Sports and Local Growth in Sweden: *Is a Successful Sports Team Good for Local Economic Growth?* *

By

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ABSTRACT

This study investigates whether net migration and per capita income growth are affected by successful local soccer or ice hockey teams. Local governments support local professional teams and are often motivated by the alleged positive externalities, which, ultimately, are supposed to enhance the tax base. We estimate spatial panel data models using data from all Swedish municipalities for the 1997-2012 period. Even with this richer modeling framework compared with those in previous studies, we still find no evidence of a positive relationship between a team's performance and the local tax base.

Keywords: Sports, growth, spatial econometrics, regional growth

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1. INTRODUCTION

Professional teams often obtain substantial financial support from local governments, although most previous research has not found any effects of such teams' performances on the growth of the local economy. The previous literature (e.g., Coates and Humphreys 1999), however, uses models with few explanatory variables other than sports environment variables, which are estimated for selected local areas, and with just one dependent variable. In this study, we simultaneously estimate spatial panel data models for Swedish municipalities that include other explanatory variables that are used in the regional-growth modeling literature.

Many local governments give substantial financial support to professional sports teams in several countries, including the U.S. (Coates and Humphreys 2003b) and Sweden (SKL 2010). Promoters of these subsidies often claim that teams who make it to the national premium leagues in the major public attendance sports will contribute significantly to the local economy and thus contribute indirectly to the tax base and tax revenues of the local government by providing marketing services that enhance the local community's public image and thus attract labor and business. In addition, a team may provide direct injections into the local economy from spectators' spending on tickets, meals, and lodging, among other things.

However, most previous empirical studies on the impact of sports on the local economy have not found any significant correlation (see, e.g., Baade 1994 and 1996, Hudson 1999 and Coates and Humphreys 2003a), while some have even found a negative relationship (see, e.g., Coates and Humphreys 1999 or Baade and Dye 1990). Coates and Humphreys (2003b) argue that negative effects could arise because of the opportunity costs incurred from crowding out other, more productive, public expenditures. No previous study has investigated whether there are any effects on the labor supply through the net migration to the local labor market; such migration could occur if people are major sports fans and are willing to relocate to be closer to their favorite teams.

The purpose of this study is to analyze whether a municipality's net inbound migration and per capita income are affected when a local sports team enters or exits the highest and second-highest national leagues in ice hockey or soccer in Sweden. The contribution of this study is at least threefold. First, to the best of our knowledge, this is the first study that seeks to study the effects of sports but also incorporates potential growth effects on labor supply that arise through net migration. We build on regional growth models inspired by Fagerberg, Verspagen and Caniëls (1997), Aronsson, Lundberg and Wikström (2001) and Lundberg (2003, 2006), using recent municipality-level panel data for Sweden from 1997-2012 and adding dummy variables that indicate whether a local sport team belongs to the national soccer or ice hockey leagues during specific time periods. We follow this literature and simultaneously estimate the effects on both per capita income growth and net migration rates, focusing on the effects of changes in sports environment variables. The main reason for studying two dependent variables is that the major source of tax revenue in Swedish municipalities is local income tax; therefore, the tax base is affected by both per capita income and population size (and, over time, by net migration). Second, compared with previous studies on regional growth in Sweden using spatial econometrics (Lundberg, 2003, 2006), we use spatial panel data modeling, where the weight matrix is based on both the distance between municipalities and the size of the municipality's labor market. Third, most empirical studies on this topic are conducted using U.S. data. By using data on Swedish localities, we add the perspective of the effects of sports in a country with a public sector that is traditionally different than that of the U.S.

To preview the main results, we find no robust statistically significant effects of any of the sports-environment variables on the average income growth rate in Swedish municipalities. Thus, using both a richer dataset and econometric modelling, our findings confirm previous results in the sports economics literature.

The paper is organized as follows. The next section contains an overview of previous studies. Section 3 gives some background, and section 4 includes a review of previous empirical modeling of regional growth in Sweden. In section 5, the empirical specifications and the spatial econometric methodology are outlined. Section 6 presents the data. In sections 7 and 8, the results are presented and discussed.

2. PREVIUS STUDIES

Baade (1994) recognizes three types of potential effects of professional sports on the local economy. First, there is a direct effect from expenditures on tickets and restaurants in the arena. Second, there are indirect expenditures that arise through the multiplier effect.[1] Third, there are other benefits, such as the enhanced image of the municipality. When a game is broadcast on TV, it also acts as an advertisement for the local area. With its enhanced entertainment value and improved profile, a municipality may attract additional businesses and labor to relocate to that particular area. Therefore, professional sports can be seen as a public good with positive externalities, which could theoretically justify subsidizing such activities (Hudson 1999).

Baade and Dye (1990) study whether a new or renovated arena or the presence of a professional team correlates with the level of total aggregated personal income. They also investigate whether the municipality's share of regional economic activities is enhanced. They find no significant impact in eight of the metropolitan areas of study, but the effect of a new stadium is positive and significant for Seattle. Further, they find that the impact of a new or renovated arena on a metropolitan area's share of regional income is statistically significant and negative. Santo (2005) conducts a similar analysis with more recent data (1984-2001). The results indicate some positive and significant effects of sports. Santos argues that the arenas built today are different in terms of their purpose and location compared with earlier arenas, which explains these results.

Baade (1996) uses two different approaches and analyzes the effects of a professional sports team on metropolitan income and the effects of a new stadium on jobs. With regard to the first question, in almost all cities, no statistically significant correlation between metropolitan income and professional sports is found. One reason for this result may be that spending on sports is a substitute for other forms of leisure spending, such as bowling and the theatre. If professional sports do not act as a substitute for other forms of leisure, they will induce job growth. The city's share of state employment in the relevant sectors will increase with the addition of a professional sports team or stadium. Baade finds no significant correlations and concludes that sport teams do not have a significant impact on job creation. Based on a regional growth model and city-level data, Hudson (1999) finds a similar result.

Common mistakes in previous studies on sports and economics have involved using both population and time trends as explanatory variables; see, e.g., Baade (1990) and Santos (2005). These two variables are highly correlated and thus create problems with multicollinearity; Coates and Humphreys (1999) expand the model used by Baade and Dye (1990) and investigate the effect of professional sports on per capita income. They attempt to correct for the potential econometric problems of previous studies by scaling income based on the population instead of including the population as an explanatory variable to avoid multicollinearity between the time trend and population. They still do not detect positive effects on the local economies. On the contrary, they find evidence that a professional sports environment[2] reduces the level of per capita income.

Earlier studies on this topic are mostly based on U.S. data. Differences between Sweden and the U.S. exist with regard to sports arenas and stadiums. Most of these differences relate to the market size: the arena size, the fan base, salaries and the size of cities. In recent years, new arenas have been constructed in several Swedish municipalities. The municipalities bear a large share of the construction and maintenance costs of these arenas. As in the U.S., teams in Sweden tend to move in the direction of private corporations, but they are still supported by tax money.

3. BACKROUND

In Sweden, the sports system is quite different from that in the U.S. In soccer and ice hockey, there is no locked highest division, meaning that teams enter and exit divisions depending on final scores. The highest league of soccer started in 1924, and, initially, only teams in the southern part of Sweden were allowed to be in this league. It was not until 1953 that all of Sweden was included. The highest league today consists of 16 teams, 5 of which were part of the league in the beginning, when there were 12 teams. In 1959, the league had the highest number of average spectators per game in its history at 13,369 spectators per game. The two teams at the bottom of the series at the end of the season are demoted to the second-highest series; the third team from the bottom gets to qualify for the highest league by playing against the third team from the top in the second-highest series.

The highest league in hockey started in 1974; before 1974, there were different elimination competitions. In the beginning, the series consisted of 10 teams; it then increased to 12 teams in 1987. Of the 10 teams that were in the highest series 1975, 7 teams were a part of the series in

2012, although all but two teams have left and returned to the highest league over time. The qualification system for the Swedish ice hockey league has the two teams at the bottom of the highest series and the four teams from the top of the second-highest series compete in a qualification series. The two top teams from the qualification series play in the highest series in the next season. However, the qualification series and the second-highest series has been altered over the years.

The income tax in Sweden is the municipality's main source of funding and makes up about two-thirds of the total revenue. Other income sources are grants from the central government, which make up about one-sixth of the total revenue (Beer 2009). Some of these grants are equalization grants that seek to create equal economic opportunities to allow all local governments to provide services, irrespective of their residents' incomes or other structural differences. Local governments have some mandatory commitments, such as child care and elder care, and some voluntary commitments, such as culture and sports. An opportunity cost accompanies the investment in sports, where the money that goes to sports and other voluntary commitments could be spent in other, perhaps more efficient, ways; see, e.g., Coates and Humphreys (2003b). There is a considerable lack of transparency in the accounting of local sports because funds or subsidies for sports teams may be granted in various forms, e.g., reduced costs for the use of the arena, subventions for maintenance of the arena, loan cancellations and other sponsorships. Due to the lack of such information, an evaluation of the economic effects of professional sports is needed. Helms (1985) finds evidence that a crucial growth factor is how state and local income tax revenues are used. His results suggests that revenues used to improve public services tend to have a positive impact on growth. He concludes that high levels of public services attract businesses and enhance growth. So are professional sports a part of these public services that the local government should support?

4. THE LOCAL GROWTH MODEL

We follow Aronsson et al. (2001) and Lundberg (2003, 2006) and define the local tax base in municipality *i* at time *t* as follows:

$$B_{i,t} = Y_{i,t} * Pop_{i,t} \qquad (1)$$

where $Y_{i,t}$ is the average income level and $Pop_{i,t}$ is the total population. The growth rate of the average income for municipality *i* over the period *t-T* to *t* is defined as follows:

$$y_{i,t} = \ln\left(\frac{Y_{i,t}}{Y_{i,t-T}}\right) \qquad (2)$$

We disregard the natural growth in the population, which is hard to explain using economic variables (Aronsson et al., 2001). Instead, we focus on net migration to observe how attractive the municipality has become. We therefore replace population growth with net migration, which is defined as follows:

$$m_{i,t} = ln\left[\frac{Pop_{i,t-T} + \sum_{k=t-T}^{t} mig_{i,k}}{Pop_{i,t-T}}\right] \qquad (3)$$

The growth of the tax base is then defined as follows:

$$b_{i,t} = m_{i,t} + y_{i,t} \qquad (4)$$

In line with Glaeser, Scheinkman and Shleifer (1995), Aronsson et al. (2001) and Lundberg (2003, 2006), the municipalities are treated as separate economies that share common pools of capital and labor, which means that differences in growth cannot come from the savings rate or exogenous labor endowments. Municipalities can differ only in the level of productivity and the quality of life. A municipality's attractiveness to a migrant is determined by earning opportunities and well-being[3].

We thus define one equation for the net migration rate and one for the average income growth rate:

$$m_{i,t} = f^{m}\left(S_{i,t-T}, EO_{i,t-T}, M_{i,t-T}, P_{i,t-T}, m_{j,t-T}\right) \forall\, i,j \; where \; i \neq j \qquad (5)$$

$$y_{i,t} = f^{y}\left(S_{i,t-T}, EO_{i,t-T}, M_{i,t-T}, P_{i,t-T}, y_{j,t-T}\right) \forall\, i,j \; where \; i \neq j \qquad (6)$$

The *S*, *EO*, *M* and *P* vectors contain information about the sports environment, earning opportunities or productivity, the demographic structure and policy variables, respectively. The variables selected to be in the model are mostly based on previous research by Lundberg (2003 and 2006) and Aronsson et al. (2001). The sports environment is first accounted for by one dummy variable that takes a value of one if the municipality has a professional sports team during one or more years in the time interval *t*-*T* to *t*, and zero otherwise. The sports variable includes only male soccer and ice hockey because they are the two major sports in terms of the number of spectators in Sweden. In 2011, the highest league in soccer had an average of 7,300 spectators per game, and ice hockey had an average of 6,400 spectators per game. These numbers can be compared with those from the highest league in speedway and the second-highest leagues in ice hockey and soccer, which all had fewer than 3,000 spectators per game in 2011 (Bränholm 2012). To allow soccer and ice hockey to have an effect even in the second-highest league, we also include the second-highest league: first, together with the highest league and then as a separate dummy variable. We will further divide the sports variable into two different dummy variables, one for soccer and one for ice hockey. The motivation for this division is that they are different sports with different characteristics and may have different effects on the growth of the tax base. As a robustness check, we also include the average spectator as a share of the municipality's total population for the highest league.

The earning opportunities or productivity (*EO*) are accounted for by the municipality's education level, *Educ*, the average income level, *Y*, and the unemployment rate, *U*. The education level is believed to have a positive effect on average income growth; a high level of human capital is related to the productivity of the labor force. A high average income and a high education level are expected to make a municipality more attractive for migrants, where the higher average income may spill over into the in-migrant population (Lundberg 2003, 2006).

Previous studies of economic growth find evidence of income convergence, which means that municipalities with low average income levels grow faster than municipalities with high average income levels, making $\frac{\Delta y}{\Delta Y} < 0$; see, e.g., Barro and Sala-i-Martin (1992) who find convergence between U.S. states, while Persson (1997) and Lundberg (2006) find evidence of convergence between Swedish counties and between Swedish municipalities. There are small technological and institutional differences across municipalities within the same nation; therefore, over time, poorer municipalities tend to catch up to richer municipalities in terms of per capita income. The cause of this trend could be migration, where unemployed or low-income individuals move to areas with higher average incomes (Barro and Sala-i-Martin, 2004). A negative correlation between income growth and the average income level is then expected. The unemployment rate is expected to be positively correlated with average income growth if unemployed individuals in the municipality migrate to find work in another municipality with a lower unemployment rate, which implies that the unemployment rate is expected to be negatively correlated with the net migration rate (Lundberg 2003, 2006).

Local and national policy decisions (*P*) will be accounted for by the total employment income tax rate (the municipal tax rate plus county tax rate), *Tax,* which may influence migration because it affects income possibilities and disposable income. The municipality's productivity is accounted for by the municipal operating expenditures per capita, *Cost*. A high cost per capita can be an indicator of low productivity in the municipality and can have a negative correlation with average income growth. However, as Aronsson et al. (2001) note, during a part of this period, the local governments were not obligated to balance their financial results for each year. Therefore, operating costs per capita and tax rates may also reflect future policy changes; therefore, a high cost today may lead to a higher tax in the future, making the interpretation of these variables difficult. As we described in the introduction, the central government in Sweden equalizes differences between municipalities by providing grants through its aid program, which will be taken into account using the *Grant*s variable.

Lundberg (2006) finds evidence of spatial effects between Swedish municipalities, where the net migration rate and average income growth of neighbors tend to be positively correlated with municipality *i*. In equations (5) and (6), we therefore also include an inverse distance weight matrix based on the distance between the different municipalities' density cores and the size of each municipality's labor market. These spatial dependencies are described in more detail in the next section.

5. EMPIRICAL SPECIFICATION

The character of regional data may cause standard econometric techniques to be unsuitable because of spatial dependence. Spatial dependence means that there is dependence between municipalities that are close to one another geographically, resulting from spatial externalities and spillover effects. One way to incorporate such spatial dependence is by using a spatial matrix (Anselin 1988). Anselin (1988) suggests using a distance measure for neighbors, in which closer neighbors are given higher influence than other neighbors. For example, one can use a binary matrix where the cells are assigned a value of one if the municipalities share a common border and zero if they do not. Another option is to use the distance between municipalities. In this study, we use a weight matrix that is based on distances, as distance is considered relevant to shopping travel and commuting interdependencies. We also add a weight proportional to the size of the municipality's labor market. It can be argued that a municipality with a large labor market potentially has a greater impact on a municipality with a small labor market than the other way around. To capture this effect, we specify the spatial effect in the following form:

$$\mathbf{W}_{i,t} = \Pi_i * \Omega_{i,t}$$

where $\Omega_{i,t}$ is the municipality's proportion of total income earned in the municipality's labor market region[4]. Π_i is an inverse distance weight matrix.[5] We believe these weights better reflects the exchange between the municipalities compared with the use of a binary weight matrix that assigns a value of one if the municipalities share borders, as in Lundberg (2006).

When estimating a spatial regression model, a choice between two different types of models is often made. The spatial lag model is described in equations (7) and (8); in this model, the spatial dependence is related to the dependent variable and expressed with the coefficient δ, where $\delta \neq 0$ indicates presence of spatial dependency. The spatial error model is the other type of spatial model; in this model, the spatial dependence instead affects the error term, where errors from different localities may display spatial covariance, i.e., $\delta = 0$ and $\varepsilon_{it} = \theta_t W \varepsilon_t + u_t$; see, e.g., Anselin (1988), Marquez et al. (2008) and Lundberg (2006).

The two estimation equations are as follows:

$$\begin{aligned} y_{it} = \alpha_{i,t}^{y} + \delta_1^{y}\boldsymbol{W}_{\boldsymbol{i,t}} ln\left(y_{j,t-T}\right) + \beta_1^{y}\ln(Y_{i,t-T}) + \beta_2^{y}\ln(Density_{i,t-T}) \\ + \beta_3^{y}\ln(U_{i,t-T}) + \beta_4^{y}\ln(Tax_{i,t-T}) + \beta_5^{y}\ln(Educ_{i,t-T}) \\ + \beta_6^{y}\ln(young_{i,t-T}) + \beta_7^{y}\ln(old_{i,t-T}) + \beta_8^{y}\ln(Cost_{i,t-T}) \\ + \beta_9^{y}\ln(Grant_{i,t-T}) + \beta_9^{y}(Sport) + \varepsilon_{it}^{y} \end{aligned} \quad (7)$$

$$\begin{aligned} m_{it} = \alpha_{i,t}^{m} + \delta_1^{m}\boldsymbol{W}_{i,t} ln\left(m_{j,t-T}\right) + \beta_1^{m}\ln(Y_{i,t-T}) + \beta_2^{m}\ln(Density_{i,t-T}) \\ + \beta_3^{m}\ln(U_{i,t-T}) + \beta_4^{m}\ln(Tax_{i,t-T}) + \beta_5^{m}\ln(Educ_{i,t-T}) \\ + \beta_6^{m}\ln(young_{i,t-T}) + \beta_7^{m}\ln(old_{i,t-T}) + \beta_8^{m}\ln(Cost_{i,t-T}) \\ + \beta_9^{m}\ln(Grant_{i,t-T}) + \beta_{10}^{m}(Sport) + \varepsilon_{it}^{m} \end{aligned} \quad (8)$$

W is the *N* x *N* weight matrix, where rows and columns match the cross-sectional observations. The element w_{ij} in the matrix expresses different effects from average income growth or net migration in municipality *j* to the average income growth rate or net migration rate in municipality *i* (Marquez et al. 2008). The β coefficients account for differences in productivity, well-being, and the sports environment in the municipality; ε is the error term.

Using fixed effects, we account for all variables that vary between municipalities but are constant over time, e.g., where the municipality is located. This model is not the true model for average income growth or net migration, but we assume that the excluded variables do not have a systematic influence on the dependent variables and that they do not affect the estimated coefficients.

Anselin (1988 p. 58) shows that if there is a spatial effect in the underlying data, then OLS will produce inconsistent and biased estimates for the parameters in the spatial model. Thus, we use an IV approach, as does Lundberg (2006), because we have a problem with endogenous variables. We will also use maximum likelihood as a robustness test. Equations (7) and (8) should preferably be estimated simultaneously. However, as Lundberg (2006) argues, the efficiency gain from a simultaneous estimation is not that significant when the equations have only one independent variable that differs. To simplify the estimation procedure, the two equations are therefore estimated separately.

6. DATA

We use official data from Statistics Sweden from 1996-2012 for all municipalities in Sweden that have unchanged borders during the entire time period studied. The total number of municipalities is 290, and four are excluded due to changes in their borders over the time period, leaving us with a final panel of 286 municipalities. When excluding municipalities, we create empty spaces in the spatial weight matrix, which will affect the coefficients of the spatial variables to some degree; not accounting for the missing municipalities' effects may bias the coefficient, making the potential spatial effects smaller.

The net migration ($mig_{i,t}$) is measured as the sum of the migration into the municipality minus the migration out of the municipality. Obviously, migration can occur both across municipal borders and across country borders. Depending on the underlying reason for immigration to Sweden, a migrant's initial choice of location may be regulated. During the time period studied, there has been a large flow of refugees into Sweden, and these individuals have been directed to different municipalities according to agreements between the municipality and the national government. We therefore include only domestic migration. The average income level ($Y_{i,t}$) and, thus, the income growth rate ($y_{i,t}$) are calculated for the population aged 20 and older[6]. When we use migration and not population in our definition of tax base growth, we disregard natural population growth. By using individuals older than the age of 20 for the average income, we try to avoid some of the dependence between age structure and the average income, which is in line with Lundberg (2003, 2006) and Aronsson et al. (2001). A description of all variables is found in Table A1 in the Appendix. All monetary variables are deflated by the consumer price index.

The variable *Sports all* is a dummy variable that takes a value of one if the municipality has an ice hockey or soccer team in the highest or second-highest series during any of the years between *t-T* and *t*, and zero otherwise. This variable is then divided into two different dummy variables, one for the highest league (*Sport*) and one for the second-highest league (*Sport2*). When a team is in the highest league, the number of spectators is also almost doubled; the exposure time on TV is also higher, and the revenues from TV rights are increased. To see if there are different effects of ice hockey and soccer, we divide the sports dummy further. The *Soccer* and *Ice hockey* variables take a value of one if the municipality has soccer or an ice hockey team, respectively, in the highest league during any of the years between *t-T* and *t*, and otherwise zero. Descriptive statistics of all the variables are presented in Table 1 and Table 2.

(Table 1 and 2 about here)

7. RESULTS

Because we have panel data, it is possible to divide the sample into different time intervals. One option is to use *T*=1, which would maximize the number of observations. However, it can be argued that it takes more than a single year for the variables included in the model to affect the growth of average income and net migration (Lundberg 2003). Aronsson et al. (2001) divide the sample into five different time periods, each with T=5. Lundberg (2006) uses T=9, and Lundberg (2003) uses $T=3,5,9$. For our benchmark model, we use T=5, where t = 2002, 2007 and 2012 and the independent variables are given by their initial values, i.e., at t-T. To maximize the number of observations and to obtain more variation in our sports variables, we also estimate equations (7) and (8) using $T=1$.

In the estimations, all variables, except the dummy variables, are in logarithms.[7] With the modified Wald test for group-wise heteroskedasticity, we can reject the null hypothesis and conclude that heteroskedasticity is present, which means that we cannot use pooled OLS regression due to omitted variable bias. We run the Breusch and Pagan LM test for random effects, where the null hypothesis is rejected in one of the two specifications; we then apply the Hausman test and conclude that we have to use fixed effects to account for regional differences.

Moran's I is used to test whether a spatial effect is present. The test statistic is significant, and we conclude that there are significant spatial effects for all the different time periods for both the local average income growth rate and the local net migration rate. To distinguish between a spatial error effect and a spatial lag effect, we use the robust Lagrangian multiplier (Anselin, Bera, Florax and Yoon 1996; Lundberg 2006). According to the results, the spatial lag operator is appropriate for some time periods, and the spatial error model is appropriate for others. We therefore test both models and conclude that, for our variables of interest, there is no difference between the two models; thus, we choose to use only the spatial lag model.

Due to potential endogeneity problems that arise from the average income level (Y) and the spatial effect variable, we estimate equations (7) and (8) using an instrumental variable approach. In accordance with Lundberg (2006), we use $Y_{i,t-T-1}$ as an instrument for $Y_{i,t-T}$ and $Wy_{i,t-T-1}$

and $Wm_{i,t-T-1}$ as instruments for $Wy_{i,t-T}$ and $Wm_{i,t-T}$, respectively. The instruments are relevant from first-step regression and are argued to be valid due to the lag structure. The regression is performed with robust standard errors. With Andersons CC test, we can also reject the null hypothesis that the equation is under-identified.

(Tables 3 and 4 about here)

The estimation results of equations (7) and (8) are presented in Tables 3 and 4, respectively. According to the results in columns 1-2, there is no significant difference in the average income growth rate nor in the net migration rate whether or not a municipality has a professional sports team in the highest or the second-highest league of soccer and/or ice hockey. In column 3, we observe that when the highest and the second-highest league are allowed to have different effects, neither have any significant effect. To further investigate whether soccer and ice hockey have different effects on the average income growth rates or the net migration rate, the sports dummy variable is split into separate variables for soccer and for ice hockey and another variable for the second-highest series in both sports. The results in column 4 of Tables 3 and 4 show no significant correlation between ice hockey or soccer, respectively, and the dependent variables. As a robustness check, we replace the sports dummy variable with a variable for the average spectators per game divided by the total population, which is summarized over the period from t-T to t. The results are shown in column 5 in Table 3 and Table 4, and the coefficients are insignificant.

The spatial effects are positive and highly significant for both the average income growth rate model and the net migration rate model, which indicates that there is a positive spillover effect from neighboring municipalities. The estimate of the coefficient for the average income level (Y)

in equation (7) is negative and significant. This finding implies conditional convergence, i.e., a municipality with a low average income grows faster than a municipality with a high average income, conditional on the other variables in the model. The human capital (*Educ*) coefficient is positive and significant for the average income growth model, where a high education level can be related to high productivity and, in turn, average income growth. The coefficients for education level (*Educ*) and average income level (*Y*) in the net migration rate model are insignificant. [8]The coefficient for the unemployment rate (*U*) is insignificant for the average income growth rate model in Table 3. For the net migration rate model in Table 4, the coefficient is significant and negative, indicating that individuals migrate out of municipalities with high unemployment rates to find work.

The coefficient for municipal costs per capita (*Cost*) is insignificant for the average income growth rate and the net migration rate. The density coefficient is significant and negative for both the average income growth model and the net migration rate model. A municipality with a higher density over time experiences less in-migration. The tax rate has a negative effect on the local average income growth rate, where a high tax rate implies lower average income growth. The correlation between the tax rate and the net migration rate is insignificant.

7.1 ROBUSTNESS CHECKS

To relate the results from the basic model of our control variables to the literature, we find a robust positive and significant spatial effect from neighboring municipalities for both the local average income growth rate and the net migration rate. This finding is in line with the findings in Lundberg (2006) and means that average income growth in one municipality has a tendency to spill over to its neighbors. Likewise, a high net migration rate in one municipality affects the net migration rate in neighboring municipalities in a positive way. Moreover, in accordance with previous studies on income growth (Barro and Sala-i-Martin, 1992, Persson, 1997; Lundberg, 2006), we find robust evidence of conditional convergence among Swedish municipalities. The coefficient of the average income level is insignificant in the net migration model; Aronsson et al. (2001) find this coefficient to be positive, while Lundberg (2003) finds it to be negative. In line with Lundberg (2006), the coefficient for the endowment of human capital is significant and positive for the average growth rates.

The variation in our sports variables is higher between municipalities than within municipalities, according to Table 2. After a Hausman test, we conclude that fixed effects were preferred over random effects, which reduces the potential concern with omitted variable bias; on the contrary, we will also lose variation in our sports variables, which is why we also run the random effects model as a robustness check. Focusing on only the sports environment coefficient, we find no significant effect on average income growth nor on the net migration rate. We also alter the specification of the weight matrix, where we only use the inverse distance weight matrix, Π_i (as shown above). Still, sports have no significant effects on the dependent variables. The spatial effects are now reduced but still positive and significant. To further test the robustness of the results for the sports variables, we use the maximum likelihood approach[9]. As with the previous robustness test, there is no positive and significant coefficient for the sports environment variables.

It can be argued that the choice of T=5 and t=2001, 2006, 2011 is too restrictive and that, e.g., a deviation in one year due to some external shock may influence the results[10]. To check the robustness of our results and to maximize the number of observations, we re-estimate equations (7) and (8), setting T=1; the dependent variable is now scaled up by a factor of 100 to observe the power in the sports coefficients. [11] Here, one of the sports environment dummy variables shows a significant and negative coefficient in the average income model: the variable that indicates whether the municipality has a team in the highest league in either soccer or ice hockey; however, when the variable is divided into two separate variables, one for soccer and one for ice hockey, neither coefficient is significant. When *T=1*, we are looking at the short-term effects, and other coefficients are affected in both models.[12]

We also exclude the three major municipalities in Sweden (Stockholm, Göteborg and Malmö) because these municipalities are larger than the rest of the Swedish municipalities and have more than one team in the highest league. As these municipalities are excluded, we find a significant and positive coefficient for the net migration rate from the *Ice hockey* variable when fixed effects are used and *T=5*. To see if this result is robust for different time periods, we look at *T=1*. The positive effect is now insignificant, and the sports variable has a significant and negative effect on the average income growth, as this variable is divided into ice hockey and soccer variables; the *Ice hockey* variable shows a negative effect, while the *sports2* variable shows a positive effect.[13]

There may also be some endogeneity problems in the sports variable itself. When the first series started, the teams were located in the cities with large companies in southern Sweden, i.e., cities that possibly have higher growth today. We have not been able to find an instrument for the location of sports that is relevant in the fixed effects models. The instrument used in column 6 of Table 3 and Table 4 is the earliest population data that we can find; with this instrument, we obtain missing data on some municipalities due to changes in borders. Because of the weak instruments, our standard errors from our IV results are large[14]. To address this issue, we turn to one more method, a generalized difference-in-difference model, where we compare the teams from the highest series against teams from the second-highest series and only include these municipalities in the sample. We also control for differences between municipalities with the same explanatory variables as before. The hypothesis changes from if growth is affected when a team is present to if growth is affected when a team is in the premium national league compared with when a team is in the second-highest league. We find a significant and negative effect of the *Ice hockey* variable on the average income growth.[15]

8. CONCLUDING REMARKS

The objective of this study was to analyze the effect of professional sports on the municipality's tax base using Swedish local data. We find no positive effect of sports on the rate of local average income growth, but we do find indications of a negative effect from having an ice hockey team in the highest league. With regard to the net migration rate, all but one specification have insignificant results for the sports environment coefficients; when we exclude the three major municipalities, we find a small significant positive effect of ice hockey on the net migration rate. Our results indicate that subsidies cannot be justified on the grounds of economic benefits, which is in line with the conclusions reached in previous studies; see Coates and Humphreys (2008). However, in our study, we do not include the surrounding effects of professional sports, e.g., the players being role models for children by encouraging physical activity or other non-financial values. In future research, it would be interesting to study non-financial benefits, in line with Carlino and Coulson (2002), who, based on a hedonic price model, find that rents are higher and wages lower in cities with professional sports. Residents might receive many benefits from having a professional team in their municipalities, which might be enough to justify all subsidies.

The opportunity cost of subsidies for professional sports teams is not the size of the subsidies; it is instead what could have been achieved if that investment had been directed towards an alternative. This alternative might be a more productive investment that affects the average income growth to a higher degree, increases the quality of other public services or reduces taxes. The differences in the quality of public service is something that would be difficult but interesting to measure. It may also be the case that residents in a municipality with a professional sports team may be willing to accept a lower income or quality of publicly provided services because of the existence of a professional team in their municipality; this willingness would then be reflected in the migration pattern. Individuals who prefer to live in municipalities with professional sports teams might migrate to such municipalities, and individuals without these preferences might migrate out of them (Coates and Humphreys 2003b).

Teams might be dependent on financial support from local governments to survive in the highest series in ice hockey or soccer. When a local government supports its team, it helps keep the team in the top series, but it simultaneously prevents the local government from investing in potentially more productive or utility-increasing investments. In the end, it is perhaps not the economic effect that should justify subsidies for professional sports; psychological effects should also be considered. Residents in a municipality may be willing to pay higher taxes and/or receive lower levels of services to be able to follow their home team to the highest series.

NOTE

[1] Depending on substitution effect (the direct incomes can be reallocations that are not new to the local economy) and the size of the multiplier (if the multiplier is smaller for sports than for the substituted good, there may be a leakage effect; see Siegfried and Zimbalist, 2000), the effect may be either positive or negative for the local economy.

[2] In their study, they include numerous dummy variables as indicators of the presence of different sports teams, franchise entries and exits, etc.

[3] See Glaeser et al. (1995) for a more detailed description.
[4] Municipalities in Sweden are divided into different labor markets based on the number of commuters (see Statistics Sweden 2010).
[5] In this case, the effect of a distant municipality that has a high proportion of the region's earned income can obtain a higher weight than a closely located municipality. To see the effect of the distance between municipalities, we also truncate the weight matrix so that municipalities that are too far away are assigned a weight of zero in the weight matrix. The result is that the spatial effect is larger, but it does not alter any of the sports variables.
[6] It can be argued that individuals who are age 65 and older are not, or at least to a very limited degree, part of the labor force and will therefore have a limited effect on the tax base. However, this group of individuals may very well be quite mobile, and their income is still part of the taxable income for the localities. We have therefore opted for the inclusion of this group as well.
[7] However, because *Grants* can be either positive or negative, the variable has first been transformed to be positive only by defining it in ten thousand SEK per capita, then by adding the number one and transforming it into logs. This transformation affects the interpretation of the point estimates. However, because we are only interested in the sign, this will have no effect.
[8] A municipality with a high endowment of human capital is expected to attract in-migrants. One problem with the average income variable is that it is highly correlated with the education level (corr. = 0.78), and it can be difficult to interpret the separate effects of these two variables (Lundberg 2003). A VIF test is performed, and it shows no significance (values of approximately 5 at the most), which indicates that we do not have problems with multicollinearity.
[9] All sports variables are tested, and all but one show insignificant coefficients. The sports dummy indicates that if there is a team in the highest league in either soccer or ice hockey (*Sports*) for $T=1$ with municipal fixed effects with the dependent variable, average income growth is significant and negative (coefficient of -0.182 and standard deviation of 0.09). The tables can be made available upon request.
[10] The model is also tested with $T=5$, but instead of using the lag explanatory variables from $t-T$, we have used the mean value of the explanatory variables during the time period. The model is also tested with the different specifications of the sports environment, and no specification shows any significant effects from the sports environment variables.
[11] Results can be obtained from the author by request. We also run the random effect model for T=1, and no significant effect can be found from the sports variable.
[12] Results can be obtained by requests
[13] The results can be obtained from the author by request
[14] If we then look at the random effects model, our instrument is relevant from the first-stage estimations when we use $T=1$. Here, we find a negative and significant coefficient for the average soccer audience on average income growth. The instruments are weak, and these results should be approached with caution, the results can be obtained by request.

[15] The three major cities of Stockholm, Göteborg and Malmö are excluded because they had teams in both series at the same time. The model is also tested with random effects, and no significant effects are found. All results can be obtained from the author by request.

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Table 1: Summary statistics for the total sample

Variable total	Mean	Std. Dev.	Min	Max
Net migration rate (*m*)	-.01	0.03	-.22	.12
Net migration (*M*)	-.69	352.56	-3091.00	7764.00
Average income growth (*y*)	.08	.04	-.04	.26
Average income level (*Y*)	172.15	28.28	116.00	384.59
Population density (*density*)	127.50	429.22	.20	4504.30
Unemployment rate (*U*)	.08	.02	.03	.21
Education (*Educ*)	.11	.06	.03	.47
Local government grants (*Grants*)	.43	1.99	-3.29	11.76
Local government expenditures (*Cost*)	30.94	5.32	17.37	48.63
Population aged 65 or older (*Old*)	.18	.036	.06	.29
Population aged 0-15 years (*Young*)	.19	.02	.12	.26
Local income tax rate in percent (*Tax*)	31.86	1.20	26.47	34.75

Table 2: Descriptive statistics for sports, T=1

	Sport all	Sport	Sport2	Soccer	Ice hockey	Soccer audience	Ice hockey audience
Mean	.125	.068	.084	.040	.038	.004	.003
Standard deviation							
Overall	.331	.251	.278	.196	.191	.023	.023
Between	.293	.224	.204	.172	.174	.018	.018
Within	.154	.115	.189	.096	.079	.015	.014

Table 3: Results for the determinants of local average income growth in Sweden, T = 5 and t = 2001, 2006 and 2011

Variables	GLS	IV	IV	IV	IV	IV
Sport all	0.001	0.003				
	(0.003)	(0.003)				
Sport			$2.6E^{-4}$			
			(0.003)			
Sport2			0.003	0.003	0.003	0.137
			(0.002)	(0.002)	(0.002)	(0.895)
Ice hockey				0.002		
				(0.003)		
Soccer				$3.7E^{-4}$		
				(0.003)		
Ice hockey audience					-0.004	2.859
					(0.006)	(18.677)
Soccer audience					0.004	3.019
					(0.009)	(20.717)
Y	-0.353***	-0.397***	-0.399***	-0.399***	-0.399***	-0.198
	(0.047)	(0.046)	(0.046)	(0.046)	(0.046)	(1.656)
Cost	-0.036	-0.008	-0.008	-0.008	-0.008	-0.071
	(0.019)	(0.016)	(0.016)	(0.016)	(0.016)	(0.514)
Educ	0.036**	0.028*	0.028*	0.028*	0.028*	-0.140
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(1.175)
Grant	0.036	-0.051	-0.054	-0.054	-0.054	-0.990
	(0.086)	(0.082)	(0.082)	(0.082)	(0.082)	(6.285)
Density	-0.068**	-0.044*	-0.044*	-0.044*	-0.044*	0.213
	(0.025)	(0.020)	(0.020)	(0.020)	(0.020)	(1.739)
Tax	-0.051	-0.088*	-0.089*	-0.088*	-0.090*	-0.068
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.983)
Young	-0.008	-0.014	-0.014	-0.014	-0.013	-0.419
	(0.023)	(0.020)	(0.020)	(0.020)	(0.020)	(2.874)
Old	0.013	-0.003	-0.002	-0.003	-0.003	-0.359
	(0.018)	(0.013)	(0.014)	(0.014)	(0.014)	(2.378)
U	-0.003	-0.003	-0.003	-0.003	-0.003	-0.087
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.580)
Constant	2.734***					
	(0.328)					
Spatial rho		1.609***	1.619***	1.621***	1.626***	0.675
		(0.209)	(0.210)	(0.210)	(0.210)	(6.541)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Local FE	Yes	Yes	Yes	Yes	Yes	Yes
N	858	858	858	858	858	846
R^2	0.898	0.913	0.913	0.913	0.913	-27.367

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Results for the determinants of the local net migration rate in Sweden, T = 5 and t = 2001, 2006 and 2011

Variables	GLS	IV	IV	IV	IV	IV
Sport all	-0.001	-0.001				
	(0.002)	(0.002)				
Sport			0.004			
			(0.003)			
Sport2			0.001	0.001	$4.7E^{-4}$	-0.020
			(0.002)	(0.002)	(0.002)	(0.116)
Ice hockey				0.002		
				(0.004)		
Soccer				0.001		
				(0.004)		
Ice hockey audience					0.002	0.507
					(0.006)	(2.561)
Soccer audience					-0.003	-1.175
					(0.010)	(2.746)
Y	-0.005	-0.076	-0.078	-0.078	-0.076	0.035
	(0.049)	(0.057)	(0.057)	(0.058)	(0.057)	(0.240)
Cost	-0.034	-0.016	-0.016	-0.016	-0.016	-0.049
	(0.019)	(0.021)	(0.021)	(0.021)	(0.021)	(0.109)
Educ	-0.016	-0.011	-0.011	-0.011	-0.012	-0.085
	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.218)
Grant	-0.046	-0.126	-0.129	-0.128	-0.127	0.138
	(0.079)	(0.086)	(0.086)	(0.086)	(0.086)	(0.808)
Density	-0.099^{***}	-0.094^{***}	-0.093^{***}	-0.093^{***}	-0.093^{***}	-0.083
	(0.028)	(0.025)	(0.025)	(0.025)	(0.025)	(0.267)
Tax	-0.055	-0.049	-0.049	-0.049	-0.049	0.105
	(0.050)	(0.052)	(0.052)	(0.052)	(0.052)	(0.304)
Young	0.079^{**}	0.074^{**}	0.074^{**}	0.074^{**}	0.074^{**}	-0.059
	(0.028)	(0.027)	(0.027)	(0.027)	(0.027)	(0.423)
Old	0.058^{***}	0.050^{**}	0.050^{**}	0.050^{**}	0.050^{**}	0.098
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.302)
U	-0.010^{*}	-0.010^{*}	-0.010^{*}	-0.010^{*}	-0.010^{*}	0.021
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.086)
Constant	1.094^{**}					
	(0.332)					
Spatial rho	-	3.240^{***}	3.273^{***}	4.392^{*}	4.344^{*}	10.964
		(0.860)	(0.860)	(2.052)	(2.060)	(2196.668)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Local FE	Yes	Yes	Yes	Yes	Yes	Yes
N	858	858	858	858	858	846
R^2	0.150	0.147	0.147	0.146	0.147	-12.530

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

APPENDIX

Table A1: Description of the variables included in the estimations

Variable	Description	Source
$\boldsymbol{Y_{i,t}}$	Total average income for residents in Sweden older than 20 years old, measured 31/12 in thousand kroner for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{y_{i,t}}$	Growth *i* average income $y_{i,t} = \ln(\frac{Y_{i,t}}{Y_{i,t-T}})$	
$\boldsymbol{mig_{i,t}}$	Net migration: the domestic migration into the municipality minus the migration out of the municipality for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{m_{i,t}}$	$m_{i,t} = \ln\left(1 + \sum_{l=0}^{l=T} (mig_{i,t-l}) / Pop_{i,t-T}\right)$	
$\boldsymbol{Pop_{i,t}}$	Total population of municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{Density_{i,t}}$	Population density (residents per square kilometer) for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{U_{i,t}}$	Average annual unemployment rate for municipality *i* in year *t*	The Swedish employment office
$\boldsymbol{Tax_{i,t}}$	Total tax rate: the sum of local and regional taxes for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{Edu_{i,t}}$	Proportion of the population (ages 25-74) with at least three years of university education for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{Grant_{i,t}}$	Total intergovernmental grants, measured in thousand SEK per capita, for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{Cost_{i,t}}$	Local government operating costs per capita	Official statistics from Statistics Sweden
$\boldsymbol{young_{i,t}}$	Share of the population between ages zero to fifteen for municipality *i* in year *t*	Official statistics from Statistics Sweden
$\boldsymbol{old_{i,t}}$	Share of the population older than 65 years of age for municipality in *i* year *t*	Official statistics from Statistics Sweden
$\boldsymbol{Longitude_{i}}$	Coordinates for the population density center for municipality i	Official statistics from Statistics Sweden
$\boldsymbol{Latitude_{i}}$	Coordinates for the population density center for municipality i	Official statistics from Statistics Sweden
$\boldsymbol{Sport\ all_{i,t}}$	Takes a value of one if the municipality has had a soccer or ice hockey team in the highest or the second-highest series during any year between t and T	The Swedish soccer association's statistical office The Swedish ice hockey league's official homepage

$\boldsymbol{Sport_{i,t}}$	Takes a value of one if the municipality has had a soccer or ice hockey team in the highest series during any year in between t and T	
$\boldsymbol{Sport2_{i,t}}$	Takes a value of one if the municipality has had a soccer or ice hockey team in the second-highest series during any year between t and T	
$\boldsymbol{Soccer_{i,t}}$	Takes a value of one if the municipality has had a soccer team in the highest series during any year between t and T	
$\boldsymbol{Hockey_{i,t}}$	Takes a value of one if the municipality has had an ice hockey team in the highest series during any year between t and T	
Audience Soccer$_{i,t}$	Average audience per game divided by the total population and summarized over the years t-T to t	The Swedish soccer associations
Audience Ice hockey$_{i,t}$	Average audience per game divided by the total population and summarized over the years t-T to t	The Swedish ice hockey league's official homepage