

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF ECONOMICS

THE ECONOMIC IMPACT OF MINOR LEAGUE BASEBALL

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SPRING 2014

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Economics
with honors in Economics

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ABSTRACT

This paper uses a data set to determine whether or not there are positive economic benefits from government subsidies on stadium construction for Minor League Baseball teams. Specifically, I used a data set consisting of 100 Metropolitan Statistical Areas in the United States from the years 2000-2012 to determine if markets that hosted a team had lower unemployment rates than Metropolitan Statistical areas that did not host a team. Overall, markets that had a Minor League Baseball team also had a statistically significant lower unemployment rates, however on an individual basis, AAA teams were correlated with higher unemployment rates while both AA and A teams were correlated with lower rates.

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ACKNOWLEDGEMENTS

I would like to thank Professor Ed Coulson for helping to guide me through the entire thesis process. From meeting to discuss potential topics, to aiding in my compiling of the data and analyzing of the regression results, Professor Coulson was able to help keep me from getting too overwhelmed. Additionally, I would like to thank Dr. James Tybout for helping me to keep pace as I progressed through the writing process as well as reviewing drafts of each section of the thesis with me. Furthermore, I thank Dr. Nola Agha for personally discussing the results of her research on Minor League Baseball with me, as well as aiding in the construction of the data set I used. Finally, I would like to thank both the Schreyer Honors College and the Pennsylvania State University Economics Department for providing me with all the necessary tools and skills that I will need to succeed both inside and outside of the classroom.

Chapter 1

Introduction

Over the past few decades, the professional sports industry has quickly become one of the largest industries in the country, with the mass consumption of professional sports boasting a total revenue of over \$470 billion in 2013 (Plunkett 2013). These sports have become so popular that they have undoubtedly engrained themselves as part of our national culture. Complete strangers can bond together over these sports teams while entire communities can be united behind a team during a playoff run. In order to lure teams to a new market, or keep a team satisfied with staying in their current market, state and local governments have often been contacted by organizations in order to provide stadium subsidies. Dating back to 1917, there have been cases where government subsidization has been used to build a new stadium. However, these stadiums were meant to be constructed in a manner that would allow it to be used for multiple activities, including parades, rallies, and festivals in addition to professional sporting events (Coates and Humphreys, 2008).

More recently, these subsidies have begun to stray from aiding in the provision of a public venue to be used for a large variety of events to allowing the construction of a large, privately controlled facility, normally owned by a professional sports franchise that has the control over availability of the stadium hosting other events. There are advocates of public stadium subsidies who argue that there are positive externalities associated with the presence of a professional team, such as an increase in incomes or jobs, and that these

increases offset the cost of the subsidy provided by the local or state government (Agha, 2013). In general, a subsidy can be justified based on whether or not it is economically efficient, meaning the marginal social benefits outweigh the marginal social costs, or can be justified as a means of redistribution, for example, public schooling.

In the case of stadium subsidization, the justification can be slightly more complicated. While some subsidies are used to move towards a more efficient outcome in an already existing market, stadium subsidies are used for the construction of a new stadium, leading to only two options – no construction of a new stadium and subsequently no events being hosted, or the construction of a new facility. These new facilities are often built in order to attempt to lure a team away from another city, or to help keep an already existing team from relocating. While there is certainly a sense of community pride that comes from hosting a professional sports franchise, there may not be much additional economic benefit.

In fact, most of the research that has been done regarding the pecuniary benefits of the presence of a professional sports team shows that there are little to no economic gains associated with a city hosting a team. During their research, Coates and Humphreys have found that there is “no evidence of a positive economic impact of professional sports teams and facilities on urban economies” (2003). Instead, it appears that a team’s presence causes a substitution of other leisure activities in the city, not any additional activity. While most economists agree that there are no direct economic benefits from the presence of a professional sports team, until 2013, there had been little research done regarding the economic impact of a Minor League Baseball team. Dr. Nola Agha decided, after noticing a minor league stadium building boom, to see if the claims by

minor league owners that their teams and ballparks lead to increased income and employment. She believed that the diversity in the cities that hosted minor league teams allowed her study to explore a sample with a larger total size and variance. While normally major league teams are located in the largest metropolitan areas which make it difficult to find any prominent effects due to normal fluctuations in the regional economy, analyzing the effect of the presence of minor league baseball teams may be easier due to the smaller sizes of the metropolitan areas in which they are located (Agha, 2013).

Another measurement for the benefits provided by a professional sports team focuses on the intangible benefits, such as civic pride, and measures compensating differentials to determine if there are any improvements in quality of life in cities that host a professional team. A compensating differential can be defined as the amount of additional income required to accept an unpleasant job, or conversely, could be the willingness to accept a lower paying job due to additional benefits, including a professional sports team. If the theory of compensating differentials is correct, then the presence of a new team would attract new people to the town, which, in turn, would drive down wages. In her research from early last year, Agha studied the effect of the presence of a minor league baseball team or stadium on income. In order to further this research I plan on analyzing the relationship between the presence of a minor league baseball team and the unemployment rate in the surrounding area. There are two opposing hypotheses for this research; if there is an economic benefit to hosting a minor league, then we would expect to see lower unemployment rates. However, if the theory of compensating differentials holds true in regards to minor league baseball, then it could also raise the

unemployment rate if teams, in fact, do not generate any additional economic activity and there is a shortage of jobs for new people moving to the market to experience the utility gained due to the presence of a team.

Chapter 2

Literature Analysis

The impact of professional sports teams on the local economy has been a subject of interest for economists over the past few decades. While there is a significant amount of research that has been done on the National Football League (NFL), National Basketball Association (NBA), and Major League Baseball (MLB), there has been significantly less research done on Minor League Baseball (MiLB). I will start by looking at some of the research that has been done analyzing pecuniary benefits of professional sports teams, then I will look specifically at the work by Carlino and Coulson on compensating differentials in the NFL, before finishing the literature review by analyzing Agha's work on the effect of minor league teams on income per capita in the metropolitan area.

In general, economists agree that there is no need to continue to spend millions of dollars providing subsidies for professional sports teams to build new facilities. During a survey of a random sample of members of the American Economic Association in 2006, Robert Whaples posed the following statements and asked members of their agreement:

Local and state governments in the United States should eliminate stadium subsidies to professional sports franchises.

This was just one of twenty agreement questions asked of the random sample. Possible responses were "Strongly Agree," "Agree," "Neutral," "Disagree," and

“Strongly Disagree.” Out of 210 Ph. D. economists surveyed through this questionnaire, 121 (58%) answered with “Strongly Agree,” and an additional 58 (28%) answered with “Agree.” There were 21 (10%) “Neutral” responses and only 10, just five percent of the sample of Ph. D. economists surveyed, disagreed with the statement by Whaples. He goes on to comment that out of the twenty questions asked, this one received a higher percentage of “Strongly Agree” votes than any other question (Whaples, 2006).

While it has become increasingly more apparent that economists agree, in general, that there is not enough of an economic impact to justify spending millions on stadium subsidies, city mayors and other officials continue to suggest that the presence of professional sports teams in their city provide benefits such as strengthening the tax base and providing the framework for future economic growth (Carlino and Coulson, 2004).

However, there is little, if any, empirical evidence to back these claims. According to Coates and Humphreys, when a city is debating building a new stadium to attract a sports team or relocate within the city using public financing, the owner of the sports franchise typically requests an economic impact study to justify the subsidy. These studies must be projective, and tend to forecast future economic activity that would flow from a new facility into the local economy. Typically they’re performed by a private consulting firm that was hired by the franchise, and project large positive benefits to the local economy, including huge increases in both tax revenues and incomes, as well as hundreds of jobs being brought to the community. These economic impact studies commonly fall under the same criticisms, that the procedures and assumptions are biased, often drawing upon unfounded claims from previous studies (Coates and Humphreys, 2003).

Aside from the projections in the economic impact studies, another category of evidence regarding the economic impact of professional sports franchises comes from retrospective studies. These are often submitted to peer-reviewed academic journals, and include extensive econometric techniques to measure the change in average level of income per capita, average earnings of workers in different sectors, and unemployment. According to a survey on the literature on retrospective studies from Sigfried and Zimbalist in 2000, there has been no retrospective econometric data that shows any evidence of positive economic impact from professional sports franchises on an economy, and even go as far to say that there has been some research showing that there is a negative economic impact from professional sports franchises on the local economy (Sigfried and Zimbalist, 2000).

Considering the large amount of empirical evidence that denounces the notion that professional sports franchises do not foster economic growth, it is important to look at the intuitive reasoning behind why these findings make sense. In their analysis of compensating differentials in the NFL, Carlino and Coulson stated that instead of professional sports teams inducing residents to spend more on entertainment value, they instead just reallocate their spending to include events and activities related to the franchise and away from other near substitutes. Another point they made, was that professional athletes and coaches do not normally live in the same place year round, and therefore even with the high salaries they are earning, the same percentage of income won't go back to the local economy when compared to that of a non-athlete. Furthermore, due to the relatively short career length of a professional athlete when compared to that of a non-athlete, athletes tend to save their money, knowing that when their playing career is

over, they still have money to live off of (Carlino and Coulson, 2004). Finally, the money that has been spent subsidizing the professional sports team is being detracted from other, potentially more important public services. Some consequences could include fewer police officers and firemen, a less productive public education system, or less upkeep on local roadways and parks, any one of which can lead to lower productivity by workers in the community, which in turn can lead to lower incomes.

If anyone of the situations described above were to occur, any additional income generated by the subsidization of stadiums for professional sports teams will be lower than if they had instead used the subsidy for alternate uses. Therefore, if we are comparing the average income per capita for a city with a professional franchise to a city without a team, we would expect to see income lower in the host city. However, this is where Carlino and Coulson decided to apply the theory of compensating differentials when analyzing the benefits of a professional franchise on the local economy. The idea is that residents will accept a lower wage at their job because the additional benefit from having a sports team in the community may outweigh the loss in income. For the theory of compensating differentials to hold true, we would expect to see people who enjoy the amenity of a sports team moving into the city while residents who do not want to accept lower wages would move out.

Measuring the effect of compensating differentials in a city that is hosting a professional sports team can prove to be difficult, however. In their 1997, Hamilton and Kahn attempted to study compensating differentials while measuring the social benefits that would come with hosting a professional sports team, but realized that despite the fact that these differentials may exist, a correlation between a sports team and the wage rate

will be thrown off by correlations between these variables and other city-specific variables including city size.

In order to weaken the correlation between city size and presence of a professional sports team, Carlino and Coulson chose to focus specifically on NFL teams in the 1990s as there was a migration from very populated cities, such as Los Angeles and Houston, to more mid-level metropolitan areas such as Charlotte, Jacksonville, and Nashville. In addition to using a sample that would be less influenced by large metropolitan areas, they also came up with a set of city fixed effects, all specific for each city, as well as time-varying city specific effects, including effects that helped control for the influence of varying populations. In order to run the regression and measure the effect of the compensating differential, a dummy variable is created that indicates the presence of a team. By controlling for various factors that can also affect the wage rate, Carlino and Coulson were able to run a regression, and their results found that there was indeed an overall decrease in the wage rate in cities that hosted an NFL franchise, thus confirming their hypothesis that once measurements for quality of life are included, these franchises become public goods and therefore stadium subsidies are a good investment for a city and its residents (Carlino and Coulson, 2004).

However, this sparked an even larger debate among economists on the benefits of professional sports and a justification for stadium subsidies. In 2006, Coates, Humphreys, and Zimbalist collaborated on a response paper to the study done by Carlino and Coulson analyzing compensating differentials in the NFL. Coates, Humphreys, and Zimbalist contend that Carlino and Coulson made some empirical errors which, when adjusted for, diminish the significance of the results. In their paper, Carlino and Coulson found that

cities with an NFL team had higher rents by an average of roughly eight percent. Upon their analysis of Carlino and Coulson's data, Coates, Humphreys, and Zimbalist found that rents in houses with holes in the floor or trash in the street suffered by the same magnitude that the presence of an NFL team provided. Furthermore, they saw that the MSA income per capita variable had virtually no effect on housing rents. This seemed off to Coates, Humphreys, and Zimbalist, as they wrote:

It seems highly unlikely that the presence of an NFL franchise in a city has about the same impact, though in the opposite direction, on the rent of a house or apartment as do holes in the floor, and is more important in explaining observed variation in rent than the level of per capita income in the MSA (2006).

While working with the data set, Coates, Humphreys, and Zimbalist found that by removing just observations with rents less than \$20 the results of the regression ran by Carlino and Coulson were no longer statistically significant. They found that the statistically significant findings were the result of a sample size that included a small number of low rent observations; the removal of observations with extremely high rents did not have the same effect on the regression as removing the lower levels of rent.

Another issue addressed by Coates, Humphreys, and Zimbalist, is that in order to truly observe the effect of an NFL team on the local economy, the sample must contain a number of observations in which a city hosted a team in one period and did not in the other. In the two samples used by Carlino and Coulson which looked at which cities hosted franchises in 1993 and 1999, only eight cities gained or lost an NFL team. Furthermore, there was no rental data available from Charlotte, so the identification of

the effect relies upon seven cities. Out of the seven cities, Coates, Humphreys, and Zimbalist argue that Los Angeles had the most dominating effect on the regression. Los Angeles lost an NFL franchise between 1993 and 1999, and while the rents in the city fell during that period, there was a 72% increase in observations from Los Angeles in between the two periods studied. Although Coates, Humphreys, and Zimbalist contested the findings of Carlino and Coulson by manipulating the sample set, they commended the work as it moves the current economic literature in the correct direction by attempting to analyze and quantify the value of non-pecuniary benefits. Nonetheless, they reached the same conclusion as almost all of the economists before them – the billions of dollars being spent on stadium subsidies cannot be justified with empirical evidence.

Carlino and Coulson would proceed to contest the findings presented by Coates, Humphreys and Zimbalist. In regards to the first point made in their comment on Carlino and Coulson's original paper, they agree that an error was made regarding the inclusion of the very low rents. However, where Coates, Humphreys, and Zimbalist found results with large standard errors, Carlino and Coulson find that by using clustering corrections for both metropolitan area and time, the standard errors are reduced and the NFL effect is still present and significant (2006).

Additionally, the comments regarding the city composition made by Coates, Humphreys, and Zimbalist were contested. They argued that because the sample only offered contained a select few cities that saw an NFL team leave or move to the city between 1993 and 1999, each having average rents varying across the relevant cities. Carlino and Coulson contend this point, arguing that the city fixed effects, including in every regression, control for those difference. Furthermore, the only thing that the seven

cities have in common was the status of an NFL team during the two periods observed. Therefore, any rent trends that the cities had in common, were due to the only other measured variable that they had in common, presence of an NFL team. In regards to the bias added by the inclusion of Los Angeles in the regression, Carlino and Coulson state the fact that the clustering corrections for both metropolitan area and time were included specifically to control for situations where sample sizes have changed drastically between periods. However, to even further address the concern that Los Angeles was driving the results favor of the NFL effect, Carlino and Coulson decided to remove the city from the regression altogether. The results were that Los Angeles was unfavorable to proving the NFL effect, and its removal from the data set substantially strengthens both the size and significance of the effect. Despite the fact that Carlino and Coulson only strengthened the point they made regarding compensating differentials and the NFL, they come to the same conclusion – while it is possible that the regression failed to control for some factor that would be positively correlated with an NFL presence and rents, it is obvious that failing to adjust for non-pecuniary benefits of a sports franchise will greatly understate the economic impact on a community (2006).

After years of research showing little to no direct economic benefit at the major league levels of professional sports, Dr. Nola Agha decided to focus her study on a professional sport played in more cities across the United States than each of the four major professional leagues combined – Minor League Baseball. The purpose of her research was to close the gap in literature where literally no studies of Minor League Baseball were present, specifically to provide an ex post analysis of whether or not the use of government investments and subsidies truly lead to economic expansion in the

surrounding market. In order to analyze the local economy of a minor league team, Dr. Agha used the existing Metropolitan Statistical Areas (MSAs) defined by the United States Census Bureau as the individual market for each specific team. It is important to note that some MSAs were so large that they hosted multiple teams during one year, such as Chicago who hosted 5 different minor league teams in 2006, and because of this some adjustments had to be made to Dr. Agha's data set.

Prior to eliminating MSAs that hosted multiple teams or were simply too large for the presence of a Minor League Baseball team to have a major effect on the economy, Dr. Agha formed a set of 4,495 team-year observations. These team-year observations included teams that had played in AAA, AA, A+, A, A-, and independent minor leagues between the years 1980 and 2006. However, after removing the MSAs that weren't reflective of the minor league team's market, and eliminating the first five years of the sample in order to establish a honeymoon effect for new teams, Dr. Agha had a complete data set spanning from 1985 to 2006 that included 238 MSAs.

The regression model used by Dr. Agha modeled income in a specific MSA for a specific year as a function of a vector of local market variables, a vector of franchise and stadium variables, as well as fixed effects for MSA and time. The local market variables were designed to mimic research completed by Coates and Humphreys and included measurements such as rate of employment and change of population. The franchise and stadium variables focused on aspects such as stadium age and capacity, as well as the popularity of the parent franchise for affiliated minor league teams.

The results of the regression were much different than the results seen at the major league level. Dr. Agha found that MSAs that hosted AAA and A teams during the

period of 1985-2006 had statistically significant higher levels of income. The presence of a AAA franchise was associated with an increase of \$67.25 (p-value of .034) in per capita income in the MSA, while the presence of a A franchise resulted in the increase of \$117.57 (p-value of .044) in per capita income. The model also included measurements of stadium age and quality, and Dr. Agha found that both AA and rookie league stadiums were associated with statistically significant higher levels of income as well (Agha, 2013).

In their paper discussing compensating differentials in the NFL, Carlino and Coulson state that the presence of an NFL team results in a reallocation of spending within the economy as opposed to increased economic activity. However, for the case of the AAA teams that resulted in higher levels of per capita income, Dr. Agha states that teams that are more geographically isolated will be able to induce spending from visitors as well as having a strong regional following. Similarly, AAA is the highest level of minor league play and therefore offers the highest quality baseball experience of all minor league classifications.

Due to the fact that there are only associations between AAA and A teams and higher levels of income as well as AA and rookie stadiums and higher levels of income, it may be more likely that there is simply a correlation between these factors and no causation. For AA and rookie stadiums which host an average of 3,837 attendees 70 times per year and 1,364 attendees 35 times per year respectively, it is hard to believe that these stadiums are generating enough economic activity to cause increased per capita income levels across a large geographic region (Agha, 2013). However, it is possible that these stadiums can be associated with an urban redevelopment, acting as the center of

new infrastructure or land development, which in turn would hopefully lead to healthier economic activity. While the majority of classifications showed no increased levels of per capita income for teams or stadiums, certain levels of play were associated with increased economic activity. Since, the majority of classifications were not correlated with higher incomes, there was most likely not a causation effect in the four areas which did result in increased per capita income. It is possible that minor league teams tend to settle in areas with healthier economies, although the presence of the team might not have any significant effect on an economy once it has settled down. The purpose of my regression will be to determine if there is a correlation between the presence of a team and unemployment rate, suggesting that teams might relocate to areas with lower unemployment in order to capitalize on a healthy economy.

Chapter 3

Data and Methodology

Similar to the data set used by Dr. Agha in her analysis, the set here matches Minor League Baseball teams to their corresponding Metropolitan Statistical Area (MSA) in order to compare the economic effects on that market. An MSA in the United States is defined to be a geographical area with a high population at its core and close economic ties throughout the region. Currently, the United States is broken up into 381 MSAs, with populations ranging from 55,000 people to over 19 million. Additionally, there are Micropolitan Statistical Areas that host smaller markets and economies, however virtually none of the MiLB teams played in a Micropolitan Statistical Area over the past few decades.

When studying the effects of Minor League Baseball teams, it is important to note that it is not a homogenous product. There are currently two AAA leagues (International and Pacific Coast), three AA leagues (Eastern, Southern and Texas), five A leagues (California, Carolina, Florida State, Midwest, and South Atlantic), as well as four more short season and rookie leagues and numerous unaffiliated independent leagues. Within each league, there are varying numbers of teams as well as varying numbers of games played based on the league classification. Furthermore, teams playing in AAA and AA leagues generally play in cities with larger populations (Census). This allows them to play in front of larger audiences at a higher quality of play over a longer season than the A counterparts, and therefore would most likely result in a higher economic benefit. In

addition, affiliated teams should boast higher quality players (taken in one of the MLB drafts) as well as benefits through branding with their MLB affiliate and increased media exposure for prospects, all of these leading to stronger economic impacts.

The analysis located here is meant to determine if the presence of a Minor League Baseball team has a positive economic impact upon its MSA, manifesting itself through lower unemployment rates than MSAs across the country that don't host teams. The Federal Reserve Economic Data provided by the St. Louis Fed contained annual unemployment rates for each of the Metropolitan Statistical Areas in the United States ranging from 2000 to 2012. Similarly, the United States Census Bureau contained population estimates for each MSA over the same span. Once the window had been established, the data collection process began by identifying which MiLB teams played in different markets in between 2000 and 2012.

There are certain minor league teams that play in both Canadian and Mexican Leagues, and since those markets are not contained in MSAs within the United States, each of those teams was immediately discarded. The MSA will most accurately represent a team's market if it is located at the center of that MSA. Unfortunately, this is not always the case, especially around large urban economies. For example, in 2012 the Riverside-San Bernardino-Ontario, CA Metropolitan Statistical Area hosted four A teams, the High Desert Mavericks, Lake Elsinore Storm, Lancaster Jet Hawks, and Rancho Cucamonga Quakes. While the 2012 population of the Riverside-San Bernardino MSA was over 4.5 million, the populations of the counties that house these cities varied considerably, with the market for the Lancaster Jet Hawks at around 175,000. Due to the fact that this problem can occur around major metropolitan areas, and we don't want a

team with a market of 175,000 people to be treated as a city with over 4.5 million people, the following major MSAs were removed due to their size: Atlanta, Baltimore, Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, Miami, Minneapolis, New York, Philadelphia, Phoenix, Riverside-San Bernardino, San Diego, San Francisco, Seattle, St. Louis, Tampa, and Washington, D.C.

Removing the largest 20 MSAs in the United States helps to eliminate bias that might come from the market of a small team located 60 miles from Chicago being treated as a major metropolitan sports team, however there is still another major factor that could cause the correlation between the presence of a minor league team and economic health, specifically unemployment – the presence of a professional sports team from either the MLB, NBA, NFL, and NHL. It is reasonable to assume that if a minor league baseball team is sharing the market with an NFL or NHL team, that the professional sports team would have more of an effect on the surrounding area than a minor league team. Therefore, the following MSAs outside of the 20 most populous that contained a professional sports team during the period between 2000 and 2012 were removed from the sample: Buffalo, Charlotte, Cincinnati, Cleveland, Columbus, Denver, Indianapolis, Jacksonville, Kansas City, Memphis, Milwaukee, Nashville, New Orleans, Oklahoma City, Orlando, Pittsburgh, Portland, Sacramento, Salt Lake City, San Antonio, and San Jose. After the removal of the 20 most populous MSAs and this list of 21 MSAs that hosted professional sports teams during our 13 year span, there are 340 MSAs left for the analysis, with populations ranging from 55,000 to 1.8 million (a drastic drop from the 19 million ceiling prior to constraining the data set).

With the remaining MSAs available, the data collection process proceeded by attempting to match each team to a distinct MSA. The analysis here will focus on all affiliated, full season minor league teams. Specifically, we will look at the two AAA leagues in the United States, as well as the three AA and five A leagues, while disregarding short-season A leagues, rookie leagues, and unaffiliated leagues, regardless of their classification.

Within the AAA classification, there are two leagues in the United States that contain affiliated teams – the International League and the Pacific Coast League – containing 14 and 16 teams, respectively. Out of the 14 teams in the International League, five teams played in one of the 41 MSAs that have been removed from the data set, and two teams transferred markets during the 13 year period. In the Pacific League, ten teams were located in the major markets and were removed from the data set, leaving four teams that remained in the same MSA and two teams who transferred markets during that time. The final sample of teams representing the AAA classification consisted of 11 teams that were constant and four teams that relocated at least once between 2000 and 2012.

As of 2012, the final year of our sample, there were 30 teams in the United States playing AA Minor League Baseball. This included 12 teams from the Eastern League, 10 from the Southern League, and 8 from the Texas League. In the Eastern League, three teams were located in major markets, and two relocated, leaving seven teams that were stationary over that period. In the Southern League, only two teams were in major markets and another two transferred markets, leaving six teams stationary and two relocating, while in the Texas League, three teams remained stationary, three teams

relocated to a new MSA, and two were contained in MSAs that have been eliminated from the sample. Overall, the data set analyzing the impact of AA MiLB contained 16 teams that played in the same market for the entirety of the 13 year span, and seven teams who relocated.

Across the five leagues playing A baseball in 2012, there were 60 teams that played in the United States. The California, Carolina, and Florida State Leagues, all condensed to play their games in the radius of a state or two, host ten, eight, and twelve teams respectively, while the larger, more expansive Midwest and South Atlantic Leagues each have 16 and 14 teams, respectively. Due to the fact that the California, Carolina, and Florida State Leagues are all confined to roughly one state, many of the teams are located in the outskirts of major MSAs that have been eliminated from the sample. In the California League from 2000-2012, only four teams were located in markets that were still in the data set, and none of those teams relocated during that period. Out of the eight teams in the Carolina League, half were located in major MSAs, and similar to the California League, the four remaining teams were stationary throughout the 13 year period. Continuing the trend in the “state based leagues,” the Florida State League had half of its teams located in the Miami/Orlando/Tampa MSAs. Out of the six remaining teams, five of them stayed in the same market while one transferred markets during this time.

Although both the Midwest League and the South Atlantic League were both spread out of a larger area than the California, Carolina, and Florida State Leagues, a good deal of the teams are still located along the outskirts of major MSAs. Out of the 16 teams in the Midwest League, only nine teams were located in eligible MSAs, and out of

those nine, two relocated. Similarly, in the South Atlantic League, there were again nine teams that played in MSAs included in the data set, but only one team transferred markets during that period. Therefore, overall for the A classification, the data set consists of 28 teams that were stationary during the thirteen year period between 2000 and 2012, while only four A teams relocated markets.

Combining all three classifications, the data set consists of 55 teams that played MiLB in the same MSA from 2000 to 2012, and 15 teams that relocated at least once during the same span, or a total of 70 MSAs that hosted a minor league team. However, the analysis would be incomplete if we were only comparing markets that had a team for the entirety of the 13 year period against those that relocated once during the same period. In order to determine if there is a correlation between the presence of a minor league team and the economic health of that market, we must be able to compare markets containing minor league teams and markets that contained a team for some length of time during the 13 year period to MSAs that never hosted a team. Instead of using all of the remaining MSAs in the United States, a smaller, random sample of 30 MSAs was chosen via a random number generator. Utilizing the data provided by both the United States Census Bureau and the Federal Reserve Economic Data through the St. Louis Fed, a total sample of 100 Metropolitan Statistical Areas was created, where 55 of the MSAs contained a minor league team for the entirety of the period, 15 MSAs had teams that relocated, and 30 MSAs that had never hosted a team during the span. At the top of the next page, Table 1 provides an overview of the data set, including observations at each classification, transfers, and average population.

Table 1: Metropolitan Statistical Areas Hosting Minor League Baseball Teams

Classification	Observations	Tranfers	Transfer %	Avg Population
AAA	15	4	26.67%	818,581
AA	23	7	30.43%	449,682
A	32	4	12.50%	398,477
No Team	30	N/A	N/A	246,602

An econometric model was created to represent the unemployment rate of a corresponding MSA (j) at time (t) of the following form:

$$U_{jt} = \alpha + X_j + Z_t + \beta_1 MiLB_{jt} + \beta_2 P_{jt} + \varepsilon$$

Where:

U_{jt} = unemployment rate in MSA j at time t

X_j = fixed effects specific to MSA j

Z_t = fixed effects specific to time t

$MiLB_{jt}$ = dummy variable indicating the presence of a Minor League Baseball team in MSA j at time t. The variable takes the value of 1 if there was a team in MSA j at time t and takes the value 0 if there was not a team present.

P_{jt} = population of MSA j at time t

ε_{jt} = the disturbance term accounting for error

The model uses an MSA specific fixed effect defined by X_j to control for any time-invariant characteristics in the MSA which could contribute to the unemployment

rate, as well as a time specific fixed effect defined by Z_t to control for any city-invariant factors during a particular year that could have potential influence of the unemployment rate of a certain MSA.

The dependent variable is the unemployment rate of the MSA during a certain year, and was gathered through the Federal Reserve Economic Data. Combined with the population data gathered from the United States Census Bureau as well as the Minor League Baseball data, the model and data set were entirely complete and the regression was able to be run.

Chapter 4

Discussion of Results

The initial regression completed utilized the entire 1300-observation sample to test the effect of all classifications of affiliated Minor League Baseball teams on the unemployment rate of their corresponding Metropolitan Statistical Area. Similar to how Dr. Agha's results suggested a correlation between some MiLB classifications and increased income, this regression yielded that the presence of a MiLB team is associated with a decrease in the average unemployment rate of the MSA by .39, with a p-value of .012. Despite the fact that years of research have shown no pecuniary benefits from the presence of major league teams on the local economy, this regression, coupled with Dr. Agha's regression, has shown that Minor League Baseball teams do have a positive effect on the corresponding MSA. There are a few reasons that this effect is present for minor league teams but not major league teams. However, before analyzing the results, it is necessary to look at the regressions which isolated the three individual classifications of affiliated Minor League Baseball.

Three additional regressions were ran, one which utilized only markets that hosted AAA franchises (as well as markets that never hosted any team), one with only AA franchises, and a third with only A teams. The different observations used as well as the coefficients of determination are provided in Figure 1 on the page 23. The first regression, which only tested the effect of the AAA teams, opposed the overall trend

Figure 1: Regression Information and Coefficients of Determination

```
. xi: reg UnemploymentRate i.City i.Year Team Population
i.City      _ICity_1-100      (naturally coded; _ICity_1 omitted)
i.Year      _IYear_2000-2012 (naturally coded; _IYear_2000 omitted)
```

Source	SS	df	MS	
Model	11135.8302	113	98.5471695	Number of obs = 1300
Residual	1127.08834	1186	.950327434	F(113, 1186) = 103.70
Total	12262.9185	1299	9.44027598	Prob > F = 0.0000
				R-squared = 0.9081
				Adj R-squared = 0.8993
				Root MSE = .97485

```
. xi: reg UnemploymentRate i.City i.Year Team Population
i.City      _ICity_1-100      (naturally coded; _ICity_1 omitted)
i.Year      _IYear_2000-2012 (naturally coded; _IYear_2000 omitted)
```

Source	SS	df	MS	
Model	6350.67888	58	109.494463	Number of obs = 585
Residual	551.454385	526	1.04839237	F(58, 526) = 104.44
Total	6902.13326	584	11.8187213	Prob > F = 0.0000
				R-squared = 0.9201
				Adj R-squared = 0.9113
				Root MSE = 1.0239

```
. xi: reg UnemploymentRate i.City i.Year Team Population
i.City      _ICity_16-100     (naturally coded; _ICity_16 omitted)
i.Year      _IYear_2000-2012 (naturally coded; _IYear_2000 omitted)
```

Source	SS	df	MS	
Model	6166.78671	66	93.4361623	Number of obs = 689
Residual	568.843302	622	.91453907	F(66, 622) = 102.17
Total	6735.63001	688	9.7901599	Prob > F = 0.0000
				R-squared = 0.9155
				Adj R-squared = 0.9066
				Root MSE = .95632

```
. xi: reg UnemploymentRate i.City i.Year Team Population
i.City      _ICity_39-100     (naturally coded; _ICity_39 omitted)
i.Year      _IYear_2000-2012 (naturally coded; _IYear_2000 omitted)
```

Source	SS	df	MS	
Model	8644.37145	75	115.258286	Number of obs = 806
Residual	798.837146	730	1.09429746	F(75, 730) = 105.33
Total	9443.2086	805	11.7306939	Prob > F = 0.0000
				R-squared = 0.9154
				Adj R-squared = 0.9067
				Root MSE = 1.0461

established by the initial test. While the original regression showed that MiLB teams are associated with a decrease in the unemployment rate by .39, AAA franchises are correlated with a .81 increase in the unemployment rate, with a p-value of .01. It would make sense then that both AA and A franchises will be associated with larger reductions to the unemployment rate to help compensate for the increases brought on by the presence of AAA teams. Indeed, this is the case, as the presence of both AA and A franchises are associated with a decrease in the unemployment rate of .51 and .92 respectively. Both of those values were statistically significant as well, with p-values of .021 for AA teams and .004 for A teams, as displayed in Table 2 located below.

Classification	Coefficient	T	p-value
All	-0.39	-2.53	0.012
AAA	0.81	2.57	0.010
AA	-0.51	-2.31	0.021
A	-0.92	-2.89	0.004

The results of the regressions confirm, to a certain degree, what Dr. Agha had found in her research – Minor League Baseball is associated with increased economic health in the surrounding Metropolitan Statistical Area. There are multiple reasons why this is the case for Minor League Baseball but not other professional sports leagues. First of all, many of these teams are geographically isolated from other professional sports. If a

consumer values the in-stadium experience of watching a baseball game, but cannot afford to take a trip to the nearest city to attend an MLB game, he or she has the opportunity to attend a minor league game instead. In fact, recent research has shown that minor league games are a substitute for the MLB, especially as the distance between the MiLB club and the MLB club is increasing (Gitter and Rhoads, 2010).

Additionally, affiliated teams stand to benefit from receiving national media attention more than their independent counterparts. Often times, when a player gets hurt at the major league level, he'll play for the minor league affiliates of his team as part of his rehabilitation. Over the past few years many MLB All Stars, including Derek Jeter, Alex Rodriguez, Josh Hamilton, and Ryan Howard, have all participated in multi-game rehabilitation programs with their minor league affiliates. While bringing in higher levels of attendance during these occasions, these teams are also benefitting from being in the media and creating a sense of identity and distinction among other smaller cities. This sense of civic pride may help to explain why unemployment rates are only higher for MSAs that host AAA franchises. Most of the rehabilitation programs that these MLB players undergo take place at the AAA level, placing both the team and city in the national media much more often than the other AA and A teams it may be affiliated with. Secondly, major prospects who are preparing for the majors will most often be found at the AAA level, such as Bryce Harper and Stephen Strasburg of the Washington Nationals, which will also lead to increased exposure for the city. The non-pecuniary benefits received in these cases could be observed as compensating differentials for the, on average, higher unemployment rate in the MSA. These effects will be more prominent

at the AAA level as it offers the highest quality of play in the most professional environment.

In order to see if these effects were able to manifest themselves in a form other than the unemployment rate, another regression was ran to determine whether or not there was an increase in the total number of business establishments in the MSAs that hosted minor league teams. There is certainly an association between the number of establishments and the unemployment rate; however the regression chose to focus on this effect, as Dr. Agha has already studied the effect of Minor League Baseball on income and is currently researching the effects a team has on wages and housing rents. Similar to the initial set of regressions, four separate tests were ran – one for all MSAs that hosted a minor league team, and once for only MSAs that hosted AAA, AA, and A teams.

The regression utilized business data on the total number of establishments in an MSA obtained from the United States Census Bureau. While the regressions that focused on the unemployment rate were calculated over a 13-year period (2000-2012), data for business establishments was only available from 2003-2011, decreasing the total sample size from 1300 observations to 900 observations. The results observed mimicked the same trends observed with the effect of a team on unemployment rate, however in all classifications combined, only AAA teams, and only AA teams, the effect was statistically insignificant, with p-values of 0.385, 0.605, and 0.358 respectively. With a p-value of 0.08, the positive effect of an increase of roughly 175 establishments associated with the presence of a A minor league team. The complete results of the regressions are located in Table 3 at the top of the next page.

Table 3: The Effect of Different Classifications of Minor League Baseball on Total Business Establishments

Classification	Coefficient	T	p-value
All	51.39	0.87	0.385
AAA	-57.61	-0.52	0.605
AA	65.03	0.92	0.358
A	174.69	1.76	0.080

Despite the fact that only one of the classifications produced a statistically significant result, the increase on total business establishments associated with A minor league franchises provides us with an interesting look at MSAs that host A teams. Table 1, which contains information on the different MSAs that had minor league franchises during the period of study, shows that out of the 32 A teams, only four transferred during the 13-year period, a transfer rate of only 12.50%, compared to 26.67% and 30.43% for AAA and AA franchises, respectively. This extremely low transfer rate relative to the other classifications, coupled with the results of the two regressions contained in this analysis as well as the results of Dr. Agha's study suggest that at the A level, there is certainly empirical evidence that the presence of a Minor League Baseball team is associated with benefits to the local economy.

However, the team might not be the cause of the increased number of total business establishments or the decreased unemployment rate. As Dr. Agha stated in her study, it is hard to believe that teams which generate averages attendances of less than

4,000 people per event are capable of driving such economic change in an area (2013). A more likely explanation is that the low transfer rates are a result of A franchises carefully analyzing a market before transferring. Metropolitan Statistical Areas that have a better economy, as evidenced through higher average incomes, lower average unemployment rates, and increased numbers of total business establishments, will most likely have residents that will be able to allocate more spending toward the franchise. Coupled with the placement of these franchises in areas that are isolated from major professional sports teams, this could be one of the main reasons that this correlation between A minor league teams and increased economic health exists.

There are some factors that were not addressed by the regression which could have led to different results. First of all, it is impossible to gather and control for all of the economic variables that could affect the unemployment rate of a Metropolitan Statistical Area. The regression utilized fixed effects for both the MSA and the year, which helped account for fluctuations in the national economy; however, there were other factors that were unaccounted for. Another issue stems from the fact that the model assumes that a minor league teams market directly corresponds to its MSA, when this may not be the case. Of course, if a team is located in the center of a Metropolitan Statistical Area, then the MSA could be a near-perfect representation of the market. This is certainly not always the case, as there are multiple teams which may have fan bases that extend beyond the MSA used to estimate the market in the model. Finally, another effect, which Dr. Agha controlled for and this model did not, was the “honeymoon” effect of a team transferring. This measured the additional newness effect of the team by looking at relative increases in interest, fanfare, and attendance. While her regression produced

roughly the same results both with and without the lagged variable, the regression contained in this study could have benefitted from attempting to measure this effect.

Moving forward and continuing to study the effect of Minor League baseball on the local economy, it would be interesting to study the likeliness of a Metropolitan Statistical Area to lose or gain a franchise as the result of annual changes in income or unemployment rate over time. This would allow us to study whether or not the presence of a team is causing the change or simply correlated with it, as we could see if changes in the variables are more prominent after a team were to transfer markets, where currently it has only been shown that there is an association between the presence of a minor league franchise and the unemployment rate of the surrounding market.

Chapter 5

Conclusion

Over the past few decades, stadium subsidies have become increasingly more popular as cities look to lure professional franchises by offering them the opportunity to play in new, state-of-the-art facilities by relocating. However, these subsidies are often paid for by taxes from the residents of the area, which could be going to improving infrastructure, local school districts, or other public utilities. For years, people have argued that these professional sports teams create additional economic activity and drive economic growth in the area. Unfortunately, almost all empirical evidence presented by economists contradicts that statement.

Last year, Dr. Nola Agha found that Minor League Baseball did lead to pecuniary benefits in the Metropolitan Statistical Area that hosted the team. Specifically, she found that AAA and A franchises, as well as AA and independent stadiums, were associated with increases in per capita income in their corresponding markets. In this paper, we continued the research by analyzing the effects of the presence of a minor league team on the unemployment rate of the MSA that hosted it. The first regression showed that the presence of any affiliated minor league team, regardless of classification, corresponded with a decrease of .39 in the unemployment rate. In terms of individual classification, however, AAA teams were associated with an increase of .81 in the unemployment rate, while both AA and A franchises were correlated with decreases of .51 and .92, respectively.

While both AA and A franchises were associated with decreases to the unemployment rate, it is not likely that the presence of these teams directly caused the drop, when considering the fact that the average attendances fall below 5,000 people per game. Furthermore, although the presence of a AAA team may act as a compensating differential for the higher average unemployment rate, the non-pecuniary benefits are too difficult to measure, especially in the model used in this study. Despite the fact that this study showed a correlation between Minor League Baseball and the health of a local economy, much more research needs to be conducted before economists can use empirical research to justify the spending on hundreds of millions of dollars or professional sporting stadiums.

BIBLIOGRAPHY

- Agha, N. (2013). The Economic Impact of Stadiums and Teams: The Case for Minor League Baseball. *Journal of Sports Economics*, 14(5), 227-252.
- Coates, D. and Humphreys, B. (2008). Do Economists Reach a Conclusion? *Econ Journal Watch*, 3(5), 294-315.
- Coates, D. and Humphreys, B. (2003). Professional Sports Facilities, Franchises, and Urban Economic Development. *Public Finance and Management*, 3(3), 335-357.
- Coates, D., Humphreys, B., and Zimbalist, A. (2006) Compensating Differentials and the Social Benefit of the NFL: A Comment. *Journal of Urban Economics*, 60, 124-131.
- Coulson, E. and Carlino, G. (2004). Compensating Differentials and the Social Benefit of the NFL. *Journal of Urban Economics*, 56, 25-50.
- Coulson, E. and Carlino, G. (2006) Compensating Differentials and the Social Benefit of the NFL: A Reply. *Journal of Urban Economics*, 60, 132-138.
- Economic Research – FRED. (2014). *St. Louis Fed*. Retrieved January 20, 2014 from <http://research.stlouisfed.org>.
- Gitter, S.R. and Rhoads, T. A. (2010). Determinants of Minor League Baseball Attendance. *Journal of Sports Economics*, 11(6), 614-628.
- Hamilton, B. and Kahn, P. (1997). Baltimore's Camden Yard Ballparks. *Sports, Jobs, and Taxes*, 245-281.

Metropolitan and Micropolitan Data. (2014). *United States Census Bureau*. Retrieved

January 20, 2014 from <http://www.census.gov/population/metro/data/>.

Minor League Baseball Encyclopedia. (2013). *Baseball Reference*. Retrieved January 26,

2014 from <http://www.baseball-reference.com/minors/league.cgi>.

Plunkett, J. Sports Industry Market Research. *Plunkett Research*. Retrieved October 7,

2013 from <http://plunkettresearch.com/sports-recreation-leisure-market-research/industry-and-business-data/statistics>.

Siegfried, J. and Zimbalist, A. (2000). The Economics of Sports Facilities and their

Communities. *Journal of Economic Perspectives*, 14(3), 95-114.

Whaples, R. (2006). Do Economists Agree on Anything? Yes! *The Berkeley Press –*

Economist's Voice, 1-6.

ACADEMIC VITA

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The Pennsylvania State University, University Park, PA
College of the Liberal Arts/Eberly College of Sciences
Major: B.S. Economics/Systems Analysis
Anticipated Graduation Date: December 2014

Research Experience for Undergraduates – Penn State, University Park, PA
Undergraduate Research Assistant for Bates White, Fall 2013

- Collected and analyzed empirical data regarding different housing markets
- Used statistical software to create the most efficient regression possible for the data collected
- Presented the findings through a detailed report in a clear manner

Associated Otolaryngologists of Pennsylvania, Camp Hill, PA and Hershey, PA
Financial Accounting Intern, Summer 2013

- Managed cash and credit bank accounts for both office locations
- Reconciled monthly bank statements to in house records and prepared monthly financial statements
- Performed weekly cash flow analysis for direct supervisors

Alpha Sigma Phi Fraternity – Upsilon Chapter – Penn State, University Park, PA
Initiated as a Brother: Fall 2010
President, Spring 2012 and Fall 2012

- Served as the Chief Executive Officer of the Chapter
- Eliminated a \$27,000 outstanding debt with the National Fraternity
- Maintained good standing with the National Fraternity, the Borough of State College, and Penn State Inter-Fraternal Council

Recruitment Chairman, Fall 2011

- Collected and organized information of all Potential New Members who visited the house
- Contacted the Potential New Members to inform them of events being held
- Organized alcohol-free events to attract rushes to the Fraternity

Member-at-Large, Spring 2011 and Fall 2011

- Third in command in the Chapter behind the President and Vice President
- Managed 20 different chairmen in the house, keeping them prepared and organized
- Held weekly meetings to track the progress of the chairs as well as discuss ideas for the betterment of the Fraternity and the house

Social Chairman, Spring 2011 and Fall 2011

- Contacted Sororities and Fraternities to arrange mixers
- Managed a budget of over \$10,000 per semester

Awards Received

Dean's List

William K. Danforth 'I Dare You' Leadership Award

Pennsylvania State University President's Freshman Award

Accepted the Alpha Gamma Upsilon Bronze Cup for Outstanding Chapter Achievement on behalf of the Alpha Sigma Phi Upsilon Chapter and Penn State, as well as seven awards for Chapter Excellence