The Economic Impact of the 2002 Olympic Winter Games in Salt Lake City

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Abstract

This paper seeks to estimate the impacts generated from the Salt Lake City 2002 Winter Olympic Games. Using a data set representing 76 metropolitan statistical areas in the western United States, and later 31 metropolitan statistical areas in Utah and its bordering neighbors, I construct an Arellano-Bond dynamic panel data regression that seeks to model metropolitan employment growth had the Olympics never taken place. With this logic I apply the Arellano-Bond regression to real personal income and real average wages, in a vector autoregression framework, estimating gains to those variables over a reasonable timeframe. The predictions from these variables are then compared to actual figures in which a picture of the economic impact of the 2002 Games is generated. Using out of sample predictions I estimate Salt Lake City's Olympic impact in employment is roughly between 20,487 and 36,150 job-years, between $ 381 and $ 2,470 to real per-capita personal income, and a decrease of $ 273 to $ 2004 in real average wages.

I. Introduction

As seen in the recent spectacle in Torino, Italy the Olympic Games are the greatest sporting event in the world. From the first stages of the bidding process until the torch is extinguished, the preparation and execution of the Olympic Games can affect over a decade of a city's history. As the largest and most esteemed sporting event in world, costing a host city often in the billions of dollars, the games spotlight a host city, attracting tourists from across the globe and amassing huge television broadcast audiences for a two week long period.

In the case of the Winter Olympic Games hosted by Salt Lake City in 2002, the games required Salt Lake City to spend over a billion dollars to investments in infrastructure, hotels, venues and ski resorts, including over three hundred million dollars on security alone. These projects were expected to raise the city's productivity, as in the case of infrastructure, but the Olympics also acted as an economic catalyst, allowing vital projects such as the city's light rail system to be completed much earlier had the Olympics never come. The construction of these facilities and venues had the promise to turn rundown or contaminated areas into recreation facilities and housing, making the Olympics an ecologically beneficial and esthetically pleasing project. The games also showcased Utah in the national and international spotlight, through the work of NBC and other networks' coverage, raising the awareness of the state of Utah as a more attractive tourist substitute destination.

However, the question then becomes, at what cost? A city, as in the case of Munich and Montreal, that uses a majority of public funding for the games runs the risk of become a tax-payers' burden if the games are not a financial success, in that hosting the games incurs a loss, or a negative fiscal impact. The games-related construction may displace residents, or turn forest or desert open space into once-used ecologically disastrous venues, or venues that require huge public spending many years after the games have taken place. The added construction can also crowd out employment in other sectors of the economy, and possibly raise wages/prices in other industries, deterring non-Olympic projects.

With the notion of opportunity cost apparent, not only must a successful Olympic Games generate some positive economic impact, but in order to support such a large and expensive project over a multitude of other social and political options there must be a rigorous method of estimating the economic impact of the Olympic Games. Too often cities rely on dubious impact studies chasing inflated revenues (as seen from the surplus generated from the Los Angeles Olympics). With billions of dollars at stake (often public dollars) no country or politician can with good conscience support the games for simple reasons of prestige and national pride. While these do accompany the games, if the best possible allocation of public funds is not reached (if it ever is) the people of a region or country may suffer. And while the course of this project is not to discourage the games, light must be shed on the true impact of the games. It is then the goal of this paper to determine the exact employment and income effects of the Salt Lake City Olympic Winter Games, and detail as much as possible the resulting economic activity. From this determination of the impact of the games will it be possible to make judgments and possibly confirm or deny any success of the games, and provide a concrete report in which can build upon existing literature, thereby giving policy makers and the general public a greater knowledge to the extent of the impact of the Olympic Games.

II. Theory of the Olympics as a Regional Economic Stimulus

"The export of the service 'Olympic Games' causes an inflow of funds to the host city, resulting in additional production which, in turn, leads to income and employment effects." In his 2004 book *The Economics of Staging the Olympics: A Comparison of the Games 1972-2008* Holger Preuss catalogues the methodology and theory behind measuring the impact of the Olympic Games on a host city. While he does not present an attempt or example of any such attempt, the work provides the macroeconomic framework of the Olympic Games.

Categorized as a mega event, the Olympic Games are generally viewed as producing an economic stimulus in the hosting city in the form of new construction, infrastructure, etc. before the administration of the games, the stimulus from directly running the games, and the effects of training volunteer and non-volunteer workers. (Hotchkiss et al. 2003, Preuss 2004) As mentioned, after the relative economic success of the 1984 Olympic Games in Los Angeles there has been a growing number of cities that bid for the Olympic Games. (Preuss 2004) However, this may be the result of biased ex ante impact studies (which will be mentioned later), which may inflate the expected impacts of the games. Furthermore, any gain seen from a particular Olympic Games is city and time specific; thereby the city's unique characteristics are often responsible for the successes or failures of the Olympic Games. Similarly, the economic conditions at the time of the games may be largely responsible for the relative successes. For instance, Los Angeles' successes in 1984 might have been the result of pre-existing venues that did not require Los Angeles to undertake huge construction projects in preparation for the games, and the Atlanta Games in 1996 might have been aided by the general recovery in the United States economy. (Preuss 2004, Baade and Matheson 2002) Furthermore, in addition to the uniqueness of individual Games, Mr. Preuss considers the Winter Olympic Games as a separate kind of event from the Summer Olympic Games stating, "They are an independent event and, in this book, are considered only occasionally." (Preuss 2004) Although the Winter Olympic Games are indeed relatively smaller, and often held in smaller cities, they hold similar economic features (as the

Summer Games), which makes their impact comparable and quantifiable, just as any Olympic Summer Games.

However, to measure the impact of the Olympic Games on a per item basis is often pragmatic, with a multitude of costs and revenues and many variables. Mr. Preuss provides a general algorithm for measuring the regional impact, similar to a simple macroeconomic model. In the time span of an Olympic Games (before, during, after) there is a primary impact (of the games) made up of direct and indirect autonomous expenditures flowing into a host region. Autonomous expenditures are categorized as any money from outside the region entering into the host city solely due to the games. These direct and indirect expenditures are in the forms of money spent by the organizing committee, venue construction, infrastructure construction, ticket sales, food and housing expenditures by tourists, etc. These expenditures then induce additional spending in the area in what is known as a multiplier effect, and in addition to the primary effect can be measured in terms of retail sales, income and employment. According to Mr. Preuss the then overall size of the impact from the games depends on the level of autonomous dollars flowing into the city and the size of the multiplier. (Preuss 2004)

A concrete applied analysis of this economic impact (for a particular games) is done in several fashions, and is typically done before an Olympic Games has taken place and therefore is ex ante in nature. The majority of such reports are impact studies, or cost benefit analyses, commissioned by an organizing committee or local government. Due to their ex ante and seemingly biased nature (commissioned by the government or organizing committee whom often desire to host the games), the legitimacy of these reports has been called into question by several individuals.[1] While cost benefit analysis is used occasionally, non-regression-based impact studies are the dominant frameworks for measuring Olympic output in either the Input-Output or

[1] See Kasimati (2003), Baade and Matheson (2002) for more detail.

Computable General Equilibrium methods and measure many aspects of the local economy including employment, income, sales, etc. (Ksimati 2003) These models have been used by such cities before their respective games as Atlanta (Humphreys and Plummer 1995), Los Angeles (ERA 1984) and Athens (Papanikos 1999). In the case of Salt Lake City, the Governor's Office of Planning and Budget released the revised "2002 Olympic Winter Games, Economic, Demographic and Fiscal Impacts" ex ante report in November 2000. The report's estimations were carried out using the Utah State and Local Government Fiscal Impact Model (FIM), and provided detailed estimates for economic output, employment, earnings, local and state revenue, visitors and population. However, among any such models, the multiplier employed, the assumptions in the framework and framework itself are routinely contested, as is the accuracy of the studies.[2] Indeed there is even controversy within the divergent impact frameworks.[3]

III. Literature on the Olympic Games

In the case of Salt Lake City, the "2002 Olympic Winter Games, Economic, Demographic and Fiscal Impacts" is the primary ex ante impact study for the 2002 Winter Olympic Games, written and updated several times in the years prior to 2002. This study generates forecasts for output (sales), employment, earnings, etc, details the SLOC budget, and identifies many of the venues and projects. Notably the study estimates the creation of 35,424 job years of employment, and $ 1,544,203,000 additional earnings. This study not only provides an estimate of the impact of the games, but these numbers can be compared to this ex post regression based analysis and attest to the accuracy of such studies. In the case of this report the

[2] See Matheson (2004).
[3] See West (1995).

"2002 Olympic Winter Games, Economic, Demographic and Fiscal Impacts" impact study will be the framework from which all regression-based results found in this report will be compared.

As noted, these studies are commissioned before the games have taken place, and rarely done after the completion of the games. In a study by Olav Spilling (1998), Mr. Spilling derives long term effects of the 1994 Lillehammer, Norway Games using basic statistical analysis from nationally produced data and firm specific surveys. Although Mr. Spilling states that there is no objective manner to measure the long-term effect of the games, he bases his study on, "personal intuition and interpretations, preferably based on in-depth knowledge of the regional industrial structure and processes that have been stimulated by the event." (Spilling 1998) His study is an attempt to determine how the Olympic Games affected the employment in the region in the long run after the games and is based on an intuition that the Winter Olympic Games may be able to influence a region's economy more than the Summer Games. More importantly, as Mr. Preuss explains, "If… the Olympic Winter Games which are hosted in much smaller cities are examined, the effects can be proven much more easily because the economic impact to the host city is comparatively larger." (Preuss 2004) Thus this gives the possibility and the hope that the Olympic Games can be an economic catalyst for a city, and that cities like Salt Lake City (due to size, location, evolution, etc.) may have benefited more than other past Olympic cities. However, Mr. Spilling finally concludes that the employment effect of the Lillehammer Games is equivalent to 400-500 full time jobs for a region of 20,000, most occurring in the tourism sector. Based on these results the author closes saying that the Olympic Games in Lillehammer were a weak agent of economic growth. However, this study raises more issues concerning the causal relationships from the Olympic Games. The extent that an individual can carefully account every gain to employment and attribute that gain to one exogenous event is certainly dubious. As Mr.

Spilling states, “When estimating the long-term impacts of an event, one will be faced with a fundamental problem of interpreting to what extent a particular development may be identified as an impact of the event or not.” (Spilling 1998) Specifically, any study that uses primitive modeling techniques encounters the problem of attributing growth in employment solely due to the Olympic Games. For instance, if an area was experiencing underemployment for a period, the cause of any progress in employment could be simply the effect of nationally improved economic conditions. Therefore results in this manner are very difficult to measure and hard to qualify.

While the history of modeling the output of the Olympic Games is a long established ritual, in fact, there have been few studies done using broad based regression techniques, which can make ceteris paribus arguments. One such is an attempt to forecast the economic impact of hosting the 2010 Olympic Games in Vancouver and author David Green (2003) makes use of regression techniques in the paper “Olympic Impacts, Should We Expect an Employment Boom?” The paper is an effort to estimate the employment effects of hosting the 2010 Winter Olympics in Vancouver based upon the employment effects seen in Lake Placid in 1980, Calgary in 1988, and Salt Lake City in 2002 and is a counter argument to the Vancouver Olympic Committee’s prediction of 244,000 jobs created due to the future Olympics.[4] Mr. Green uses a least squares dummy variable panel regression using the log of the employment rate as the dependent variable with the independent variables consisting of dummy variables each representing the American or Canadian region, time binary variables, and interaction terms (years and regions). Mr. Green then uses dummy variables for the particular Olympic host region for the years prior to the games, during and after the games to determine the employment growth

[4] The Ministry of Competition, Science and Enterprise estimates between 79,000 and 133,000 gross person years of employment attributable to the Olympic Games.

rate for the region hosting the games. He then uses the employment information of past games to estimate the effects that might be seen for the Vancouver 2010 Olympics. In his results, Mr. Green estimates the creation of about 10,000 job years (10,000 jobs lasting approximately one year). However, this report is still ex ante in nature and therefore cannot make the same assumption that what happened in Salt Lake City, Calgary and Lake Placid would closely represent the experience in Vancouver. Although this is an attempt to use econometric techniques to evaluate the impact of the Olympic Games, such results are only forecasts, the rigorousness of which can only be determined after the fact of the games.

In addition to the impact studies conducted for the Atlanta and Los Angeles Games, another regression-based ex post study has been conducted looking at the employment effect of these two Summer Olympics. This model is a pooled cross section regression (Baade and Matheson 2002) entitled "Bidding for the Olympics: Fools Gold?" This model seeks to estimate the additional employment gains resulting from the 1984 and 1996 Olympic Games in Los Angeles and Atlanta, respectively. This regression, in a pooled cross-section of the 50 largest Metropolitan Statistical Areas (MSAs) in the United States explains metropolitan employment growth by past employment growth and other factors such as population, personal income, wages, and taxes using a sample of cities from 1969-1997. The model also includes dummy variables for the Olympic Games, geographic regions, and oil boom-bust cycles. Their regression looks to past studies[5] that model metropolitan growth and uses independent variables to which these studies mark as significant in an effort to "use past work to help identify how much growth in metropolitan employment is attributable to the Summer Olympic Games." (Baade and Matheson 2002) Thus, the model uses independent variables that establish employment in a city had the games not taken place, using binary variables to represent the Olympic Games. However,

[5] See Mills and McDonald (1992).

these binary variables do not emerge as significant, so the predicted values of the regression are then compared to actual employment figures to derive deviations in employment attributable to the Olympic Games. They then use information derived from the Atlanta 1995 impact study (Humphreys and Plummer 1995) to determine the duration and extent of the employment effect of the Olympics, and establish several high/low estimates for the probable output of the games. In their results they found that the Olympic Games in Atlanta and Los Angeles generated between 3,467 and 42,448 jobs and 5,043 jobs, respectively. In the case of Atlanta, this estimate is far more conservative from the 77,000 jobs attributed to the Olympic Games by Humphreys and Plummer, and provides material support to question of rigorousness of ex-ante impact studies. The authors describe its relative success, and report an R-squared of .707 and a Durbin-Watson statistic of 1.83 explicating a relatively well-fit model. However, as the authors describe,

> "Given the number and variety of variables found in regional growth models and the inconsistency of findings in regard to coefficient size and significance, criticisms of any single model could logically focus on the problems posed by omitted variables." (Baade and Matheson 2002)

In another attempt to estimate the impact of the 1996 Olympic Games in Atlanta, Hotchkiss et al. (2003) use standard OLS techniques in the paper, "Impact of the 1996 Summer Olympic Games on Employment and Wages in Georgia". Using a differences-in-differences (DD) regression model, the authors derive employment and wage impacts from the Olympic Games in the levels and the rates of employment and wages. In a sample comprised of counties in Georgia that had Olympic venues, or were close to venues (the treatment group) and a control group of counties not involved with the games, the DD regression measures the changes that occurred within the groups before and after the games, and attributes any change within the gap between the control and treatment groups to the impact of the Olympic Games. In their conclusion, the authors verify the positive impact of the games as first reported by Humphreys and Plummer (1995) and Baade and Matheson (2002). While their research into wage impacts does not find significant results, they estimate a seventeen percent increase in employment in the counties that had or were in nearby proximity to venue sites from the years 1994 to 2000. The authors then translate this into the creation of 293,000 jobs in the pertinent counties due to the Olympic Games over the suggested time period. However, this estimate relies on the notion that the treatment and control groups exhibit similar behavior, and that the Olympic Games is the only departure from simultaneous behavior between the groups. On this the authors remark, "A robustness check confirmed that this employment impact of the Olympics is not attributable to some unobserved, systematic difference across the VNC[6] and the non-VNV counties." (Hotchkiss et al. 2003) As compared to the two mentioned studies from the Atlanta Olympic Games, these results are quite divergent. In this study, the authors consider the games as not merely a short-run phenomenon (as Baade and Matheson suggest) but a lasting effect with even greater employment effects than the 70,000 suggested by Humphreys and Plummer. Unlike Baade and Matheson who argue the overzealous nature of ex ante impact studies, these authors explain even greater gains to employment due to the Olympic Games than previous ex ante impact studies. As the authors prophesize in the introduction,

> "If it can be shown that an exogenous shock to a labor market, such as that brought about by the Olympic Games, can improve the employment situation of workers, it may prompt urban policy makers to rely more on promoting development projects when tackling the issue of unemployment instead of relying on alternate strategies such as targeted wage subsidies." (Hotchkiss et al. 2003)

While this seems to be a bit extreme, as well as an exorbitant estimate, this paper simply represents another tool used to quantify the games' impact. While this literature review is not

[6] Venue, Near-Venue

totally comprehensive to the whole of the literature that exists, it exemplifies the types of techniques that have been used to study the games in the past.

IV. Dynamic Employment Model

Due to the nature of the labor market (long term contracts, sticky wages, prices, etc.) there is justification to use a dynamic panel data model to estimate employment at the metropolitan level, that is, to explain employment by past values of employment. There is perhaps a certain persistence within the labor market, in addition to the unobserved heterogeneity of each MSA or the fixed effect, which suggests that past employment is a fairly good predictor of present employment. Therefore employment in period t should be a function of employment in periods t-1, t-2, and t-3 and necessarily requires a dynamic panel data method as prescribed by Arellano and Bond (1991), or the Arellano-Bond estimator.

This model's dynamic panel data or Arellano-Bond regression is based on a large n, small t panel data format, in which there is a sample of all 76 cities defined by the United States Office of Management and Budget as a metropolitan statistical area (MSA) in the states of California, Arizona, Oregon, Washington, Montana, Wyoming, Colorado, New Mexico, Idaho, and Utah from the years 1990 to 2004. These cities were all chosen based on proximity to Salt Lake City and the notion that these cities most closely model the Salt Lake and western region economy. The goal, that a picture of the western economy can be constructed that can explain metropolitan growth, after eliminating the city specific fixed effects that can act as a predictor for what Salt Lake City would have experienced without the Olympic Games. Therefore, in effort to completely capture the western economy all cities within these western states were chosen, first, in an effort to eliminate any guesswork or favoritism in city selection, and secondly, to increase the degrees of freedom in the model. The years 1990 to 2004 were used in effort to create a generous time line in which to measure the Olympic effect, as Salt Lake City's bid was accepted in 1995 and all Olympic projects were started after this time. Although it can be argued that this timeline is not indeed long enough, the majority of games-related employment is created close in time to the games, therefore, starting in 1990 should be appropriate.

From this data set regressors are chosen to try to model regional metropolitan growth in the western United States. Therefore, without including it in the model, this regression models the growth of Salt Lake City, if in fact the Olympic Games would not have taken place. Therefore, after running this regression the predicted values of the model are compared to the actual employment figures of the Salt Lake City MSA under a reasonable timeframe[7] to generate a prediction for the employment impact of the 2002 Winter Olympic Games, which may be then compared to the ex ante impact study previously mentioned. In the 2002 Winter Olympic Games the majority of the events were held in the Salt Lake City and Park City areas[8] with several events located within the Ogden and Provo MSA areas. The effect of the Olympics should be relatively smaller in these areas, and these areas will not be included in generating a prediction, as the errors in the predictions are probably greater than any effect that we might estimate.

In the equation, the dependent variable is the MSA's ratio of employment to population. Due to the nature of the independent variables (ratio form) the ratio of employment to population is used as the dependent variable instead of the level of employment to enable explanation of levels of employment with ratios such as tax burden (explained by total taxes paid as percentage of personal income), real average wages, and real per-capita personal income.

[7] This will be determined according to theory.

[8] The MSA for Salt Lake City includes Salt Lake, Toole, and Summit Counties. The Park City area is in Summit County. The town of Park City is a mountain resort town located thirty minutes from Salt Lake City. Besides being a location for many venues, Park City contained much of the housing, nightlife and tourist attractions associated with the Olympic Games.

On the right hand side of the model, the existing framework (Baade and Matheson 2002) uses real per capita income, nominal average wages, and population growth; however, these variables may be endogenous explanatory variables. In any regression modeling employment, economic theory suggests that real per capita personal income and wages should be simultaneously determined with the level of employment in the labor market. For example, theory suggests that raising the minimum wage will lead to lower levels of employment. In this manner, their model probably suffers from simultaneity bias, that is, real per capita personal income and wages will be correlated with the error term.[9] In addition, lags of real per capita personal income and real (not nominal) average wages are included in the model, as there is theoretical evidence that past values of these variables should affect employment if wages and prices are indeed inflexible. Contemporaneous values of total tax burden as a percentage of personal income and a time trend are also included as independent variables in the regression, as well as the log of the population in an effort to explain if the rate at which a cities population is growing has an influence on employment in that city. This suggests the following model.

$$E/P = \beta_1 E/P_{it-1} + \beta_2 E/P_{it-2} + \beta_3 R_{it} + \beta_4 R_{it-1} + \beta_5 R_{it-2} + \beta_6 W_{it} + \beta_7 W_{it-1} + \beta_8 W_{it-2} + \beta_9 L_{it} + \beta_{10} T_{it} + \beta_{11} Y_{it} + a_i + \varepsilon_t \qquad (1)$$

In this equation E/P is the ratio of employment for each MSA to its population, R is real per capita personal income, W is the real average wage per job, L is the log of population, T is the combined local and federal tax burden, Y is a yearly time trend, and a is the unobserved

[9] Baade and Matheson do say that inconsistency in regard to the signs of these coefficients “can be attributable to an inability to separate cause and effect.”

heterogeneity or fixed effect in the model. The summery statistics for these variables are reported in Table 1.

In a panel data context, running this regression with the fixed effects method will cause correlation between the lagged dependent variable and the error process, thus making past values of employment/population endogenous explanatory variables. With the Arellano-Bond estimator, this equation is differenced to remove the fixed effect (a_i), and then instrumental variables are inserted for the endogenous variables. In this context, further lags of employment/population are used as instruments for the lagged values of employment/population. These values should be highly correlated with their future lagged values but uncorrelated with the error or moving average (MA (1)) created in the first differencing process. In addition, due to the endogenous nature of real per capita personal income and real average wage per job, further lagged values of these variables will be used as instruments as well. Thus after first differencing, these additional lagged values used as instruments for the endogenous variables will eliminate the correlation between regressor and error, and provide a unbiased and consistent estimator. In addition to the elimination of the endogenous explanatory variables, autocorrelation in the error process must be avoided for correct specification. In the Arellano-Bond framework test statistics are derived for AR(1) and AR(2) errors and reported. In addition, the Hansen test, which examines if the model's over-identifying restrictions are appropriate, is reported and should not be rejected if the model is satisfactory. (Baum 2006)

The equation, then, was run under the relatively new Arellano-Bond framework available in the Stata statistic package as xtabond2 (Roodman 2006) in which new techniques (Arellano and Bover 1995, Blundell and Bond 1998) make use of the original estimator plus an additional estimator in which lagged levels as well as lagged differences are available as instruments, or the system GMM approach. (Baum 2006) Thus this equation was run under system and difference GMM approaches using the two-step robust estimation, and reported in Table 2 as variations of equation (1). This model was then extended to include three lagged values of employment/population and three lagged values of real per capita income and real average wages using both system and difference GMM.

V. Dynamic Employment Model (Border States Model)

In addition, it may be argued that the whole western region of the United States is a poor benchmark for the Salt Lake City economy. Therefore, the above specifications are applied to a panel of 31 cities in Utah and the bordering states, including Arizona, Nevada, New Mexico, Colorado, Wyoming, and Idaho. If the western pacific states do not represent a good theoretical benchmark for the Salt Lake City, these predictions should be the most accurate in representing the Olympic effect. However, due to the setup of the Arellano-Bond regression, both models may look similar and report similar test statistics, making the judgment of superiority to one model or the other problematic. Although both are reported in this study, theoretical justifications may be used to favor one model over the other, such as coefficient size and strength, and other test statistics. As with the first regressions, this was tested using system and difference GMM incorporating both two and three lag models, and reported in Table 3.

VI. Simultaneous Equations for Wages and Income

In addition to modeling employment as one viable indicator of economic performance, in theory, real average wages and real personal income should help describe a fuller picture to the effect of the 2002 Winter Olympic Games. Although past research has not tackled these variables in addition to employment, this study not only seeks to estimate the job creation of the Olympic Games, but how the Games can additionally affect wages and income.

However, theoretical limitations, much like in the first model, make modeling wages and income problematic. In effort to get away from much of the guesswork in modeling such factors, a simultaneous equation format can be used to model both series, without the boundaries put on by economic theory. In this extended model, wages and income act as the dependent variables regressed against an endogenous vector (wages, employment/population, and income) and additional exogenous variables. Much like the format of a vector autoregression, there are no restrictions placed upon the variables by economic theory and each series is regressed upon lags of itself, and the lags of the remaining variables. As previously explained in the first model, the endogenous explanatory variables necessitated the Arellano-Bond dynamic panel data format and the same format as equation (1) is used with a panel of 76 cities from 1990 to 2004. In two equations, real average wages per job and per capita real personal income act as separate dependent variables regressed upon themselves and contemporaneous and lagged values of employment/population in addition to the additional exogenous vector (tax burden, log (population), trend). The following represent the two regressions, each run using system and difference GMM, with two and three lag specifications, reported in Tables 4 and 5.

$$W = \beta_1 W_{it-1} + \beta_2 W_{it-2} + \beta_3 R_{it} + \beta_4 R_{it-1} + \beta_5 R_{it-2} + \beta_6 E/P_{it} + \beta_7 E/P_{it-1} + \beta_8 E/P_{it-2} + \beta_9 L_{it} + \beta_{10} T_{it} + \beta_{11} Y_{it} + a_i + \varepsilon_t \quad (2)$$

$$R = \beta_1 R_{it-1} + \beta_2 R_{it-2} + \beta_3 E/P_{it} + \beta_4 E/P_{it-1} + \beta_5 E/P_{it-2} + \beta_6 W_{it} + \beta_7 W_{it-1} + \beta_8 W_{it-2} + \beta_9 L_{it} + \beta_{10} T_{it} + \beta_{11} Y_{it} + a_i + \varepsilon_t \quad (3)$$

VII. Theoretical Expectations

In regard to the theoretical expectations on the coefficients on the model, Baade and Matheson describe inconsistency with regard to past literature. Indeed, in many of the coefficients, there is reason to doubt a concrete positive or negative sign within many of the variables just as there is controversy in labor supply models whether there is a substitution or income effect. In regard to the lagged dependent variable, there should be a very strong positive coefficient, as per capita employment in period t-1 should be a fairly successful predictor of per capita employment in period t if there is indeed a persistent relationship between current and past employment. In the case of average real wages, one would expect a negative coefficient, as the wages increase there may be a decline in employment in the area. However, as personal income increases one might expect a positive coefficient, for example, as incomes increase, perhaps small business can afford to hire more workers, thereby increasing employment in the local area. One would expect a positive trending variable, as was the general macroeconomic trend in the late 90's, however, due to the recession in the early 2000's it is difficult to interpret the expectation of this coefficient. The tax burden variable should be negative, as an increase in taxes in one area should not necessarily cause an out migration, but influence individuals considering relocation to one area over another. However, if the places that are most desirable to live indeed have the highest tax burden, the coefficient could be positive. In regard to the log of the population one would expect this coefficient to be negative, as it could be expected that the largest cities might contain lower per capita employment rates. Although, in the western United States, it is often typical that some of the smaller rural areas might exhibit lowest levels of per capita employment, simply due to region specific factors. In the lags of per capita employment, the log of real averages wage per job, and the log of real per-capita personal income, there should be a diminishing effect as the lags increase; however, in regard to the signs and significance of the coefficients, it is impossible to have a concrete ex ante prediction. These coefficients create the possibility that past wages, employment, and income may have a contemporaneous effect on per capita employment. In regard to all coefficients, as mentioned earlier there is no cut and dried expectation for any coefficient, and therefore the strength of a model will be a function of its coefficients and the statistics reported under the Arellano-Bond framework, namely the Hansen test of over identifying restrictions, and the Arellano-Bond AR(p) tests, RMSE, and etc.

VIII. Results of the Data

The results in Table 2 represent the first specification of the panel, which includes all 76 metropolitan statistical areas in the western United States. In the first and third columns of Table 2 the system GMM results are given and the difference GMM results given in columns two and four. In the first specification (column one, system GMM) employment/population (E/P) is lagged twice, and log (real average wages) and log (real per capita personal income) (R, W) contain contemporaneous and two lagged values. In this model, as expected, employment/population has a very strong coefficient with a t statistic of 17.21. Contemporaneous and the first lagged value of the log of average wages come in strong in the model significant at the five percent level, while only the lagged values of log (income) are significant at the five percent level. The total tax burden, and log (population) are not significantly less the zero, however, the trend is significant.

In the third column, none of the added lagged terms are significantly different from zero at the five percent significance level; although the third lag of employment/population and log (wages) are significant at the ten percent significance level.

In the second and fourth columns of Table 2 the difference GMM results are given. These results were slightly different, with smaller coefficients for the lagged value of employment/population, and significant coefficients on total tax burden and year.

Although there were no strong ex ante expectations regarding the signs of the coefficients, each regression seemed to contain similar information in regard to the signs. In each model there was a strong positive coefficient on the first lag of employment/population with relatively less significant following lags. In the log (real per capita personal income) there was a consistent negative contemporaneous relationship, however, a strong positive coefficient on the first lag of this variable. In the models, the log (real average wages) contemporaneous coefficient is positive, but following lagged values are negative. In the four regressions, the total tax burden and log (population) variable were only significant in the difference GMM estimator with positive and negative coefficients, respectively.

In these regressions, all models contained satisfactory Hansen tests, which measures if a particular regression's over-identifying restrictions are appropriate. Each model was also able to reject first order auto correlation as reported in the AR (1) test in Table 2. These make up the most important summary tests for the Arellano-Bond regression, generally describing satisfactory models.

The results in Table 3 represent the previous four models ran under a panel of 31 different cities, each located in Utah and its bordering neighbors. In the four specifications only the first lag of employment/population is significant, however, fairly less significant when compared with the results from Table 1. In each specification no additional variable is significant at any meaningful level. This may be the result of limiting the n element of the data set, or similar problem. When compared to the original data set these results were generally weaker in terms of coefficient size and strength. Similarly, although each Hansen test is satisfactory, three out of the four models could not reject first order autocorrelation in the errors at the 5% significance level. Due to the relative inefficiency of the majority of the regressions, the original specification of the data will be given precedence.

In the regression in which log (real per capita income) and log (real average wage per job) become the dependent variables, each dependent variable was modeled under four specifications, that is, two and then three lags of each endogenous explanatory variable each run with both system and difference GMM predictions. Similarly, as in the regression modeling employment, several variables come through very significant. In the regression in which income is the dependent variable, the first lag of log (income) is very significant in each specification, with no additional lag significant at the five percent significance level. The ratio of employment/population is only contemporaneously significant in the thrice-lagged difference GMM specification, making employment/population a poor indicator of real per capita personal income. As expected with their high correlation, the log (real average wage) is very significant in each model with a strong positive contemporaneous effect, and a negative lagged effect. In each specification total tax burden has a strong positive effect, although there is mixed results in regards to log (population) and trend variable, as the significance changes along with the sign as the alternate forms of the GMM estimator are used. However, each model's test statistics are satisfactory, rejecting over-specification, and first order autocorrelation.

In the regressions in which log (average wage per job) is the dependent variable, there is a very strong positive coefficient representing the first lagged value of real wages in each model. Similarly, employment/population is only contemporaneously significant in the difference GMM predictions, and log (real per capita personal income) is positively contemporaneously significant, while the lagged value is negative and significant. In regard to the exogenous vector of variables, log (population) is the only variable that is consistently positive and significant, with the remainder of the variables changing with the alternative methods. Each model's summary test statistics are also very encouraging, as the Hansen and autocorrelation tests are satisfactory.

IX. Predictions to Salt Lake City

In the four main regression sets explored in this paper, the system GMM approaches will be the preferred models in generating predictions for the impacts of the Salt Lake City Winter Olympic Games in 2002. Although there was a general consensus between the two models in regard to coefficient size and strength, in regard to summary test statistics such as the Hansen and AR tests the predictions estimated by the difference GMM estimator contain a larger standard deviation from that of the actual data, and from the system GMM predictions. Each difference GMM prediction was also accompanied by a larger RMSE (root mean squared error) than identical system GMM estimates. It is in this manner, for the sake of efficiency and parsimony, the system GMM predictions will be used to generate employment, personal income, and average wages estimates.

In regard to a logical timeframe in which these predictions can be applied, the "2002 Olympic Winter Games, Economic, Demographic and Fiscal Impacts" report can give the theoretical background for correct timeframe specification. In this report, the Governor's Office of Planning and Budget estimates that Olympic related job growth started in 1996 and lasted until 2003, with yearly estimates described in Table 6. Although ideally one would like to predict back this far in the past, due to the errors in the prediction, only the years in which theory describes as generating the most employment should be predicted. Under a more limited timeframe, estimates to employment, real per-capita personal income, and averages wages for 1999, 2000, 2001, 2002, and 2003 are predicted. These estimates are described in Table 6. The second column contains out of sample predictions (OOS), each predicted using data up to the previous year: for instance, the estimation for the year 2002 was generated using data dated 2001 and before. However, simply using out of sample predictions might create the suspicion that data influenced by the Olympic Games is already incorporated in the model[10], that is, over-predicting the out of sample predictions. In the third column employment and income are predicted using the data from the year 1999 and predicted up to 2003 (1999 data). In this manner, the data generated in the Olympic year is never used to create a prediction for the same Olympic year. In this way are the Olympic Games treated as an exogenous event, separate from much of the normal economic activity. Both the out of sample (OOS) and the (1999 data) estimates are reported in Table 6, and represent a high (1999 data) and a low estimate (OOS). These predictions, in hope, mimic the growth of Salt Lake City all else equal, namely, without the impact of the Olympic Games. In this study, the original specification (OOS) measuring employment predicted 495,585, 480,722, and 505,382 jobs for the years 2000, 2001, and 2002 respectively, and 495,584, 491,713, and 487,552 jobs over the same timeline using the 1999 data. These predictions were fairly smaller than the 504,410, 504,955, and 501,636 actual jobs in Salt Lake City in 2000, 2001, and 2002, respectively. In addition, the income specification (3) under-

[10] For example, if estimating 2002 estimates using 1990-2001 data, the Olympic effect in 2000 and 2001 is enveloped into the model.

predicted the real per capita personal income for the Salt Lake City Area of 25,110, 25,270, and 25,134 from 2000 to 2002. However, the wage specification (2) over-predicted the real average wage per job. As reported in Table 6, the 2002 Winter Olympic Games in Salt Lake City generated between 29,312 and 36,150 job-years of employment, between $ 1,241 and $ 2,470 to real per capita personal income, and a decrease of $ 897 to $ 2004 in real average wages. However, if one denies that the Olympic effect to be three years in duration, a more conservative estimate would include the years 2001 and 2002 in the prediction. Thus including two years of an Olympic effect, it is estimated that between 20,487 and 27,325 job-years of employment were created due to the Olympic Games, between $ 381 and $ 1,610 in real per capita personal income, and a decrease of $ 273 and $ 1,380 to average wages per job.

X. Conclusion

Using both predictions as an interval estimate, these results confirm a positive effect of the games as predicted by theory and anecdotal evidence. Similarly, these results do not qualitatively differ from the "2002 Olympic Winter Games, Economic, Demographic and Fiscal Impacts" which estimates around 35,000 person-years of employment generated due to the games alone. Due to limitations in the regression framework, estimating for years earlier to 2000 is problematic and there must be restrictions in the model to the years most indicative of a pre-theorized impact. However, between 20,487 and 36,150 job-years of employment can be attributed to the games in the timeline from 2000-2002, and 2001 to 2002, and a substantial increase to real per-capita personal income can be seen during the same period. There is also an implication that there may a lagged effect of the games, in that the year 2003 is under predicted in the model, which cannot explain the creation of more than 10,000 jobs, and significant gains to real income. Perhaps as indicated by Mr. Preuss, there is reason to theorize the possibility of the long term effect of the games, or a legacy effect (as seen in smaller markets, i.e., St. Moritz[11]), but confirmation on this necessitates a more generous timeline. Although probably undeterminable with regression analysis, a long term legacy effect should be viewed as possible, with strongest implications to the tourism sector, and would be worth studying in the future. This makes opportunity cost even more of a pragmatic estimate, as the possible value added in the long term makes the Salt Lake City Olympics a more valuable social project. Thus this study does not seek to evaluate the long term effects, but only notes them as possible.

In the figures to employment, real income, and real wages, the estimates were similar in regard to theoretical expectations. Generally, due to demand factors before and during the games, there was expected to be the largest effect, in terms of number estimates, to real income and employment. This study cannot, however, account for the decrease in wages during the same period. As Preuss and Green indicate, one possible outcome of the games is the crowding out in the labor market, which would increase wages in some sectors due to local constraints. This study found no such anomaly, but instead found wages lower than expected under the timeframe of 2000-2002. As providing a general unit of estimation, in terms of comparability for the economy as a whole, employment was expected to rise for the timeframe used, due to many factors mentioned in this paper. This study confirms those expectations, and notes that in general most of the expectations had their expected outcomes, as in the case of employment and real income.

In terms of implications from this study, these positive results represent an addition to the body of literature in which make ex-post findings of the Olympic Games. Through this, and

[11] "St. Moritz, 1928 and 1948, still profits from its image gained through hosting the Olympic Winter Games 76 and 56 years ago respectively." (Preuss 2004)

other similar studies, policy makers have another useful tool in their hands when determining the prospectus of possibly hosting the games. However, this study does not reject the hypothesis as noted in the Salt Lake City impact study, but rather cannot reject the creation of around 30,000 jobs. Unlike the earlier Baade and Matheson study, which strongly denied the more liberal ex ante estimates, the employment implications to Salt Lake City are indeed similar, if not a fair bit less than the Salt Lake City impact study.

Although it can be said with more certainty that the Olympic Games in Salt Lake City had a positive effect, any notion of opportunity cost is an uneasy estimation. As this paper does not flatly deny any positive economic effect, the Olympics must be judged with a rule of reason mindset, in that the economic impact of the Olympics is but one of numerous consequences of the games. The Olympic Games, although often seen as an economic tool, is never implemented for purely short run economic gain. If indeed there is a long term effect on the Utah economy as a whole[12], a short run stimulus, and the myriad social, political, etc. benefits, then perhaps the Olympic Games is a viable option for a city to undertake. However, such results as these are city-specific and there is little logic to the notion that these results are typical and/or transferable to another city. Thus any wise policy maker must account for every issue that necessarily comes with the games, and have every resource with which to measure the games. In hope, this study adds to those resources, and can be beneficial to anyone who seeks a more concrete and objective analysis concerning the impact of the Olympic Games.

[12] The author theorizes that the Olympic Games in Salt Lake City, as an advertising project, may increase future tourists to Salt Lake City, due to being seen as a more attractive substitute to that of such cities as Denver, Tahoe, etc.

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XII. Appendix

Table 1: Summary Statistics for the Western United States, 1990-2004

Variable	Mean	Std. Dev.	Min	Max
Employment	328206.2	723663.9	18506	6012938
Labor Force	349701.1	770990.3	19270	6396271
Population	687012.3	1534061	40714	1.28E+07
Total Tax Burden	31.26307	1.975396	26.5	36.5
Log (Population)	12.53649	1.166077	10.61433	16.36656
Employment/Population	0.46338	0.0561947	0.2922884	0.6055131
Real Per Capita Personal Income	22372.85	4582.188	14423.7	45974.84
Real Average Wage Per Job	25680.82	4630.084	18157.3	63447.27
Log (Real Per Capita Personal Income)	9.995971	0.1958907	9.576628	10.73585
Log (Real Average Wage Per Job)	10.13967	0.1610678	9.806828	11.05796

Table 2: Robust two-step DPD estimates, Employment/Population

E/P	System GMM	Difference GMM	System GMM	Difference GMM
Constant				
	0.7308951	N/C	1.361075	N/C
	(0.2664)		(0.3174)	
E/P				
t-1	1.010305***	0.7374425***	0.9144137***	0.6562406***
	(0.0587)	(0.0787)	(0.0622)	(0.0754)
t-2	-0.0536742	-0.120564	-0.0074587	-0.0499582
	(0.0658)	(0.0659)	(0.0783)	(0.0871)
R				
t	-0.0179751	-0.1587606**	-0.0699865	-0.1978968***
	(0.0362)	(0.0657)	(0.0463)	(0.0756
t-1	0.1132904**	0.0606537	0.1085283**	0.0464077
	(0.055)	(0.0475)	(0.0509)	(0.0489
t-2	-0.0737361**	-0.0685867	0.0218151	-0.0268025
	(0.0347)	(0.0459)	(0.0371)	(0.06
W				
t	0.0769017**	0.1513634***	0.1504145**	0.2369441***
	(0.0385)	(0.0539)	(0.0582)	(0.0804
t-1	-0.1147634**	-0.0368917	-0.1471934**	-0.0411199
	(0.0541)	(0.0511)	(0.0577)	(0.0608
t-2	0.0047489	-0.0342996	-0.0507157	-0.0242094
	(0.0321)	(0.0432)	(0.0412)	(0.0576
T				
	0.0002978	0.0014207***	0.0004454	0.0012865**
	(0.0003)	(0.0004)	(0.0003)	(0.0005
P				
	0.0009022	-0.0609769**	0.0009555	-0.1220251***
	(0.0008)	(0.0249)	(0.0009)	(0.0334)
Y				
	-0.0003061***	0.0029353***	-0.0006074***	0.0036473***
	(0.0001)	(0.0007)	(0.0001)	(0.0009)
E/P				
t-3			0.0495112*	-0.0363608
			(0.0274)	(0.046)
R				
t-3			-0.0420045	-0.0114181
			(0.0244)	(0.0275)
W				
t-3			0.0142906	-0.0515507
			(0.0404)	(0.0447)
Cities	76	76	76	76
Obs.	912	836	836	760
Wald Chi Squared	(11) 6903.03	(11) 249.80	(14) 9266.57	(14) 219.43
Prob > Chi Squared	0	0	0	0
Number of Instruments	76	76	76	76
Hansen Chi Squared	(175) 72.03	(130) 71.73	(172) 67.14	(127) 72.08
Prob > Chi Squared	1	1	1	1
AR (1)	-3.31	-3.19	-2.94	-2.82
Pr > z	0.001	0.001	0.003	0.005
AR (2)	0.02	1.07	-0.12	0.04
Pr > z	0.985	0.286	0.902	0.966

* p<0.10, ** p<0.05, *** p<0.01

Table 3: Robust two-step DPD estimates, E/P, Utah and Bordering States

E/P	System GMM	Difference GMM	System GMM	Difference GMM
Constant				
	0.5479025	N/C	1.580029	N/C
	(1.0326)		(0.8093)	
E/P				
t-1	0.9292302***	0.7171455***	0.8585637***	0.6795063***
	(0.0858)	(0.1180)	(0.1272)	(0.0965)
t-2	-0.1449275	-0.1791735	-0.1605992	-0.2051416
	(0.1627)	(0.1884)	(0.2498)	(0.1907)
R				
t	0.1453203	0.0845	0.1377832	0.0658542
	(0.1009)	(0.0857)	(0.1729)	(0.0955)
t-1	-0.0292062	-0.0319757	-0.0746598	0.0163297
	(0.0841)	(0.0633)	(0.0917)	(0.1308)
t-2	-0.107144	-0.099871	0.0231486	-0.0772063
	(0.1392)	(0.0845)	(0.1000)	(0.0831)
W				
t	-0.0770817	-0.0369822	-0.0949845	0.0306629
	(0.1250)	(0.0812)	(0.1244)	(0.1593)
t-1	0.0744921	0.0606916	0.117016	-0.0667045
	(0.1095)	(0.1464)	(0.1516)	(0.2330)
t-2	0.0078979	-0.0513826	-0.1429207	-0.0449195
	(0.1319)	(0.0646)	(0.0887)	(0.0942)
T				
	-0.0009373	-0.0002825	-0.0008685	0.0005628
	(0.0011)	(0.0012)	(0.0016)	(0.0012)
P				
	0.00112	0.0734058	0.0001024	-0.0551707
	(0.0121)	(0.1432)	(0.0085)	(0.1255)
Y				
	-0.0002869	-0.0004802	-0.0008381	0.0025714
	(0.0003)	(0.0045)	(0.0005)	(0.0037)
E/P				
t-3			0.1327097	-0.192841
			(0.1993)	(0.2272)
R				
t-3			-0.0803578	0.003355
			(0.0603)	(0.1344)
W				
t-3			0.1350188	0.0121182
			0.1250)	(0.1194)
Cities	31	31	31	31
Obs.	372	341	341	310
Wald Chi Squared	(11) 1956.40	(11) 308.84	(14) 1273.18	(14) 357.46
Prob > Chi Squared	0	0	0	0
Number of Instruments	31	31	31	31
Hansen Chi Squared	(175) 24.06	(130) 24.44	(172) 22.19	(127) 20.64
Prob > Chi Squared	1	1	1	1
AR (1)	-2.24	-1.89	-1.77	-1.94
Pr > z	0.025	0.059	0.076	0.052
AR (2)	0.47	0.68	0.6	0.23
Pr > z	0.64	0.5	0.55	0.819

* p<0.10, ** p<0.05, *** p<0.01

Table 4: Robust two-step DPD estimates, Real Per Capita Personal Income

R	System GMM	Difference GMM	System GMM	Difference GMM
Constant				
	1.668028	N/C	3.280212	N/C
	(0.3782)		(0.7247)	
R				
t-1	0.8932783***	0.4839896***	0.7725609***	0.4214241***
	(0.0750)	(0.1101)	(0.0700)	(0.1005)
t-2	0.0490915	-0.066405	0.113614*	-0.031472
	(0.0728)	(0.0940)	(0.0615)	(0.1018)
E/P				
t	-0.0183308	-0.3021966*	-0.1089098	-0.4166047**
	(0.1235)	(0.1688)	(0.1366)	(0.1815)
t-1	0.1501207	0.1058917	0.1038804	0.0548687
	(0.1807)	(0.1505)	(0.1965)	(0.1423)
t-2	-0.0253931	-0.0768116	0.10783	0.0136692
	(0.1088)	(0.0817)	(0.1144)	(0.0909)
W				
t	0.7103154***	0.7184988***	0.825553***	0.807399***
	(0.0617)	(0.0797)	(0.0791)	(0.1075)
t-1	-0.6362223***	-0.3148478**	-0.6509764***	-0.3242011***
	(0.1177)	(0.1271)	(0.1036)	(0.1153)
t-2	-0.0465344	0.056352	-0.0697645	0.0670591
	(0.0834)	(0.0963)	(0.0703)	(0.0964)
T				
	0.002339***	0.0048868***	0.0022313***	0.0046909***
	(0.0005)	(0.0007)	(0.0006)	(0.0009)
P				
	-0.0003396	-0.0986037**	-0.0008931	-0.1815352***
	(0.0015)	(0.0432)	(0.0024)	(0.0472)
Y				
	-0.0007435***	0.0051159***	-0.001563***	0.0061688***
	(0.0002)	(0.0012)	(0.0003)	(0.0013)
E/P				
t-3			-0.0007413	0.0091409
			(0.0553)	(0.0664)
R				
t-3			0.0595714	0.0622217
			(0.0734)	(0.0517)
W				
t-3			-0.0768081	-0.1319243***
			(0.0577)	(0.0486)
Cities	76	76	76	76
Obs.	912	836	836	760
Wald Chi Squared	(11) 46183.41	(11) 2047.70	(14) 38680.65	(14) 2214.81
Prob > Chi Squared	0	0	0	0
Number of Instruments	76	76	76	76
Hansen Chi Squared	(175) 73.87	(130) 70.43	(172) 71.01	(127) 71.34
Prob > Chi Squared	1	1	1	1
AR (1)	-3.61	-2.76	-3.64	-2.66
Pr > z	0	0.006	0	0.008
AR (2)	-1.28	-0.14	-1.33	-0.21
Pr > z	0.199	0.892	0.184	0.835

* p<0.10, ** p<0.05, *** p<0.01

Table 5: Robust two-step DPD estimates, Average Wage Per Job

W	System GMM	Difference GMM	System GMM	Difference GMM
Constant				
	-1.612051	N/C	-3.241753	N/C
	(0.3299)		(0.5281)	
W				
t-1	0.9626967***	0.5785844***	0.8524764***	0.5255068***
	(0.0721)	(0.0806)	(0.0641)	(0.0806)
t-2	-0.0376345	-0.1283566**	-0.0282604	-0.103977
	(0.0668)	(0.0640)	(0.0657)	(0.0813)
E/P				
t	0.1454621	0.2879356**	0.193913*	0.3637114***
	(0.1156)	(0.1343)	(0.1070)	(0.1354)
t-1	-0.1658989	-0.0496564	-0.0226024	0.008244
	(0.1784)	(0.1395)	(0.1736)	(0.1574)
t-2	0.0553571	0.2479379**	-0.1187887	0.0495836
	(0.1162)	(0.1041)	(0.1302)	(0.0907)
R				
t	0.5690916***	0.612783***	0.574573***	0.6183128***
	(0.1261)	(0.1304)	(0.1079)	(0.1233)
t-1	-0.6463201***	-0.385104***	-0.5009606***	-0.2999475***
	(0.1456)	(0.1083)	(0.1058)	(0.0831)
t-2	0.1177384*	0.2016305***	0.0152604	0.0863812
	(0.0605)	(0.0584)	(0.0630)	(0.0654)
T				
	0.0009149	-0.001376	0.0006396	-0.0013718
	(0.0006)	(0.0008)	(0.0005)	(0.0010)
P				
	0.0050067***	0.0856802**	0.0045244***	0.1527737***
	(0.0014)	(0.0428)	(0.0013)	(0.0421)
Y				
	0.0009316***	-0.0026034*	0.0016997***	-0.0028847*
	(0.0001)	(0.0015)	(0.0002)	(0.0016)
E/P				
t-3			-0.0388552	0.0374248
			(0.0463)	(0.0579)
R				
t-3			-0.0522307	-0.074978
			(0.0585)	(0.0477)
W				
t-3			0.1162862**	0.1621285**
			(0.0567)	(0.0727)
Cities	76	76	76	76
Obs.	912	836	836	760
Wald Chi Squared	(11) 48106.39	(11) 1660.12	(14) 57134.70	(14) 1621.10
Prob > Chi Squared	0	0	0	0
Number of Instruments	76	76	76	76
Hansen Chi Squared	(175) 74.53	(130) 70.10	(172) 69.23	(127) 68.47
Prob > Chi Squared	1	1	1	1
AR (1)	-4.12	-3.87	-4.17	-3.6
Pr > z	0	0	0	0
AR (2)	-1.14	-0.01	-0.85	-0.02
Pr > z	0.254	0.993	0.394	0.983

* p<0.10, ** p<0.05, *** p<0.01

Table 6: Predicted Vs. Actual Employment/Real Per Capita Personal Income/Average Wages Estimates

Employment

Year	Realistic Expectation (1999 Data)	Realistic Expectation (OOS)	SLC Impact Study
1999			5,243
2000	8,825	8,825	7,317
2001	13,241	24,233	12,590
2002	14,084	(3,746)	6,409
2003			256
Total	36,150	29,312	31,815

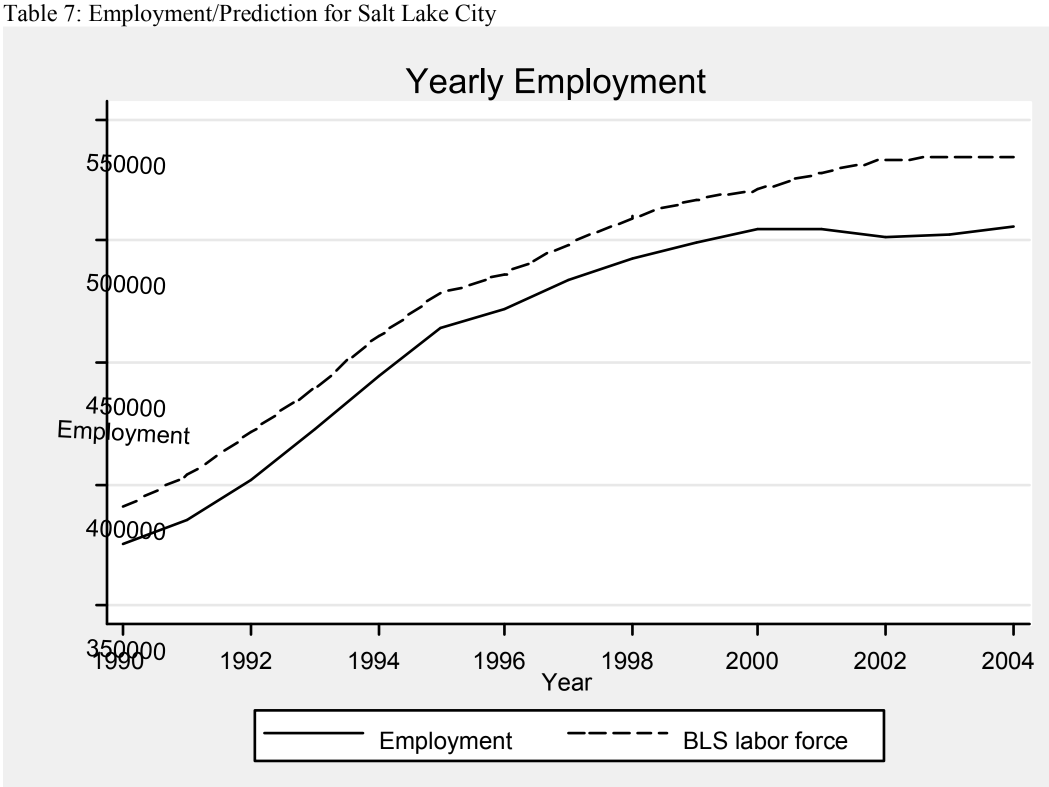
Real Personal Income

Year	Realistic Expectation (1999 Data)	Realistic Expectation (OOS)	SLC Impact Study
1999			
2000	859.92	859.92	N/A
2001	903.27	709.76	
2002	707.07	(328.54)	
2003			
Total	2,470.26	1,241.14	

Real Average Wage Per Job

Year	Realistic Expectation (1999 Data)	Realistic Expectation (OOS)	SLC Impact Study
1999			
2000	(623.94)	(623.94)	N/A
2001	(855.01)	(828.68)	
2002	(525.40)	554.91	
2003			
Total	(2,004.35)	(897.71)	

Table 7: Employment/Prediction for Salt Lake City



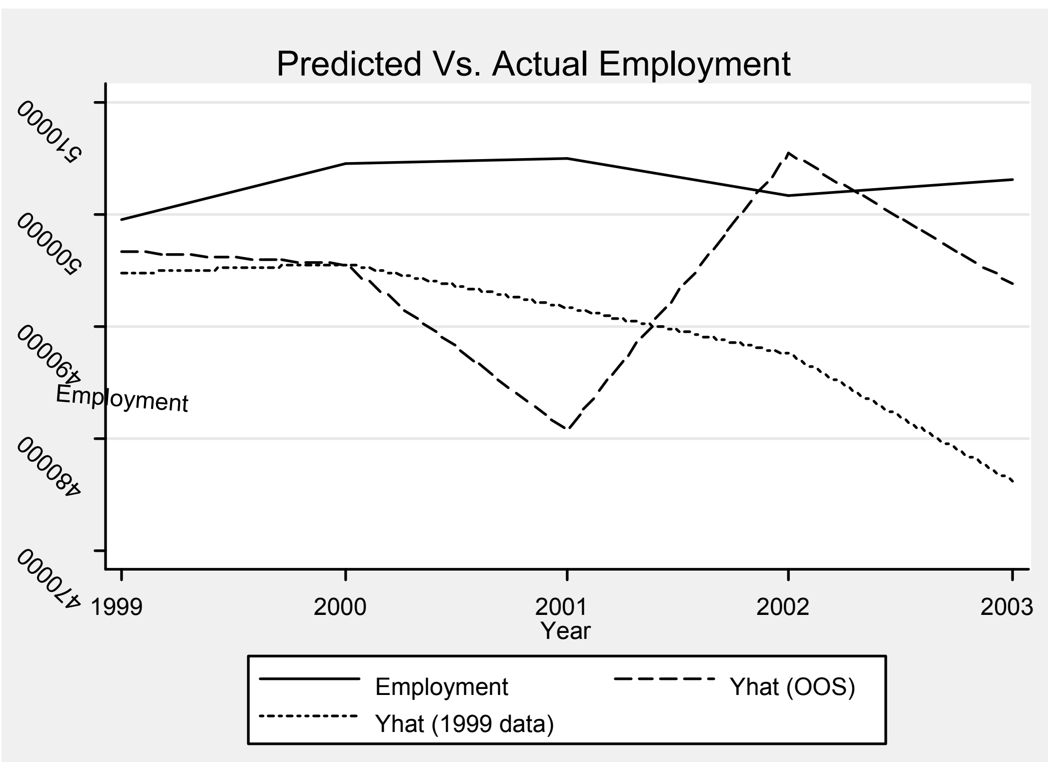


Table 8: Real Per-Capita Income/Prediction for Salt Lake City

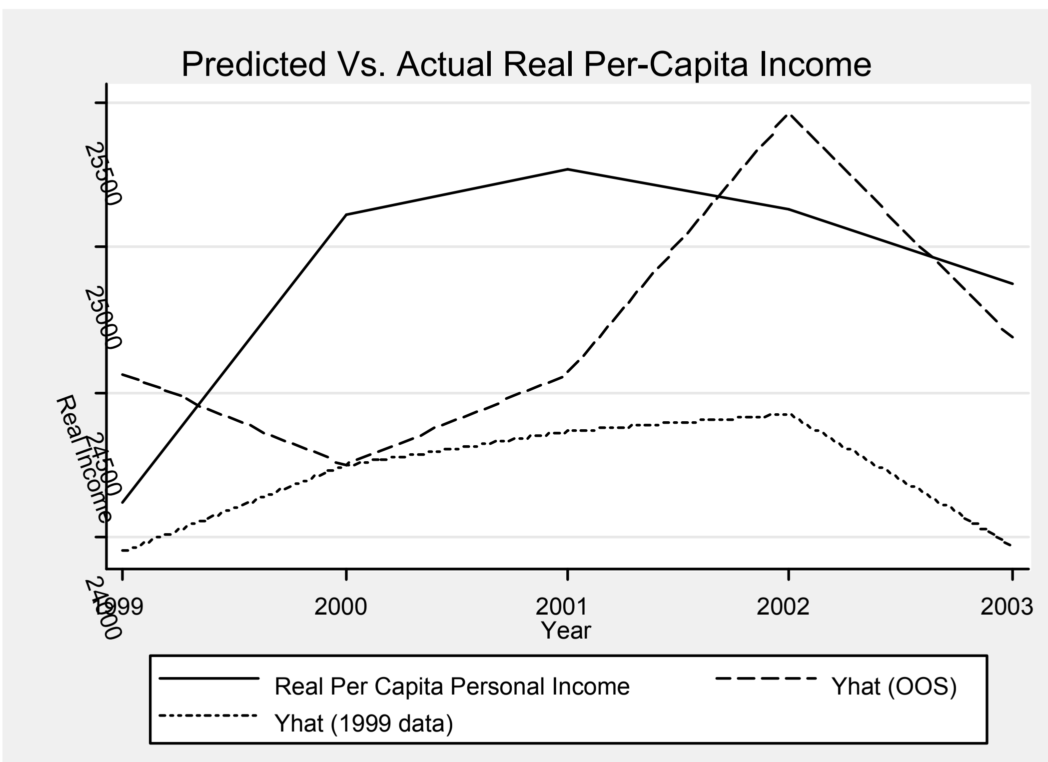


Table 9: Real Average Wage/Prediction for Salt Lake City