SUPER BOWL OR SUPER (HYPER)BOLE?

ASSESSING THE ECONOMIC IMPACT OF
AMERICA'S PREMIER SPORTS EVENT

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ABTRACT:

      Civic boosters generally have estimated the Super Bowl to have an impact of $300 to

$400 million on a host city's economy. The National Football League (NFL) has used the

promise of an economic windfall to convince skeptical cities that investments in new stadiums

for their teams in exchange for the right to host the event makes economic sense. In fact the

recent average public contribution for a new or renovated NFL stadium, $209 million, is less

than the size of the economic impact estimates. The purpose of this paper was to evaluate

booster claims. Statistical analysis reveals that, on average, the Super Bowl could not have

contributed by any reasonable standard of statistical significance, more than $300 million to host

economies. Indeed, the evidence indicates that at best the Super Bowl contributes approximately

one-quarter of what the NFL promises.

1. INTRODUCTION

A joint study conducted by the National Football League (NFL) and the Sport Management Research Institute (SMRI) of Westin Florida estimated an economic impact of $393 million from Super Bowl XXXIII on the South Florida economy (NFL, 1999). If those numbers are accurate, "Super" is an apt adjective for the event. Only the Summer Olympic Games can seriously be thought to generate an impact of such magnitude for a short-term sporting event. Reasons for skepticism, however, abound, and one may well need look no further than the NFL's motivation for making such lofty claims. Can a study either commissioned or performed by the NFL be unbiased if the NFL has used the promise of a future Super Bowl as an enticement for cities to build new facilities? Modern sports stadiums generally receive some form of public funding, and the NFL at least indirectly has rationalized public financial support on the grounds that the economic impact from a single Super Bowl approximates the cost of building a new stadium. Coincidence? The purpose of this study is to estimate the economic impact of Super Bowls from 1970 through 2001. The results indicate that the economic impact of the Super Bowl is likely on average one-quarter or less the magnitude of the most recent NFL estimates.

2. REVIEW OF SUPER BOWL IMPACT STUDIES

The economic impact estimates for the Super Bowl extend from one intellectual end zone to the other. The NFL-SMRI study is the most optimistic appraisal attributing a $670 million increase in taxable sales in South Florida (Miami-Dade, Broward, and Palm Beach counties) and an increase in economic activity of $396 million to the event (NFL, 1999). Tacitly, the NFL-

commissioned study envisioned a horde of affluent spendthrifts descending on the three-county

area. The NFL-SMRI team reported that the average income of Super Bowl attendees is more

than twice that of the average visitor to South Florida during the peak tourist months of January

and February ($144,500 compared to $40,000-$80,000), and they spend up to four times as much

as the average visitor to South Florida ($400.33 per day compared to $99-$199 per day). Jim

Steeg, the NFL's Vice President for special events since 1977, puts the Super Bowl at the center

of the mega-event universe.

> The Super Bowl is the most unique of all special events. Extensive studies by
> host cities, independent organizations and the NFL all try to predict the economic
> impact the big game will have on a community. They talk to tens of thousands of
> attendees, local businessmen, corporate planners, media and local fans -- looking
> to see how they are affected.
>
> These studies have provided irrefutable evidence that a Super Bowl is the most
> dramatic event in the U.S. Super Bowl patrons are significantly more affluent,
> spend more and have more spent on them, and influence future business in the
> community more than attendees of any other event or convention held in the U.S.
> (Steeg, 1999).

Steeg based his Super Bowl claims on several factors. Most prominent among them from

his perspective were: the substantial spending by the NFL and NFL Properties;[1] the number of

visitors from outside the community who attended the game and related events; and the ideal fit

of the Super Bowl into the convention calendar, which Steeg opined has the capacity for

transforming the historically slack month of January into a convention windfall for the host city.

The NFL understands that it is competing for the sports entertainment dollar, and the

League believes that stadiums factor prominently into consumer decisions relating to leisure

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[1] Steeg claimed that the NFL and NFL Properties spend a combined $43 million on Super
Bowl XXXIV, for example.

spending. With the completion of stadium construction in Chicago, Green Bay, and

Philadelphia, 21 NFL stadiums will have been built or significantly refurbished over the period

1995 through 2003. This substantial transformation of NFL infrastructure has been accomplished

in part through league incentives to include hosting a Super Bowl in some cases and using

League shared club seat revenues to help finance stadium construction.[2]   In light of the NFL's

strategic success, Steeg's claims warrant further scrutiny.

Scholars not directly connected to the NFL disagree on the economic impact of the Super

Bowl. In assessing the impact of Super Bowl XXVIII on the City of Atlanta and the State of

Georgia, Jeffrey Humphreys (1994) estimated that the event created 2,736 jobs and had an

impact of $166 million on the Georgia economy. Of the $166 million, Humphreys estimated

direct and indirect economic impact of $76 and $90 million, respectively. The direct impact was

derived from estimating the number of "visitor days" (306,680) and multiplying that statistic by

the average estimated per diem expenditures per visitor ($252). The indirect or induced

economic impact was estimated using the Regional Input-Output System (RIMS II) model

developed by the Bureau of Economic Analysis. A portion of the roughly $230 million

difference between the estimates for Super Bowls XXXIII and XXVIII is explained by price

increases, but most of the difference is attributable to the number of visitors and the daily

spending attributable to each of them. In Table 1, a sample of economic impact estimates for

selected Super Bowls from 1995 through 2003 are recorded to help provide a context for the

impact of the event.

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[2] At the March 1999 NFL meetings, the teams agreed to allow teams to qualify for up-front loans in an amount equal to 34 to 50 percent of the private contributions for stadium projects. The specific amount would be determined by the size of the project and the market the stadium would serve.

Phil Porter (1999) has provided a far less sanguine appraisal of the Super Bowl's economic impact. Porter used regression analysis to determine that the impact of the event was statistically insignificant, that is not measurably different from zero. After reviewing short-term data[3] on sales receipts for several Super Bowls, Porter concluded:

> Investigator bias, data measurement error, changing production relationships, diminishing returns to both scale and variable inputs, and capacity constraints anywhere along the chain of sales relations lead to lower multipliers. Crowding out and price increases by input suppliers in response to higher levels of demand and the tendency of suppliers to lower prices to stimulate sales when demand is weak lead to overestimates of net new sales due to the event. These characteristics alone would suggest that the estimated impact of the mega-sporting event will be lower than the impact analysis predicts.

Similarly, Baade and Matheson's (1999) examination of twenty-five Super Bowls from 1973 to 1997 found the game associated with an increase in host metropolitan area employment of 537 jobs. Based on simple assumptions regarding the value of a job to a community, they estimate an average economic impact of roughly $30 million or roughly one-tenth the figures touted by the NFL. Coates and Humphrey's (2002) cursory look at all post-season play in American professional sports found that hosting the Super Bowl had no statistically significant effect on per capita income in the host city.

From 1995 through 2003, approximately $6.4 billion dollars, or an average of $304 million, will have been spent to build or substantially refurbish twenty-one NFL stadiums. The public contribution will have been $4.4 billion, an average of $209 million, or roughly 69 percent of the construction costs of these facilities (Peter, 2002). The NFL has offered the Super Bowl as an inducement to convince otherwise reluctant cities that the construction of a new

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[3] Porter's use of monthly sales receipts is important. If the researcher can compress the time period, then it is less likely that the impact of the event will be obscured by the large, diverse economy within which it took place. The use of annual data has the potential to mask an event's impact through the sheer weight of activity that occurs in large economies over the course of a year unless steps are taken to isolate the event.

stadium makes economic sense. Scholars do not agree on the economic impact of the Super Bowl, and in the next section of the paper, reasons for the disagreement are identified and analyzed.

3. THEORETICAL ISSUES

If there is an exaggeration of the benefits induced by a sports mega-event, it occurs for several fundamental reasons. First, the increase in direct spending attributable to the games may be a "gross" as opposed to a "net" measure. Some subsidy advocates estimate direct spending by simply summing all receipts associated with the event. The fact that the gross-spending approach fails to account for decreased spending directly attributable to the event represents a major theoretical and practical shortcoming. Surveys on expenditures by those attending the event, complete with a question on place of residence, would appear to be a straightforward way of estimating direct expenditures in a manner that is statistically acceptable. However, while such surveys may well provide acceptable spending estimates for those patronizing the event, they do not reveal changes in spending by residents not attending it. It is conceivable that some local residents or potential visitors may dramatically change their spending given their desire to avoid the congestion at least in the venue's environs. A basic shortcoming of typical economic impact studies, in general, pertains not to information on spending by those included in a direct expenditure survey, but rather to the lack of information on the spending behavior for those who are not.

Robert Baade (1996) has cited the failure to account for the difference between gross and net spending as a chief reason why sports events or teams do not contribute as much to

metropolitan economies as boosters claim. However, in the case of a "mega-event," a large

proportion of all attendees come from outside the local area, and their spending qualifies as

export spending. If the host city's residents who do not attend do not reduce their expenditures

within the city, one might contend that direct expenditure by nonresidents who attend events

approximates net impact. Unfortunately, this will not be true if some nonresidents, who might

have visited the city, decide not to do so because of congestion and high prices during the

event's period. In addition, some Super Bowl fans may have already been planning on visiting a

city but rearrange their schedule to accommodate a sporting event. Even though the economic

analyst may attribute this visit to the athletic contest, in fact, this type of time switching does not

lead to a net increase in economic activity in the city but simply alters the time period in which

the activity takes place.

Recent evidence assessing the economic impact of the Summer Olympics in 2000 in

Sydney, Australia indicate this particular "substitution effect" may be substantial even in cases

where the event has a clear international character. An Arthur Andersen (2000) survey on hotel

activity in Sydney and other capital cities prior to and during the Olympic Games concluded,

> As expected, survey results indicate the vast majority of Sydney hotels peaking at near 100% occupancies during the Games period from September 16-30. This represents an increase of 49% in occupancy levels relative to the first half of September. In contrast, other capital cities experienced significant demand shortfalls for the same period. For example, occupancies in Melbourne and Brisbane plummeted by 19% and 17% in the second half of September relative to the period from 1-15 September. Overall, with the exception of Sydney and Adelaide, all hotel markets in Australia experienced a decline in occupancy in September 2000 relative to September 1999 despite the Olympic Games, as reported in the Hotel Industry Benchmark Survey. Hoteliers indicate that while international demand was strong..., domestic leisure travel traditionally taking place during the September school holiday period was displaced to Sydney for the Olympics.

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The Anderson report indicates the importance of the substitution effect, and compels consideration of which, if any, governmental entities should be involved in subsidizing sports mega-events. Sydney's gains may well have come at the expense of other Australian cities, and if the federal government subsidizes the games there must be a rationale for enriching Sydney at the expense of Adelaide and other regional cities.

A second reason economic impact may be exaggerated relates to what economists refer to as the "multiplier," the notion that direct spending increases induce additional rounds of spending due to increased incomes that occur as a result of additional spending. If errors are made in assessing direct spending, those errors are compounded in calculating indirect spending through standard multiplier analysis. Furthermore, correct multiplier analysis includes all "leakages" from the circular flow of payments and uses multipliers that are appropriate to the event industry. Leakages may be significant depending on the state of the economy. If the host economy is at or very near full employment, for example, it may be that the labor essential to conducting the event resides in other communities where unemployment or a labor surplus exists. To the extent that this is true, then the indirect spending that constitutes the multiplier effect must be adjusted to reflect this leakage of income and subsequent spending. Siegfried and Zimbalist (2002) note that only 29% of professional athletes in their study live in the metropolitan area in which their team plays leading to very high levels of leakage from local expenditures on professional sports.

Labor is not the only factor of production that may repatriate income. If hotels experience higher than normal occupancy rates during a mega-event, then the question must be raised about the fraction of increased earnings that remain in the community if the hotel is a

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nationally owned chain. Finally, most economic impact analyses use expenditure multipliers

(rather than income multipliers) to assess the economic impact of an event. The use of

expenditure multipliers is unjustified, however, as the important point is not how much business

activity is created by an event but rather how the income of local residents is impacted by it. In

short, to assess the impact of mega-events, a balance of payments approach should be utilized.

That is to say, to what extent does the event give rise to income inflows and outflows that would

not occur in its absence? Since the input-output models used in the most sophisticated *ex ante*

analyses are based on fixed relationships between inputs and outputs, such models do not

account for the subtleties of full employment and capital ownership noted here.

As an alternative to estimating the change in expenditures and associated changes in

economic activity, those who provide goods and services directly in accommodating the event

could be asked how their activity has been altered by the event. In summarizing the efficacy of

this technique Davidson (1999) opined:

> The biggest problem with this producer approach is that these business managers
> must be able to estimate how much "extra" spending was caused by the sport event.
> This requires that each proprietor have a model of what would have happened during
> that time period had the sport event not taken place. This is an extreme requirement,
> which severely limits this technique.

While many potential criticisms of *ex ante* economic analysis exist, the real question is

whether these estimates of the economic impact of the Super Bowl conform to *ex post* estimates

of the economic impact this event exerts on its host cities? In the next section of the paper, the

model that is used to develop *ex post* estimates is detailed.

4. THE MODEL

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Ex ante models may not provide credible estimates on the economic impact of a mega-event for the reasons cited. An *ex post* model may be useful in providing a filter through which the promises made by event boosters can be strained. A mega-event's impact is likely to be small relative to the overall economy, and the primary challenge for those doing a post-event audit involves isolating the event's impact. This is not a trivial task, and those who seek insight into the question of economic impact should be cognizant of the challenges and deficiencies common to both *ex ante* and *ex post* analyses.

Several approaches are possible in constructing a model to estimate the impact an event has had on a city, and are suggested by past scholarly work. Mills and McDonald (1992) provide an extensive summary of models that have been used to explain metropolitan economic growth. These theories seek to explain increases in economic activity through changes in key economic variables in the short-run (export base and neoclassical models) or the identification of long-term developments that enhance the capacity for growth in metropolitan economies (product cycle, cumulative causation, and disequilibrium dynamic adjustment models).

Our task is not to replicate explanations of metropolitan economic growth, but to use past work to help identify how much of an increase in economic activity in U.S. cities hosting the Super Bowl is attributable to the event. To this end we have selected explanatory variables from existing models to predict economic activity in the absence of the game. Estimating the economic impact of the Super Bowl involves comparing the projected level of economic activity without the event to the actual levels of economic activity that occurred in cities that have hosted it. The success of this approach depends on our ability to identify variables that account for the variation in growth in economic activity in host cities.

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Given the number and variety of variables found in regional growth models and the inconsistency of findings with regard to coefficient size and significance, criticisms of any single model could logically focus on the problems posed by omitted variables. Any critic, of course, can claim that a particular regression suffers from omitted-variable bias, but it is far more challenging to specify the model so as to remedy the problem. In explaining regional or metropolitan growth patterns, at least some of the omitted variable problem can be addressed through a careful specification of the independent variables. As noted above, representing relevant variables as deviations from city norms, leaves the scholar a more manageable task, namely that of identifying those factors that explain city growth after accounting for the impact of those forces that generally have affected regional or national MSA growth. It is important, for example, to model the fact that relocating a business could occur as a consequence of wages increasing in the MSA under study or a slower rate of wage growth in other MSAs. What matters is not the absolute level of wages in city i, but city i's wage relative to that of its competitors.

The purpose of *ex ante* studies is to provide a measure of the net benefits a project or event is likely to yield. To our knowledge there is no prospective model that has the capacity for measuring the net benefits of a project relative to the next best alternative use of those funds. If one assumes that the best use of funds has always occurred prior to a mega-event, then the growth path observed for a city can be construed as optimal. If this optimal growth path, identified by the city's secular growth trend, decreases after the mega-event occurs, then the evidence does not support the hypothesis that a publicly subsidized mega-event put those public monies to the best use.

Our model is designed to predict changes in income attributable to the Super Bowl in host cities 1970 and 2001. The cohort of cities used in the sample includes seventy-three metropolitan areas that represent the largest MSAs in the United States by population over the time period 1970-2001 including every MSA that was among the largest sixty MSAs at some time during that period. While the choice of seventy-three cities is largely arbitrary, the list was expanded to include all metropolitan areas that have hosted the Super Bowl, cities with professional sports franchises (with the exception of Green Bay, WI), and MSAs with professional sports aspirations. The data used are described more fully in Appendix 1.

At this point the analysis can be conducted in two ways. Traditionally, researchers such as Coates and Humphreys (2002) and Baade and Matheson (2000) have used fixed effect models on this type of panel data with a dummy variable included for the sporting event(s) and individual dummy variables included for each city in the model to account for regional difference in economic growth. Equation (1) represents the model used to predict changes in income for host cities.

$$\Delta Y_t^i = \beta_0 + \beta_1 \Delta Y_{t-1}^i + \beta_2 \frac{Y_{t-1}^i}{\sum_{i=1}^{n} Y_{t-1}^i / n} + \beta_3 W_t^i + \beta_4 G_t^i + \beta_5 OT_t^i + \beta_6 POP_t^i + \beta_7 SB_t^i + \alpha_i C^i + \gamma_i t_t^i + \varepsilon_t^i \ (1)$$

For each time period t, Y_t^i is the real personal income and ΔY_t^i is the change in real personal income in the ith metropolitan statistical area (MSA), n is the number of cities in the sample, W_t^i is the nominal wages in the ith MSA as a percentage of the average for all cities in the sample, G_t^i is the state and local taxes in the ith MSA as a percentage of the average for all cities in the sample, POP_t^i is the log population of the ith city, SB_t^i is a dummy variable for

hosting the Super Bowl, and ε_t^i is the stochastic error. OT_t^i is a dummy variable that represents

any significant city-specific economic influences that cannot be explained by other variables in

the model including the effects of the oil booms of the 1970s and the subsequent oil bust of the

1980s on oil patch cities of New Orleans and Houston, the effects of Hurricane Andrew on the

economy of South Florida, and the economic consequences of the tech boom in Silicon Valley.

C^i is a vector of dummy variables representing the fixed effect for each city i, and t is a vector of

dummy variables representing each year t representing the business cycle.

The results of ordinary least-squares regression using equation (1) are shown in Table 2.

The coefficient (0.4058%) and t-statistic (1.409) on the Super Bowl variable indicate that hosting

the Super Bowl is associated with an increase in city personal income growth of 0.4% but that

this figure is not statistically significantly different from zero at a 10% level.

While the use of fixed effect models is widespread due to their simplicity, they present

numerous theoretical and applied difficulties that make their use undesirable when they can be

avoided. First, the assumptions implicit in the model are quite extreme in that it is assumed the

only difference in city growth rates is a fixed percentage in each period. This belies the fact that

some cities (such as Detroit or San Jose) are strongly influenced by cyclical industries, and

others have experienced growth spurts or slowdowns at varying times in their recent history. To

assume that every economic variable affects every city's economic growth in exactly the same

way is an absurd albeit often necessary assumption. Next heteroscedasticity is identified as a

problem since the variability of the residuals differs widely between cities. Finally, because the

size of the economies of the host cities varies widely, it is difficult to translate the coefficient

indicating a 0.4% increase in economic growth into a convenient dollar figure. For these reasons

a second method is tried, and equation (2) represents the revised model used to predict changes in income for host cities.

$$\Delta Y_t^i = \beta_0 + \beta_1 \sum_{i=1}^{n} \frac{\Delta Y_t^i}{n_t} + \beta_2 \Delta Y_{t-1}^i + \beta_3 \frac{Y_{t-1}^i}{\sum_{i=1}^{n} Y_{t-1}^i / n} + \beta_4 W_t^i + \beta_5 T_t^i + \beta_6 TR_t^i + \beta_7 OT_t^i + \alpha SB_t^i + \varepsilon_t^i \quad (2)$$

The variables remain the same as in equation (1) except for the Super Bowl variable. SB_t^i is now a vector of dummy variables representing the Super Bowl with a separate dummy variable being included for each year a particular city has hosted the game. The major change is that equation (2) was separately estimated for each of the eleven different metropolitan areas that have hosted at least one Super Bowl since 1970. Not every variable specified in equation (2) emerged as statistically significant for every city. The decision of whether to include an independent variable known to be a good predictor in general but failing to be statistically significant in a particular city's case is largely an arbitrary one. The inclusion of theoretically valuable variables that are idiosyncratically insignificant will improve some measures of fit such as R-squared but may reduce other measures such as adjusted R-squared or the standard error of the estimate. Since the purpose of equation (2) is to produce predictive rather than explanatory results, variables were included in the regression equation as long as they improved predictive success, and as long as the omission of the variable did not significantly alter the coefficients of the remaining variables. Table 3 presents the regression results for all cities with the combination of variables that minimizes the standard error of the estimate (SEE).

As mentioned previously, rather than specifying all the variables that may explain metropolitan growth, we attempted to simplify the task by including only the independent variables that are common to cities in general and the ith MSA in particular. In effect we have

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devised a structure that attempts to identify the extent to which the deviations from the growth of

cities in general ($\Sigma \Delta Y_t^i / n_t$) and city i's secular growth ΔY_{t-1}^i, are attributable to deviations in

certain costs of production (wages and taxes) or demand-side variables (relative income levels,

wages, and taxes).

Relative values of wages and tax burdens are all expected to help explain a city's growth

rate in income as it deviates from the sample norm and its own secular growth path. As

mentioned above, past research has not produced consistency with respect to the signs and

significance of these independent variables. It is not at all clear, for example, whether high

levels of relative wages lead to higher or lower income growth. A similar situation exists with

relative levels of taxation. As a consequence, *a priori* expectations are uncertain with regard to

the signs of the coefficients. That should not be construed as an absence of theory about key

economic relationships. As noted earlier, the models include those variables that previous

scholarly work found important.

5. RESULTS

The coefficient on the dummy variables for the Super Bowl vector for each model

identified in Table 3 are an estimate of the effect of the Super Bowl in each specific year on the

host city. These coefficients are shown in Table 4 along with the real income of each city during

the Super Bowl year and the actual observed growth in real income. If it is assumed that any

difference between actual and predicted income can be accounted for by the presence of the

Super Bowl, this method allows for a dollar estimate of the impact of the game on host cities.

For example, the actual personal income growth rate for Phoenix in 1996 was 5.598

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percent while the model predicted only a 5.070 percent increase in income (absent the Super

Bowl dummy) corresponding to an impact attributed to the Super bowl of 0.528 percent. Based

on Phoenix's $71.3 billion economy, this 0.528 percent difference corresponds to an economy

that produced income $377 million in excess of what would have expected during 1996 if the

city had not hosted the championship. The $377 million can be interpreted as the contribution of

the Super Bowl to the Phoenix economy. In total, the model estimates that the average host city

experienced a *reduction* in personal income of $133.4 million relative to the predictions of the

model.

The statistics recorded in Table 4 suggest two things worth noting. First, the dollar

differences recorded in final column vary substantially with some cities exhibiting income gains

well in excess of reasonable booster predictions, and other cities showing a large negative

impact. Second, the Super Bowl has an overall negative impact on the host city economy of

$133.4 million. While this figure is biased downward due to the poor economic performance of

Los Angeles in several years, nevertheless this estimate stands in stark contrast to the annual

gains of $300 or $400 million projected by the NFL.

The magnitude of the variation of the estimates at first blush appears high. Some host

cities (Los Angeles, 1987, and San Diego, 1998) exhibited well over a billion dollars in

increased income while others (Los Angeles, 1993 and 1973, and Atlanta, 2000) experienced

reductions of billions of dollars. The explanation for this range of estimates is simply that the

models do not explain all the variation in estimated income, and, therefore, not all the variation

can be attributed to the Super Bowl. In short, there are omitted variables. While the model fit

statistics for the individual city regressions display moderately high R-squared numbers, the

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standard error of the estimate for the typical city is above one percent meaning that one would

expected the models to predict actual economic growth for the cities in question within one

percentage point less than about two-thirds of the time. For the cities in question, a one percent

error translates into a $200 to $500 million difference for the smallest cities such as Miami and

New Orleans and over a $2 billion difference for Los Angeles, the largest host city. Given the

size of these large, diverse economies, the effect of even a large event with hundreds of millions

of dollars of potential impact is likely to be obscured by natural, unexplained variations in the

economy. Indeed, none of the standardized residuals are statistically significant at the 5% level.

While it is unlikely that the models for any individual city will capture the effects of even

a large event, one would expect that across a large number of cities and years, any event that

produces a large impact would emerge on average as statistically significant. The t-statistics of

the Super Bowl coefficients for the 32 years are normally distributed with a standard deviation of

1. A test on the null hypothesis that the average t-statistic is greater than zero provides a p-value

of 23.0 percent. In other words, if the game really had no positive effect on the host cities, then

the sample results had only a 23.0 percent probability of occurring.

This procedure can be carried one step further. Since the presence of the Super Bowl is

not included in making predictions about the economic growth in a particular city, if the Super

Bowl has a substantial positive effect on host economies as the boosters suggest, then the

appropriate hypothesis test would not be whether the average standardized residual is greater

than zero (meaning simply that the event had a positive economic impact) but whether the

average standardized residual is greater than some figure that essentially represents a

combination of the size of projected impact in comparison to the size of the host city (meaning that the event had a positive economic impact of some designated magnitude.)

Table 5 records various estimates that combine estimates provided by NFL boosters and those predicted by the model. For the purpose of exposition, a $300 million Super Bowl (in 2000 dollars) effect is assumed, a figure on the low end of the most recent booster estimates. The model indicates that Phoenix exhibited an increase in income of $377 million over that predicted for the city during 1969 if it had not hosted the game. The difference of $77 million represents the contribution of the Super Bowl to the Phoenix economy above that of boosters' estimates. While the model predicts that Phoenix should have grown 5.070 percent in 1999 compared with 5.598 percent actual growth, if a booster estimate of $300 million is accurate and the model's predictors are uncorrelated to the presence of the Super Bowl, the prediction for Phoenix's economic growth would have been 5.491 percent. Using these new predicted growth rates that include booster growth projections, new t-statistics can be calculated. A new test on the null hypothesis that the new average t-statistic is greater than zero provides a p-value of 5.00 percent. In other words, had the game had a positive effect of $300 million as asserted by the boosters over the thirty-two year period covered by the data, the actual growth rates experienced by the sample would have had only a 5.00 percent probability of occurring.

The Super Bowl contribution to predicted growth (and hence the standardized residual) can be adjusted by assuming an economic impact larger or smaller than the $300 million figure used in this example. The resulting p-values shown are shown in Table 6.

The predicted economic impact at which the mean t-statistic is zero is $91.9 million, a figure roughly one-quarter that of the booster's estimates, and increases in income of $300

million and $392.8 million can be rejected at the 5% and 1% significance levels, respectively. The crowding-out, substitution, and leakages effects can explain the large discrepancy between the observed and actual economic growth and the NFL's claims. While the Super Bowl undoubtedly attracts large numbers of wealthy, out-of-town visitors, the "crowding-out" effect due to perceptions relating to limited hotel rooms and high hotel prices, rowdy behavior of football fans, and peak use of public goods such as highways and sidewalks are substantial. Furthermore, the net effect on the host economy of the conventions or other tourists who went elsewhere would depend on the details relating to the spending patterns of football fans versus those of the lost visitors and convention attendees. The spending of residents of the host city may be altered to the detriment of the city's economy as local citizens may not frequent areas in which the event occurs or the fans stay. In addition, although hotel room rates in host cities invariably increase substantially during the Super Bowl weekend, the to the extent that these hotels are nationally owned chains, the higher prices benefit corporate stockholders, not local residents and are not reflected in the personal income levels of the metropolitan area.

6. CONCLUSIONS AND POLICY IMPLICATIONS

The National Football League and other sports leagues have used the promise of an all star game or league championship as an incentive for host cities to construct new stadiums or arenas, and with few exceptions, at considerable public expense. Recent NFL studies have estimated that Super Bowls increase economic activity by hundreds of millions of dollars in host cities. Our analysis fails to support NFL claims. Our detailed regression analysis revealed that over the period 1970 to 2001, on average Super Bowls created $92 million in income gains for

host cities, a figure roughly one-quarter that of recent NFL claims. While this figure, like any econometric estimate, is subject to some degree of uncertainty, statistical analysis reveals that, on average the Super Bowl could not have contributed, by a reasonable standard of statistical significance, more than $300 million to host economies.

Cities would be wise to view with caution Super Bowl economic impact estimates provided by the NFL. It would appear that padding is an essential element of the game both on and off the field.

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TABLE 1
Economic Impact Estimates Provided by Boosters for Selected Super Bowls Between 1995 and 2003

Year	Author	City	Estimate in millions of $ and (in millions of 2000 $)
1995	NFL and Kathleen Davis, Sports Management Research Institute	Miami	$365 ($412.4)
1998	PriceWaterhouseCoopers	San Diego	$295 ($311.7)
1999	NFL and Kathleen Davis, Sports Management Research Institute	Miami	$393 ($406.2)
2000	Jason Ader, Bear Stearns	Atlanta	$410 ($410)
2000	Jeffrey Humphreys, Georgia State University	Atlanta	$292 ($292)
2003	Super Bowl Host Committee	San Diego	$375 ($356.8)

TABLE 2
Regression results for Fixed Effect Model

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.87428	0.7644	0.7509	0.01474	2.03963

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
	Regression	1.42920	116	0.01232	56.7116	0
	Residual	0.44055	2028	0.00022		
	Total	1.86965	2144			

Dependent Variable: %Δ Income Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Std. Error	Beta		
(Constant)	0.3827	0.0493		7.764	0.0000
%Δ Income (t-1)	0.4432	0.0207	0.4503	21.366	0.0000
Log Population	-0.0519	0.0074	-0.4811	-7.006	0.0000
Income as % of sample average (t-1)	-0.0343	0.0077	-0.1723	-4.452	0.0000
Taxes as % of sample average	-0.0018	0.006	-0.0087	-0.291	0.7714
Wages as % of sample average (t-1)	-0.0335	0.0078	-0.1572	-4.287	0.0000
Hurricane Andrew	-0.0399	0.0107	-0.0413	-3.736	0.0002
Hurricane Andrew recovery	0.0582	0.0088	0.0736	6.607	0.0000
Tech Boom 1	0.0478	0.0089	0.0605	5.370	0.0000
Tech Boom 2	0.0804	0.0090	0.1018	8.937	0.0000
Tech Bust	-0.0978	0.0093	-0.1237	-10.497	0.0000
Super Bowl	**0.0041**	**0.0029**	**0.0164**	**1.409**	**0.1590**
Oil Boom 1	0.0099	0.0040	0.0307	2.505	0.0123
Oil Boom 2	0.0153	0.0035	0.0544	4.400	0.0000
Oil Bust	-0.0268	0.0032	-0.1100	-8.483	0.0000
Albany-Schenectady-Troy (MSA)	-0.0067	0.0054	-0.0271	-1.243	0.2141
…					
Year 2001	-0.0112	0.0025	-0.0691	-4.479	0.0000
…					

Fixed effects for individual cities/years shown for Albany MSA and the year 2001 but are excluded for remaining years and cities. Full results available from the authors upon request.

TABLE 3
Regression results for equation (1). (t-stats in parentheses)

MSA	Cons.	Average Y_t	Y_{t-1}	Y_{t-2}	Y_{t-3}	Income as %	Wages as %	Taxes as %	Log Population	Time	Other	Fit
Atlanta	-15.85 (-3.30)	1.092 (8.02)	.232 (2.44)	.090 (0.92)	.034 (034)	-.616 (-2.74)	-	-.395 (-2.93)	-.698 (-2.61)	.0107 (3.124	-	Adj. R^2 = .9027 SEE = 0.9729%
Detroit	.024 (3.79)	1.166 (8.21)	.432 (5.17)	-	-	-.815 (-4.76)	-.107 (-0.70)	-.164 (-1.61)	1.354 (2.86)	-.0041 (-3.31)	-	Adj. R^2 = .9314 SEE = 0.9314%
Houston	.192 (2.37)	.737 (3.13)	.395 (2.35)	-	-	-.185 (-2.27)	-	-	-	-	.0402 (2.84)	Adj. R^2 = .5186 SEE = 2.3443%
											-.0416 (-2.66)	
Los Angeles	-1.902 (-1.69)	.968 (7.37)	.218 (2.11)	-	-	-	-	-	-.621 (-1.92)	.0031 (1.90)	-	Adj. R^2 = .7308 SEE = 1.3386%
Miami	12.14 (2.42)	.904 (5.92)	.260 (2.14)	-	-	-.671 (-2.35)	.430 (2.32)	-	-	-.0060 (-2.45)	-.0805 (-5.11)	Adj. R^2 = .8461 SEE = 1.4108%
											.0865 (3.47)	
Mpls.	-.869 (-3.64)	1.042 (18.12)	.058 (1.12)	-	-	-.269 (-2.70)	.212 (2.25)	-	.144 (4.22)	-	-	Adj. R^2 = .9521 SEE = 0.5115%
New Orleans	.320 (2.52)	.601 (3.78)	-	-	-	-.179 (-1.96)	-	-.191 (-2.51)	-	-	.0153 (1.79)	Adj. R^2 = .5768 SEE = 1.3397%
											-.0213 (-2.33)	
Phoenix	-33.19 (-2.10)	1.310 (8.50)	.516 (5.942	.327 (2.86)	-	-1.104 (-3.39)	.427 (3.11)	-.187 (-2.54)	-1.597 (2.71)	.0221 (2.27)	-	Adj. R^2 = .8635 SEE = 1.3188%
San Diego	1.036 (3.37)	1.023 (8.56)	.240 (2.87)	-	-	-	-.227 (-2.69)	-	-.127 (-3.39)	-	-	Adj. R^2 = .8360 SEE = 1.1329%
San Jose	-11.54 (-4.72)	1.138 (8.22)	-	-.	-	-.362 (-7.09)	-.643 (-4.68)	.150 (2.25)	-	.0063 (4.88)	.0900 (5.44)	Adj. R^2 = .8919 SEE = 1.5260%
											.1815 (10.46)	
Tampa	-9.215 (-1.78)	0.909 (5.44)	.311 (2.64)	-	-	-.529 (-1.68)	-.309 (-1.97)	-.392 (-2.00)	-.815 (-1.96)	.0077 (1.94)	-	Adj. R^2 = .7303 SEE = 1.3746%

TABLE 4
Super Bowl Contribution to Local Economies

Year	City	Real Income (2000 $)	Pred. Growth	Actual Growth	Difference (S.B. coeff.)	Std. Residual	Income +/-
1970	New Orleans	$ 18,748,279	1.776%	1.860%	0.084%	0.061	$ 15,796
1971	Miami	$ 27,239,344	7.182%	5.332%	-1.850%	-1.020	$ (503,947)
1972	New Orleans	$ 20,493,238	4.281%	5.855%	1.574%	1.052	$ 322,620
1973	Los Angeles	$166,013,025	4.911%	1.941%	-2.970%	-2.006	$ (4,929,805)
1974	Houston	$ 47,263,119	8.079%	7.471%	-0.608%	-0.221	$ (287,386)
1975	New Orleans	$ 22,191,318	2.549%	2.447%	-0.102%	-0.066	$ (22,664)
1976	Miami	$ 31,966,339	3.434%	2.083%	-1.351%	-0.746	$ (431,897)
1977	Los Angeles	$178,631,079	4.810%	3.983%	-0.827%	-0.558	$ (1,477,256)
1978	New Orleans	$ 26,342,160	3.520%	5.852%	2.332%	1.609	$ 614,179
1979	Miami	$ 35,677,084	2.890%	2.567%	-0.323%	-0.210	$ (115,390)
1980	Los Angeles	$190,215,123	-0.688%	-1.584%	-0.896%	-0.602	$ (1,704,380)
1981	New Orleans	$ 28,341,623	2.316%	4.089%	1.773%	1.159	$ 502,444
1982	Detroit	$ 95,268,030	-2.905%	-4.366%	-1.462%	-1.282	$ (1,392,485)
1983	Los Angeles	$198,917,705	2.600%	3.414%	0.814%	0.585	$ 1,618,840
1984	Tampa	$ 40,867,873	7.323%	7.707%	0.383%	0.219	$ 156,553
1985	San Jose	$ 46,226,956	4.311%	3.069%	-1.242%	-0.762	$ (574,343)
1986	New Orleans	$ 29,492,582	-0.311%	-1.166%	-0.855%	-0.550	$ (252,203)
1987	Los Angeles	$240,763,733	2.230%	4.440%	2.210%	1.523	$ 5,321,993
1988	San Diego	$ 66,440,307	4.189%	5.394%	1.206%	0.990	$ 800,941
1989	Miami	$ 47,494,929	1.868%	4.078%	2.210%	1.497	$ 1,049,803
1990	New Orleans	$ 29,669,092	1.247%	1.600%	0.353%	0.244	$ 104,677
1991	Tampa	$ 51,242,892	-0.896%	-1.330%	-0.434%	-0.270	$ (222,309)
1992	Minneapolis	$ 79,702,545	3.413%	4.050%	0.637%	1.101	$ 508,062
1993	Los Angeles	$243,170,360	-0.256%	-2.506%	-2.250%	-1.583	$ (5,471,429)
1994	Atlanta	$ 96,197,361	4.644%	5.381%	0.737%	0.624	$ 709,310
1995	Miami	$ 50,355,627	0.344%	3.139%	2.795%	1.792	$ 1,407,511
1996	Phoenix	$ 71,299,199	5.070%	5.598%	0.528%	0.340	$ 376,529
1997	New Orleans	$ 33,755,733	2.137%	2.768%	0.631%	0.450	$ 213,078
1998	San Diego	$ 82,567,615	6.479%	8.457%	1.977%	1.601	$ 1,632,475
1999	Miami	$ 57,068,632	1.458%	3.525%	2.068%	1.321	$ 1,179,931
2000	Atlanta	$139,018,879	7.578%	6.368%	-1.210%	-0.968	$ (1,681,953)
2001	Tampa	$ 69,855,497	3.551%	1.066%	-2.485%	-1.093	$ (1,736,037)
	Average		3.098%	3.206%	0.108%	0.132	$ (133,398)

TABLE 5
Super Bowl Contribution to Local Economies assuming a $300 million Super Bowl boost.

Year	City	Income	Super Bowl Growth	Model Pred. Growth	Total Pred. Growth	Actual Growth	Difference	Std. Residual
1970	New Orleans	$ 18,748,279	1.600%	1.776%	3.376%	1.860%	-1.516%	-1.096
1971	Miami	$ 27,239,344	1.101%	7.182%	8.283%	5.332%	-2.951%	-1.627
1972	New Orleans	$ 20,493,238	1.464%	4.281%	5.745%	5.855%	0.110%	0.074
1973	Los Angeles	$166,013,025	0.181%	4.911%	5.092%	1.941%	-3.150%	-2.128
1974	Houston	$ 47,263,119	0.635%	8.079%	8.713%	7.471%	-1.243%	-0.451
1975	New Orleans	$ 22,191,318	1.352%	2.549%	3.901%	2.447%	-1.454%	-0.937
1976	Miami	$ 31,966,339	0.938%	3.434%	4.372%	2.083%	-2.290%	-1.264
1977	Los Angeles	$178,631,079	0.168%	4.810%	4.978%	3.983%	-0.995%	-0.671
1978	New Orleans	$ 26,342,160	1.139%	3.520%	4.659%	5.852%	1.193%	0.823
1979	Miami	$ 35,677,084	0.841%	2.890%	3.731%	2.567%	-1.164%	-0.757
1980	Los Angeles	$190,215,123	0.158%	-0.688%	-0.531%	-1.584%	-1.054%	-0.708
1981	New Orleans	$ 28,341,623	1.059%	2.316%	3.374%	4.089%	0.714%	0.467
1982	Detroit	$ 95,268,030	0.315%	-2.905%	-2.590%	-4.366%	-1.777%	-1.558
1983	Los Angeles	$198,917,705	0.151%	2.600%	2.751%	3.414%	0.663%	0.477
1984	Tampa	$ 40,867,873	0.734%	7.323%	8.058%	7.707%	-0.351%	-0.201
1985	San Jose	$ 46,226,956	0.649%	4.311%	4.960%	3.069%	-1.891%	-1.160
1986	New Orleans	$ 29,492,582	1.017%	-0.311%	0.707%	-1.166%	-1.872%	-1.205
1987	Los Angeles	$240,763,733	0.125%	2.230%	2.355%	4.440%	2.086%	1.437
1988	San Diego	$ 66,440,307	0.452%	4.189%	4.640%	5.394%	0.754%	0.619
1989	Miami	$ 47,494,929	0.632%	1.868%	2.499%	4.078%	1.579%	1.069
1990	New Orleans	$ 29,669,092	1.011%	1.247%	2.258%	1.600%	-0.658%	-0.455
1991	Tampa	$ 51,242,892	0.585%	-0.896%	-0.311%	-1.330%	-1.019%	-0.634
1992	Minneapolis	$ 79,702,545	0.376%	3.413%	3.789%	4.050%	0.261%	0.451
1993	Los Angeles	$243,170,360	0.123%	-0.256%	-0.132%	-2.506%	-2.373%	-1.670
1994	Atlanta	$ 96,197,361	0.312%	4.644%	4.955%	5.381%	0.425%	0.360
1995	Miami	$ 50,355,627	0.596%	0.344%	0.939%	3.139%	2.199%	1.410
1996	Phoenix	$ 71,299,199	0.421%	5.070%	5.491%	5.598%	0.107%	0.069
1997	New Orleans	$ 33,755,733	0.889%	2.137%	3.026%	2.768%	-0.258%	-0.183
1998	San Diego	$ 82,567,615	0.363%	6.479%	6.843%	8.457%	1.614%	1.306
1999	Miami	$ 57,068,632	0.526%	1.458%	1.983%	3.525%	1.542%	0.985
2000	Atlanta	$139,018,879	0.216%	7.578%	7.794%	6.368%	-1.426%	-1.140
2001	Tampa	$ 69,855,497	0.429%	3.551%	3.980%	1.066%	-2.915%	-1.282
	Average		0.642%	3.098%	3.740%	3.206%	-0.535%	-0.299

TABLE 6
Probabilities for Various Levels of Economic Impact Induced by the Super Bowl

Economic Impact	Probability of such an impact or greater having occurred
$400 million	0.87%
$392.8 million	1.00%
$300 million	5.00%
$252.7 million	10.00%
$200 million	19.28%
$100 million	47.40%
$91.9 million	50.00%
$0	77.00%
Negative	23.00%

Table A1: Cities and years used to estimate model in Tables 2, 3j

MSA Name	1969 Population	1969 Rank	2000 Population	2000 Rank	Wage Data availability
Akron, OH	676,214	59	695,781	77	1972-2000
Albany, NY	797,010	50	876,129	68	1969-2000
Atlanta, GA	1,742,220	16	4,144,774	9	1972-2000
Austin, TX	382,835	88	1,263,559	47	1972-2000
Baltimore, MD	2,072,804	12	2,557,003	18	1972-2000
Bergen, NJ	1,354,671	26	1,374,345	44	1969-2000
					(State data 1969-2000)
Birmingham, AL	718,286	54	922,820	67	1970-2000
					(State data 1970-1971)
Boston, MA	5,182,413	4	6,067,510	4	1972-2000
Buffalo, NY	1,344,024	27	1,168,552	52	1969-2000
					(Average of cities)
Charlotte, NC	819,691	49	1,508,050	42	1972-2000
Chicago, IL	7,041,834	2	8,289,936	3	1972-2000
Cincinnati, OH	1,431,316	21	1,649,228	34	1969-2000
Cleveland, OH	2,402,527	11	2,250,096	24	1969-2000
Columbus, OH	1,104,257	33	1,544,794	41	1972-2000
Dallas, TX	1,576,589	18	3,541,099	10	1972-2000
Dayton, OH	963,574	42	950,177	65	1969-2000
Denver, CO	1,089,416	34	2,120,775	25	1977-2000
Detroit, MI	4,476,558	6	4,444,693	7	1976-2000
Fort Lauderdale, FL	595,651	70	1,632,071	36	1969-2000
					(State data 1988-2000)
Fort Worth, TX	766,903	51	1,713,122	30	1976-2000
					(State data 1976-1983)
Fresno, CA	449,383	79	925,883	66	1969-2000
					(State data 1982-1987)
Grand Rapids, MI	753,936	52	1,091,986	59	1976-2000
Greensboro, NC	829,797	48	1,255,125	48	1972-2000
Greenville, SC	605,084	67	965,407	63	1969-2000
					(State data 1969)
Hartford, CT	1,021,033	39	1,150,619	53	1969-2000
Honolulu, HI	603,438	68	875,670	69	1972-2000
Houston, TX	1,872,148	15	4,199,526	8	1972-2000
Indianapolis, IN	1,229,904	30	1,612,538	37	1989-2000
Jacksonville, FL	610,471	66	1,103,911	57	1972-2000
					(State data 1988-2000)
Kansas City, MO	1,365,715	25	1,781,537	28	1972-2000
Las Vegas, NV	297,628	116	1,582,679	39	1972-2000

Los Angeles, CA	6,989,910	3	9,546,597	1	1969-2000
					(State data 1982-1987)
Louisville, KY	893,311	43	1,027,058	61	1972-2000
Memphis, TN	848,113	45	1,138,484	54	1972-2000
Miami, FL	1,249,884	29	2,265,208	23	1969-2000
					(State data 1988-2000)
Middlesex, NJ	836,616	47	1,173,533	51	1969-2000
					(State data 1969-2000)
Milwaukee, WI	1,395,326	23	1,501,615	43	1969-2000
Minneapolis, MN	1,991,610	13	2,979,245	13	1972-2000
Monmouth, NJ	650,177	62	1,130,698	56	1969-2000
					(State data 1969-2000)
Nashville, TN	689,753	57	1,235,818	49	1972-2000
Nassau, NY	2,516,514	9	2,759,245	16	1969-2000
New Haven, CT	1,527,930	19	1,708,336	31	1969-2000
					(Average of cities)
New Orleans, LA	1,134,406	31	1,337,171	46	1972-2000
New York, NY	9,024,022	1	9,321,820	2	1969-2000
Newark, NJ	1,988,239	14	2,035,127	26	1969-2000
					(State data 1969-2000)
Norfolk, VA	1,076,672	36	1,574,204	40	1972-2000
					(State data 1973-1996)
Oakland, CA	1,606,461	17	2,402,553	21	1969-2000
					(State data 1969-1987)
Oklahoma City, OK	691,473	56	1,085,282	60	1969-2000
Orange County, CA	1,376,796	24	2,856,493	14	1969-2000
					(State data 1982-1987)
Orlando, FL	510,189	76	1,655,966	33	1972-2000
					(State data 1988-2000)
Philadelphia, PA	4,829,078	5	5,104,291	5	1972-2000
Phoenix, AZ	1,013,400	40	3,276,392	12	1972-2000
					(State data 1972-1987)
Pittsburgh, PA	2,683,385	8	2,356,275	22	1972-2000
Portland, OR	1,064,099	37	1,924,591	27	1972-2000
Providence, RI	839,909	46	964,594	64	1969-2000
Raleigh-Durham, NC	526,723	73	1,195,922	50	1972-2000
Richmond, VA	673,990	60	999,325	62	1972-2000
Riverside, CA	1,122,165	32	3,280,236	11	1969-2000
					(State data 1982-1987)
Rochester, NY	1,005,722	41	1,098,314	58	1969-2000
Sacramento, CA	737,534	53	1,638,474	35	1969-2000
					(State data 1982-1987)
St. Louis, MO	2,412,381	10	2,606,023	17	1972-2000
Salt Lake City, UT	677,500	58	1,337,221	45	1972-2000

San Antonio, TX	892,602	44	1,599,378	38	1972-2000
San Diego, CA	1,340,989	28	2,824,809	15	1969-2000
					(State data 1982-1987)
San Francisco, CA	1,482,030	20	1,731,716	29	1969-2000
					(State data 1982-1987)
San Jose, CA	1,033,442	38	1,683,908	32	1972-2000
					(State data 1982-1987)
Scranton, PA	650,418	61	623,543	84	1972-2000
					(State data 1983-1984)
Seattle, WA	1,430,592	22	2,418,121	19	1972-2000
					(State data 1982-2000)
Syracuse, NY	708,325	55	731,969	73	1969-2000
Tampa, FL	1,082,821	35	2,403,934	20	1972-2000
					(State data 1988-2000)
Tulsa, OK	519,537	74	804,774	71	1969-2000
Washington, DC	3,150,087	7	4,948,213	6	1972-2000
W. Palm Beach, FL	336,706	105	1,136,136	55	1969-2000
					(State data 1988-2000)

Complete data on population and income were available for all cities from 1969 to 2000. This implies that data on income growth and income growth lagged one year were available from 1971 to 2000. Data regarding state and local taxes as a percentage of state GDP were available for all cities from 1970 to 2000 and were obtained from the Tax Foundation in Washington, D.C. Wage data from the Bureau of Labor Statistics Current Employment Statistics Survey were available for cities as described above. When city data were not available, state wage data were used in its place. When possible, the state wage data was adjusted to reflect differences between existing state wage data and existing city wage data. For MSAs that included several primary cities, the wages of the cities were averaged together to create an MSA wage as noted in Table A1.

The Other dummy variable was included for cities highly dependent on oil revenues such as New Orleans and Houston. The first variable was set at a value of 1 for boom years, 1974-1976 and 1979-1981, and the second variable was set at 1 for the bust years, 1985-1988. The Other dummy variables were also set at a value of 1 for the years 1992 and 1993 for the city of

Miami to account for the impact of Hurricane Andrew.

Income and population data were obtained from the Regional Economic Information System at the University of Virginia, which derives its data from the Department of Commerce statistics.