

Attendance in the NY-Penn Baseball League: Effects of Performance, Demographics, and Promotions

**Rodney J. Paul, Kristin K. Paul,
Michael Toma, and Andrew Brennan***

ABSTRACT

A regression model is specified for the NY-Penn Baseball League which uses independent variables that consist of demographic, team performance, timing of the game, and promotional variables. Fans appear to treat the NY-Penn League like they would most sports and entertainment activities. The game itself is a normal good and higher population areas attract more fans. Consumers of these games respond favorably to teams that post high win percentages and attend games in greater numbers when popular promotions are offered. The greatest attendance gains due to promotions are shown to be from fireworks shows, concerts, events, and merchandise giveaways.

I. INTRODUCTION

The NY-Penn League is a minor league baseball league which plays a short season (June-Sept). The teams all have affiliations with a Major League Baseball team, which stocks their rosters with drafted players and free agents. These players are typically in the early stages of their career, often right out of high-school or college. In the year studied, 2006, the NY-Penn League consisted of three divisions (McNamara, Pinckney, and Stedler) and a total of 14 teams (Staten Island, Brooklyn, Aberdeen, Hudson Valley, Auburn, Mahoning Valley, State College, Batavia, Jamestown, Williamsport, Tri-City, Oneonta, Lowell, and Vermont).

The main question to be studied in this research is what attracts fans to NY-Penn League games? This is a rather low-level minor league that has teams located across a wide-range of demographics. There are teams located in small towns in Pennsylvania, New York, Maryland, and Vermont and also teams (Brooklyn and Staten Island) located within New York City. Many studies have attempted to determine what drives attendance in major league sports, but questions arise when these factors are put to the test for minor league attendance, especially for such a low-level minor league. What factors really put fans in the seats for these games? Do demographics of the towns/cities matter? Could minor league baseball be an inferior good? Does winning make a difference in the eyes of the

*Rodney J. Paul – St. Bonaventure University, St. Bonaventure, NY 14778, rpaul@sbu.edu, (716) 375-2145, (585) 223-4008; Kristin K. Paul – St. Bonaventure University; Michael Toma – Armstrong Atlantic State University; Andrew Brennan – St. Bonaventure University

fans? Is attendance all about promotions, marketing, and gimmicks? This research attempts to determine what factors influence attendance at a low-level minor league.

A regression model is specified using common factors found in attendance modeling. The data set is relatively rich, as it contains information on all promotions and events for each game for each of the fourteen teams. These promotions and events are translated into dummy variables to allow for an estimation of their impact on attendance. Fan preferences for the performance of the local team, the excitement of the games, and the promotions and events involved in the minor league baseball experience are studied.

Economists have studied fan (consumer) behavior in relation to baseball through a variety of models. Independent variables included in existing models of baseball attendance include population, income per capita, star players, and recent success (Noll, 1974), televised games, quality of the team, and availability of substitutes (Demmert, 1973), expected probabilities of winning a championship (Whitney, 1988), salary structure (Richards and Guell, 1998), turnover in team rosters (Kahane and Shmanske, 1997), and the impact of interleague play (Butler, 2002; Paul, Weinbach, Melvin, 2004).

Nearly all studies of baseball attendance have been conducted for teams at the Major League level. The few studies of minor league attendance include Siegfried and Eisenberg (1980); Branvold, Pan, and Gabert (1997); Bernthal and Graham (2003); and Lee, Ryder and Shin (2003). As compared to the above studies, this inquiry is most like that of Siegfried and Eisenberg (1980) with a focus on regression analysis of actual attendance data, rather than factor analysis of survey data (Lee, Ryder and Shin (2003); Bernthal and Graham (2003)). Both Siegfried and Eisenberg (1980) and Branvold, Pan, and Gabert (1997) study home *season* attendance data for a sample of minor league teams collectively ranging in quality from AAA to rookie leagues. Our analysis differs from these in that we focus on attendance data for *each home game* of the 2006 season for all teams in the NY-Penn League.

We further extend the analysis by focusing on the effects of promotions on game-by-game attendance in the NY-Penn League. Promotions have been considered in the baseball attendance literature almost since the seminal work on the topic in the 1970s. Siegfried and Eisenberg (1980), Hill, Madura and Zuber (1982), and Marcum and Greenstein (1985) represent early examples of attendance research that includes a binary characterization of promotions to indicate the presence of game-day specific price or non-price promotions. MacDonald and Rascher (2000) extended the analysis of promotions from what generally had been a binary characterization along the lines of major/minor promotions to include a continuous variable measuring the value of the promotional item. A more recent contribution by Boyd and Krehbiel (2003) extends the characterization of the promotion variables to include special events that contribute to the entertainment value of the game without being price or merchandise concessions.

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The paper proceeds as follows. Section II presents the regression model and the results of the model. Section III discusses the findings and concludes the paper.

II. A REGRESSION MODEL OF ATTENDANCE FOR THE NY-PENN BASEBALL LEAGUE

The data for this study was primarily obtained through the NY-Penn League website on www.minorleaguebaseball.com. The website has a link for each team with the season results that includes the date of the game, the game outcome, and the final score. Data on promotions were obtained from the website of each team, under their promotional schedule. Missing promotional dates were kindly provided by the teams themselves upon e-mail request of the authors. Data on other sources are noted in the variable descriptions below.

The regression model used in this research is a simple Ordinary Least Squares estimation with per game attendance as the dependent variable. Although the model is run in levels, the model was also specified in logs without a change in the significance levels of the independent variables. Therefore, for ease of discussion, the results are discussed in level form to explain the results in terms of the number of fans affected by each of the independent variables. Every game of the 2006 season for each team is included in the model. Very few of the games in the sample were sellouts, so therefore a restricted dependent variable model was not necessary as attendance did not suffer from capacity constraints. Ticket prices are set at the beginning of the season, presumably to maximize profits for the teams. Therefore, ticket prices are assumed to be endogenous within the model and are not included as an independent variable.

The independent variables fall into different categories. To begin, the model is specified using a lag of the dependent variable as an independent variable. Autocorrelation was a concern within the original model, but Durbin H-tests revealed that autocorrelation was not a problem after the inclusion of the lagged dependent variable. The lag is generated per team for the sample, with the first observation lag, per team, assumed to be the same as the first paid attendance of the season. This specification allows for the inclusion of the first observation for each team, but dropping this observation, per team, did not lead to a significant change in the independent variables. To account for the inclusion of this first observation per team, a dummy variable for opening day is also included in the model to allow for any increase in attendance associated with the first home game of the season.

The second category of independent variables is the demographic data of the cities/towns. These variables include population and income per capita. These data were found on www.city-data.com, which presents demographic data for cities and small towns across the United States. Population and income per capita are both expressed as their actual values reported in the demographic data and are not expressed as fractions of actual values. Both population and income per capita are expected to have positive effects on attendance as bigger cities have more potential customers and higher incomes should lead to fans attending more games, if NY-Penn League baseball is a normal good. Noll (1974) and Bruggink and Eaton (1996) found that income has a negative and significant impact

on major league attendance. Negative, but insignificant results were found in Coffin (1996). Demmert (1973) obtains positive, but insignificant results for income and major league attendance, while Seigfried and Eisenberg (1980) obtain a similar result for minor league attendance.

The next category of independent variables is related to the performance of the team itself. Win Percentage is calculated by taking the wins of the team and dividing it by the number of games played. This variable is calculated on a running basis per game and the win percentage going into the current game is used as the relevant observation for each data point of attendance. If fans prefer to see winning teams, this variable should have a positive and significant effect on attendance. Higher win percentages led to an increase in attendance for Major League Baseball (Hill, Madura and Zuber, 1982; Rascher, 1996; Bruggink and Eaton, 1996; MacDonald and Rascher, 2000; Coates and Harrison, 2005). Previous studies of minor league attendance find no relationship between team performance and attendance (Seigfried and Eisenberg, 1980; Branvold, Pan and Gabert, 1997; Bernthal and Graham, 2003).

Another aspect of the game that fans may prefer to see is high scoring. Teams that score many runs, or are typically involved in high-scoring games, may be more entertaining for fans to watch. Therefore, runs scored per game are included in the model as a proxy for excitement of the games themselves. Runs scored per game are calculated as a running average dividing the total runs scored by the number of games played. It should be noted that to win games, teams obviously need to score runs. Therefore, the interpretation of results is somewhat complicated by the multicollinearity that is likely to exist between runs scored per game and winning percentage. To account for this, an alternative regression specification is used where total runs scored per game, adding the runs scored per game and the runs allowed per game by the home team, is included as a proxy for expected excitement of the baseball game.

A third category of independent variables is the timing of the game, specifically, the day of the week and the month of the year. The opportunity cost of fans' time is very important and may vary significantly throughout the week depending upon work and other factors. Weeknights are typically more difficult draws for sports teams as most fans need to wake up early for work the next morning. The months of the year may matter in this sample, even though league games are played in the summer months. For example, August usually involves back-to-school activities that could keep fans away from the ballpark. These results have been explored before in Hill, Madura and Zuber (1982), Rascher (1996), and Bruggink and Eaton (1996).

The last category of independent variables addressed in this study is promotions. Promotions vary across teams and are arranged in many different ways. In looking at the lists of promotions for all of the teams, some fell into very neat categories, while others were a bit more difficult to label. In the end, we settled on the following categories, for which dummy variables were created to be used in the regression model: food, beer, merchandise giveaways, free or reduced-price tickets, fireworks, group

and family nights, concerts, and other events. Food promotions include either free food or reduced prices on typical baseball stadium fare like hot dogs. Beer promotions include either free beer or reduced prices on beer at the game. Merchandise giveaways include any item that was given to fans for attending the game such as caps, t-shirts, towels, bobble heads, trading cards, etc. There are likely differences between the quality of promotions, but attempts to distinguish between high-value and low-value promotional merchandise did not yield significantly different results. Therefore, a single variable for promotions was settled upon. Free or reduced-price tickets are self-explanatory. Fireworks signify post-game shows, typically on holidays or on weekend nights. Group and family nights are themed-nights or reduced-price nights for specific local groups (Boy Scouts, workplace, and churches) or for families. Concerts are pre- or post-game concerts that are included with the price of admission. The dummy variable “events” is included for all other activities that do not fit into one of the above categories, such as run-the-bases nights, special appearances, etc.

The regression results are shown below for both possible specifications of runs scored (the proxy for excitement of games). Due to a season worth of sellouts, the Lowell Spinners were dropped from the regression model due to lack of variation in their attendance figures. Initial regression results indicated problems with heteroskedasticity within the data, therefore, White’s heteroskedasticity-constant standard errors and co-variance adjustment is used in reporting the results. Coefficient estimates and their t-statistics are noted. *-notation is used to identify statistical significance at the 10 percent (*), 5 percent (**), and 1 percent (***) levels.

Table 1: NY-Penn Baseball League Attendance Model: 2006

Variable	(1) Dependent Var: Attendance	(2) Dependent Var: Attendance	(3) Dependent Var: Attendance
Constant	-1,250.72*** (-3.7795)	-1,157.69*** (-2.8122)	-1,437.97*** (-2.6239)
Attendance _{t-1}	0.6974*** (18.8642)	0.6966*** (18.6240)	0.6982*** (18.9362)
Opening Day	222.4955 (0.9396)	232.9409 (0.9159)	201.8380 (0.8298)
Population	0.0007*** (5.9472)	0.0007*** (5.8762)	0.0007*** (5.9755)
Income Per Capita	0.0395*** (4.3288)	0.0388*** (4.1151)	0.0404*** (4.2491)
Win Percentage	912.8515** (2.1551)	1,010.87* (1.7862)	914.0583** (2.1898)
Runs For		-24.9202 (-0.3150)	
Total Runs			17.4868 (0.4214)
July	54.9445 (0.2990)	45.3793 (0.2437)	66.1656 (0.3660)
August	87.1857 (0.4694)	79.4190 (0.4272)	96.5716 (0.5311)

September	-49.9861 (-0.2384)	-61.2615 (-0.2922)	-35.2155 (-0.1714)
Sunday	-4.0707 (-0.0248)	-2.0327 (-0.0123)	-7.6228 (-0.0460)
Monday	117.2747 (0.7319)	116.8939 (0.7295)	116.4671 (0.7255)
Tuesday	332.2263** (2.0896)	333.3990** (2.0843)	328.3192** (2.0629)
Thursday	500.5214*** (3.1649)	500.6314*** (3.1571)	497.0683*** (3.1314)
Friday	450.3165** (2.5193)	451.2175** (2.5210)	449.2823** (2.5067)
Saturday	58.3382 (0.2896)	57.6275 (0.2860)	56.5477 (0.2816)
Food	-8.5691 (-0.0324)	-14.8022 (-0.0557)	-3.3638 (-0.0127)
Beer	64.2971 (0.2655)	64.8723 (0.2669)	63.0988 (0.2610)
Merchandise	229.5607** (1.9797)	221.2610* (1.9352)	237.2754** (2.0476)
Fireworks	856.9910*** (5.3753)	845.0417*** (5.2635)	870.7227*** (5.3824)
Free Tickets	145.8076 (0.8525)	139.6261 (0.8161)	159.2970 (0.9180)
Group Nights	198.9388 (1.5268)	193.4272 (1.4827)	203.3272 (1.5414)
Concerts	652.8377* (1.6476)	654.3599* (1.6347)	656.5517* (1.6730)
Events	279.6452** (2.0052)	269.2264* (1.8974)	289.6061** (2.0487)
R-squared	0.7711	0.7711	0.7712
Adj. R-squared	0.7602	0.7598	0.7598

The intercept and the lag of attendance were found to be significant at the 1 percent level of significance. The opening day dummy was found to be positive, but not significant. This could be due to the way that the lag of attendance was specified for the first observation or opening day could simply not have as strong of an effect at a lower-level minor league.

The demographic variables took the expected signs and were found to be significant at a 1 percent level. Both population and income per capita were found to have positive effects on attendance. Larger cities/towns tend to attract more fans to the games. In addition, the NY-Penn League appears to be a normal good, even though it is a relatively low minor league, as higher income per capita cities/towns tend to have higher attendances. These results are in contrast with Demmert (1973) and Seigfried and Eisenberg (1980), which did not find significant results. It is also the opposite effect that has been found in some Major League Baseball studies (Noll, 1974; Bruggink and

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Eaton, 1996) as income per capita for the NY-Penn league was found to have a positive effect. This could be due to the wide range of income per capita across the teams in this 14-team league.

The team variables also revealed interesting results. First, the success of the team is an important determinant of attendance. Teams with higher win percentages tend to attract more fans. Depending upon the specification, an additional increase in win percentage by 0.100 leads to an increase of around 90-100 fans, which accounts for an approximate 3 percent increase in attendance. This supports previous findings in Major League Baseball (Hill, Madura, and Zuber, 1982; Rascher, 1996; Bruggink and Eaton, 1996; MacDonald and Rascher, 2000; Coates and Harrison, 2005), but contradicts the results found in previous minor league baseball studies (Seigfried and Eisenberg, 1980; Bravold, Pan, and Gabert, 1997; Bernthal and Graham, 2003). This could be because the preferences of minor league fans have changed in recent years, or it could be due to the structure of this study which analyzes game-by-game attendance, instead of aggregating. Runs scored, in either specification, were not found to be significant. Therefore, fans in the NY-Penn league respond to teams that win, but not necessarily to teams that score more often.

The months of the year were found to not be significantly different from each other. The games are played in the summer months and there does not appear to be significant differences between the months. The days of the week were found to have significant differences between them. The omitted dummy variable day was Wednesday. Compared to Wednesday, the dummy variables for Friday, Thursday, and Tuesday were found to be positive and significant. Somewhat surprisingly, Saturday and Sunday were not found to be significant. This could indicate that there are alternative entertainment possibilities in these cities/towns that are available on the weekend that may not be available to local residents during the week (perhaps outdoor activities that tend to take larger allotments of time such as hiking, swimming, biking, etc.).

The results for the promotional dummy variables revealed some expected and some unexpected results. Fireworks had the largest effect on attendance and were found to be significant at the 1 percent level. Games that were followed by post-game fireworks shows attracted around 850 more fans to the game, about 25 percent more than the average attendance per game. Events, such as special appearances by former players or celebrities, shows, or activities such as kids run the bases, led to more than 250 additional fans per game with the results significant at the 5 percent level. Merchandise giveaways were also found to have a positive and significant effect on attendance. Promotional giveaways led to around 220 more fans and were found to be significant at the 5 percent level. Post-game concerts were also found to have a positive and significant effect on attendance.

Food and beer-related promotions were not found to have a significant effect on attendance. Although beer is often considered to be an important component in a fan's decision to attend a game, fans did not turn out in significant numbers for reduced-price beer. It is likely that some fans do enjoy free or inexpensive beer at games, but this is countered by other fans. For example, reduced price or

free beer might cause families to not attend a baseball game. Reduced prices or free food also did not appeal enough to fans to have a significant impact.

Group-related promotions and free or reduced-price tickets were both found to have positive effects on attendance, but were not found to be significant. These promotional activities did not attract enough fans to have a noticeable effect on attendance. Fans may not be overly sensitive to price changes, as tickets are relatively inexpensive to begin with.

In summary of the regression results, it appears that NY-Penn fans respond favorably to winning teams and to certain promotions (fireworks, merchandise, events, and concerts). Demographic variables had the expected results as population and income per capita each had positive effects on attendance. The days of the week were also found to have some interesting effects as weekend days (Saturday and Sunday) were not as popular as expected, but days such as Tuesday, Thursday, and Friday had positive and significant increases in attendance.

III. CONCLUSIONS

The regression results for the NY-Penn League appear to correspond to what we typically believe the demand function for sporting events looks like. Fans will come to the ballpark to see teams that consistently win and they like the promotions that usually accompany a minor league game. The promotions that fans in the NY-Penn league were attracted to the most were fireworks, merchandise giveaways, events, and concerts. Other promotions, such as reduced prices on food, beer, or even the tickets themselves, do not appear to be as popular. Demographic variables appear to matter as areas with greater populations attract more fans and the NY-Penn League appears to be a normal good as higher income per capita areas also attract a greater number of paying customers. The most surprising result is that Saturday and Sunday games were not as popular as would be anticipated, as mid-week games seemed to fare better at the gate than in other leagues.

The most striking result of this research, to the authors, is that the NY-Penn league looks so much like what we envision a typical sports league to be. There does not appear to be the typical concerns that minor league baseball could be an inferior good, nor that winning games does not matter. Short season baseball fans in the NY-Penn league do respond to teams that are winning and the game itself appears to be a normal good. Promotions add extra value, either as a giveaway or some added event, and fans like these items and activities as well. It appears that the NY-Penn League could be modeled like any typical business that offers entertainment activities in the United States.

These results may or may not hold across different leagues of minor league baseball. There are likely to be regional differences, differences in leagues where teams are more or less geographically tied together, and at different levels of minor league play (AAA, AA, A, etc.). There appears to be advantages to studying leagues individually, instead of solely relying upon aggregated attendance, to decipher the similarities and differences that may exist across leagues. This will help researchers

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better understand the interests of consumers, and, perhaps more importantly, help teams in their quest to offer a better product and thereby maximize profits.

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