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Migration effects of Olympic siting: A pooled time series cross-sectional analysis of host regions

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Abstract. There has been considerable opposition to the 2002 Winter Olympics, to be held in the Salt Lake City metro area. This opposition stems primarily from fears of increased population growth due to the international attention. Proponents maintain that the Games will enhance the quality and quantity of jobs in the local economy, mitigating any undesirable impacts. This paper analyzes the experiences of past North American Olympic host regions, rather than the single case of Salt Lake City, to determine whether concerns are substantiated. Findings show that most population growth effects relate to the announcement of the Olympics rather than the actual hosting of the event. While the Olympics are likely to attract jobs to the host region, the nature of this employment growth and its effect on per-capita income are questionable.

1. Introduction

In 1995, Salt Lake City was chosen as the site of the 2002 Winter Olympic Games. At that time, Utah Governor Mike Leavitt commented that, "Certainly the biggest reason so many (people) are attracted to Utah, and one that makes it such an appealing contender for the Winter Olympic Games, is the beautiful outdoors." This appeal reflects a current emphasis on quality of life issues among businesses and households making migration decisions. While Salt Lake City's case for the 2002 Winter Olympics was apparently persuasive, many of Utah's citizens would argue that attempts to publicize Utah's quality of life are self-defeating. International attention to Utah's outdoors and clean communities may indirectly, but dramatically, erode the quality of

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life they have learned to enjoy due to excessive population growth in the Salt Lake City metro region.

To these concerns, the common response given by the proponents of the 2002 Games is that the economic benefits will mitigate any potential negative impacts. For example, Utah's Sports Authority (1992) responded to initial opposition with the claim that hosting the 2002 Olympics will increase tax revenues by $113 million and the economy as a whole by $1.46 billion. However, opponents remain unconvinced, maintaining that this economic growth will entice yet more migrants, leading to further population growth and a net decrease in the standard of living and quality of life.

Whether projected increases in economic growth outweigh the hazards of increased in-migration is a subjective judgment based on personal interpretation and opinion, but such judgment requires more accurate estimates of both impacts. It is the objective of this paper to determine some of the migration and economic impacts of hosting the Olympics by focusing on actual population and economic data from previous host regions. An analysis of both direct (migration trends surrounding the Olympics) and indirect (economic changes such as employment growth and income changes which may lead to further migration) impacts is conducted. In pursuit of this objective, a pooled time series cross-sectional analysis of pre- and post-Olympic migration experiences in past host regions is used. Although such analysis will be less complete than one using a full economic system model (such as a CGE or SAM), it provides a manageable method of including recent North American Olympic hosts in the analysis.

2. Migration models

One of the biggest concerns among Olympic opponents is the possible impact that hosting the Games will have on demographic growth and change. Since the late 1980's, Utah's economic growth has attracted record numbers of in-migrants (Perlich 1996a,b). Yet, some posit that in-migrants are also drawn by quality of life issues, including relatively low crime and environmental attributes such as open space. The host cities and regions tend to receive special attention during the Olympics, essentially advertising to a global population the amenity value of these areas and increasing the awareness of the quality of life.

It is clear that households may choose to migrate for both economic and nonpecuniary reasons, but Olympic hosting potentially affects both sets of factors. Of interest to policy makers and demographic researchers is how important and interdependent these reasons may be, especially since economic development goals of the region could be impacted in quite different manners. To estimate the likelihood of further population growth fueled by Olympic exposure, it is important to understand the general tenets of migration behavior, and more specifically, the migration experiences of past Olympic hosts.

Migration decisions are generally not taken lightly. They require careful planning and calculation with respect to several factors and assumptions. In short, "households must typically overcome a high degree of inertia before they make a decision to move" (Greenwood 1985). Because of the effort required for households to collect the necessary information and to overcome this "inertia", a relocation decision is likely to be a delayed response to opportunistic circumstances. For this reason, most of the determinants of migration are most appropriately modeled using both current and lagged variables that are indexed to national levels.

There are two fundamental components of population modeling, net natural increase and net in/out-migration. Net natural increase is relatively stable and, thus, fairly easy to model and forecast. Migration, on the other hand, is both volatile and elusive (Greenwood and Hunt 1991). Besides being the most difficult factor of population growth to predict, migration often causes significant changes in the size and composition of a given population. While migration is most often a result of employment opportunities (or lack thereof), the decision to relocate entails a number of variables, economic and otherwise. Indeed, the only accepted generalization concerning migration is that "people only move when their expected benefits exceed probable costs." (Bailey 1993)

Employment variables are commonly included in migration models. Lowry (1966) found that employment growth encouraged net-in migration. However, Sutton (1996) included an employment variable in his simultaneous equation model of migration in Arkansas and found that "... while net migration is significant in explaining variation in employment growth, employment growth is not significant in explaining variation in net migration." These conflicting results illustrate the complex causality relationship between employment growth and migration. Muth (1968, 1971) reconciled these opposing views in his paper arguing that, "employment growth and migration are mutually dependent ... regions in which the employment growth is highest will experience high rates of in-migration and low rates of out-migration. The rates of migration in the region will, in turn, affect both the supply and demand for local labor." Previous research on potential impacts of the 2002 Olympic Games, conducted using the Utah Process Economic and Demographic (UPED) Model[1], recognized employment growth as the single most important driver of migration (Perlich 1996a).

In his model, Greenwood claims that migration is commonly treated in an ad hoc fashion in population change models since it is typically difficult to collect the necessary data. He maintains that complicated migration models can be simplified to the point that employment growth rates, both local and national, are the only explanatory variables remaining in the model without losing the fundamental dynamics of migration. Many have explored unemployment as an explanatory variable in migration models, claiming that those without employment have a significant incentive to relocate to regions with relatively low unemployment rates and/or more employment opportunities. In these models, however, unemployment rates have frequently been found to have insignificant coefficients and, occasionally, unanticipated signs. Greenwood (1985) justifies these findings by explaining that the unemployed repre-

[1] This study was done to complement findings from the UPED model. In contrast to the UPED model, which relies on Utah-specific demographic trends, the model developed in this paper will rely more heavily on economic variables, thus allowing for comparisons between Olympic host regions. Additionally, the UPED model internally accounts for estimated shocks due to hosting the Olympics, while the model in this paper seeks to specify the magnitude and timing of these shocks.

sent a small percentage of the labor force and an even smaller percentage of the total population.

Migration models commonly include a labor market equilibrium component in employment variables. That is, "[the] migrant attractiveness of local jobs is a function of national economic conditions, rising during cyclical upturns and falling during periods of slower employment growth" (Greenwood 1986). "Because in a closed national system net migration is a zero-sum proposition, employment growth in each other region in the system, as well as locally, must be taken into account" (Greenwood et al. 1991). Moreover, Greenwood recognizes that the detailed data needed for complex migration modeling is commonly not available and proposes that local and national employment growth variables are typically sufficient.

The relationship between income and migration may initially seem to be quite simple; if a person could receive a more attractive salary elsewhere, migration would be an option worth considering. Lowry (1966) found that greater income growth induced net in-migration. Sutton (1996) found that this relationship is not so simple. He claims that, "regions with high wages may signal low employment possibilities to potential migrants whereas low wage regions may indicate present and future employment through new firm entry to the region". These multifaceted implications of income growth are similar to interpretations of stock price fluctuations. One may interpret a high growth rate of a stock in the market as either a signal of future growth or as a sign that investors seeking to capitalize on yesterday's growth have pushed the stock to its optimal price. Krumm (1983) found that while households are more likely to experience higher wage growth after migrating, there is no support for arguments that systematic patterns of movement are the result of high or low nominal wages. In short, it may be necessary to consider the type of income growth (i.e., industry make-up, distribution) when modeling its impact on migration.

In addition to purely economic factors, there are several other potential determinants of migration. Because labor markets for specialized occupations tend to be national, while markets for unskilled workers tend to be local, there is an important relation between dominant occupations and tendency for migration (Sjaastad 1962). Barff et al. (1993) confirmed that the variation of migration rates across occupations is largely caused by differences across industrial sectors. Moreover, professionals are much more likely to cross county and state borders when relocating than unskilled operators or laborers (Sjaastad 1962). It is also likely that industrial employment structure may indirectly affect perceptions of potential economic growth. Kusmin et al. (1996) found that industry structure was an important determinant of rural county earnings growth while Henry and Drabenstott (1996) found the degree of industry specialization affects economic growth. As discussed previously, income growth may send conflicting signals about potential economic growth. However, the level of construction employment would more clearly signal optimism about future industrial or income expansion.

There has also been research to address how economic growth directly related to the service and trade sectors affects employment risk. Neumann and Topel found that distinct sectoral employment compositions explained much of the difference in employment risk across regions. Fawson, Thilmany and Keith found that rural employment cycles differ significantly across sectors. For example, tourism-led trade and service sector employment growth exhibited low long-term job persistence whereas retirement-based trade and service growth led to more stable employment. Perceived employment risk clearly represents a deterrent to migration. Thus, the economic structure of a region may influence migration behavior in both direct and indirect ways.

Amenities and overall quality of life factors have also been found to be significant determinants of migration. Although these attributes are not directly modeled in this study, it is argued that Olympic host regions are likely to draw those with a propensity towards outdoor amenities. This relationship is increasingly important as an unprecedented wave of retirees make relocation decisions and as recreational opportunities and environmental quality gain importance in migration decisions of young professionals. Greenwood (1985) seems to confirm this trend, suggesting that, "evidence suggests that location-specific amenities are important in explaining migration." Yet, he is quick to point out that, "this entire pattern of causation between amenities, jobs, and migration remains undiscovered." Although this study includes no direct measures of amenity valuation by migrants, inclusion of the Olympic-timing variables may proxy for such if one believes the claims that hosting the Olympics increases amenity-driven migration.

3. An empirical analysis of migration to Olympic host regions

The objective of this study is to determine whether hosting the Olympics has any measurable impacts on net migration to the host region. Thus, the dependent variable in the primary model will be net migration as measured by a net in- or out-migration rate. The independent variables in the model will be used both to control for known migration factors and to introduce variables related to specific Olympic announcements and events to test the hypothesis that hosting the Games is positively related to net migration rates.

3.1. The model

Table 1 lists the variables to be included in the analysis. Employment growth and income will be the primary focus of the analysis. Borrowing from Greenwood (1991), disequilibrium-driven migration[2] will be used in calculating the employment growth variable. However, the national employment growth rate will be combined with the local employment growth rate in a single employment growth variable, calculated as the difference between the local employment growth rate and the national employment growth rate. This variable is expected to be positively associated with net in-migration. Based on the discussion of differential perceptions of economic growth and stability across industrial sectors, the shares of total employment in each sector will also be included in the estimated models.

Income will be represented by the local change in per capita income relative to national trends (adjusted to 1982–1984 dollars). Much like the employment variable, the change of income relative to other areas, as measured by change

[2] Greenwood indicates that if local employment is growing faster than most other regions (measured by national employment growth) people will migrate to that area.

Table 1. Variable definitions

Variable	Definition
MIG	Net migration rate
INC1	(Change in regionally deflated local per capita income) – (Change in nationally deflated national per capita income) lagged 1 year
INC2	INC lagged 2 years
EMP	(Local employment growth rate) – (National employment growth rate)
EMP1	EMP lagged 1 year
CON	Share of employment in construction
MAN	Share of employment in manufacturing
TRANS	Share of employment in transportation, communications, and other utilities
TRADE	Share of employment in wholesale and retail trade
FIRE	Share of employment in finance, insurance, and real estate
AG	Share of employment in primary industries (i.e., agriculture and mining)
PUB	Share of employment in public administration (federal, state, and local).
SERV	Share of employment in service sector
OLY	Dummy variable equal to 1 for all years proceeding Olympic Games, 0 Otherwise
ANN	Dummy variable equal to 1 for all years proceeding awarding of the Olympic Games, 0 Otherwise
SMR	Dummy variable equal to 1 if Summer Olympics, 0 if Winter Olympics

in national per capita income, will be used to pick up any disequilibrium-driven dynamics. More precisely, the income variable will be calculated as the difference between the change in local per capita income deflated with a regional Consumer Price Index (CPI) and the change in national per capita income deflated with a national CPI. This variable should be positively correlated with net in-migration, indicating that an area experiencing above average growth in per capita income should attract people from areas with below average income growth. By including the income variable in indexed-rate of change form, many of the conflicting findings of previous models which included income in absolute levels may be avoided (Sutton 1996). As discussed previously, lags of the EMP and INC variables will be included in the model, based on the theory that it may take several years of positive economic indicators to attract migrants (Bailey 1993).

Table 1 defines the sectors that will be included in the model as well as Ag and Pub[3], which have been chosen as the reference group. The impact of each of these private, non-farm sectors on migration rates will be measured relative to the combined impact of Ag and Pub. Theoretically, there should be a positive correlation between migration and the relative employment share of the construction sector, although the causality is less certain. Increasing migration, ceteris paribus, should increase construction in the housing sector, but it could be argued that industrial construction signals future economic and employment growth, thereby increasing migration. Although the timing of the

[3] Those counties included in this study are mostly urban, so their agricultural (Ag) sectors were not sufficiently big to act as a reference group to compare sectoral results, or as an excluded variable to allow for econometric estimation. Thus, the Pub sector was also excluded from the estimated model. This choice is based on the argument that government jobs are the least sensitive to market changes, at least in the short-run.

effect is not clear, it is argued here that construction affects migration in a positive manner.

For other employment sectors, the expected sign is not clear. Barff et al. (1993) found that professionals have much higher migration rates than laborers or operators, but whether this characteristic can be extended to entire industrial sectors is uncertain[4]. While some sectors are more skill intensive than others, there is some level of employment at the professional level in every industrial sector. Although there are no definite priors about the expected effects of employment structure on migration, inclusion of these shares in the model serves two purposes. In addition to exploring potential effects on migration, it will be interesting to note how such structure interrelates to other variables that affect migration. For this reason, employment structure variables will also be included in the models of economic and income growth.

For this model, hosting the Olympic Games will be included as a proxy for all amenity-related factors. To measure the impact of hosting the Olympics on net migration rates, two related aspects must be considered and represented in the model. First, substantial regional attention is given to the host region during the years of preparation leading to the Olympics. This will be included in the model as a dummy variable, which is 0 each year until the year the city is awarded the Games after which the variable will become 1. A similar dummy variable will control for the years prior to and following the actual host year of the Olympic Games. If the predictions of Olympic opponents in Utah are accurate, these variables should have a positive relation to migration. The sign on these variables will test the primary hypothesis of this study: whether the hosting of Olympic games significantly impacts migration rates.

A final aspect of amenity-driven in-migration as related to hosting the Olympic Games is whether the city hosts the Summer or the Winter Games, represented in this model as a dummy variable ($0 = $ Winter, $1 = $ Summer). Variations between the Summer and Winter Olympics are hypothesized to be significant because of differences between the two events in size (both of the actual event and the city itself), attention and format. For example, the venues for many of the Summer Games events are held indoors, while many of the Winter events take place in more natural, outdoor venues. More importantly, however, the Summer Olympics attract much more attention than the Winter Olympics (as indicated by the money spent by network sports divisions to obtain broadcast rights). The ambiguity of these potential impacts on net migration will be sorted out by the inclusion of the summer dummy variable in the model.

3.2. Data

Since the purpose of the model is to determine the impact of hosting an Olympic Games on net migration to the host region, data has been collected from counties that have hosted the Olympics within the past 20 years. The data set was limited to North American Olympic host areas where the avail-

[4] The employment shares are only disaggregated to the sector level due to data and degrees of freedom limitations. Thus, any significant results must be interpreted with care since these sectors are broadly defined.

Table 2. Counties included in Olympic host regions

		Counties Selected
1980 Winter Olympics	Lake Placid, New York	Clinton Essex* Franklin Warren
1984 Summer Olympics	Los Angeles, California	Los Angeles* Orange Riverside San Bernadino Ventura
1988 Winter Olympics	Calgary, AB, Canada	Calgary*
1996 Summer Olympics	Atlanta, Georgia	Cherokee Clayton Cobb DeKalb Douglas Forsyth Fulton* Gwinnett Paulding Rockdale

*county of host city

ability of economic and demographic data allowed for more direct comparisons with Salt Lake City. Counties from each of the representative regions have been chosen based on geographic proximity to the host-city and degree of involvement in hosting the Olympic Games (i.e., location of competition venues). Differences in local government structure and unavailability of data make direct county comparisons between the United States and Canada difficult. Thus, the Calgary observations represent city, rather than county level data. Additionally, the relatively small size of counties in Georgia requires the selection of numerous counties to sufficiently represent the region impacted by the 1996 Atlanta Summer Olympics.

From each of the 20 counties included in the regional analysis, 11 years of observations[5] were included for a total of 220 observations. The final data set represents counties from four recent Olympic host regions (Table 2)[6]. Table 3 shows the aggregate summary statistics for the net migration rates defined using several different categorizations. The categories present rates of net

[5] The original intent was to include 5 years of data before the Olympics and 10 years afterward. Because of the limits on data availability however, this was not possible for the Calgary, Lake Placid and Atlanta data sets and the maximum possible was 11 years of observations for each cross section. Again because of data limitations, the timing of the Olympics within these 11 observations is not uniform across cross sections. The ANN and OLY variables will control for these differences in timing.

[6] Data sources: USA Counties (1997) *Government Information Sharing Project* [online]. (Oregon State University). http://govinfo.kerr.orst.edu/usaco-stateis.html; Holt R. (1997) *Regional Economic Information Service* [online], (University of Virginia), http://www.lib.virginia.edu/socsci/reis/reis1.html; and Calgary Year Book.

Table 3. Net migration rates before and after Olympic events

Net migration rate	N	Mean	Standard deviation	Variance	Minimum	Maximum
Summer Olympics						
Before Olympics	50	0.0217	0.0156	0.0002	−0.0004	0.0686
After Olympics	50	0.0171	0.0193	0.0004	−0.0070	0.0621
Winter Olympics						
Before Olympics	61	0.0084	0.0185	0.0003	−0.0181	0.0654
After Olympics	61	0.0013	0.0071	0.0000	−0.0129	0.0201
Summer and Winter						
Before Olympics	113	0.0163	0.0173	0.0003	−0.0181	0.0686
After Olympics	113	0.0084	0.0158	0.0003	−0.0129	0.0621
Summer Olympics						
Before announcement	105	0.0252	0.0203	0.0004	−0.0142	0.0789
After announcement	105	0.0193	0.0174	0.0003	−0.0070	0.0686
Winter Olympics						
Before announcement	89	0.0093	0.0199	0.0004	−0.0348	0.0677
After announcement	89	0.0009	0.0075	0.0001	−0.0181	0.0201
Summer and Winter						
Before announcement	131	0.0229	0.0212	0.0005	−0.0142	0.0789
After announcement	131	0.0130	0.0177	0.0003	−0.0181	0.0686

migration before and after the year of the Olympics, and before and after the year the region was chosen to host the Olympics (with statistics broken down for Summer and Winter Game host regions). It is interesting to note that mean net migration rates seem to be lower after the year of the Olympics than before the Olympics for regions that hosted both the Summer and Winter Games. This is also true, but to a lesser degree, for migration during the year following the Olympic site announcement.

It is interesting to note that all net migration rates from this data set are positive. Because net migration in a closed national system is a zero-sum proposition, all net in-migration to one region must be countered by net out-migration from another (Greenwood 1991). In a closed system, the net migration rates will sum to zero. This seems to indicate that Olympic host regions, as a group, happen to be more attractive to potential migrants than other areas, even if the relative migration rate drops after the Olympics are held. This is not surprising given the economic stability and favorable infrastructure conditions that attract attention to a potential Olympic host city. More precise relationships can be determined from the empirical results presented below.

Net migration rates, per capita income and employment growth (aggregated across counties) for each host region are graphed to identify any preliminary trends (Figs. 1, 2 and 3)[7]. The time line represents years before or after the Olympics (year of Olympics = 0). These graphs visually represent

[7] Atlanta is not shown in the graphs because currently available data does not include post-game timelines (data was gathered only through the year of the Olympics, 1996).

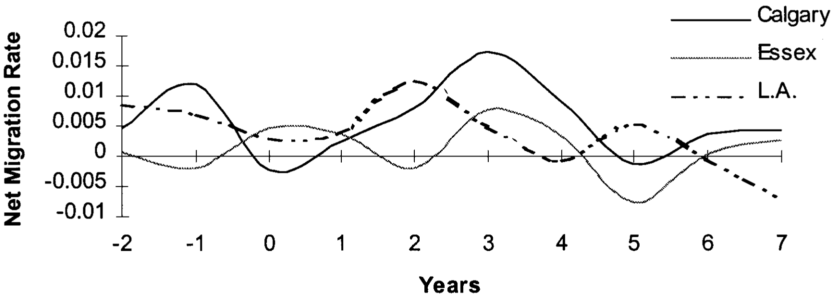

Fig. 1. Net migration rates across Olympic host regions (*Note:* Year 0 is the year the Olympic Games was held)

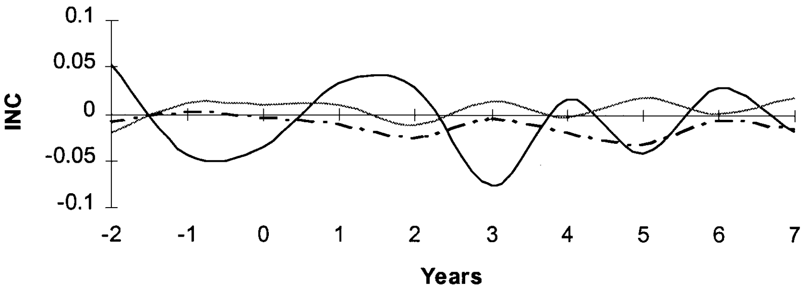

Fig. 2. Per capita income growth rates across Olympic host regions (*Note:* Per capita income growth rates are adjusted for inflation and relative to national growth rates)

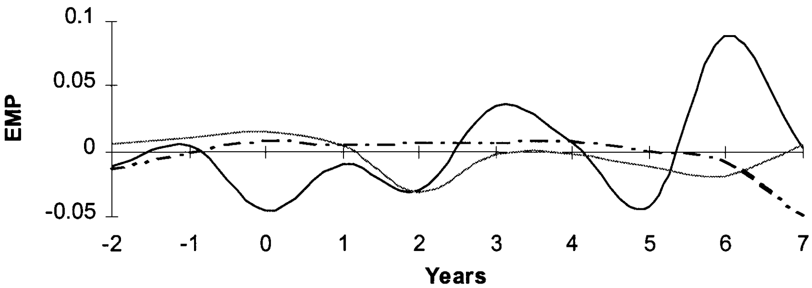

Fig. 3. Employment growth rates across Olympic host regions (*Note:* Employment growth rates are relative to the national growth rate)

migration, income growth and employment patterns for these three regions. This preliminary analysis of net migration means and graphs must be interpreted with caution since only general trends are apparent. It appears that a peak in net migration rates may occur two to three years after the Olympics, followed by a decline. This eventual decline in net migration rates may help to explain the results (Table 3) that suggest net migration rates actually fall after the Olympics. Figure 3 illustrates that Calgary has more volatile income and employment growth than Essex County, New York or Los Angeles County, California. Because both employment and income growth have been calculated as the difference between local and national conditions, it follows that Canadian economic conditions could differentially impact INC and EMP. Moreover, the large and diverse Los Angeles economy is expected to be less volatile than the economies of Essex County and Calgary.

3.3. Econometric methods and issues

To better understand the complex relationships between migration rates and the selected structural and Olympic variables, regression analysis is appropriate. There are several econometric issues that must be addressed. Since current and lagged employment and income growth rates will be included in the model, there is the potential for multicollinearity problems. Thus, INC and EMP2 will be removed from the model based on our perceptions of the timing and informational value of each of these variables[8]. Current income growth rates are not available to migrants at the point of their decision, but rather, they may know that a region is economically strong based on past income growth statistics. Thus, the lagged values of income growth, INC1 and INC2 will be included in the migration model. Employment growth rates more directly affect migration decisions since it is usually an actual job offer that attracts a new resident to the area. Thus, the current and most recent employment growth rates are included in the model. To assure that our priors and the somewhat ad hoc decision of which variables to include did not bias results, models with different sets of variables were run and sensitivity analysis was performed.

Autocorrelated errors are also a common problem with time-series estimations. However, since the model has been specified in growth-rate form and is a pooled cross-section, time series model, the potential for autocorrelated errors is significantly less than the same model in absolute level form (Granger and Newbold 1977).

3.4. Estimation

Four pooled cross-section time-series models were estimated. First, a purely structural model of net migration (the dependent variable), excluding either of the Olympic variables and a fully specified model of net migration rate with the Olympic-timing variables were estimated. Then, the fully specified models with (1) income growth and (2) employment growth as the dependent variables were estimated to test for some of the direct economic impacts of greatest interest to this study's objectives.

The models were estimated using the pooled cross-section time-series method from SHAZAM. From each of the 20 counties included in the regional analysis (Table 2), 11 years of observations were included for a total of

[8] Correlations were calculated across these variables to determine potential multicollinearity issues as well. Results are available from the authors.

Table 4. Empirical results of migration (2), income and employment models

Parameter	Structural model	Fully-specified model	INC-dependent model	EMP-dependent model
INC1	0.0676*	0.0738**	–	0.3877**
INC2	0.025	0.053**	–	0.0784
EMP	0.1047*	0.0882**	0.4027**	–
EMP1	0.051*	0.0402*	0.0741	–
CON	0.223*	0.2437**	−0.2910**	0.3387**
MAN	0.0139	0.0111	−0.0183	0.0794**
TRANS	−0.0245	−0.0539	0.2365**	−0.1659*
TRADE	0.072*	0.0440	−0.1804**	0.2297**
FIRE	0.0977*	0.0523	0.1528*	−0.2220**
SERV	−0.0417*	−0.0302	−0.0312	−0.0139
OLY	–	−0.0029*	−0.0101**	0.0071**
ANN	–	0.0061**	−0.0133**	0.0098**
SMR	–	0.0058**	−0.0187**	0.0236**
Constant	−0.0193*	−0.0191	0.0696**	−0.0687**
R^2	0.5765	0.516	0.4430	0.5869
Log of the Likelihood Function	775.537	778.346	596.426	585.282

* indicates significance at the 10% level
** indicates significance at the 5% level

220 observations. The reported results are robust. Durbin-Watson tests were conducted, and no significant autocorrelation is present.

4. Empirical results

The results from the four regression models are presented in Table 4. The purely structural migration model coincides with the initial hypothesis and seems to support several previous migration models which found employment growth to be a significant determinant of net migration (Sutton 1996; Lowry 1966; Greenwood 1985, 1991; Perlich 1996a). Although EMP has the highest absolute coefficient of any variable included, Greenwood's model that considers only current employment growth as an important determinant of net migration rates (1991) is not strongly supported. Lagged income growth and current and lagged employment growth all positively contribute to net in-migration rates, although INC2 is insignificant. The result on INC1 and INC2 corresponds with the findings of several previous models (Lowry).

Employment structure (as defined by share of employment in various sectors) also appears to affect migration in this model. The results for sectors of employment should be interpreted as the impact on migration relative to the reference group (AG, PUB). This in mind, there exists significant correlation between net migration rates and CON (construction). This is an intuitively agreeable relationship since a relatively higher share of employment in construction may signal economic growth to potential migrants. TRADE, FIRE and SERV are also significant, demonstrating that the make-up of an economy may provide information or incentives for migrants. SERV is the only sector negatively associated with net migration, a finding consistent with Barff's et al. (1993) conclusion that those in the service sector half as likely to migrate as those in professional, technical, and sales sectors. Although the results on employment by industry are interesting to note, the reasons for such findings will be left to future research. In short, it is likely that there is some interdependencies and two-way causality between the structure of an economy and the propensity to migrate.

The findings for the fully-specified model are very similar in terms of sign, magnitude and significance of the income and employment variables. The coefficients for the Olympic variables seem to support the original hypothesis, but with a modified explanation. It appears that while hosting the Olympics may decrease net migration overall, the year the region is awarded the Games that is positively correlated with net migration. It is also interesting to note that several of the sector employment share variables (TRADE, FIRE and SERV) are no longer significant. This, together with the significance of the announcement variables, may suggest that the impacts of hosting the Games indirectly manifest themselves in changes in employment structure. Thus, if a variable is included to account for the period preparing for the Olympics, employment shares are no longer as necessary to explain migration behavior. This finding may have long-term implications for general economic conditions of a region given the differential earnings and stability among various employment sectors (Fawson et al.).

SMR is found to be both positive and significant in the fully-specified model. This is also intuitive since the Summer Olympics are typically much larger than the Winter Olympics. For example, the 1996 Atlanta Summer Games hosted five times as many events and competitors as the 1994 Lillie-hammer Winter Games (International Olympic Committee, 1997). Thus, it is logical that both public exposure to amenities, and any local economic activity growth, would be relatively higher as well. It is important to note that this positive result is relative to migration for the Winter games due to the nature of this dummy variable, so migration associated with announcements for both types of Olympic hosts may be positive.

The INC and EMP models were estimated to test our secondary hypotheses: that the Olympics directly affect economic variables as well as migration. The models allow us to test whether the migration and growth experienced with the Olympics have positive externalities on the economy, by analyzing the effect on income and employment growth. The findings from these two models are somewhat surprising, and have some potential implications for regional economic development goals. Consistent with expectations, both models signal that income and employment growth are positively related. Although some lagged values are also significant, the strongest positive relationship exists between current income and employment.

It appears that the Olympics do indeed promote employment growth as does the preparation period between the announcement of the host and the actual games. Since the dependent variable is a growth rate, the coefficient can be interpreted directly as almost 1% growth during both periods. In the Income growth model, these two variables have negative and significant coefficients that are absolutely greater than the employment growth rates (-1 and -1.3%, respectively). This suggests that the hosting of Olympic games may have a detrimental influence on per capita income growth, countering the claims by Olympic supporters in Utah. Finally, the Summer games appear to create relatively more jobs (2.4%), but have a greater negative impact on income growth (−1.9%).

Once again, there are significant relationships between the share of employment in some sectors and employment and income growth. Perhaps the most striking result is the positive effect of a higher share of trade and construction jobs on employment growth and the negative effect of those sectors on per capita income. It may signal that the sector is labor-intensive and relatively low paying. Conversely, employment in transportation, communications and utilities (TRANS) and finance, real estate and insurance (FIRE) have negative relationships with employment growth but may increase per-capita income growth rates.

5. Conclusion

The Olympic experience for a region is likely to have both direct (migration, economic growth) and indirect (structure of the economy) effects on the overall economy and quality of life for the host region. Although this experience is likely to vary depending on the region's existing economic base and infrastructure, we argue that there is a common set of effects that can be expected within the region. This study complements previous research in this area by evaluating the actual migration and economic effects of hosting a large event on previous sites (four former Olympic host regions). Although the results are not as individualized as single region or case studies, the addition of data on actual post-event experience lends credibility and a more generalizable contribution to the impact analysis literature.

Both sides of the debate on potential migration and economic impacts to Salt Lake City from hosting the Olympic games appear to assert valid points. Population growth may be fueled by public exposure associated with the Olympics, Games-related economic activity, or both. Yet, the overall effect on the economy, simply measured by income and employment growth in this study, appear mixed. Empirical findings from this study indicate a significant positive correlation between hosting the Olympics and migration. However, this upward migration trend begins when the city is awarded the Olympics and continues only through the actual year of the Games. Not surprisingly, those areas hosting the Summer Olympic Games tend to exhibit consistently higher net migration rates than those hosting the Winter Olympics.

The potential impacts of hosting the Olympics on the economy seem to be mixed. While the Olympics may indeed promote employment growth, it also appears to have a detrimental effect on per capita income growth. Unlike migration, the economic trends begin after the announcement that the region will host the Olympics, and continue after the hosting of the Games. The mixed economic signals may indicate that newly created jobs are in lower-paying sectors, a theory supported by the findings on employment sectors. The share of employment in various sectors, including retail trade and construction, had similar impacts on both employment growth (positive) and per capita income growth (negative). It is likely that hosting the Olympics would increase the share of employment in such sectors, so the direct effects on income and employment may be further augmented by changes in employment structure. Future research may more closely examine the role of employment restructuring, costs of pursuing a bid for host region or longer-term economic effects.

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