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Sports and Regional Growth in Sweden

Is a successful professional sports team good for regional economic growth?

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Sports and Regional Growth in Sweden

Is a successful professional sports team good for regional economic growth?

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Preliminary draft

Abstract

This study investigates whether net inbound migration and per capita income growth of a municipality is affected when a local sports team enters or exits the premium national leagues in ice hockey or soccer in Sweden. Local governments frequently support a local professional team through direct subsidies; beneficial funding of arenas, etc., which often is motivated by alleged, positive externalities through effects on the attractiveness of the municipality as a leisure-travel destination, or place for living or doing business, which ultimately is supposed to enhance the tax base and the tax revenues of the local government. Previous literature on such effects is based on simple models estimated on a selected sample of cities and without consideration of spatial interdependencies between local areas. We carry out a simultaneous estimation of spatial panel-data models of income per capita growth and net migration rates using annual data from all Swedish municipalities from 1995-2011 (except for four municipalities that have changed borders). With this richer modeling framework we still find no evidence of a positive relationship from performance of a local team on any of these two variables.

Keywords: Sports, growth, spatial econometrics, regional growth

1. Introduction

Professional teams often get substantial financial support from local government, although most previous research has not found any effects from the performance of such teams and the growth of the local economy. The previous literature (e.g. Coates and Humphreys 1999), however uses simple models with few other explanatory variables than sports environment variables, estimated on a selection of local areas, and with just one dependent variable. In this study we estimate a simultaneous spatial panel-data model for Swedish municipalities that includes other explanatory variables used in the regional-growth modeling literature.

Many local governments give substantial financial support to professional sports teams in several countries, for instance the U.S. (Coates and Humphreys 2003b) and Sweden (SKL 2010). Promoters of these subsidies often claim that teams that make it to the national premium leagues in the major public attendance sports contribute significantly to the local economy, and therefore indirectly to the tax base and tax revenues of the local government, by providing marketing services that enhance the public image of the local community and therefore attract labor and business; and from direct injections to the local economy from spectators´ spending on tickets, meals, lodging etc.

However, most previous empirical studies on the impact of sports on the local economy have not found any significant such 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 opportunity costs from crowding-out of other, more productive, public expenditure. However, these empirical findings are all obtained by using models of regional growth that contain few explanatory variables aside sports environments variables, without accounting for spatial interdependencies, and estimated on data from a limited sample of local areas. Also, no previous study has investigated whether there are any effects on labor supply through net migration to the local labor market. The purpose of this study is therefore to investigate effects from sports on both net migration and per capita income with richer models, by extending a type of spatial panel-data model that previously has been used to study regional growth in Sweden, for other periods of time, with variables that measure the sports environment; more precisely changes between subsequent time periods in whether a local team is in the national premium league in ice hockey or soccer, respectively.

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 1995 – 2011 and adding dummy variables that indicate whether a local sport team belongs to the national premium league in soccer or ice hockey during specific time periods. We do a simultaneous estimation of effects on both per-capita income growth and net migration rates, focusing on effects from changes in the sports environment variables. The main reason for studying two dependent variables is that the major source of tax revenue of Swedish municipalities come from the local income tax, so the tax base is affected both by per-capita income and population size (and therefore over time by net migration). The explanatory variables aside sports environment variables are unemployment, population density, average per-capita income, age-distribution variables, proportion of population with university-level education, per capita intergovernmental grants, per capita local government operating costs, and the local income tax rate. With some exception the estimation results for these other explanatory variables accord to previous findings in the regional growth studies. For the sports-environment variables no significant positive effects are found. We are thus able to confirm the results in the previous sports economics literature using these much richer empirical models.

The paper is organized as follows. The next section contains some background and theoretical discussion followed by section 3 that include a review of previous empirical modeling of regional growth in Sweden. In section 4 the empirical specification and the spatial econometric methodology are outlined. Section 5 presents the data. In sections 6 and 7 results are presented and discussed. The final section concludes.

2. Background and Theoretical discussion

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 an enhanced image for the municipality. When a game is broadcast on TV it acts as advertisement also for the local area. With the enhanced entertainment value and improved profile for the municipality it may attract additional businesses and labor to locate in that municipality. Therefore professional sports can be seen as a public good with positive externalities in such case in theory subventions can be justified (Hudson 1999).

Baade and Dye (1990) investigate if a new or renovated arena or the presence of a professional team correlates with the level of the total aggregated personal income. They also investigate if the municipalities' share of regional economic activities is enhanced. They find no significant impact in eight of the metropolitan areas. In Seattle they find a significant positive impact of a new stadium. They also find that the impact of a new or renovated arena on the metropolitan areas share of regional income is statistically significant and negative. Santo (2005) conducts a similar analysis as Baade and Dye (1990) with more recent data (1984-2001). The results indicate some positive and significant effects from sports. The author argues that arenas built today are different in their purpose and location then the earlier arenas.

Baade (1996) uses two different approaches and investigates the effects of a professional sports team on metropolitan income, and the effects of a new stadium on jobs. For the first question no statistical significant correlation between metropolitan income and professional sports is found in almost all cities. One reason for this result can be that sport spending is a substitute for other forms of leisure spending like bowling, theatre and so on. If professional sports are not a substitute for other form of leisure it would induce job growth. The city's share of state employment in the relevant sectors would increase with addition of a professional sports team or stadium. Baade finds no significant correlation and concludes that sport teams do not have significant impact on job creation. The similar result is found by Hudson (1999) based on a regional growth model and city-level data.

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[1] Depending on substitution effect (the direct incomes can be reallocations and not new to the local economy) and the size of the multiplier (if the multiplier is smaller for sports then 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.

Common mistakes made in previous studies on sports and economics has been to use both population and a time trend as explanatory variables, these two are highly correlated and creates problems with multicollinierity see e.g. Baade (1990) and Santos (2005). Coates and Humphreys (1999) expand the model used by Baade and Dye (1990) and investigate the effect of professional sports on the income per capita. They attempt to correct for potential econometric problems from previous studies by scaling income by the population instead of including 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. However, evidence is found 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. There exist some differences between Sweden and the US when it comes to sports arenas and stadiums. Most of these differences are related to the market size; the size of the arenas, 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. This is not different from the U.S.

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 that make up about one-sixth of the total revenue. (Beer 2009) Some of these grants are so called equalization grants with the purpose to create equal economic opportunities for all local governments to provide services irrespective of their residents' income and other structural differences. There is an opportunity cost for the investment in sports, see e.g., Coates and Humphreys (2003b). Helms (1985) found evidence that a crucial factor for growth is how the state and local income taxes revenues are used. The result suggests that revenues used to improve public services tend to have a positive impact on growth. Helms 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?

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

3. The regional 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

$$B_{i,t} = Y_{i,t} * Pop_{i,t} \tag{1}$$

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

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

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

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

The growth of the tax base is then defined as

$$b_{i,t} = m_{i,t} + y_{i,t} \tag{4}$$

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. The attractiveness of a municipality for a migrant is determined by earning opportunities and well-being[3].

From this we define one equation for the net migration rate and one for the average income growth rate

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

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

The vectors *S*, *EO*, *M* and *P* contain information about the sports environment, earning opportunities or productivity, demographic structure and policy variables. 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 the value one if the municipality has a professional sports team during one or more years in the time interval *t*-*T* to *t*. The sports variable includes only male soccer and ice hockey since these two sports are the two major sports in terms of number of spectators in Sweden. The highest league in soccer had an average of 7300 spectators per game and ice hockey had an average of 6400 spectators per game. This can be compared to the highest league in speedway, second highest league in ice hockey and soccer which all had less than 3000 spectators per game in 2011 (Bränholm 2012).

We will disaggregate the sports variable in two different dummies one for soccer and one for ice hockey. The motivation for this is that they are different sports with different characteristics and may have different effects on the growth of the tax base. Second we analyze whether it matters if the professional ice hockey or soccer team is well established in the highest league or if it jumps between the highest and the second highest league by using four different dummy variables. The underlying reason for doing this is a notion that teams established in the highest series have built up a trust in the municipality and has an established relationship within the local government. On

[3] See Glaeser et al. (1995) for a more detailed description.

the other hand, it may well be the case that the municipality in which a team is located receives an extra boost when its team climbs to the highest series or a high loss in confidence when the team falls out.

The earning opportunities or productivity (*EO*) are accounted for by the education level, *Educ,* in the municipality, 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 are related to the productivity of the labor force. A high average income and a high education level is expected to make a municipality more attractive for migrates where the higher average income may spill over to the in-migrant (Lundberg 2003, 2006). Previous studies on economic growth finds evidence of income convergence, which means that municipalities with low levels of average income grow faster than municipalities with high levels of average income making $\frac{\Delta y}{\Delta Y} < 0$; see, e.g. Barro and Sala-i-Martin (1992) that finds convergence between U.S. states while Persson (1997) and Lundberg (2006) find evidence of convergence between Swedish counties and municipalities, respectively. There are small differences in technology and institutions across municipalities within the same nation so as time goes poorer municipalities tend to catch up to richer municipalities in terms of per capita income. The cause of this could be migration where unemployed or low income individuals move to areas with higher average income (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 to average income growth if unemployed individuals in the municipality migrate to find work in another municipality with lower unemployment rate. This implies that the unemployment rate is expected to be negatively correlated with the net migration rate (Lundberg 2003, 2006).

The local and national policy decisions (*P*) will be accounted for by the total tax rate, *Tax,* (local plus county tax rate) which may influence migration because it affects the income possibilities. A higher tax rate in a municipality is expected to reduce the disposable income. The productivity of the municipality is accounted for by the municipality 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 the growth in average income. However, as Aronsson et al (2001) point out during the period the local governments were not obligated to balance their financial results for each year. Therefore operating cost per capita and tax rate may reflect future policy changes as well, so a high cost today may lead to higher tax in the future so to make interpretation of these variables are difficult. As we described in the introduction the central government in Sweden equalizes the income between different municipalities by a grant in aid program. This will be taken into account by the variable, *Grant*s.

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 core. Municipalities closer together are given higher weight than municipalities further apart. These spatial dependencies are described in more detail in the next section.

4. Empirical specifications

The character of regional data can cause standard econometric techniques to be unsuitable due to spatial dependence. Spatial dependence means that there is dependence between municipalities that are close to one another geographically, due to spatial externalities and spill-over effects. One way to incorporate such spatial dependence is by using a spatial matrix (Anselin 1988). Anselin (1988) suggests using a distance measure of neighbors in which closer neighbors are given higher influence than other. For example, one can use a binary matrix where the cells are assigned the value one if the municipalities share a common border, and zero if they don't. Another option is to use the distance between municipalities. In this study we use a weight matrix that is based on distances, as this is considered relevant to shopping travel and commuting interdependencies. Perhaps a better alternative would be to use time travel distance but unfortunately we lack such data. The distance between municipalities does to our belief reflect the exchange between the municipalities in a better way than using a binary weight matrix that assigns the value one if the municipalities share borders as in Lundberg (2006).

When estimating a spatial regression model the choice between two different types are often made. The spatial lag model is described in equations (7) and (8) where the spatial dependence is related to the dependent variable and expressed by the coefficient δ. $\delta \neq 0$ indicates presence of spatial dependency. The spatial error model is the other type of spatial model where the spatial dependence instead affects the error term, where errors from different regions 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 statistical equations are given by

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

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

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

We account for all variables that vary between municipalities but are constant over time, e.g., where the municipality is located, the industry focus in the municipality etc., by using fixed effects. This model is not the true model for the growth in average income or the migration but we assume that the variables left out 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 maximum likelihood as an alternative. Another alternative is to an IV-approach as Lundberg (2006), since we have problem with endogenous variables. 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 dependent variable that differs. To simplify the estimation procedure the two equations are therefore estimated separately.

5. Data

We use official data from Statistics Sweden 1995-2011 for all municipalities in Sweden that have unchanged borders during the entire time period. The number of municipalities in total is 290 and four are excluded due to changes in borders over the time period, leaving us with 286 municipalities. When excluding municipalities we create empty space in the spatial weight matrix which will affect the coefficients of the spatial variables to some degree. The description of all variables is found in Table A1 in Appendix.

The net migration $M_{i,t}$ is measured as the sum of the migration into the municipality minus migration out of the municipality. Migration can take place across municipal borders or across country borders, so the sum is equal to net migration into Sweden. The average income level ($Y_{i,t}$) and thus the income growth rate $y_{i,t}$ is calculated for the population aged 20 and above. When we use migration and not population in our definition of the growth in the tax base we disregard natural population growth. By using individuals over the age of 20 for the average income we try to avoid some of the dependence between age structure and the average income. This is in line with Lundberg (2003, 2006) and Aronsson et al. (2001). The variable *Cost* is the total net costs of the municipality's service operations and is measured in thousands of SEK per capita. *Grant* is the total grants given to or taken from the municipalities in thousands of SEK per capita. Education (*Educ*) is measured as the fraction of the population aged 25 and above who has a post upper secondary education that is three years long or more. The unemployment rate (*U*) is the unemployed share of the population between 20-64 years. The *Tax* variable is the sum of the local and county tax rates in percentage points. All monetary variables are deflated by the consumer price index.

The variable *Sports* is a dummy variable that takes the value one if the municipality has an ice hockey or soccer team in the highest series during any of the years between *t-T* and *t*. To see if there are different effects of ice hockey and soccer we further disaggregate the sports dummy. The variables *Soccer* and *Ice hockey* take the value one if the municipality had a soccer or an ice hockey team, respectively, in the highest series during any of the years between *t-T* and *t*, otherwise zero. The variables are then separated further to see if there is any differences in the effect if a soccer or an ice hockey team is established in the highest series or jumps between the highest and the second highest series. The variables *Soccer1* and *Ice hockey1* take the value one if the municipality had a soccer or ice hockey team, respectively, in the highest series during any of (except all) the years between *t-T* and *t*, otherwise zero. The variables *Soccer2* and *Ice hockey2* take the value of one if the municipality had a soccer or ice hockey team, respectively, in the highest series all of the years in between the time interval *t-T* and *t*.

Descriptive statistics of all the variables is presented in Tables 1 and 2. Over the time period studied about eight percent of the municipalities had a sports team in the highest series of soccer or ice hockey. The average income growth has varied from negative to over 24 %. Grants from the central government are used to equalize between the municipalities and can be either positive or negative. The fraction of highly educated individuals also differs substantially between the municipalities where the highest levels are found near Stockholm and municipalities with a university. The population density also differs substantially where the northern part of Sweden has lower density.

(Tables 1and 2 about here)

5. Results

This section contains results of the estimation of equations (7) and (8). The choices made in the estimation process are explained followed by the results from a Maximum likelihood approach. We are aware of the endogeneity problem for the average income level and the spatial effect variable. This is why we as a robustness check follow up with an IV-approach.

Since we have panel data it is possible to divide the sample in 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 rate of growth and net migration (Lundberg 2003). Aronsson et al. (2001) divide the sample in five different intervals each with T = 5. Lundberg (2006) uses T = 9, and Lundberg (2003) uses T = 3, 5 and 9 years. For our benchmark model we use T = 5, where t = 2001, 2006 and 2011 and the independent variables are lagged five years. We also use a panel data approach, where we increase the number of observations from $3 \times N$ to $12 \times N$ when T is equal to five. This is done to test the sensitivity of the results to the choice of t. To check the robustness of the choice of T we also test to lag our variables by three years.

In the estimations all variables except the dummy variables are in logarithms. However, since *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 then transformed in logs. This affects the interpretation of the point estimates. However, since we are only interested in the sign, this will have no effect. We start with a pooled OLS regression and run the Breusch and Pagan Lagrangian multiplier test for independence. We cannot reject the null hypothesis that no cross-sectional dependence is present which indicates that we cannot use pooled OLS. We then apply the Hausman test and conclude that we have to use fixed effects to account for regional heteroskedasticity. The results of the tests can be found in Table A3 in the appendix. With a fixed effects model no time invariant variables can be estimated in the model. The professional sports variable differs in time where a municipality can jump in and out of the top series. With the Modified Wald test for group wise heteroskedasticity we can reject the null hypothesis and conclude that heteroskedasticity is present. With the Wooldridge test for autocorrelation in panel data we can reject the null hypothesis that no first order autocorrelation is present and because of this we will use Driscoll-Kraay robust standard errors.

(Table 3 about here)

In Table 3 we test for spatial effects. To test if spatial effect is present the Moran's I test is used. The test is significant and we conclude that there are significant spatial effects for all the different time periods for both average growth in income and net migration rate. To determine if there is a spatial error effect or a spatial lag effect we use the robust Lagrangian multiplier (Anselin, Bera, Florax and Yoon 1996 and Lundberg 2006). The test states that the spatial lag operator is appropriate for all time periods for the net migration rate. For the average income growth it is difficult to determine if there are lag or error effects for the year 2011 for all other periods the lag effect is appropriate. Thus we choose to use the spatial lag model.

(Tables 4 and 5 about here)

The estimation of equations (7) and (8) are presented in Tables 4 and 5, respectively. According to the results in columns 1-3 there is no significant difference in the average income growth or the net migration rate if a municipality has a professional sports team in the highest series of soccer and/or ice hockey or not. To investigate whether soccer and ice hockey have different effects on the average income or the net migration the sports dummy variable is split into separate variables for soccer and for ice hockey. The results in column 4 of Tables 4 and 5 show no significant correlation of neither ice hockey nor soccer with our dependent variables. To investigate if there are differences in effect between established teams and teams that jump between the highest and the second highest series we further divide the ice hockey and soccer dummy variables into four dummies; one dummy variable if the soccer and ice hockey team, respectively, has been in the highest series for the whole period from t-T to t, and one dummy if the soccer and ice hockey team, respectively, has been jumping between the highest and the second highest. The results presented in column 5 in Table 4 indicate a negative and significant correlation between ice hockey teams that are established in the highest series and average income growth. No significant effect is found with the other sports environment dummies.

The spatial effects are positive and highly significant for both the average income growth model and the net migration model. We conclude that there is a positive spillover effect from neighboring municipalities. The estimate on the coefficient for the average income level is negative and significant. This implies conditional convergence, i.e., a municipality with a low average income grows faster than a municipality with high average income, conditional on the other variables in the model. The coefficient of human capital is positive and significant for the average income growth model where high education can be related to high productivity and thereby the growth in average income. The coefficient of average income level in the net migration rate model is insignificant. However the endowment of human capital has a positive correlation with the net migration rate. A municipality with 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 (correlation of 0.78) and it can be difficult to interpret separate effects of the two (Lundberg 2003). A VIF test is performed and show no significance (values around 5 at the most), which indicate that we do not have problems with multicollinearity. The coefficient for the unemployment rate is insignificant for both the average income growth and net migration rate.

The coefficient of municipality costs per capita is negative and significant for both the net migration rate and the average income growth. Note that costs refer to operating costs where a high cost means that it is expensive to run the municipality at the time. The coefficient of density is significant and negative in both the average income growth model and the model for net migration rate. A municipality with high density experiences less in-migration then a municipality with a lower density. The tax rate has a negative effect on average income growth where a high tax rate implies a lower growth in average income. The correlation between the tax rate and the net migration rate is insignificant.

5.1 Robustness checks

Since we have used T = 5 we have t = 2001, 2006 and 2011 with three years included we suspect that a deviation in one year due to some external chock to have effect on the results, this is why we here change the value of T to three and also use a panel data approach with T = 5 and T= 3. The results can be found in the appendix Table A3 and A4.

All the sports environment variables are still insignificant except the dummy for an established hockey team that keeps the negative sign which is significant for all the different choices of t and

T.[4] The coefficient of the average income level is insignificant for the net migration rate in our benchmark model. However, the result is not robust for different choices of t and T and the coefficient show significant and positive correlation when the time interval is set to three year and when the panel model approach is being used. Other variables that changes in the average income growth model are costs that become insignificant, density that becomes positive and tax that becomes positive for one of the other model specifications. In the net migration rate model the coefficient for unemployment rate becomes significant and negative, where a high unemployment rate causes individuals to move out from the municipality. We also test the model whit the use of average attendance per season for soccer and ice hockey instead of the dummy variable. The results can be found in table A7 in the appendix and the result has not been changed.

Due to the endogeneity problem for the average income level and the spatial effect variable we use IV estimation as a robustness check of the results. As Lundberg (2006) we use $Y_{i,t-T-1}$ as an instrument for $Y_{i,t-T}$, $Wy_{i,t-T-1}$ and $Wm_{i,t-T-1}$ as instruments for $Wy_{i,t-T}$ and $Wm_{i,t-T}$ respectively. An endogeneity test indicates that IV regression is preferred over OLS and the instruments are relevant. The regression is performed with heteroskedasticity and autocorrelation robust standard errors. With Andersons CC test we can also reject the null hypothesis that the equation is under identified. The results reported in Table A5 and A6 in the appendix show that the negative effect of the established ice hockey team is robust for different model specifications when T = 5 and the panel data approach. If we change time interval and use T= 3 the variable becomes insignificant but only just so. No other sports environment dummy variables show any significant effect, for either the average income growth or the net migration rate. The IV- model still report a positive and significant spatial effect and a negative effect from the average income level on the average income growth.

[4] The three major cities of Stockholm, Göteborg and Malmö are all in the group that has had an established ice hockey team in the top series. As a robustness check we exclude these cities from the sample. We find that the coefficient of ice hockey2 is still significant and negative, and all other dummy variables are still insignificant.

6. Discussion

As most of the previous research in the area of sports and growth we cannot find any positive effect from sports on the economic growth. And as some previous studies we do find indications of a negative effect from sports on the growth of average income. Thus, it appears as if a team consistently keeps its place in the top series it is a financial burden for the municipality in terms of income growth. A tentative explanation for this result is that established teams also have a more established relationship with the municipality in terms of funds, which makes it easier for the team to increase their claims on the municipality. The opportunity cost of these funds is however expenditures that might be more productive and affect the average income growth to a higher degree. The result is robust regardless of the choice of t and T and is against the claims that the local government make when they justify these subsidies. However, it may very well be the case that to stay in the highest series in ice hockey the teams are dependent on financial support from the local government. When the local government supports its team it enables them to keep their team in the top series, but it prevents the local government to invest in other, and perhaps more productive investments. However, there is a great lack of transparency in the accountancy in local expenditures, since funds or subsidies to sports teams may be granted in various forms, e.g., reduced costs for using the arena, maintaining subventions, cancellation of loans and other sponsorships. Due to lack of such information we cannot comment on whether the subsidy is larger for a team that holds their position in the highest series.

To relate the results of our controlling variables to the previous studies on the growth in the local tax income, we find a positive and significant spatial effect from neighboring municipalities both for the average income growth and the net migration rate This is in line with the findings in Lundberg (2006) and means that growth in average income for one municipality has a tendency to spill over to its neighbor. We also see that a high net migration rate in one municipality affects the net migration rate in neighboring municipalities in a positive way. The positive spatial effects are robust for different time intervals and changes in T. We also find that we have a significant and negative correlation for the average income growth and the average income level, which imply conditional convergence. This result is in line with earlier studies on income growth; see, e.g., Barro and Sala-i-Martin (1992), Persson (1997) and Lundberg (2006). This result is robust for different *t* and *T*. The coefficient of the average income level is insignificant in the net migration model, Aronsson et al. (2001) found it to be positive and Lundberg (2003) finds it to be negative. The result is not robust for different specifications of the model and show significant and positive correlation when the time interval is set to three year and when the panel model approach is being used. The coefficient on the endowment of human capital is significant and positive for the average growth rates this is in line with Lundberg (2006).

7. 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 from sports on the growth of tax base, however, a small negative and significant correlation between having a well-established professional ice hockey team located in the municipality and the rate of average income growth is found. These points to the conclusion that subsidies cannot be justified on the grounds of economic benefits, which are in line with the conclusion found in previous studies as well; see Coates and Humphreys (2008). However, in our study we do not include surrounding effects of professional sports, e.g., the players being role models for children who encouraged to physical activity, or additional police efforts needed during games. In future research it would be interesting to study non-financial benefits in line with Carlino and Coulson (2002) that based on a hedonic price model finds that rents are higher and wages lower in a city with professional sports. This means that the negative effect can be justified by compensating differentials (Carlino and Coulson 2002).

Residents in the municipality with a professional sports team may be willing to accept a lower income because of the existence of a professional team in the municipality; these would then be reflected in the migration pattern. We find no correlation between professional sports and the rate of net migration. However, it may be the case that individuals with preferences for professional sports migrate to the municipality and individuals without these preferences migrate out of the municipality (Coates and Humphreys 2003b). A more detailed study of the migration pattern for individuals may answer this question. To have an established ice hockey team in the top series can be an economic burden for the local tax base, where the municipality may start to identify itself with the team and the local council may therefore be willing to go further in their efforts to keep the team in the top series.

Why are there a negative correlation from an established ice hockey team and not an established soccer team? Can there be more positive externalities from soccer then ice hockey that make soccer as productive as the opportunity investments. The number of active individuals in total for soccer is considerably larger than for ice hockey. If a municipality has a top soccer team this might encourage more individuals to be physically active, this might in turn have other positive effects for the municipality that reduces costs for other public services. To investigate if this is the case a study of if the number of active individuals per capita is different if the municipality has a soccer team in the top series is needed; this is a subject for future research.

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Table 1 Descriptive statistics, total sample

Variable Total	**Mean**	**Std. Dev.**	**Min**	**Max**
Sport	.08	.27	0	1
Soccer	.05	.22	0	1
Soccer1	.03	.18	0	1
Soccer2	.02	.13	0	1
Ice hockey	.05	.21	0	1
Ice hockey1	.02	.15	0	1
Ice hockey2	.02	.16	0	1
Net migration rate (*m*)	.00	.03	-.09	.13
Net migration (*M*)	105.44	556.36	-829.00	13054.00
Average income growth (*y*)	.09	.04	-.04	.26
Average income level (*Y*)	172.15	28.28	116.00	384.59
Population density (*density*)	126.78	425.52	.20	4504.30
Unemployment rate (*U*)	.08	.02	.03	.21
Education (*Educ*)	.11	.06	.03	.47
Local government Grants (*Grants*)	.44	2.00	-3.29	11.76
Local government expenditures (*Cost*)	30.94	5.32	17.37	48.63
Population aged 65 years or above (*Old*)	.18	.036	.06	.29

Population aged 0-15 years (*Young*)	.19	.02	.12	.26
Local income tax rate in percent (*Tax*)	31.84	1.20	26.47	34.75

Table 2 Descriptive statistics, year 2005

Variable 2005	Mean	Std. Dev.	Min	Max
Sport	.08	.27	0	1
Soccer	.05	.22	0	1
Soccer1	.03	.17	0	1
Soccer2	.02	.14	0	1
Ice hockey	.05	.21	0	1
Ice hockey1	.01	.12	0	1
Ice hockey2	.03	.17	0	1
Net migration rate (*m*)	.00	.02	-.07	.08
Net migration (*M*)	93.76	258.06	-322	2072
Average income growth (*y*)	.09	.02	.02	.13
Average income level (*Y*)	186.52	22.40	155.65	347.47
Population density (*density*)	128.02	430.27	.2	4106.9
Unemployment rate (*U*)	.09	.02	.04	.16
Education (*Educ*)	.13	.06	.06	.44
Local government Grants (*Grants*)	.59	1.95	-3.04	8.91
Local government expenditures (*Cost*)	33.69	3.48	26.04	45.65
Population aged 65 years or above (*Old*)	.18	.03	.09	.28
Population aged 0-15 years (*Young*)	.19	.02	.14	.25
Local income tax rate in percent (*Tax*)	31.96	.95	28.9	34.24

Table 3, Test results

	2001		2006		2011	
	y	**m**	**y**	**m**	**y**	**m**
Moran's I	20.171	8.575	7.123	7.983	5.024	4.895
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Spatial Error						
Lagrange multiplier	146.400	21.501	12.852	17.043	5.323	4.950
	(0.00)	(0.00)	(0.00)	(0.00)	(0.021)	(0.026)
Robust Lagrange multiplier	25.066	0.086	0.187	0.196	0.009	0.110
	(0.00)	(0.770)	(0.665)	(0.658)	(0.925)	(0.740)
Spatial Lag						
Lagrange multiplier	182.446	49.569	26.548	24.288	7.440	17.055
	(0.00)	(0.00)	(0.00)	(0.00)	(0.006)	(0.00)
Robust Lagrange multiplier	61.112	28.153	13.882	7.441	2.126	12.216
	(0.00)	(0.00)	(0.00)	(0.006)	(0.145)	(0.00)

Table 4 Average income growth T = 5 and t = 2001, 2006 and 2011

Variables	OLS	GLS	Spatial lag	Spatial lag	Spatial lag
sport	0.002	0.002	0.002		
	(0.78)	(0.50)	(0.45)		
Soccer				0.002	
				(0.51)	
Ice hockey				0.001	
				(0.22)	
Soccer1					0.002
					(0.52)
Soccer2					0.002
					(0.28)
Ice hockey1					0.004
					(1.09)
Ice hockey2					-0.019**
					(-3.04)
Y	-0.054***	-0.362***	-0.194***	-0.195***	-0.188***
	(-4.56)	(-9.51)	(-8.69)	(-8.69)	(-8.43)
Cost	-0.221***	-0.060**	-0.044***	-0.044***	-0.044***
	(-21.28)	(-2.90)	(-3.73)	(-3.72)	(-3.76)
Educ	0.021***	0.016	0.022***	0.022***	0.023***
	(7.05)	(1.22)	(3.30)	(3.30)	(3.41)
Grant	0.054***	0.033*	0.034***	0.034***	0.035***
	(8.72)	(1.97)	(4.87)	(4.87)	(4.98)
Density	-0.004***	-0.097***	-0.028*	-0.028*	-0.028*
	(-4.80)	(-4.02)	(-2.11)	(-2.11)	(-2.15)
Tax	0.006	-0.215***	-0.122***	-0.122***	-0.119***
	(0.27)	(-4.64)	(-5.30)	(-5.30)	(-5.21)

Young	0.088***	0.033	0.048***	0.048***	0.050***
	(7.65)	(1.21)	(3.56)	(3.56)	(3.77)
Old	0.028***	0.014	0.024**	0.024**	0.029**
	(4.28)	(0.57)	(2.66)	(2.65)	(3.17)
U	0.020***	-0.001	-0.005	-0.005	-0.005
	(6.66)	(-0.14)	(-1.19)	(-1.20)	(-1.20)
Constant	1.396***	3.320***			
	(14.81)	(11.45)			
Spatial rho			0.322***	0.322***	0.335***
			(19.03)	(18.98)	(19.62)
N	858	858	858	858	858
Adj. R^2	0.744	0.901			
Log-likelihood			2742.6609	2742.7129	2751.2897

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

Table 5, net migration rate T = 5 and t = 2001, 2006 and 2011

Variable	OLS	GLS	Spatial lag	Spatial lag	Spatial lag
sport	0.006*	0.001	0.002		
	(2.17)	(0.19)	(0.59)		
Soccer				-0.001	
				(-0.12)	
Ice hockey				0.000	
				(0.07)	
Soccer1					-0.000
					(-0.07)
Soccer2					-0.005
					(-0.76)
Ice hockey1					0.000
					(0.07)
Ice hockey2					0.002
					(0.30)
Y	-0.039**	0.077	0.008	0.008	0.007
	(-3.26)	(1.87)	(0.33)	(0.32)	(0.31)
Cost	0.008	-0.042	-0.041**	-0.041**	-0.042**
	(0.80)	(-1.55)	(-3.09)	(-3.09)	(-3.13)
Educ	0.028***	0.031*	0.025**	0.025**	0.025**
	(9.53)	(2.28)	(3.17)	(3.20)	(3.25)
Grant	-0.005	0.041***	0.018*	0.019*	0.019*
	(-0.74)	(3.50)	(2.26)	(2.29)	(2.28)
Density	0.004***	-0.174***	-0.160***	-0.160***	-0.159***
	(4.74)	(-5.94)	(-10.93)	(-10.90)	(-10.82)
Tax	-0.126***	0.021	0.040	0.040	0.041
	(-5.66)	(0.41)	(1.54)	(1.54)	(1.59)

Young	0.001	0.118***	0.076***	0.076***	0.076***
	(0.07)	(4.59)	(4.90)	(4.89)	(4.88)
Old	-0.008	0.053**	0.049***	0.049***	0.048***
	(-1.26)	(2.73)	(4.77)	(4.75)	(4.59)
U	-0.013***	-0.012	-0.008	-0.008	-0.008
	(-4.47)	(-1.33)	(-1.87)	(-1.86)	(-1.89)
Constant	0.613***	0.583*			
	(6.50)	(2.03)			
Spatial rho			0.526***	0.525***	0.526***
			(20.23)	(20.09)	(20.42)
N	858	858	858	858	858
R^2	0.490	0.415			
Log-likelihood			2620.0593	2619.8928	2620.3709

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

Appendix

Table A 1, Explanation of the variables

Variable	Description	Source
$\boldsymbol{Y_{i,t}}$	Total average income for residents in Sweden over the age of twenty years measured 31/12 in thousand kroner for municipality *i* year *t*	Official statistic 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 migration in to the municipality minus the migration out of the municipality for municipality *i* year *t*	Official statistic 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 for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{Density_{i,t}}$	Population density residents per square kilometer for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{U_{i,t}}$	Average annual unemployment rate for municipality *i* year *t*	Swedish employment office
$\boldsymbol{Tax_{i,t}}$	Total tax rate: The sum of local and	Official statistic from statistics

	regional tax for municipality *i* year *t*	Sweden
$\boldsymbol{Edu_{i,t}}$	Proportion of the population age 25-74 with at least three years of university education for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{Grant_{i,t}}$	Total intergovernmental grants measured in thousand SEK per capita, for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{Cost_{i,t}}$	Local government operating costs per capita	
$\boldsymbol{young_{i,t}}$	Share of the population between age zero to fifteen for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{old_{i,t}}$	Share of the population over 65 years for municipality *i* year *t*	Official statistic from statistics Sweden
$\boldsymbol{Longitude_{i}}$	Coordinates for the population density center for municipality i	Official statistic from statistics Sweden
$\boldsymbol{Latitude_{i}}$	Coordinates for the population density center for municipality i	Official statistic from statistics Sweden
$\boldsymbol{Sport_{i,t}}$	Takes the value one if the municipality have had a soccer or ice hockey team in the highest series during any year in between t and T	
$\boldsymbol{Soccer_{i,t}}$	Takes the value one if the municipality have had a soccer team in the highest series during any year in between t and T	
$\boldsymbol{Soccer1_{i,t}}$	Takes the value one if the municipality have had a soccer team in the highest series during any except all year in between t and T	The Swedish soccer associations statistical association
$\boldsymbol{Soccer2_{i,t}}$	Takes the value one if the municipality have had a soccer team in the highest series during all year between t and T	The Swedish soccer associations statistical association
$\boldsymbol{Hockey_{i,t}}$	Takes the value one if the municipality have had a ice hockey team in the highest series during any year in between t and T	The Swedish ice hockey league official homepage
$\boldsymbol{Hockey1_{i,t}}$	Takes the value one if the municipality have had a ice hockey team in the highest series during any except all year in between t and T	The Swedish ice hockey league official homepage

$\boldsymbol{Hockey2_{i,t}}$	Takes the value one if the municipality have had a ice hockey team in the highest series during all year between t and T	The Swedish ice hockey league official homepage

Table A2 Chi squared results

Test	Average income growth	Net migration rate
Breusch and Pagan	922.19***	5224.68***
Hausman	861.80***	400.66***

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

Table A3 Maximum Likelihood T = 5

	Average income t= 2001,2006,2011	**Average income** Panel approach 2000-2011	**Net migration** t= 2001,2006,2011	**Net migration** Panel approach 2000-2011
Soccer1	0.002	0.001	-0.000	0.003
	(0.52)	(0.31)	(-0.07)	(1.29)
Soccer2	0.002	-0.002	-0.005	-0.004
	(0.28)	(-0.59)	(-0.76)	(-1.18)
Ice hockey1	0.004	0.000	0.000	-0.001
	(1.09)	(0.17)	(0.07)	(-0.28)
Ice hockey2	-0.019**	-0.014***	0.002	0.000
	(-3.04)	(-3.70)	(0.30)	(0.08)
Y	-0.188***	-0.255***	0.007	0.022*
	(-8.43)	(-22.70)	(0.31)	(2.51)
Cost	-0.044***	0.008	-0.042**	-0.032***
	(-3.76)	(1.26)	(-3.13)	(-5.50)
Educ	0.023***	0.039***	0.025**	0.021***
	(3.41)	(10.83)	(3.25)	(5.95)
Grant	0.035***	0.002	0.019*	0.014***
	(4.98)	(0.49)	(2.28)	(3.64)
Density	-0.028*	0.013	-0.159***	-0.164***
	(-2.15)	(1.71)	(-10.82)	(-22.14)
Tax	-0.119***	-0.032**	0.041	0.043***
	(-5.21)	(-2.71)	(1.59)	(3.85)
Young	0.050***	0.067***	0.076***	0.077***
	(3.77)	(8.01)	(4.88)	(9.53)
Old	0.029**	0.039***	0.048***	0.052***
	(3.17)	(6.68)	(4.59)	(9.22)
U	-0.005	0.001	-0.008	-0.004**
	(-1.20)	(0.66)	(-1.89)	(-3.00)

Spatial lag	0.335***	0.351***	0.526***	0.520***
	(19.62)	(37.27)	(20.42)	(36.70)
N	858	3432	858	3432
Loglikelihood	2751.2897	10533.4972	2620.3709	10662.4167

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

Table A4, Maximum Likelihood T = 3

	Average income t= 1999, 2002, 2005, 2008, 2011	**Average income** Panel approach 1998-2011	**Net migration** t=1999, 2002, 2005, 2008, 2011	**Net migration** Panel approach 1998-2011
Soccer1	-0.001	-0.000	0.002	0.002
	(-0.41)	(-0.10)	(0.67)	(1.19)
Soccer2	0.002	-0.000	-0.001	-0.002
	(0.57)	(-0.11)	(-0.40)	(-0.96)
Ice hockey1	0.000	0.003	-0.002	-0.002
	(0.03)	(1.29)	(-0.74)	(-0.84)
Ice hockey2	-0.008*	-0.010***	0.003	0.000
	(-2.23)	(-4.31)	(0.73)	(0.15)
Y	-0.075***	-0.096***	0.029*	0.021**
	(-5.76)	(-12.80)	(2.18)	(3.16)
Cost	-0.007	-0.002	-0.040***	-0.033***
	(-0.87)	(-0.31)	(-5.00)	(-7.35)
Educ	0.002	0.023***	0.018***	0.017***
	(0.45)	(8.04)	(3.63)	(6.73)
Grant	0.022***	0.023***	0.018***	0.016***
	(4.57)	(7.41)	(3.82)	(5.60)
Density	0.030***	0.047***	-0.076***	-0.080***
	(3.45)	(8.27)	(-9.28)	(-15.60)
Tax	0.035*	-0.022*	0.022	0.014
	(2.21)	(-2.33)	(1.39)	(1.62)
Young	0.042***	0.020**	0.038***	0.040***
	(4.69)	(3.25)	(4.17)	(7.16)
Old	0.001	0.015***	0.020***	0.022***
	(0.25)	(3.64)	(3.32)	(5.71)
U	0.011***	0.002	-0.003	-0.004***
	(5.88)	(1.61)	(-1.50)	(-3.98)
Spatial lag	0.385***	0.508***	0.488***	0.503***
	(29.33)	(71.68)	(16.10)	(31.11)
N	1430	4004	1430	4004
Loglikelihood	4722.834	12744.5166	4715.608	13141.340

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

Table A5, Instrumental variable regression T=5

	Average income t= 2001,2006,2011	**Average income** Panel approach 2000-2011	**Net migration** t= 2001,2006,2011	**Net migration** Panel approach 2000-2011
Soccer1	0.001	-0.001	-0.006	-0.004
	(0.26)	(-0.44)	(-0.85)	(-1.40)
Soccer2	0.002	0.001	0.000	0.003*
	(0.61)	(0.75)	(0.06)	(2.28)
Ice hockey1	0.005	0.001	-0.001	-0.000
	(1.26)	(0.32)	(-0.11)	(-0.18)
Ice hockey2	-0.018*	-0.010*	0.003	0.001
	(-2.15)	(-2.57)	(0.27)	(0.23)
Y	-0.262***	-0.271***	-0.034	-0.021
	(-9.03)	(-16.52)	(-0.95)	(-1.51)
Cost	-0.024	-0.000	-0.040	-0.004**
	(-1.68)	(-0.27)	(-1.93)	(-2.78)
Educ	0.035***	0.035***	0.024*	0.050***
	(4.18)	(4.56)	(2.24)	(6.59)
Grant	0.035***	0.058***	0.008	0.057***
	(3.76)	(5.77)	(0.74)	(5.65)
Density	-0.023	-0.031*	-0.151***	0.046***
	(-1.49)	(-2.02)	(-7.18)	(3.51)
Tax	-0.142***	-0.007	0.048	-0.159***
	(-4.74)	(-0.70)	(1.40)	(-14.49)
Young	0.049**	0.004	0.055**	0.008
	(2.85)	(0.87)	(2.67)	(1.80)
Old	0.029*	0.031***	0.045**	0.021***
	(1.96)	(7.29)	(3.12)	(4.77)
U	-0.011*	-0.015*	-0.007	-0.032***
	(-2.07)	(-2.06)	(-1.11)	(-4.11)
Spatial lag	0.327***	0.254***	0.781***	0.747***
	(13.38)	(13.99)	(8.03)	(16.54)
N	858	3432	858	3432
R^2	0.894	0.887	0.257	0.450

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

Table A6, Instrumental variable regression T=3

	Average income t= 1999, 2002, 2005, 2008, 2011	**Average income** Panel approach 1998-2011	**Net migration** t=1999, 2002, 2005, 2008, 2011	**Net migration** Panel approach 1998-2011
Soccer1	0.002	0.000	-0.001	-0.002
	(0.65)	(0.02)	(-0.45)	(-1.21)
Soccer2	-0.001	0.000	0.002	0.002*
	(-0.33)	(0.09)	(1.18)	(1.99)

Ice hockey1	-0.000	0.002	-0.002	-0.001
	(-0.13)	(0.95)	(-0.71)	(-0.75)
Ice hockey2	-0.006	-0.009**	0.003	0.001
	(-1.63)	(-3.01)	(0.84)	(0.40)
Y	-0.090***	-0.066***	-0.012	-0.012
	(-5.19)	(-6.94)	(-0.58)	(-1.20)
Cost	-0.011	-0.027***	-0.035***	-0.029***
	(-1.12)	(-3.98)	(-3.51)	(-4.89)
Educ	-0.004	0.011**	0.019**	0.017***
	(-0.63)	(3.08)	(2.96)	(5.22)
Grant	0.019**	0.026***	0.011	0.009**
	(3.19)	(6.50)	(1.79)	(2.62)
Density	0.010	0.034***	-0.072***	-0.077***
	(0.87)	(4.00)	(-6.91)	(-10.94)
Tax	0.061***	-0.004	0.033	0.022*
	(3.46)	(-0.34)	(1.79)	(2.24)
Young	0.046***	0.014	0.023*	0.027***
	(4.21)	(1.90)	(2.10)	(4.16)
Old	-0.006	0.011*	0.020**	0.021***
	(-0.87)	(2.34)	(2.61)	(4.60)
U	0.015***	0.002	-0.003	-0.003**
	(5.59)	(1.45)	(-1.35)	(-3.18)
Spatial lag	0.284***	0.430***	0.767***	0.738***
	(10.49)	(15.86)	(9.18)	(15.66)
N	1430	4004	1430	4004
***R*²**	0.872	0.830	0.249	0.364

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

Table A7 Maximum Likelihood

	Average income t= 2001,2006,2011	**Average income** t= 1999, 2002, 2005, 2008, 2011	**Net migration** t= 2001,2006,2011	**Net migration** t= 1999, 2002, 2005, 2008, 2011
Audience	0.038	0.019	0.014	0.008
Soccer	(1.82)	(1.09)	(0.59)	(0.50)
Audience Ice	-0.077**	-0.028	0.033	0.028
hockey	(-3.09)	(-1.52)	(1.14)	(1.48)
Y	-0.193***	-0.076***	0.009	0.030*
	(-8.71)	(-5.83)	(0.37)	(2.22)
Cost	-0.044***	-0.007	-0.040**	-0.039***
	(-3.76)	(-0.88)	(-3.02)	(-4.93)
Educ	0.024***	0.003	0.024**	0.017***
	(3.57)	(0.51)	(3.00)	(3.46)
Grant	0.036***	0.022***	0.019*	0.018***
	(5.12)	(4.56)	(2.29)	(3.80)
Density	-0.031*	0.029***	-0.159***	-0.076***

	(-2.33)	(3.41)	(-10.85)	(-9.30)
Tax	-0.118***	0.036*	0.039	0.021
	(-5.16)	(2.27)	(1.53)	(1.35)
Young	0.052***	0.042***	0.074***	0.037***
	(3.87)	(4.75)	(4.76)	(4.08)
Old	0.028**	0.001	0.049***	0.020***
	(3.12)	(0.12)	(4.70)	(3.40)
U	-0.005	0.011***	-0.008	-0.003
	(-1.32)	(5.78)	(-1.84)	(-1.40)
Spatial lag	0.330***	0.383***	0.526***	0.488***
	(19.49)	(29.17)	(20.36)	(16.10)
N	858	1430	858	1430
Loglikelihood	2749.3214	4721.0067	2620.6712	4715.0542

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