Examining the Long-term Economic Impact of College Football Success on Local Communities

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Abstract

While many studies have investigated short-run economic impacts of college sporting events, nationally recognized college sports programs may have long-run and potentially transformational effects on local economies. This study examines how the success of a college football program impacts the surrounding county using historical data on AP poll rankings from 1960 to 2010 and economic indicators including median income, poverty rates, and education levels. I use a fixed effects specification to examine how shifts in national rankings correlate with changes in local economic conditions. Results suggest a positive relationship between the rating of a college football team on population size, and a negative relationship between rating and median age of a county when population size is restricted. Other economic factors, such as income per capita, education level per capita, and poverty level per capita all suggest a positive, but insignificant relationship with college football team rating.

Table of Contents:

Introduction

When the first intercollegiate sporting event, a crew regatta between Yale and Harvard, took place in 1852 on Lake Winnipesaukee, New Hampshire, no one could have predicted that over a century later, college athletics would become a multi-million dollar industry (StateUniversity). Now, it is not crew teams, but other college sports such as football, basketball and baseball that generate large amounts of revenue for their schools. These revenues brought in by a combination of ticket sales, food purchases, and apparel sales benefit collegiate institutions for obvious reasons.

I intend to determine whether or not college sporting events have an economic impact on the local communities surrounding them. The sport I want to examine in particular is college football, and the impact their games have on the local economy. I have chosen college football because it generates more revenue as a whole than any other collegiate sport.

A study by The Department of Education found that in 2014, college football generated just over $4.6 billion in revenue. This figure is much larger than the second highest grossing revenue sport, basketball, which brought in about $2.6 billion in 2014. Further, a study by Fulks (1997) found that the revenue produced by football between 2004 and 2006 accounted for 43% of total revenue for athletic departments.

I think the question is worth studying to see if a college football team's success does in fact affect the economy of the town they play in. If there is an affect, this could influence how colleges and universities fund certain programs. For example, should my research find that a college football program's success does have a positive economic impact on local communities, this may encourage state politicians to increase funding towards football programs. On the contrary, if my research finds that there is negative or no affect of a college football team's success on the local economy, state politicians and/or school administrators may want to consider allocating funds to other academic or athletic programs. However, if my research proves to be significant, studies could be done on other collegiate sports such as basketball or baseball to determine if their success also has an economic impact on the local communities.

While several studies have looked at the short-run impact of college sporting events, there has yet to be significant research done on the long-run effects these sports have on local economies. I plan to use a fixed effects specification to examine if change in a football team's national ranking is associated with changes in local economic conditions. The dependent variables I intend to use are percentage changes in income and population, education per capita, median age, and poverty levels per capita of the local community. The independent variables I plan to use will be the college football team's rating and the number of times they were ranked over the course of a decade.

Literature Review

Although there has been a significant amount of research done on the economic impact of professional sports teams to their local economies, college sports have received little attention on this topic. The source of literature most relevant to the question of interest is a study done by Baade, Baumann and Matheson (2008) in which the economic impact of college football games were analyzed. The study looked at 63 metropolitan areas that were either hosts to national championship games or generally ranked in the top 50 in attendance between 1969 and 2004. The study found that neither the number of home games played, winning percentage or number of national championships won prove to have a significant impact on employment or personal income of the metropolitan area the teams played in. Although the study includes a large enough sample size with appropriate explanatory and response variables, a key limitation would be the metropolitan areas chosen for the study. Most of the metro areas analyzed are large cities that have to maintain large economies. There are several other factors that could influence the economy of these metropolitan areas that are not accounted for in the study. Another limitation is that the study only looked at short-run effects of economic conditions the year immediately following a college football team's season. Looking at short-run effects fails to give us an accurate indication of how the economy is actually influenced because one year is not a long enough time period to see significant changes in an economy.

Another study by Coates and Depken (2009) looked at the impact of college football games on local sales tax and revenue of four cities in Texas. The study found that each game resulted in a taxable sales increase between $281,000 and $465,000 USD, which resulted in a tax revenue increase between $20,000 and $34,000 USD. Although this study shows a positive relationship between college football games and revenue for their town, the sample size is small, and they admit that it is only statistically significant for small town colleges, and larger cities such as Dallas, Houston and Austin show little effect.

Other pieces of literature have examined the economic impact that professional sports and college basketball have on local economies. Siegfried and Zimbalist (2000) looked at the economic impact that professional sports, particularly the construction of sport stadiums and arenas, bring to metropolitan areas. They found there to be no statistically significant positive correlation between the construction of sporting arenas and the economic growth of the cities these arenas were being built in. Once again, the limitations with this study are the cities being looked at. Most professional sporting arenas are located in large cities whose economies are affected by variables other than just the success of the sports teams.

A later study by Matheson and Baade (2003) looks at the economic impact of the Final Four Championship for NCAA women's and men's basketball. The study examined individual cities that played host to the Final Four Championship Game between the years 1970 and 1999. A regression model was run to determine predicted income growth for the metropolitan statistical areas (MSA); this was then compared to the actual income growth the MSAs experienced during the years they played host to the Championship Game. The results found that the gain or loss of real income accrued from the Final Four Championship was statistically insignificant for host cities for both men’s and women’s basketball. The limitation on this study is that only the short-run economic impact of the cities sampled were analyzed. Looking at real income growth over the course of one year does not help in revealing the long-term effects the Championship game has on the host city. Furthermore, since the Championship game changes host cities every year, no long-term impact can be determined for the city.

There has also been extensive literature done on the amount of revenue college football generates for their respected schools. Looking at revenue generated by football programs is relevant to the question at hand because it is important to show that football is generally the largest and most profitable college athletic program. A study by Caro and Benton (2012) looked at the dispersion of revenue among Football Bowl Subdivision

(FBS) schools. Data included the average revenue generated from each football conference between the years 2003 and 2009 and then analyzed. Caro and Benton found that there indeed was a statistically significant discrepancy between the revenue received by the eleven conferences. The six conferences that were automatically qualified (AQ) for bowl games brought in an average revenue significantly higher than the five conferences that were not automatically qualified. Furthermore, the Big East conference generated the lowest average revenue of the AQ schools ($15,058,066). However, this was still significantly more than the average revenue brought in by the highest earning non-AQ school, the Mountain West conference (8,401,775). These findings are important to the study under consideration because the schools that generate more revenue go to more lucrative bowl games and get the chance to represent their school to thousands of television viewers. The recognition a school receives during the bowl games could lead to a bigger fan base, thus more people coming to their home town to watch them play in future years.

Furthermore, an earlier study by Brown (1994) looks at revenue sharing among college football programs. They found that colleges who participate in football revenue sharing programs across conferences have less incentive to perform well. The thought process is that as long as the opponent they are sharing the revenue with has a successful season, their program does not have to spend money on building a strong team because their opponent will make up for it.

Data

Data was collected from a combination of the AP College Football Poll and the U.S. Census. The Associated Press (AP) Poll is responsible for providing weekly rankings for Division I college football and basketball. The poll ranks the top 25 teams in the nation by asking 65 people who are very knowledgeable about the sport, usually sportswriters and sports broadcasters, to provide their own rankings of the top 25 teams. These individual rankings are then combined by giving the team 25 points for a first place vote, 24 points for a second place vote, and so on (AP College Poll, 2008). The AP Poll has been ranking college football teams since 1936, and is considered one of the most used and trusted ranking systems in collegiate sports. I collected rankings from years 1950 to 2009 of the top 20 college football teams. I gathered data on top 20 teams instead of the top 25 because only the years 1990 to 2009 had top 25 rankings.

Because the ranking of a college football team has an inverse relationship with a team's success (a team that has a lower rank is more successful than a team with a higher rank), we decided to implement a rating system that made this relationship easier to understand. Team success was therefore measured using the team's average rating from the preceding decade where:

$rating = 21 - AP\ rank$

By using this equation, we are saying that a unit increase in rating implies that a team's rank was one closer to the number one ranking.

To focus on the economic impact of communities that are geographically located near the college, I examine economic outcomes at the county-level. Most outcome variables used in the analysis come from the decennial U.S. Census of Population and Housing dating back to 1960. I was able to identify which county the ranked college was located in by performing a basic search of the college and its geographical location. To do this, I searched the college name via Wikipedia and was able to find out what town the college was located in. I then clicked on the link Wikipedia provided for the town and was able to identify the county these towns were located in through Wikipedia. Some towns were located in multiple counties. For example, Texas Christian University is located in Fort Worth, Texas, which is spread over four separate counties.

The variables collected from census data include population, median household income, median age, and number of people living below the poverty line. Data on population and number of people living below the poverty line are available from 1960 to 2010. Data for median household income are available for the years 1980 to 2000. Further, data on median age are available for years 1980 to 2010, and data for number of people living below the poverty line are accessible for years 1960 to 2010. Lastly, I collect data on level of education attained compiled by the USDA Economic Research Service for each decade from 1960 to 2010.

Once colleges are matched to their respective counties, they are linked to county-level economic outcomes using a Federal Information Processing Standard (FIPS) county code.[1] In some cases, the ranked college was located in multiple counties. For these observations, I take a population-weighted average of the county-level outcomes associated with that college.

Empirical Framework

Because I am looking at the long-run effects of economic conditions on local communities, the data I am using needs to be observed over several time periods. For this

[1] All US Census data including county FIPS codes are accessed from the National Historic Geographic Information System (NHGIS) database (nhgis.org). FIPS codes are used to uniquely identify counties in the United States. Because some of the counties the ranked colleges are located in share the same name, FIPS codes were necessary to ensure a unique match.

reason, I found that using a panel data fixed effects specification would be the most appropriate model to run for developing the test. Panel data is useful to use in this situation because it is likely that the independent variables being used depends on explanatory variables that cannot be observed, but are correlated to the observed explanatory variables. Panel data will allow us to consistently estimate the effect of explanatory variables that are observed.

Further, I have chosen to use a fixed-effects model over a random-effects model to estimate the data. As mentioned before, it is important to control for variables that differ over time. Using the fixed-effects model allows us to use the changes in variables over time to estimate the effects that the dependent variables (income, population, education per capita, poverty level per capita, and median age) have on the independent variables (rating and number of times ranked).

The fixed effects model is:

$$y_{it} = \alpha_i + \alpha_t + \beta rating_{it} + \varepsilon_{it}$$

Where t represents the decade, i is the college-county, y_{it} is outcome of interest in county i in period t, and $rating_{it}$ is the average end-year rating in the ten years before t. α_i is the college-county 'fixed effect' which absorbs average differences between the colleges and counties being examined. Similarly, α_t is a decade effect, which absorbs average differences across time. Further, the β term in the fixed effects model estimates how recent changes in a college football team's success are correlated with changes in outcomes in the surrounding county. The main concern with the model is that these correlations are explained by something other than the impact of a football team's success on these outcomes. Using the fixed effects model allows us to rule out a lot of these concerns. Lastly, in order to interpret β as a causal effect, we must assume that rank is uncorrelated with other time-varying variables that impact the outcome (ε_{it}).

Econometric Results and Interpretation

The results show that there seems to be a more significant effect between shifts in a team's ranking on population, income, education per capita, median age, and poverty level per capita when the sample population was restricted. The first test I ran was a simple fixed effects model in which the outcomes were the log of population, log of median income, fraction of the population with a college degree, poverty rate, and median age. We find that an improvement in a team's rating over the previous decade led to a statistically significant increase (at the 5% level) in log population. Every time the rating of a college football team increases by one position, population in the county decreases by 0.971% (Table 2 of Appendix). In other words, as the average rating of a college football team improves, the population in that county tends to increase. Improvements in a team's rating was also associated with changes in income, education, median age, and poverty level, but these relationships were not statistically significant at conventional levels.

I then ran the same fixed effects regression, but instead of using the team's rating from the previous decade, I made the number of times a college was ranked in a decade the independent variable. The results for this were similar but seemed to have a slightly larger effect compared to average rating. For every extra time a college football team was ranked in a given decade, the population of that corresponding county increased 1.28%.

Once again, none of the other variables proved to be statistically significant at any level (Table 3 of Appendix). This increase in population is what we would expect to happen when a college football team becomes more successful. Oftentimes, the best college football teams tend to play in important championship games at the end of the season and get more television time because of it. People from across the country get to see these teams play and may develop a certain favoritism or attachment to a particular school. People who have already graduated college may not feel the need to relocated and live close to their favorite college teams, but younger people who have not yet attended college may choose a college based on the team they've been rooting for since they were young.

One concern with the analysis, is that colleges may only be a small part of a county's economy, and therefore it will likely be harder to detect the impact of college football success within these counties. For this reason, the analysis was repeated on samples restricted to counties with populations less than 500,000 and populations less than 350,000. By limiting the sample size, I was able to get slightly more significant results. Eliminating counties with a population size greater than 500,000 left us with 353 observations. Results revealed that the rating of a team is significantly correlated with percentage change in population at a 5% level of significance. In other words, an improvement in the average rating of a football team by one unit is associated with a population increase of 0.906%. As was the case with the unrestricted population size, improvement in a team's rating was also associated with an increase in income, education per capita, poverty level per capita, and a decrease in median age, but at levels that were not statistically significant (Table 5 of Appendix).

Further, the regression we ran when the number of times ranked in a decade was used as the independent variable yielded similar, but stronger results. For ever extra time a team was ranked in a decade, population increased by 1.23%, and the other dependent variables (income, education per capita, poverty level per capita, and median age) yielded a similar yet insignificant relationship as that of the previous regressions ran. (Table 6 of Appendix).

Following these results, I then repeated the process by dropping counties that had a population size greater than 350,000. The regression yielded results similar to that with a 500,000 population restriction. One notable observation is that median age became significantly correlated to average rating of a college football team at a 10% level. Further, every time a college football team's average rating improves by one, the median age of the corresponding county decreases by 0.0809 (Table 8 in Appendix). While this correlation is not as strong as the population variable, it does make sense that the median age would decrease. As mentioned before, population tends to increase with a football team's success rate, and a potential cause of this could be the fact that more students are applying to the college as its football team becomes more successful. It would only make sense that median age of the county decreases as more college aged people begin to attend that school.

Finally, when we ran the regression using the number of times a team was ranked in a decade as the dependent variable, we found population to be statistically correlated with an increase in number of times ranked, but not median age or any other dependent variable (Table 9 of Appendix).

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Conclusion

Unfortunately, a college football team's success and the impact this has on the economic performance of local communities proved to be of little statistical significance when associated with income levels, education per capita, and poverty levels per capita. However, we did find that population change as a percentage showed a statistically positive correlation with shifts in a team’s average rating from the preceding decade and number of times a team was ranked in a given decade. These findings held true when population size was unrestricted as well as when it was restricted to 500,000 and 350,000 people or less. In addition, when population size was restricted to 350,000 people or less, we also saw a statistically significant negative correlation between changes in average rating and the median age of the corresponding county.

Further research can still be done on this topic. To begin, other economic indicators can be looked at to determine if a college football team's ranking has any influence on them. Examples of other economic variables could be unemployment rate or housing values. It may also be beneficial to look at other collegiate sports such as basketball or baseball to see if their team's success rate has an impact on local economies. Just because football is the highest revenue grossing collegiate sport does not necessarily mean it is the most influential amongst certain communities.

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Appendix

Table 1. Descriptive Statistics with Full Population Size

Variable	Observations	Mean	Std. Dev.	Min	Max
Income	245	14118.43	6442.629	4776	32795
Median age	328	30.61148	4.060607	22.1	41.3
Population	493	506526.1	756946.3	21290	5492369
Education per capita	493	69152.17	120100.6	0	968642
Poverty level per capita	493	65534.75	100864.8	2963	839805
Rating	493	18.90913	3.284915	2.9	21
Rank	493	1.94929	2.492155	0	10
Log income	245	9.445151	0.4808419	8.471358	10.39803
Log population	493	12.41186	1.195661	9.965993	15.51887

Table 2. Regression Results with Unrestricted Population Size and Average Rating from the Preceding Decade as Independent Variable

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log of population	Log of income	Education per capita	Poverty level per capita	Median age
Rating	0.00971**	0.00139	0.000532	0.000602	0.0271
	(0.00409)	(0.00198)	(0.000523)	(0.000684)	(0.0309)
Observations	493	245	493	493	328
R-squared	0.975	0.991	0.896	0.787	0.944

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Regression Results with Unrestricted Population Size and Number of Times Ranked as Independent Variable

VARIABLES	(1) Log of population	(2) Log of income	(3) Education per capita	(4) Poverty level per capita	(5) Median age
Rank	0.0128**	0.00232	0.000775	0.000523	-0.00806
	(0.00549)	(0.00263)	(0.000702)	(0.000918)	(0.0411)
Observations	493	245	493	493	328
R-squared	0.975	0.991	0.896	0.786	0.944

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Descriptive Statistics with Restricted Population Size of 500,000 or Less

Variable	Observations	Mean	Std. Dev.	Min	Max
Income	173	13034.77	5837.627	4776	28976
Median age	227	29.58207	4.04612	22.1	41.2
Population	353	176971.7	125714.5	21290	496938
Education per capita	353	23230.37	24051.97	0	109723
Poverty level per capita	353	26031.69	19028.83	2963	152042
Rating	353	18.67082	3.50718	2.9	21
Rank	353	2.121813	2.640249	0	10
Log income	173	9.37106	0.4664345	8.471358	10.27422
Log population	353	11.80984	0.7743404	9.965993	13.11622

Table 5. Regression Results with Restricted Population Size of 500,000 or Less and Average Rating from Preceding Decade as Independent Variable

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log of population	Log of income	Education per capita	Poverty level per capita	median age
Rating	0.00906**	0.00213	0.000800	0.000940	-0.0375
	(0.00353)	(0.00204)	(0.000576)	(0.000815)	(0.0380)
Observations	353	173	353	353	227
R-squared	0.963	0.992	0.895	0.774	0.934

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. Regression Results with Restricted Population Size of 500,000 or Less and Number of Times Ranked as Independent Variable

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log of population	Log of income	Education per capita	Poverty level per capita	median age
Rank	0.0123**	0.00288	0.00108	0.00107	-0.0207
	(0.00478)	(0.00281)	(0.000780)	(0.00110)	(0.0516)
Observations	353	173	353	353	227
R-squared	0.963	0.992	0.895	0.773	0.934

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Descriptive Statistics with Restricted Population Size of 350,000 or Less

Variable	Observations	Mean	Std. Dev.	Min	Max
Income	150	12763.4	5769.699	4776	28976
Median age	193	29.01985	3.84508	22.1	41.2
Population	309	141651.6	87971.17	21290	346038
Education per capita	309	18039.81	17751.56	0	97499
Poverty level per capita	309	21926.64	14016.72	2963	89988
Rating	309	18.64369	3.568286	2.9	21
Rank	309	2.139159	2.661056	0	10
Log income	150	9.348978	0.4680457	8.471358	10.27422
Log population	309	11.64687	0.685487	9.965993	12.7543

Table 8. Regression Results with Restricted Population Size of 350,000 or Less and Average Rating from Preceding Decade as Independent Variable

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log of population	Log of income	Education per capita	Poverty level per capita	median age
Rating	0.00812**	0.00184	0.000373	0.00126	0.0809*
	(0.00356)	(0.00214)	(0.000593)	(0.000895)	(0.0414)
Observations	309	150	309	309	193
R-squared	0.958	0.992	0.902	0.769	0.928

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9. Regression Results with Restricted Population Size of 350,000 or Less and Number of Times Ranked as Independent Variable

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log of population	Log of income	Education per capita	Poverty level per capita	Median age
Rank	0.0107**	0.00343	0.000546	0.00150	-0.0818
	(0.00490)	(0.00301)	(0.000816)	(0.00123)	(0.0577)
Observations	309	150	309	309	193
R-squared	0.958	0.992	0.902	0.769	0.927

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1