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If You Win They Will Come:

Fans care about winning in minor league baseball*

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Abstract: *The established literature and prevailing industry wisdom suggest that unlike other sports, minor league baseball attendance is not strongly tied to team performance. The results of this paper counter this claim by showing a strong relationship between a minor league team's winning percentage and their attendance. The empirical analysis takes advantage of a unique data set with over 2,000 team-year observations encompassing all A, AA, and AAA teams between the years 1992 and 2006. Consistent with previous research on minor and major league baseball we find that at AA and AAA, team homeruns are positively related to team attendance. Finally, we examine the relationship between minor league teams and their Major League Baseball (MLB) affiliate. For the most part, minor league baseball teams serve to train young players for their MLB affiliate, but our results suggest MLB team characteristics impact their minor league affiliate's attendance. We find a positive relationship between the price of attending an MLB game and their affiliated minor league team's attendance, which suggests the two products are substitutes.*

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I've been doing this for about nine years now and I've been around some winning teams and I've never seen the attendance increase or decrease any more than 2%. The actual team on the field usually doesn't make a difference.
-Pat Day, General Manager of the Lansing Lugnuts (Class A affiliate of the Toronto Blue Jays)[1]

I. Introduction

Prevailing industry wisdom suggests that attendance at minor league baseball games is not dependent on the quality of the team on the field. For many years, minor league baseball teams have served as player development grounds for their Major League Baseball (MLB) affiliate; player development has often taken precedence over winning at the minor league level. As a result, minor league attendance trends are generally ignored. And with minor league baseball teams often noted more for the creativity of their promotions department in attracting fans to the game, the assumption that fans are not responsive to the success of a minor league team is perpetuated. Empirical evidence even confirms the prevailing wisdom, as Siegfried and Eisenberg (1980) estimated demand for minor league baseball and found no impact of winning on attendance.

But MLB fans are noted for positively responding to winning a pennant (Noll 1974, Baade and Tiehen 1990) and to winning regular season games (Horowitz 2007). For minor league baseball fans to behave in a significantly different way than fans of MLB suggests they are drawn from a different population and have different underlying characteristics driving their behavior. We contend this is not likely. Instead, we offer that minor league baseball fans are indeed responsive to the success of a minor league baseball team just as fans of MLB are responsive to the success of a major league team.

We take advantage of what is perhaps the largest data set assembled to date to examine attendance characteristics of minor league baseball fans. We include data for minor league baseball attendance for 2076 team/year observations from 1992 to 2006. Every minor league team at the A level

[1] Taken from an interview with Hardballtimes.com (26 December 2007) http://www.hardballtimes.com/main/article/an-interview-with-a-minor-league-general-manager/; accessed 19 August 2008.

and above in existence during this time period is included in the data set. This unique data set provides benefits to our analysis that heretofore have not been possible because other studies of minor league baseball attendance suffer from potentially unreliable or insufficient data to draw reliable conclusions. Siegfried and Eisenberg (1980) rely on self-reported data from 27 different minor league teams over a five-year period. This data is likely to suffer from selection bias and only 86 team-year observations are represented in this survey data. In another study, Gifis and Sommers (2006) are able to include lots of detail in their data but can only look at one team for one year.

Using this rich data set, we get results that differ from the existing baseball literature but compare well with the results for minor league and junior hockey (Winfree and Fort 2008). Because our results differ from the baseball literature, we provide a test of fan behavior to determine if minor league baseball fans are similar to MLB fans. Specifically, we examine how the success of the MLB affiliate affects attendance for a minor league team. Each minor league baseball team is affiliated with exactly one MLB team. Each MLB team is currently affiliated with a number of minor league teams; from higher quality to lower quality, these affiliations include exactly one AAA team, one AA team, two A teams (one high A and one low A) and at least two Rookie teams. While the MLB affiliate pays players' salaries, the minor league team pays for all the other expenses of running the team. Affiliations between minor league teams and MLB teams are contracted and can change and vary in length. The design of minor league baseball suggests a fairly strong association between the minor league team and the MLB affiliate.

We examine fan attendance at professional baseball games in this study. Many times, MLB teams and their minor league affiliates are located in relatively close proximity, giving baseball fans a choice of professional baseball games to attend. While the level and quality of play can be quite different between minor league baseball and MLB, baseball fans generally enjoy going to any ballpark to

enjoy any ballgame.[2] In fact, for families with young children, there may be no significant difference in the quality of the experience at the stadium between MLB and minor league baseball games except that minor league baseball games often can be experienced at a lower price. Further, because the minor league team is where future stars of the MLB affiliate generally get their start, fans often desire to watch these games to see the young players develop their skills. These unique features linking minor league baseball teams with their MLB affiliate provides the chance to investigate whether an MLB affiliate serves mainly as a substitute or complement to a minor league baseball team.[3] Our data allows us to estimate the extent to which this kind of relationship exists while providing a test of fan behavior.

The primary aim of this paper is to therefore carefully measure the effect of success of minor league baseball teams on attendance. We further test the robustness of these findings by probing the impact that proximity to and success of the MLB affiliate has on the demand for minor league baseball. In doing so, we are able to present a fairly full picture of the typical minor league baseball fan that is responsive to MLB ticket prices and does not seem to ignore the possibility that the presence of the major league affiliate could be either a substitute or a complement.

We find that fans of minor league baseball respond positively to the success of a minor league baseball team just as fans of MLB do. Moreover, by including the price of attending an MLB game, we find that minor league baseball fans appear to be deliberate in making decisions to attend games when accounting for the proximity to and success of the major league affiliate. In providing detailed insight to the behavior of minor league baseball fans using a rich data set, our paper gives useful information that

[2] We suggest that baseball fans treat MLB and minor league baseball games as close substitutes just as Fort and Quirk (1999) suggest that NFL and big-time college football and Winfree and Fort (2008) find that NHL and minor and junior hockey league teams are close substitutes.

[3] Some MLB teams are located close to both affiliate and non-affiliate minor league teams. We only examine affiliate minor league teams as there likely are synergies that fans recognize and respond to with affiliates—they are primarily developmental grounds for young players of the MLB team—that are not present with non-affiliates. Therefore we assume non-affiliate teams may serve as a substitute but not as a complement to the MLB team.

can aid baseball executives in deciding where to locate minor league affiliates and could suggest some marketing strategies that are consistent with revealed fan behavior.

The remainder of this paper is structured as follows. Section 2 provides a link to the literature, noting the strong connection between minor league and MLB fan behavior. Section 3 describes the data and presents a simple model of minor league baseball attendance. Empirical results and a discussion of these results are given in section 4. Section 5 concludes.

II. Literature Review

Starting with Rottenberg (1956) and Noll (1974), demand estimation, labor issues and stadium funding and location decisions have attracted a lot of attention in MLB research; the same is true in the minor league baseball literature. Siegfried and Eisenberg (1980) model the demand for minor league baseball, Gifis and Sommers (2006) determine the impact of promotions on minor league baseball attendance, Krautmann et al (2000) examine minor league training costs of MLB players, Davis (2006, 2007) looks at location decisions of minor league baseball teams, and Colclough et al (1994) estimate the economic impact of building a minor league baseball stadium.

We focus on demand estimation for minor league baseball here. Horowitz (2007) provides a lengthy inventory of many of the things that have been found to impact MLB attendance. Beginning with Rottenberg's (1956) modeling of attendance at MLB games and Noll's (1974) more general modeling of attendance at professional sporting events, winning is among the first items found to bring more fans to MLB games. While less attention has been placed on estimating demand for minor league baseball, the emerging story in describing attendance for minor league baseball is that fan demand does not appear to be driven by the same things in MLB as in the minor leagues. Other than an affinity for seeing more homeruns in both leagues (Siegfried and Eisenberg, 1980 and Greenstein and Marcum,

1981), very little overlap exists in the direction and magnitude of attendance factors for MLB and minor league baseball (Gifis and Sommers 2006).

Perhaps expecting to see characteristics mirroring that found in MLB, Siegfried and Eisenberg (1980) note, “surprisingly, winning has no effect on attendance” in minor league baseball. This result may have helped solidify the perception that minor league baseball's role is mainly to prepare players for the MLB parent team (Siegfried and Eisenberg 1980) and to provide fans with a link to baseball's simple roots (Gifis and Sommers 2006). In Moneyball, Lewis (2003) offers that fans of a low-payroll, star-deprived MLB team like the Oakland A's can respond positively to winning, suggesting the same may hold for minor league baseball teams.

Siegfried and Eisenberg (1980) conclude that winning has no affect on minor league baseball attendance, contrasting Noll’s (1974) finding for all the major North American professional sports leagues. Their model is estimated using sample survey data that includes only 86 team/year observations from 27 different minor league teams over the 1973-1977 period. We suspect there is selection bias in the data, as some of the teams in the sample were not in existence for very long before the time period studied. For example, Elizabethton began operations in 1974, Midland in 1972, and Asheville disbanded from 1972 to 1975. A honeymoon effect may be at work for each of these teams, suggesting that attendance and winning for these teams are unrelated for at least a part of the 1973-1977 time period. Perhaps the richer and longer data set that we have could more precisely tease out those characteristics affecting demand for minor league baseball without running into problems of selection bias.

A casual observation of MLB’s ticket prices, number of teams and length of season together suggest there may be viable competitors to MLB (Bradbury 2007). Winfree et al (2004) note that new MLB teams that move close to an incumbent MLB team are a substitute and take fans away from the incumbent. Noll (1974) finds evidence that more sports teams in a city will serve as substitutes for an

MLB team. These results suggest that the presence of an MLB team close to a minor league team would likely serve as a substitute for the minor league team. But there is the possibility that this same MLB team could serve as a complement to the minor league team because many fans want to watch players on the minor league team's roster develop into the future stars of the MLB affiliate. The better the MLB affiliate does, the more desire there is to see the future stars of that team. Additionally, there is enhanced fan loyalty, so fans will want to support all levels of the MLB organization. Determining whether fans of minor league baseball treat MLB baseball as a substitute or complement allows us to observe more closely the behavior of these fans. We now move to the next section that describes the data and sets up our model.

III. Data Description and Econometric Model

If minor league baseball fans have the same preferences as MLB fans, then minor league baseball per game attendance should rely on the quality of the minor league baseball team. Additionally if these fans are from the same fan base minor league baseball attendance may also depend on the availability, quality, and price of MLB substitutes (Winfree et al 2004). However, there may also be complementarities between MLB and their minor league baseball clubs if fan loyalty increases demand for minor league baseball through success of the MLB team. We follow the framework established in Rottenberg (1956) and Noll (1974) and reinforced in Winfree and Fort (2008) in setting up our model of minor league baseball per game attendance. The model takes all three of the aspects noted above into account and incorporates team specific characteristics such as minor league ticket prices, income, and population in a minor league team fixed effect (see Winfree and Fort 2008):

$$(1) \qquad MiLB\ Attend = F\begin{pmatrix} MiLB\ Team\ Characteristics, MiLB\ Quality, MLB\ Quality, \\ MLB\ Price, MLB\ Availability, Complementarities \end{pmatrix}$$

We use data from two sources. The first source provides attendance data for minor league baseball and MLB teams from the years 1992 to 2006 (Sports Reference LLC, 2007). In the data set there

are 2076 minor league baseball team/year observations. Previous studies of minor league baseball attendance have used survey data or single team attendance. This data set is extremely robust as it includes data on all minor league teams from A-AAA for every year in the sample. The second source of data is the Fan Cost Index collected by Team Marketing Report, which is a basket of goods that a typical family of four might purchase while attending a game.[4] The Fan Cost Index data is available for every MLB team from 1992 to 2006 but is limited to only 63 team/year observations in 2005 and 2006 for minor league teams. Because the minor league ticket price data is only available for 3% of the observations we cannot include ticket prices for the minor league teams. Instead, like Winfree and Fort (2008), we include team fixed effects to capture minor league baseball ticket prices.

The dependent variable of interest is average per game home attendance for a minor league baseball team (MiLB_Att).[5] At this point it is worth noting that there are four levels of minor league baseball: Rookie, A, AA, and AAA. As players improve they generally move up levels from Rookie to A, AA, and AAA in that order. Therefore, player quality generally is better at higher levels of minor league baseball. Additionally, there is a relationship between location and level (Davis 2006). AAA teams are generally located in mid-sized cities (e.g., Portland (OR), Sacramento (CA), Columbus (OH), and Buffalo (NY)), while A level teams are located in smaller cities (e.g., Cedar Rapids (IA), Macon (GA), South Bend (IN), and Rancho Cucamonga (CA)). Additionally at the lower levels team location is also determined by membership in a league. The leagues are generally clustered in an area of one or a few states for lower levels (e.g., California League, Midwest League, or Texas League) while in AAA teams are spread throughout the US. To control for regional variation and differences between leagues we include league

[4] TMR's Fan Cost Index tracks the cost of attendance for a family of four. The FCI includes: four average-price tickets, four small soft drinks, two small beers, four hot dogs, two game programs, parking, and two adult-size caps.

[5] Average per game attendance is calculated by total attendance/(.5*total games). The data set has home attendance data and while it has total (home and away) games, we do not know the exact number of home games, but barring cancelled games, half of all games should be played on the road and half at home.

dummies. This measure should also proxy for regional factors that might influence demand for minor league baseball such as the percentage of baseball fans and income.

We utilize data from the three highest levels (A-AAA), as data on Rookie league attendance is only partially available.[6] Below Figure 1 shows the average home attendance for three levels of minor league baseball and MLB by year. A few trends of note emerge. First, in general minor league baseball attendance has risen over the examined period in all three levels. In the sample period (1992-2006) per game attendance has increased 75%, 40% and 20% in levels A, AA, AAA, respectively. MLB attendance has returned to its 1994 peak, the year of the baseball players' strike which cancelled the end of the 1994 season and beginning of 1995 season. The second obvious relationship is the difference in attendance between the levels, with lower levels having lower attendance. On average A level attendance per game has been about 60% of AA and 40% of AAA. Given the differences in attendance levels, we provide separate estimations by level to avoid possible heteroskedastic results. Additionally we include year fixed effects to control for the rising attendance in all levels of minor league baseball and MLB through the time period studied.[7]

We now turn to a discussion of the independent variables. The descriptive statistics for all of the independent variables are listed in Table 1. As previous works have shown, MLB team performance is a strong indicator of attendance for MLB teams. Therefore, it is likely minor league baseball team attendance is tied to winning of the minor league baseball team. To control for this possibility, we include minor league baseball team winning percentage (Win %). Since each game is a zero-sum game, the average winning percentage is 50%. The standard deviation is about .07. Winning percentage varies

[6] Level "A" is divided into high A and low A. An examination of attendance between these divisions does not show a substantial difference between the variation of A level minor league baseball. We therefore group them into one level.

[7] A separate model not reported here that replaces year fixed effects with MLB team fixed effects yields results that are not substantially different, with the exception of the relationship between the cost of attending an MLB game and minor league attendance, which have both been increasing over time.

more at the A level with a standard deviation of winning percentage of .075, while the standard deviation of winning percentage is closer to .06 for both AA and AAA. For comparison the MLB standard deviation of winning percentage was .07. Additionally, Siegfried and Eisenberg (1980) and Greenstein and Marcum (1981) suggest that fans not only like to see their team win, but also enjoy homeruns. To account for this, we include minor league baseball team homeruns (Homeruns) as an independent variable.[8] The average for the sample was 92 homeruns, with the three levels, A-AAA, having averages of 74, 106, and 132 respectively. Like MLB, the number of minor league baseball home runs has increased over the observation period, although there was some decline in 2006, the final year of the observation period.

We begin the analysis with a simple regression equation (2), which estimates minor league team variables on the average per game minor league baseball attendance (MiLB_Att) for team i in year t. As suggested above, attendance will be determined by team winning percentage (Win%) and team homeruns (Homeruns). Additional controls are added for league dummies and year fixed effects. Both sets of controls are a series of binaries indicators that equal 1 if team i is in league j or the observation is in year t.[9]

$$\text{MiLB\_ATT}_{it} = \beta_0 + \beta_1 \text{Win\%}_i + \beta_2 \text{Homeruns} + \sum_{j=1}^{j=n} \text{LeagueDummy}_j + \sum_{i=1992}^{2006} \text{Year}_t + \varepsilon_{it} \quad (2)$$

Each minor league team is associated with a major league affiliate. The MLB team selects players for its minor league baseball team and makes decisions in terms of movement of players between teams in the organization. We now turn to our second analysis, where we examine the impact of the MLB affiliate on their minor league team. First, we test if MLB is a substitute or complement to

[8] The homeruns variable measures both homeruns hit at home and on the road. Although fans may care more about homeruns hit at home than total homeruns, our data set contains only total homeruns. Total homeruns should be highly correlated with homeruns hit at home.

[9] Previous works such as Winfree and Fort (2008) use a log-linear model to calculate elasticities. We opt to use a linear model to make the comparison in magnitude of changes between leagues easier. The results of the log-linear model are not substantially different in terms of statistical significance or magnitude.

probe the preferences of minor league baseball fans. For each teams' MLB affiliate, we include a measure of the cost of attending an MLB game called the fan cost index (MLBcost). The fan cost index is a yearly measure of a basket of goods that a typical family of four might purchase at MLB games including tickets, parking, concessions and souvenirs. We convert the index into real terms using constant (1982-1984) dollars from the CPI. The fan cost index measure has been used elsewhere in the literature to control for the prices of the ancillary purchases associated with attending a major league baseball game (Clapp and Hakes 2005). The basket from the fan cost index averaged $126 in nominal terms for the sample. Over the sample period the MLB cost index has gone up 37% in real terms with an average real growth rate of over 2% per year.

A minor league baseball team is many times located within the operating or television territory of its MLB affiliate, but as defined in the MLB Constitution, the size of these territories can be quite different across MLB teams. These territories effectively dictate how large each MLB team's home geographic area is. Some MLB home territories are quite large, so even though a minor league baseball team is within the MLB home territory, sometimes it can be very far away from the home MLB affiliate. Thus, proximity of the minor league baseball team to its MLB affiliate will be expected to impact attendance and MLB prices will likely be more important the closer the minor league team is to their MLB affiliate. For example the Detroit Tigers, an MLB team, have minor league baseball affiliates in Toledo, OH (AAA) and Grand Rapids, MI (A level). The Detroit Tigers are considered the home MLB team in both Toledo and Grand Rapids. The two cities are approximately 60 and 160 miles respectively from Detroit, meaning that local minor league baseball fans can attend an MLB game with relative ease, although it will likely be easier for fans in Toledo to attend a Tigers game in Detroit than fans in Grand Rapids. Even so, this is less likely to be the case for the Tigers' minor league affiliates in Lakeland, FL or Oneonta, NY where fans cannot easily drive to Tigers games.

To control for the impact of distance we include two binary dummy variables. The first (*Local)* is equal to one if a minor league team is less than 100 miles from the major league team affiliate. The second (*Regional*) is equal to one if the minor league team is less than 250 miles and more than 100 miles from their MLB affiliate. The reasoning for the two variables is that a fan within 100 miles (*Local =1*) might be able to leave work at 5pm and attend a night game on a week night starting at 7pm and still return home by midnight. This would be less feasible for a fan over 100 miles away. However, fans within 250 miles would be able to attend a game as a day trip. About 16% of the sample minor league baseball teams are less than 100 (*Local*= 1) miles away from their MLB affiliate, with minimal variation between the levels. Another 14% are less than 250 miles and more than 100 miles (*Regional* = 1) from the MLB affiliate with 8%, 16% and 27% from levels A-AAA, respectively. To test the substitutability for minor league baseball and MLB based on different distances between minor league baseball and MLB clubs, these distance variables are interacted with the MLB fan cost index. These variables are named MLBcost*Local and *MLBcost*Regional, respectively.

To measure the quantity of the MLB team, the final variable of interest is MLB affiliate's per game attendance (MLB_attend).[10] This measure is in thousands of fans per game and over the period MLB teams averaged around 29 thousand fans per game. Like the cost measure, this variable is also interacted with the two distance variables to test the impacts of demand for a local MLB and a local minor league baseball team. A second model is presented where MLB_attend is replaced by the MLB affiliate's team winning percentage (MLBwin%). Given the strong link between wins and attendance, using wins may eliminate impacts of a new MLB stadium or other exogenous shocks to MLB attendance (e.g., weather, local economic factors, new MLB stadiums). With the above explained variables, we create a second regression equation that measures both minor league baseball and MLB affiliate

[10] A simple t-test shows that those minor league teams less than 100 miles away from their affiliate have statistically significantly higher MLB prices than those more than 250 miles away. A comparison of the 100-250 mile group is not statistically different from zero using a simple t-test.

impacts on minor league baseball per game attendance. Below, equation (3) shows the estimation equation that includes MLB data. The dependent variable of interest is attendance for minor league baseball team i in year t (*MiLB_ATT*) predicted using characteristics of the minor league baseball team as well as their related MLB affiliate. As in the first model both models are estimated using year fixed effects and separately for each of the three minor league baseball levels. We estimate a third model where MLBattend is replaced by MLB team winning percentage (MLBwin%).

$$(3)\quad MiLB\_ATT_{it} = \beta_0 + \beta_1 \text{Win\%} + \beta_2 \text{Homeruns} + \beta_3 \text{MLBcost} + \beta_4 \text{Local} + \beta_5 \text{Regional} + \beta_6 \text{MLBcost*Local} + \beta_7 \text{MLBcost*Regional} + \beta_8 \text{MLBattend} + \beta_9 \text{MLBattend*Local} + \beta_{10} \text{MLBattend*Regional} + \sum_{j=1}^{j=n} \delta_j \text{LeagueDummy}_j + \sum_{i=1992}^{2006} \alpha_i \text{Year}_t + \varepsilon_{it}$$

IV. Results

This section presents three sets of results for each of the three separate estimations by level (e.g., A, AA, and AAA). The three sets of results differ in that the first uses only minor league team characteristics, the second uses data from the MLB affiliate including MLB team attendance and the third replaces MLB attendance with MLB winning percentage. The minor league only results are shown in Table 2. We find that minor league team winning percentage at all levels and homeruns at AA and AAA are associated with increased attendance. This result is consistent with our hypothesis that minor league baseball fans are primarily fans of the game of baseball and are therefore likely to behave similar to MLB fans. The positive relationship between minor league baseball per game attendance and team winning percentage and homeruns is robust to inclusion of additional variables to control for MLB effects. Both of the final two specifications show that minor league baseball attendance increases with higher MLB costs, suggesting that the two goods are substitutes. For the lowest level, A, both MLB attendance and winning percentage negatively impact minor league attendance. However, the results

of the two specifications have opposite signs at the AAA level; MLB attendance is negatively related to minor league attendance and MLB winning percentage is positively related to minor league attendance. These results suggest that complementarities between MLB quality and minor league attendance may not exist or are weak and outweighed by other factors. Finally, we conclude with a series of F-tests in Table 5 that examine the impact of MLB costs and success on minor league baseball teams for teams that are local and regional to their MLB affiliate.

IV.A: Results with Minor League Variable Only

We begin with the discussion of the impact of minor league baseball independent variables only on attendance seen in Table 2. Similar to MLB, there appears to be a positive relationship between winning and attendance at all three minor league levels. A one standard deviation increase in winning percentage in each of the three levels would be associated with an increase of 150, 180, and 440 fans per game for each of the three levels, respectively. In percentage terms this would be a little over a 6%, 4%, and 7% increase for each of the levels, A-AAA respectively. For comparison purposes we note that Greenstein and Marcum (1981) find that win percentage alone accounts for a little over one-fourth of the variation in MLB attendance.

Next we turn to the relationship between homeruns and attendance. Each additional homerun brings 8.3 fans and 7.4 fans more per game at AA and AAA, respectively. Team homeruns have a standard deviation of about 26 and 31 for AA and AAA, respectively. This means that a one standard deviation increase in homeruns is associated with 215 and 240 more fans per game in AA and AAA, respectively. The coefficient on homeruns is not significant for the lowest level, A.

IV.B: Impact of MLB Cost

Tables 3 and 4 present the final two specifications that include a measure of the price of attending an MLB game and demand for MLB games. Before examining the MLB effects on their minor league baseball affiliate it is worth noting that the estimates of the effect of minor league baseball team characteristics such as winning percentage and homeruns are robust to the inclusion of additional MLB data and do not substantially change between the models.

The results suggest that at different levels and distances, MLB and minor league baseball teams are often substitutes. Both specifications show statistically significant positive relationships between MLB prices and minor league baseball attendance for all three levels (A-AAA). To examine the marginal impact of MLB cost on teams with 100 or 250 miles, we perform several F-tests of the sum of the MLB cost variable (MLBcost) and its interaction with the distance variables. These results are presented in Table 5. Beginning with the lowest level A, the impact of MLB cost is only seen by minor league teams within 100 miles of their MLB affiliate such as the Frederick Keys (BAL) and Modesto A's (OAK). As shown in Table 5 an F-test for teams within 100 miles in A (MLBcost + MLBcost*Local = 0) is significant at the 10% level in the first model and 1% in the second. For those teams over 100 miles the effect of MLB cost is not statistically significant for the A level. For A level teams within 100 miles of their affiliate a $1 real increase in the MLB affiliate's fan cost index is associated with about 40 additional fans per game for both models. A one standard deviation increase in price in real terms of MLB fan cost index (14.7) is associated with an increase of almost 600 fans per game. These effects are substantially larger than the increases due to minor league baseball team winning.

For AA, the impacts of MLB price are greatest for teams 100-250 miles from the MLB affiliate (Regional = 1). The estimated impact for those teams of an additional $1 increase in the real MLB fan cost index is 25 and 41 fans per game in the two models. This would mean a 1 standard deviation increase in MLB fan cost index would be associated with an increase in attendance of roughly between 360 and 600 fans per game. Additionally, in the second model for teams within 100 miles of their

affiliate, MLB price and attendance is significant at the 10% level and a $1 increase in MLB fan cost index is associated with 25 more fans per game. For AA teams within 100 miles of their MLB parent club like the Reading Phillies (PHL) and Bowie Baysox (BAL) an F-Test of (MLBcost + MLBcost*Local = 0) is significant at the 10% level in both models. For those teams like the Greenville Braves (ATL) and Wichita Wranglers (KCR) (MLBcost + MLBcost*Regional= 0) is significant at the 5% level in both models.

Distance between MLB affiliate and minor league baseball team does not play a factor in the impact of MLB prices on AAA teams. In both models the impacts are seen for all AAA teams not just those within 100 or 250 miles of the major league affiliate. In both models an additional $1 increase in the affiliates MLB fan cost index is associated with 25 more fans per game. There are two possible explanations to the lack of impact of distance. Teams at the AAA level are closer substitutes for MLB in general as the level of play at AAA is closer to MLB than any other level. Additionally, larger stadiums, crowds and amenities make attending a popular AAA team not that different than a sparsely attended MLB game. One possibility is that it is not the MLB affiliate, but general increases in MLB fan cost index that are not captured by year fixed effects. The second possibility is that price may be associated with MLB team quality. Higher quality teams might attract more fans, when star players are on rehab assignments often at the AAA level.

Finally, the results here provide information for modifying models of habit formation in the presence of close substitutes (see Winfree and Fort 2008 and Lee and Smith 2008). Note that a $1 real increase in the MLB affiliate's fan cost index pushes a similar number of fans to minor league baseball games at all levels. This suggests that MLB fans that are pushed into a close baseball substitute due to higher prices in MLB baseball are perhaps mainly fans of baseball and their loyalty is to the sport more than to the team. This supports Gifis and Sommers (2006) assertion that minor league baseball provides fans with a link to baseball's simple roots.

IV.C: Impact of MLB Successes

The final variables of interest to examine are the impacts of demand for MLB affiliate. Table 3 presents a model that includes MLB attendance as a predictor of minor league attendance. Table 4 replaces attendance with MLB winning percentage. Beginning with the lowest level A, for regional teams (within 100 or 250 miles of their MLB affiliate) an increased winning percentage for the MLB affiliate is associated with lower minor league attendance. For a one standard deviation increase in MLB winning percentage (.07) the associated drop in minor league attendance is around 200 and 500 fans per game for minor league baseball teams within 100 or 100-250 miles, respectively. An F-test of MLBwin% + MLBwin%*Local= 0 (significant at the 5% level and MLBwin% + MLBwin%*Regional (significant at the 1% level). The sign of the coefficients is the same for A level teams for MLB attendance, however the relationship is not statistically significant. One possible explanation is that MLB teams with low winning percentages for several years will obtain better minor league players through both the first year player draft and through trades. Highly touted prospects that have the potential to become MLB stars may increase A level attendance in the short run.

In the case of the AA level the relationship between MLB and minor league baseball attendance or wins shows positive and statistically significant coefficients for teams within 250 miles of the affiliates (Regional = 1). As shown in Table 5 both teams within 100 miles and 100-250 miles show positive and significant increases in minor league baseball attendance when MLB attendance increases. An F-test of MLBattend + MLBattend*Local =0 is significant at the 10% level, MLBattend + MLBattend*Regional =0 is significant at the 1% level.

Finally, we end with AAA, where the impacts of MLB performance are not as clear. In the first model higher MLB attendance is associated with lower minor league baseball attendance for teams within 100 miles (this is significant using an F-test at the 1% level). On the other hand MLB team winning percentage is used, it is positively associated with attendance using an F-test for both teams

within 100 miles and those within 100-250 miles (this result is significant using an F-test at the 1% level). One possible explanation is team MLB attendance may pick up other factors that win % does not. One possibility is that of the five AAA teams with an MLB affiliate within 100 miles three MLB teams built new stadiums during the sample period (Detroit, Colorado, and Seattle).

V. Conclusions

Fans of minor league baseball appear to respond to winning the same as fans of other sports—more winning leads to higher attendance. Our results are intuitive, but they contradict previous research and prevailing industry wisdom on the topic. We are confident that our results accurately portray fan behavior largely because we take advantage of a relatively long and complete data set that was, until recently, very difficult to assemble. Further, we observe a reasonable marginal effect on minor league baseball attendance when accounting for the cost, proximity and quality of the MLB affiliate.

We highlight a few observations from this research and offer some possible extensions of this research. First, fans of minor league baseball seem to behave in a predictable manner when treating them as fans of the game of baseball. When the cost of attending an MLB game increases, fans of all levels of minor league baseball respond by attending more minor league baseball games. Treating all levels of minor league baseball as a substitute of MLB is consistent with Gifis and Sommers' (2006) suggestion that minor league baseball fans have an interest in baseball's roots. They seem to be saying, in effect, that fans of minor league baseball are primarily fans of the game of baseball. To treat minor league baseball and MLB as substitutes then is consistent with this observation. Our results show this to be the case at A, AA and AAA level baseball so that minor league baseball executives should not discount the value of winning when developing marketing strategies to attract more fans.

Second, fans are more likely to follow the progress of star players at all levels of their development as interest in fantasy baseball leagues has increased. But even more, fans also seem to be subject to the familiarity bias that is well documented in the experimental economics literature. That is, all else equal, fans will tend to be more responsive to current media attention than more established trends and traditions. More media attention is likely placed on those top first year player draft picks that poor performing MLB affiliates sign. And because these players usually get their professional start with the A level team in the organization, higher attendance is likely to come immediately as fans want to see the highly touted player begin his career. This familiarity bias also appears to be at work at the AAA level as there is higher attendance for these teams when the MLB affiliate has more success. Because players on the AAA team may be on rehab assignment from the MLB affiliate or may soon be promoted to the MLB affiliate, there is likely more media attention surrounding their presence on the AAA team. With more success for the MLB team, any given player promoted from the AAA team then is more likely to be a part of a possible MLB playoff run. Future research may consider computing the effect of star players at the A, AA and AAA level of the organization.

Finally, because proximity to the MLB affiliate affects minor league baseball attendance, baseball executives would do well to not ignore this factor when considering any alterations in MLB affiliation. Maximizing organization revenues likely includes optimizing proximity to MLB affiliate for teams at each level of the organization. A future research agenda should include estimating more precisely the effect of proximity to MLB affiliate. Using actual distance to MLB affiliate instead of one of a few categories of proximity can provide useful information to baseball executives. Additionally examining the effect of a local or regional MLB non-affiliate on minor league baseball attendance, such as the Washington Nationals on the Frederick Keys, can also provide useful information if revenues are to be maximized.

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Figure 1: Minor League Baseball and MLB Per Game Attendance By Year.

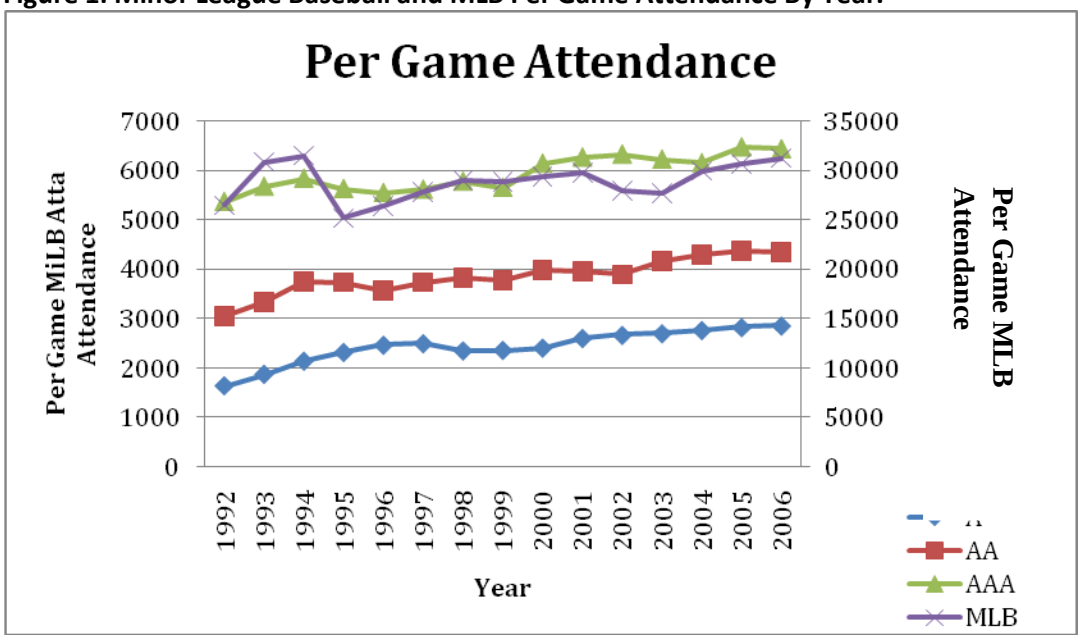

Table 1: Descriptive Statistics

	Mean	Standard Deviation	Min	Max
Minor League Baseball Team Per Game Home Attendance	3476.20	2213.55	234.77	15525.93
Minor League Team Winning Percentage	0.50	0.07	0.25	0.76
Minor League Team Homeruns	92.40	38.73	11.00	231.00
MLB Per Game Home Attendance in Thousands	28.88	9.25	7.94	56.09
MLB Fan Cost Index	126.58	35.44	72.30	287.84
Local = 1 if Distance to MLB team less than 100 miles	0.16	0.37	0.00	1.00
Regional= 1 if Distance to MLB team less than 250 miles more than 100 miles	0.14	0.35	0.00	1.00
Observations = 2076				

Table 2: Minor League Baseball Attendance with League and Year Fixed Effects

	A	AA	AAA
Win%	2083.838	2903.801	7019.718
	(567.105)**	(1187.918)*	(1648.191)**
Homeruns	-1.799	8.262	7.428
	(2.02)	(3.350)*	(3.750)*
Carolina League	571.055		
	(180.754)**		
Florida State League	-1280.586		
	(173.229)**		
Midwest League	644.575		
	(166.015)**		
Northwest League	601.105		
	(218.239)**		
New York Penn League	132.371		
	(215.82)		
South Atlantic League	-31.859		
	(161.63)		
Eastern League		244.859	
		(176.05)	
Southern League		-532.044	
		(179.277)**	
American Association			585.983
			(363.40)
Pacific Coast League			-964.149
			(205.941)**
Constant	1492.729	1635.941	1871.497
	(339.925)**	(602.636)**	(837.781)*
Observations	1215	432	436
Number of year	15	15	15
Standard errors in parentheses			

* significant at 5% level; ** significant at 1% level

Omitted League Dummies (A California League, AA Texas League, AAA International League)

Table 3: Minor League Baseball Attendance with MLB Cost and Attendance

	A	AA	AAA
Win%	1706.292	3203.361	7233.699
	(543.656)**	(1072.650)**	(1619.078)**
hrs	-0.704	6.056	6.846
	(1.94)	(3.071)*	(3.76)
MLBcost	-1.514	1.671	22.418
	(4.24)	(7.89)	(13.67)
Local	-1559.27	-907.891	2141.18
	(531.293)**	(1183.50)	(1467.92)
Regional	907.438	-4502.54	505.653
	(746.20)	(825.567)**	(1282.94)
MLBcost*Local	42.164	18.215	13.66
	(7.593)**	(16.65)	(17.08)
MLBcost*Regional	9.187	25.486	0.863
	(11.80)	(12.085)*	(20.65)
MLBattend	3.153	-9.283	23.098
	(5.75)	(10.28)	(16.49)
MLBattend*Local	-18.664	37.905	-113.055
	(12.92)	(19.87)	(31.959)**
MLBattend*Regional	-33.47	79.924	-5.296
	(22.32)	(25.755)**	(28.88)
Constant	2098.91	1907.639	-1328.16
	(379.392)**	(740.542)*	(1175.86)
Observations	1208	432	436
Number of year	15	15	15

Standard errors in parentheses

* significant at 5% level; ** significant at 1% level

Year Fixed Effects and League Dummies included, but omitted from the results

Table 4: Minor League Baseball Attendance with MLB Cost and MLB Wins

	A	AA	AAA
Win%	1700.51	3137.35	6143.95
	(538.605)**	(1079.596)**	(1615.386)**
hrs	-0.358	6.606	7.001
	(1.92)	(3.103)*	(3.72)
MLBcost	-0.428	-0.554	24.416
	(3.84)	(6.97)	(11.703)*
Local	-462.12	-2275.4	-5124.6
	(814.63)	(1596.10)	(1949.904)**
Regional	3779.25	-5039.1	-2599.7
	(1085.511)**	(1288.469)**	(1835.90)
MLBcost*Local	40.413	25.555	-13.114
	(6.851)**	(15.91)	(16.24)
MLBcost*Regional	5.853	41.846	-4.035
	(10.08)	(10.771)**	(17.71)
MLBwin%	63.775	-672.06	750.086
	(667.47)	(1175.40)	(1810.40)
MLBwin%*Local	-3035.5	4030.8	11907.6
	(1532.166)*	(2655.30)	(3753.107)**
MLBwin%*Regional	-7201.9	3133.42	6558.79
	(1886.222)**	(2527.90)	(3241.396)*
Constant	2068.31	2093.38	82.119
	(443.967)**	(890.409)*	(1333.70)
Observations	1208	432	436
Number of year	15	15	15
Standard errors in parentheses			
* and ** significant at 5% and 1%			
includes year and league fixed effects			

Table 5: F-test of Distance and MLB Variables

			F-Test MLBCost + MLBCost*Distance = 0		F-Test: MLBQuality + MLBQuality*Distance = 0	
Level	Distance (@)	Example Teams	Model 2 MLB Attend	Model 3 MLB Win%	Model 2 MLB Attend	Model 3 MLB Win%
A	Local	Fredrick Keys (BAL) Modesto A's (OAK)	+	+++	NS	- -
AA	Local	Reading Phillies (PHL) Bowie Baysox (BAL)	NS	+	+	NS
AAA	Local	Toledo Mudhens (DET) Tacoma Rainiers (SEA)	+++	NS	- - -	+++
A	Regional	PeoriaChiefs (CHC/STL) Pittsfield Mets (NYM)	NS	NS	NS	- - -
AA	Regional	Greenville Braves (ATL) Wichita Wranglers (KCR)	++	++	+++	NS
AAA	Regional	Buffalo Bison (CLE) Scranton/Wilkes (PHL)	NS	NS	NS	+++
+++, ++, + and - - - , - -, - (positive and negative significantly different from zero at 1%, 5%, and 10% level) and NS (not statistically significant)						
(@) Distance: Local = 1 if distance between MLB and minor team is than 100 miles or Regional =1 if between 100 and 250 miles						