansas City	44.77 (.40)	-44.59 (-.91)	21.23 (.57)	.04	1.93
Los Angeles	195.92 (.50)	-33.81 (-.52)	-47.43 (-1.20)	-.02	1.88
Miami	-79.27 (-.26)	39.94 (.15)	49.8 (.28)	-.06	1.93
Milwaukee	-82.19 (-.80)	18.67 (.33)	-11.53 (-.10)	-.09	1.92
Minneapolis	448.72 (.71)	-119.14 (-.54)	-133.86 (-1.32)	.04	1.98
New Orleans	-176.36 (-1.16)	99.88 (.93)	-84.28 (-.67)	-.04	1.82
New York	-846.31 (-1.41)	93.90 (1.21)	43.39 (.83)	.04	1.99
Orlando	29.41 (.28)	-123.22 (-.44)	N.A.	.14	1.86
Philadelphia	12.48 (.01)	6.79 (.02)	-17.94 (-.18)	.09	2.00
Phoenix	35.4 (.135)	-85.83 (-.42)	148.03 (.73)	.10	1.77
Pittsburgh	-188.87 (-.45)	39.37 (.28)	62.58 (1.23)	-.02	1.91

TABLE A
(Continued)

City/ Statistic	β_0 (t-statistic)	β_1 (t-statistic)	β_2 (t-statistic)	\bar{R}^2	Durbin- Watson ^a
Portland ^d					
Sacramento	-50.58 (-.69)	176.22 (.98)	-193.35 (-.79)	.03	1.75
Saint Louis	-220.45 (-1.28)	84.34 (1.41)	-101.1 ^e (-3.14)	.26	1.95
Salt Lake City	-65.86 (-1.71)	-89.69 (-1.59)	N.A.	.03	1.88
San Antonio	89.13 (.66)	-200.16 (-1.50)	22.82 (.19)	.13	1.92
San Diego	26.09 (.13)	1.77 (.02)	-54.07 (-.52)	-.08	1.97
San Francisco/ Oakland	-18.48 (-.06)	49.63 (.60)	-132.19 ^e (-1.94)	.16	1.85
Seattle	497.81 ^e (1.99)	-132.24 (-1.34)	-227.84 (-1.61)	.33	1.64
Tampa Bay	28.03 (.16)	48.54 (.27)	-57.27 (-.34)	.07	1.85
Washington, D.C.	479.26 ^e (1.93)	-76.79 (-.93)	-204.44 ^e (-2.11)	.08	1.98
ALL ^e	4.17 (.31)	4.24 (.69)	-22.28 (-1.36)	.00	N.A.

^a After Cochrane-Orcutt adjustment.

^b The Charlotte Hornets and their stadium came on line together in 1988. Only the team is considered in the model, since the model cannot separate the economic impact of the team and the stadium when the two are introduced simultaneously.

^c The probability is five percent or less that the correlation is the result of random events.

^d It was not possible to match Portland data with the general array of teams and stadiums.

^e "ALL" includes all 48 cities in sample except Portland, Des Moines, and Waco.

The "t-statistics" appear in the parentheses.

"N.A." signifies that there was no change in the number of teams or new stadiums and arenas throughout the sample period.

TABLE B
The Impact of New Stadiums and Professional
Sports Teams on Real, Trend-Adjusted, Per Capita Personal
Income Growth For the Eight Major Regions in the
Continental United States, 1958-1987:
Regression Analysis Results

Region/ Statistic	β_0 (t-statistic)	β_1 (t-statistic)	β_2 (t-statistic)	\bar{R}^2
Far West	89.82 ^a (3.03)	-4.23 (-.37)	-67.54 ^a (-2.37)	.04
Great Lakes	-39.39 (-1.28)	3.86 (.35)	-31.57 (-.93)	-.01
Mideast	-1.79 (-.14)	5.38 (.90)	-20.56 (-1.28)	.00
New England	128.59 (1.76)	18.83 (.81)	-141.75 ^a (-1.82)	.04
Plains	-48.44 ^a (-2.26)	17.63 (1.18)	-39.23 (-1.04)	.00
Rocky Mountains	-45.98 (-1.50)	-14.86 (-.50)	171.83 ^a (2.07)	.04
Southeast	-3.61 (-.14)	8.08 (.34)	-31.66 (-.68)	-.01
Southwest	-55.33 (-1.29)	-32.73 (-1.22)	168.39 ^a (2.88)	.05

* The probability is five percent or less that the correlation is the result of random events.

The "t-statistics" appear in parentheses.

The MSAs in each region are given below.

Far West: Los Angeles, Portland, Sacramento, San Diego, San Francisco/Oakland, San Jose, Santa Barbara, Seattle.

Great Lakes: Chicago, Cincinnati, Cleveland, Detroit, Green Bay, Indianapolis, Milwaukee, Springfield, IL.

Mideast: Baltimore, Buffalo, New York, Philadelphia, Pittsburgh, Washington, D.C.

New England: Boston, Hartford.

Plains: Des Moines, Duluth, Kansas City, Minneapolis, St. Louis, Springfield, MO,
Wichita.
Rocky Mountains: Boise, Denver, Phoenix, Salt Lake City.
Southeast: Atlanta, Charlotte, Miami, New Orleans, Orlando, Roanoke, Savannah, Tampa
Bay.
Southwest: Dallas, Houston, San Antonio, Waco.

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